1.READING AND ANALYSIS OF MAPS

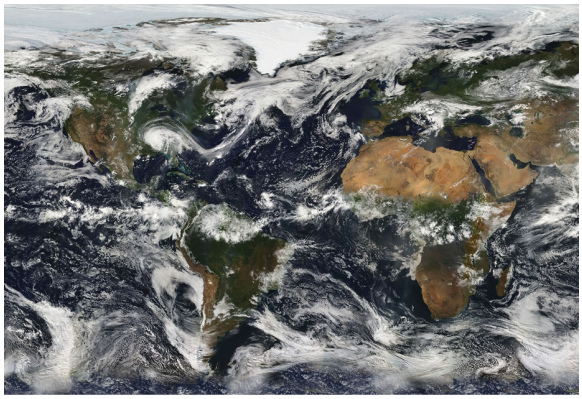
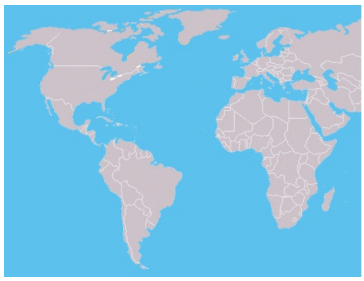


Fig 1.1: Photograph showing Africa, Europe and America

You may recall making maps in Class VI and learning about maps which show heights. By now you must have studied a large number of maps relating to different places. Can you say the difference between a map and a photograph of the same place taken from the sky? For example look at the photograph (Fig 1.1) and the map (Map 1) relating to the same place. Can you point out all the similarities and differences between the two?



Map 1: Map of Africa, Europe and America

A map, unlike a photograph does not show any real features. A map is used by geographers to show features that we consider important – for example: distribution of rainfall, soil types, population, languages spoken by people, crops grown, markets, schools etc. A map maker may also leave out many features visible on a photo, like individual houses, trees, etc. A map actually is a model of a place giving those features that the map maker considers to be of important. Photo may not be able to show you how much it rains in a place, or how hot it gets there or what languages people speak there – All these can be shown on a map. That is why people make different kinds of maps depending upon the purpose. You will now see some of the maps made in early times and how they depended upon the purpose.

Maps Down the Ages

Fig 1.2: Sumarian clay tablet

Maps have a long history behind them. Some of the earliest surviving maps were made by Sumerians (present day Iraq) about four thousand years ago. These were imprinted on clay tablets. The Sumerian temples owned large tracts of land and they had to keep account of income from the lands. That is why they tried to keep records of the lands with the help of maps.

Babylonians (also people of present day Iraq) made some of the earliest ‘world maps’; that is the world as they thought of it. See below one of the such map drawn on a clay tablet about 2600 years ago. They imagined the world as a round disc. The inner circle had all the cities (the small circles), villages, rivers, marshes and mountains they knew about. The city of Babylon was shown in the middle. Beyond the inner circle was ‘bitter river’ or salt water ocean in which there were seven triangular islands.

Fig 1.3: Babylonian clay tablet

Around the same time Greek geographers like Anaximander and Hecataeus of Miletus (now in Turkey) and Herodotus, also prepared world maps by arranging places from east to west and north to south. Their ideas were similar to the Babylonians who believed that the earth was a round disc surrounded by ocean water. They travelled widely and wrote down descriptions of the land and people and their histories they saw or heard about. They prepared maps based on these travels and descriptions. Though these maps have not survived, historians have tried to recreate them with the help of their descriptions.

Map 2: World after Hecataeus

As you can see they placed Greece in the middle of the map. They also divided the world into three continents: Europe, Libya (Africa) and Asia, all of which were separated by the Mediterranean sea
(Map 2). The Greeks and after them the Romans were greatly interested in making maps and knowing about places near and far. They wanted to conquer the world, build colonies in far off places and trade with them. You may have heard of Alexander, a Greek king who tried to conquer the whole world and came as far as India some 2300 years ago. Similarly, Roman traders had established trading stations on Indian coasts to which they came by ships. Maps became useful and necessary for them.

In order to help the sailors the maps also had to be accurate. The Greeks tried to make the maps accurate with the help of longitudes and latitudes. Let us see how this was done. They tried to find out a set of places where the midday occurred at the same time. They were joined with a line from the north to the south – this was the 'Meridian' (Noon line) or Longitude. They also tried to draw Latitudes by joining places which had equal length of shadow at noon. With the help of these two kinds of lines they drew a grid on the map and located all places from east to west and north to south along these lines. Preparing these lines accurately was not an easy task and it took about 2000 years to finally get correct longitudes and latitudes. But locating places on maps with the help of these two lines became very useful for travellers and sailors who could orient the direction of their travel to their destinations. The sailors in turn helped the map makers by telling them about the places they visited.

Ptolemy was one of the most famous geographers of the ancient world who prepared detailed maps of the world using these lines. However these maps were all lost a long time ago.

You may have noticed that most of these maps give more correct information of Europe and nearby countries. In fact they usually place Greece or Rome in the middle of the map. They also give more correct information about places visited by sailors and traders, on the coasts of various countries, but they did not know about the interior places. Thus on the map of Asia you can see India shown much smaller than Sri Lanka as the sailors were more familiar with it.

Map 3: Map by Al Idrisi

These books of Ptolemy were used by the Arab scholars and sailors to prepare maps. One famous Arab map maker was Al Idrisi who prepared a world map for his king in 1154. The map, with legends written in Arabic, while showing the Eurasian continent fully, shows only the northern part of the African continent and lacks details of the southern Africa and Southeast Asia.

There are many interesting things about this map. Firstly, it shows the south towards the top of the map and north towards the bottom

(map 3). It places Arabia prominently in the centre of the map.

- Can you guess why? Can you locate India and Sri Lanka (which was shown much bigger than it is)?

Around the same time the Chinese too were preparing maps as their emperors wanted to know about the villages and towns under their control. These maps showed China at the centre and Europe, half-way round the globe, depicted very small and horizontally compressed at the edge. Significantly, Africa was also mapped from an Indian Ocean perspective, showing the Cape of Good Hope area, which Europeans would not visit until much later. See the map of *Da Ming Hun Yi Tu*, painted on 17 sq. m. of silk in 1389 for the emperor of China.

Map 4: Map of Da Ming Hun Yi Tu of China (1389)

- Can you identify India, Arabia and Africa in Map 4?

Before they discovered the books of Ptolemy, European map makers were greatly influenced by religious ideas of the Bible and made maps of the world to represent those ideas. See below a map made around those times.

Map 5: Model of the world according to Bible

This really was a model of the world according to the Bible. It is surrounded by oceans, and is divided into three continents – Asia, Europe and Africa. Of these Asia was considered the largest and the most important as it had Jerusalem which was the birthplace of Jesus Christ. It is therefore also shown on the top. Europe and Africa are shown at the bottom and in a smaller size.

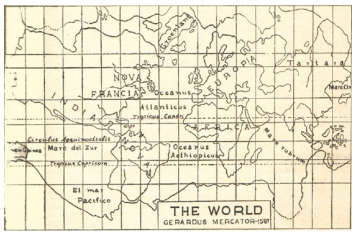
Around 1480s Europeans rediscovered Ptolemy's books (but not the maps) and were stunned to learn about his accurate description of location of places. They prepared new maps based on them. You can see one such map here.

Map 6: Map based on mathematical calculations prepared after reading the books of Ptolemy

Unlike the map shown above this is based on actual mathematical calculations of distances and directions.

During the 15th century, Ptolemy inspired a new enthusiasm in the non-Arabic world and some important schools – the Italian school, the French school, the English school, the German school grew up. Fortunately it happened to be an age of discovery and exploration which popularised map and its importance. The Arabs had blocked the trade route to India across the Mediterranean sea. West European traders (from Spain, Portugal, Holland and England) began to search for other routes to India. Thus Columbus went westwards and discovered America while Vasco da Gama went around Africa and reached India. All this also helped to prove that the Earth was not a flat disc but a sphere like a ball.

In the 16th century, Holland emerged as a major trading power. With the rise of Holland's maritime supremacy and trade, their map makers made major breakthrough in their work. The father of Dutch cartography was Gerardus Mercator (1512-94), who examined the previous works and did much original work on maps. Mercator's map projection is famously known Mercator Projection. Most of the world maps we use are based on his projection.



Map 7: World map by Gerardus Mercator in 16th century

Projection in a Map

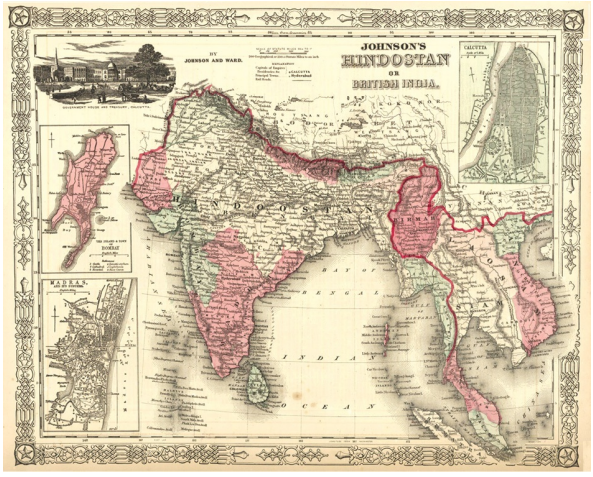
As you know the world is like a ball, but when we draw it on paper we cannot show the curvature and have to show it as flat. This inevitably causes some distortion – either the shape of the continents and the distances will get distorted or things will get placed in wrong directions. Sailors needed correct directions and shapes so that they could identify the landmarks. Mercator devised a method for showing the correct shapes and directions of continents but with distortion of sizes and distances. This method (called Mercator's projection) is still used to show the world.

- In what ways do you think the sailors influenced the making of maps in early times?
- Why do you think the map makers placed their own country in the middle of the map?

Colonisation, Explorations, Military use and Map making

When European powers colonised the entire continents like North and South Americas, Africa, Australia and Asia they needed to know about the places, their climate, crops, mineral resources and about the people living there. They sent scientific expeditions consisting of map makers and others to explore the different parts of the world and prepare maps. These teams fought their way into interiors of continents crossing mountains, deserts and rivers, fighting local people to get the necessary information. This information and the maps enabled the colonial powers to establish their rule over these areas and also exploit their resources.

When the British established their power in India, they began making detailed maps of the interiors of the country. They established a department called 'Survey of India' to survey the entire country and prepare maps. James Rennell was appointed the 'Surveyor General' and he prepared one of the first survey based maps of India. Look at the map of India (Map 8) created during the British period and compare it with a current map.



Map 8: An Early map of India

In 1802 William Lambton began one of the most important geographical surveys in the world starting from Chennai in the south and culminating in the Himalayas to determine the length of a longitude and also the heights of various places. This survey was completed by Sir George Everest. It is this survey which established that Mt Everest is the highest peak in the world (it was named after George Everest who measured its height for the first time using scientific methods). The survey began in Chennai because all heights are measured from the sea level.

Maps were also in great demand during times of war as armies and air forces needed them. Thus map making received great impetus during the first two World Wars. Many governments tried to keep such detailed maps secret so that enemies could not use them. However, in our own times the use of satellite imagery has transformed the nature of mapping. We not only have very accurate and detailed maps, but it is no longer possible for governments to keep them as secrets. This information is available to all people for study and use today.

- Do you think this free access to maps is a good thing? Why?
- Why do you think the colonial powers invested so much money to prepare detailed maps?
- Find out about the lives of some of the great explorers like David Living- stone, Stanley, Amundsen etc. Find out who sponsored their expeditions and why.

Use of Maps in our Times

As we saw above, maps were made and used for a variety of purposes: for trade, sailing, for conquests and colonising and for fighting wars. In our own times maps are used extensively for planning, development of countries. This requires planners to identify the problems faced by a region and its resources etc. This is done with the help of maps. For example we can make a map of regions which

have very little drinking water. We can compare this map with maps showing water resources – rainfall, groundwater and rivers. Based on this comparison we can decide what is the best way to make drinking water available to all the people of the region – by sinking tube wells, or building dams across streams or making tanks *(cheruvus)* or bringing water from distant places in large pipes. Similarly, we can plan agricultural development, setting up new industries, building roads, hospitals and schools with the help of maps.

Can you suggest how maps can be used to plan setting up new schools and colleges? What different kinds of maps would have to be studied for this?

Maps are also used by companies to plan their business work. For example, a mobile telephone company that wants to spread its network in an area will need maps of villages and towns and about hills and forests to set up microwave towers.

- If someone wants to choose an appropriate place to set up a hospital what kind of maps would be useful to her? Make a list.
- Why do you think maps are useful to armies in times of war?

Reading Thematic Maps

You saw above that maps do not just show the names of places and distances between them. They can also be used to show different kinds of information, like the nature of the terrain (hilly, rock, plain etc), economic activities of people, languages spoken, literacy etc. Usually a map focuses on only one aspect. Such maps are called 'Thematic Maps'. There are for example, Political Maps which give information about mandals, districts, states, countries, capitals etc. Some are Physical Maps which show mountains, rivers, plateaus etc. Some are 'Land Use Maps' which show how people use land. For example some parts of village lands may be used for pasture, for raising food crops, for raising cash crops like cotton, while some parts may be reserved for residence, schools, places of worship and shops. Some parts may even be kept as waste or fallow land or for water reservoirs. When we make a map to show the use of land in that village we have to use different kinds of symbols, colours and patterns to show each of these separately. Given below is the colour code used to represent the land cover and land use in maps.

Colour	**Land cover/ Land use**
Dark Green	Forest
Light Green	Grasslands
Brown	Land useful for agriculture
Yellow	(Topographical maps) Cropped area
Dark Grey	Mountains
Light Grey	Hills
Yellow	Plateaus & Swamps
Light Red	Wastelands
Light Blue	Tanks, Rivers, Canals, Wells etc.
Dark Blue	Seas and Oceans
White	Places where minerals are available
Black	Boundaries

In representation of various socio-economic aspects/ details we can use the technique of map patterns like points, symbols, lines etc. Quantitative data can be represented by dot method, circles, graphs, charts etc. In stipulated thematic maps shading can be used as pattern.

Make a Population Map!

For example, draw a sketch map of your school showing different class rooms; find out the number of students in each class and put one small line(|) for every five students of the class. This is your population map of your school! Remember to write in the key box how many students each line represents.

Population can also be shown on a map through shading. These are called population density maps. First we estimate the total number of people living in a place. Then we measure the total area of the place and then divide the number of people by the area of the place. For example if the area of a village is ten square kilometres and one thousand people live in it, the population density of the village is hundred per square kilometre. By using the same method we can find out the density of population of entire states. See the following table which gives the population density of different states of India.

Density of Population year - 2011 (Census - 2011)

state	density
Andhra Pradesh	308
Arunachal Pradesh	17
Assom	397
Bihar	1102
Chhattisgarh	189
Goa	394
Gujarat	308
Haryana	573
Himachal Pradesh	123
Jammu & Kashmir	56
Jharkhand	414
Karnataka	319
Kerala	859
Madhya Pradesh	236
Maharashtra	365
Manipur	122
Meghalaya	132
Mizoram	52

Nagaland	119
Odisha	269
Punjab	550
Rajasthan	201
Sikkim	86
Tamilnadu	555
Telangana	310
Tripura	350
Uttarakhand	189
Uttar Pradesh	828
West Bengal	1030

In the map below, colour the states according to the density of population as given in index:

Index

0 - 250

251 - 500

1000 above

501 - 750

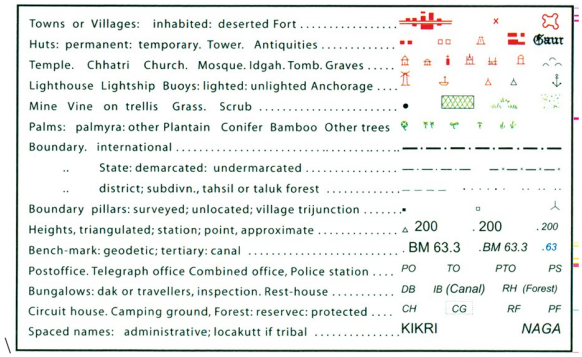
751 - 1000

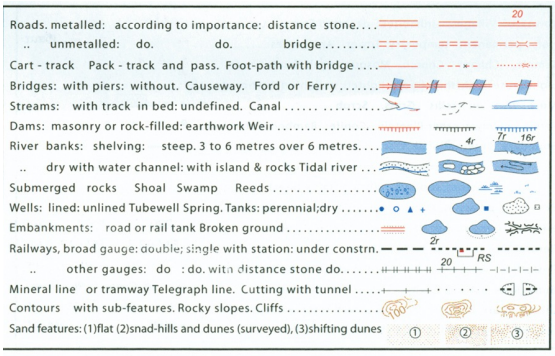
Lakshadweep

Map 9: India - Density of population

Conventional symbols on maps

While map makers usually use their own symbols, some symbols are used conventionally by most map makers. In India we usually follow the conventions used by the Survey of India. See for example the conventional symbols given below the 'Topo sheets' of Survey of India.





Representation of relief features on maps

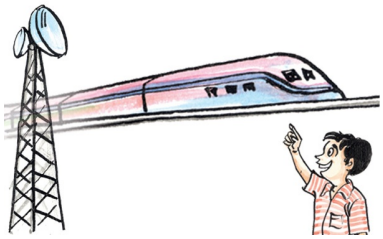


Fig 1.4: Thankfully they did not create symbols for these!

Relief feature means the high and low places on the surface of the earth. The main relief features are: hills, valleys, plateaus, plains, river basins, rocky and sandy places. Since the maps are flat we cannot show the heights on them. We therefore use a special symbol for this called contours or contour lines. You read about them in Class VII. Contours are lines on map joining places of same height – measured from the sea level. In other words all places on a contour line will have the same height from the sea level. Contour lines are also called isolines – lines joining places with some common features.*(Isopleth map)*

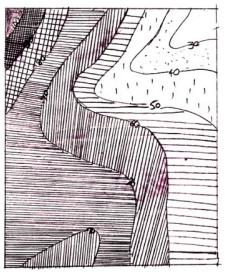
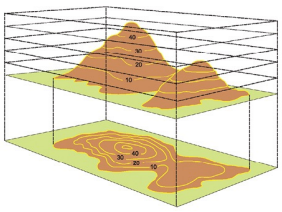


Fig 1.5: Map with intensity of patterns

Contour lines are usually drawn at fixed intervals of height such as 20 metres, 50 metres, or 100 metres. Uniform contour interval is maintained on a given map.



Contour Lines

Fig 1.6: Hills

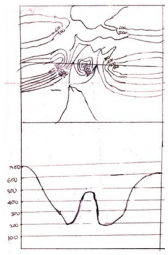


Fig 1.7: 'V ' shaped valley

Contour lines give an indication of the slope of the land as well as the elevation above sea level. Where contour lines are far apart, it represents a gentle slope, closer lines represent steep slope and uniformly spaced lines represent uniform slope.

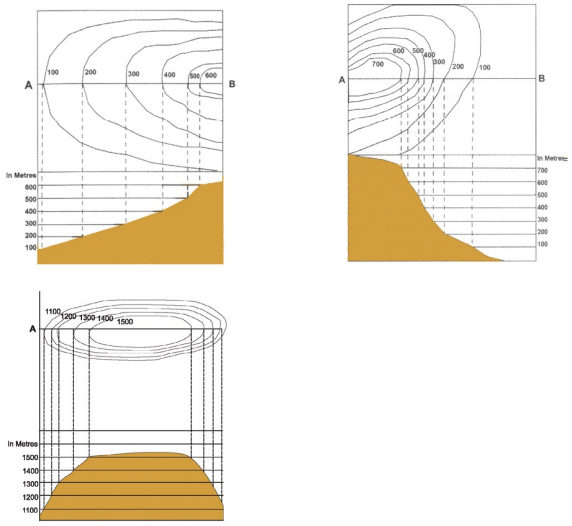
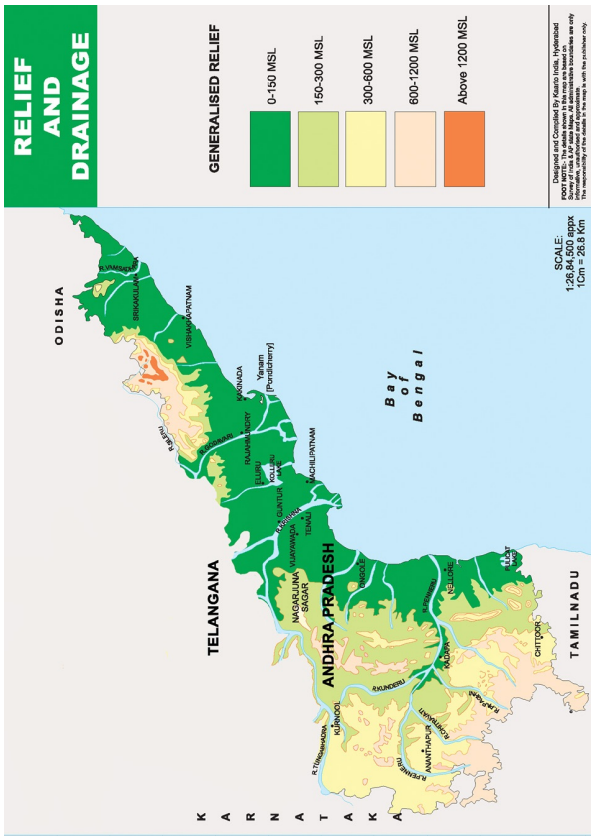


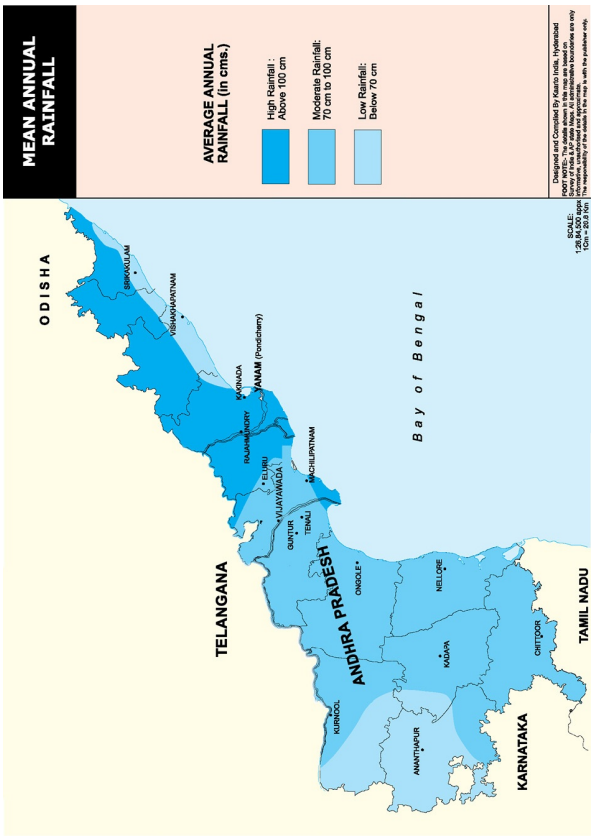
Fig 1.8: Gentle slope *Fig 1.9: Steep slope* *Fig 1.10: Plateau*

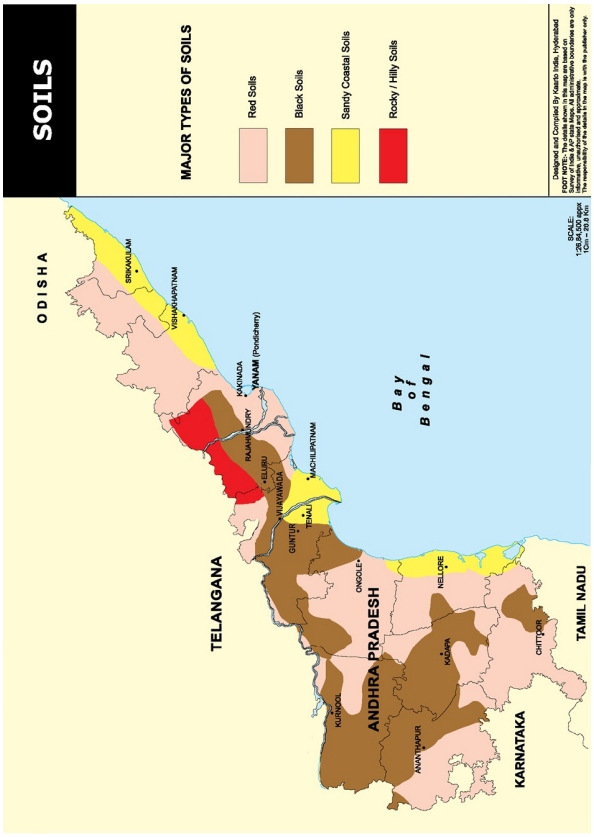
- In this book there are different Thematic maps i.e. Relief and Drainage (p.14), Mean Annual Rainfall (p.15), Soils (p.16), Forests (p.55) and Minerals (p.65). Now make a table to identify different information given for your district from the maps mentioned above.

Atlas

An atlas is a collection of maps – usually arranged according to different themes. Open the School Atlas and look at the list of all the maps shown in it. You can find out much useful information about different places and use it to imagine the life of people living there. Can you imagine the life of people living in Arunachal Pradesh based on the information on the same themes from the Atlas?







Key words

1. Projection 2. Symbols 3. Geographer

1. Study the School atlas carefully by looking at various thematic maps.AS_2
2. Do you think the use of maps has changed between the time of ancient Greeks and now? In what way is it similar and different? AS_1

In ancient Greece	**Now**
Similarities	
Differences	

3. Many people believe that making of maps by the Colonial powers was a more powerful tool for exploitation and control of the colonies than guns. Do you agree? Why? AS_1
4. In what ways were the maps prepared by the British different from the one made by Ptolemy or Idrisi? AS_5
5. Read the text of page number 8 about the "Use of maps in our times" and answer the following question:

What are the various purposes for which maps are used in our times? AS_1

6. Prepare a few questions to know about different types of maps. AS_5

2.Energy from the Sun

The Earth on which we live is full of diversity. We saw in the previous classes about some aspects of this diversity – oceans and continents, mountains, plateaus and plains on the continents, and regions of high and scanty rainfall. In this lesson we shall study about another important form of diversity – which we cannot see but only feel. This is diversity in temperature. You would have noticed that while it is cool in the morning it gets warmer during the day and gets cooler again in the night. Similarly, you may have noted that it is very hot in some months of the year and less hot in other months. This is variation of temperature in one place. Temperature also varies from place to place on the Earth. Some regions are warmer while some regions are so cold as they are covered by ice throughout the year. You have read about the Equatorial regions where it is warm throughout the year and later on you will read about Polar regions which are very cold.

Temperature difference between places also causes winds and rains. The amount of rain received at a place is to some extent determined by temperature differences between places.

Temperature and rainfall affect life in very critical ways. Plants and animals depend upon heat and water: only certain kinds of trees and plants will grow in hot regions, and some other kinds will grow in cold regions. Nothing grows in very cold regions. Thus we have variation in vegetation and animal life. In this chapter we will study about variation in temperature in different parts of the world.

- Have you been to places that have different climate than where you live? Describe it in the class.
- You know that the Sun is the source of heat on the Earth. But why do you think the heat varies from morning to night or from season to season and from place to place? We are listing some variations here. Try to think a reason for it and discuss in the class before you proceed to read this chapter.
    1. Cool in the early morning and warmer in the afternoon.
    2. Warm in summer and cool in winter.
    3. Cool on hill tops and warm in the plains.
    4. Warm in Equatorial region and cold in Polar region.

Solar Energy and Sun's Rays

Green Houses

Interestingly human societies have tried to grow crops everywhere by creating artificial environment for plants. Thus we grow vegetables and fruits in very cold regions by building green-houses. These buildings with transparent roofs and walls which allow heat to come in but not escape. We create marshy environments for crops like paddy by irrigating the fields.

Fig 2.1: Artificial environment for plants

The Sun is the principal source of energy on the Earth's surface. It is like a powerhouse which generates and gives out energy in the form of light and heat. This energy constantly emitted by the sun is known as solar radiation. When a body gives out energy it is called radiation. The energy produced by the Sun comes to us in the form of Sun's rays. Some aspects of this energy we can see and feel, like light and heat. However, we also receive many other forms of energy like UV rays, radio waves, x rays, from the sun which we can neither feel nor see.

The energy radiated by the Sun is more or less constant with very little variation throughout the year and year after year. Then what causes the change in temperature on the Earth?

The solar radiation received on the surface of the Earth is called 'insolation'. The actual amount of solar energy received on the ground level is only a small portion of what reaches the Earth's atmosphere. This is because about one third of the solar energy is reflected back (like a mirror reflecting light) by the Earth's atmosphere. Further some portion of the energy is scattered and absorbed in the higher reaches of the atmosphere. In fact some of the harmful rays of Sun like the UV rays don't reach the ground and this has made life possible on the Earth. Some amount of solar rays are also absorbed or reflected away by clouds and smoke or dust in the atmosphere. You would have noticed that on cloudy days it does not get very hot.

- Can you point out the difference between insolation and radiation?
- What will happen if the atmosphere gets more polluted with smoke and dust?

Sun's Rays and Earth's Surface

Even the rays that reach the ground do not heat the Earth's surface uniformly. This is because of the curved nature of the Earth's surface. Compare the two pictures given here to understand this.

You can see from the above that due to the curvature of Earth's surface, the same amount of solar energy falls on a smaller area on the Equator and on a larger area as we move north or south of it. Thus it will get warmer on the Equator than near the Poles.

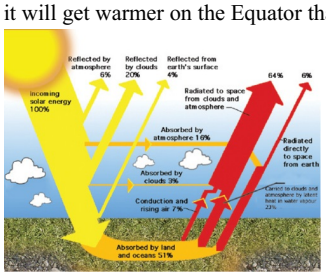


Fig 2.2: Insolation and terrestrial radiation

You can see that while the sun rays fall at about 90 degrees on the Equator, they fall slantingly towards the Poles. This is called the 'Angle of Incidence' or the angle at which the rays fall on the earth's surface. See the chart below to understand what difference the 'angle of incidence' makes for the amount of energy received on the surface.

If the insolation received at the Equator (0 degrees) is 100 units, then

At 45^0	(Northern Japan)	75 units are received
At 66 ½ ^{0}	(Polar Circle)	50 units are received
AT 90^0	North and South Poles)	40 units are received

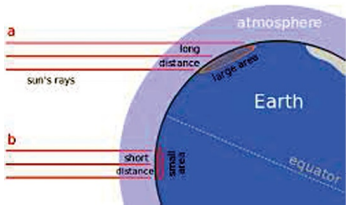


Fig 2.3: Angle of Incidence

- Where will the rays fall more slanting – in Japan or North Pole?
- Where will Sun's rays fall more intensively, in Andhra Pradesh or Rajasthan?
- If the Earth is flat and not curved then which will get more heat - Japan or Equator, or both equally?
- Look at the globe and say which countries will be hotter and which will be cooler?

Even though more intense sun rays fall on Equatorial region, it is usually cloudy there after midday and less sun rays fall on the ground. Hence Equatorial regions are not as warm as the regions immediately north or south of them.

But this is not all. As the Earth goes around the Sun in the course of the year the angles of incidence constantly change. Thus the angle of incidence increases in the north during the months of November, December and decreases in the months of May, June. We will look at this in detail in the next lesson.

Land and Water Contrasts

The temperature distribution over land and oceans is much different and varying. This will be very clear if you measure (record) temperature of places over continents and oceans. Land is considered as good conductor of heat, whereas water bodies are different. While land gets heated and cooled quickly, oceans will take time to heat and cool.

- Can you tell why there is difference in heating of land and water?

In the map (p.22) the regions marked in brown receive maximum heat while the regions shaded with blue get the least.

Heating of the Atmosphere

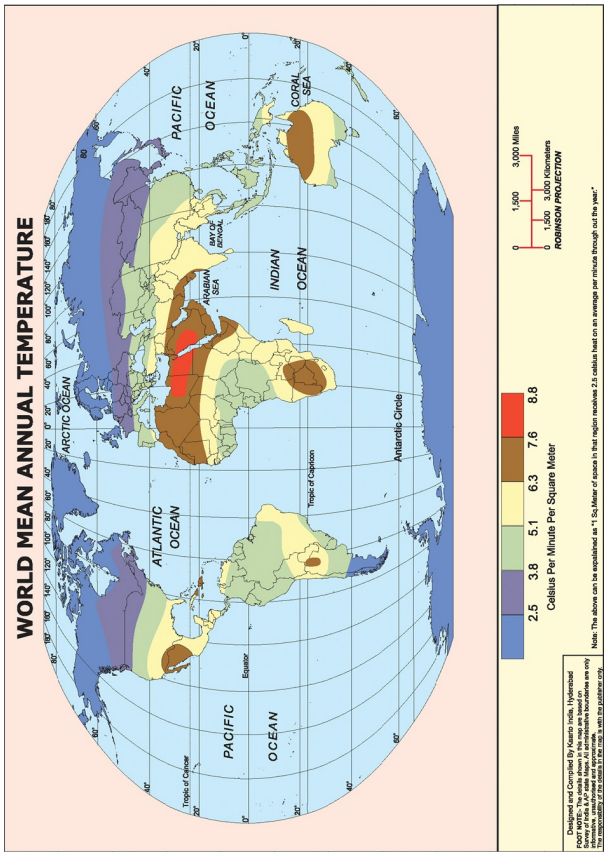
You may be surprised to know that the atmosphere or the air around us is not heated directly by the rays of the Sun. In fact it allows the rays to pass through without being heated by them. The Sun rays first heat the Earth's surface. This in turn begins to radiate heat which heats up the air around us. That is why it is warmer near the surface of the Earth compared to higher reaches of the atmosphere.

Heat Balance

The heat the earth receives from the Sun is radiated back by the earth in different ways. As we saw, about one third of it is immediately reflected back into the space. The rest heats up the earth surface which in turn heats the atmosphere and eventually is radiated into the space. This complete radiation of the heat received from the Sun is important. If the entire heat is not radiated back, then every day the amount of heat that remains will accumulate and it will become hotter and hotter. On the other hand if the earth received less heat than it gave out in radiation it would get cooler and cooler.

Did you observe absolutely flat land over a long stretch? Everywhere the land seems to be slightly undulating and sloping, resulting in variations in the amount of solar energy received on the land. Will it be more on flat land or sloping land? Will the two sides of a mountain front receive the same amount of sun rays? What may be the reasons?

Some gases like carbon dioxide prevent radiation of heat from the earth. Carbon dioxide in the atmosphere increases due to increased use of diesel and petrol, cutting down of forests etc. If the carbon dioxide proportion in the atmosphere increases then less heat will be radiated causing an increase in global temperatures. This results in what is called ‘Global Warming’.



The Temperature of Atmosphere

Bring a Celsius thermometer to the classroom. Note the temperature that the thermometer shows. This is the present temperature of air in your class.

- To get an idea of other temperatures, measure and note the temperature of the following things. Before you start measuring, guess the temperature of each one.

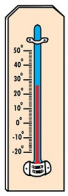
Thing	*Temperature, °C*	
	Guess	*Measurement*
Water in bucket		
Ice		
Glass of cold water		
Warm bath water		

- It is safer and advisable to use thermometers that have a scale of -10°C to 110°C. Using such a thermometer, also measure and note the temperature of boiling water and hot tea.

Measure the temperature for a week in different months throughout the year. You will be able to see the temperature differences that occur between the summer, winter, monsoon, and other seasons.

- For the next week, measure the air temperature each day at the same time and place (Remember to choose a place that is in the shade). Each day before you measure, write down your guess. Keep your record in a separate notebook.

Thermometer



Place _____
Time _____
Month _____

	Air Temperature, °C	
Date	*Guess*	*Measurement*

- Record the temperature every day for one week for few months.
- Calculate the weekly average temperatures.
- Discuss the variations between different weeks.

High and Low Temperatures

Scientists have recorded the highest and lowest temperatures reached on the earth. For example the highest temperature recorded is from a place called Azizia in Libya (Africa) where in July 1922 the temperature reached 57.8 degrees Centigrade! Likewise on a place, at Vostok Station in the Antarctica the temperature fell to -89.2 degrees Celsius in July 1983.

Do you know what it means for the temperature to be –5°C or –89°C? You already know that when water reaches a temperature around 100°C it starts boiling, and at about 0°C it freezes into ice. The minimum temperature below is –273.16°C. Temperature cannot go below this. When the temperature reaches below 0°C it is recorded in *–x* °C. Look at the number line below, you can see how + and – numbers are marked.

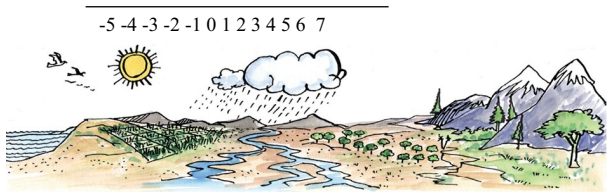


Fig 2.4: Factors influencing temperature

.

- Which temperature is greater: 5°C or -5°C?
- At which of these two temperatures will we feel colder?
- How many degrees difference is there between —5° and 5°?
- Write in short form each of the following temperatures:
  - 88 degrees below zero, Celsius
  - 38 degrees above freezing, Celsius
  - 32 degrees below freezing, Celsius
- Did you note the temperature in your classroom today? 88 degrees below zero Celsius is how many degrees lower than the temperature you measured?
- The temperature of a normal human body is 37°C. How much hotter than normal body temperature is 50°C?
- How much colder than the normal body temperature is –5°C?
- Arrange the following temperatures from the highest to the lowest: 12°C, –16°C, 29°C, 0°C, – 4°C.
- At which of the above temperatures will we feel hottest?
- At which of the above temperatures will we feel coldest?

Recording temperatures

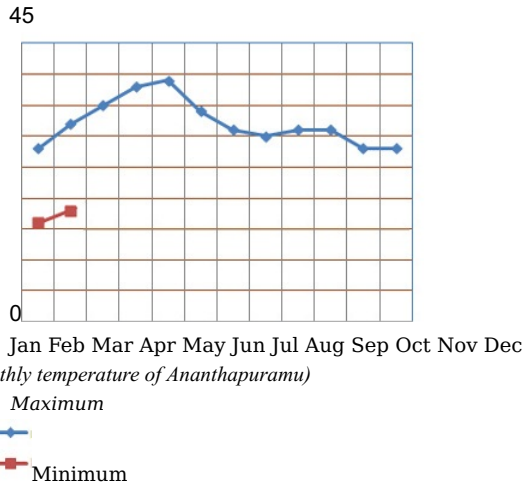
Note down the highest and the lowest temperatures of the day by using Six maximum-minimum thermometer. Remember you learnt in VII class how to record the temperature. At the end of the month note down all the maximum temperatures and calculate the average maximum temperature for the place (by adding up all the maximum temperatures and dividing the total by no.of days). In this way we can get the average maximum temperature and average minimum temperature for the month.

See below the average monthly temperatures of each month of Ananthapuramu.

Table 1: (Average monthly temperature of Atp.)

Month	*Maximum,°C*	*Minimum, °C*
Jan	30	17
Feb	33	19
Mar	37	22
Apr	39	26
May	39	26
Jun	35	25
Jul	33	24
Aug	33	24
Sep	33	23
Oct	32	23
Nov	30	20
Dec	29	18

Use the data in the Table 1 and plot the average minimum monthly temperatures for Ananthapuramu on the same graph paper in which the graph of maximum temperatures is drawn for your understanding. The first two months have already been done for you in the Graph 1.



Graph 1 (Average monthly temperature of Ananthapuramu)

Look at the data and the graph and answer the following questions about Ananthapuramu:

- How cold does it usually get in November in Ananthapuramu?
- Which month has the highest maximum temperature in Ananthapuramu?
- What is the difference between the highest maximum temperature and the lowest maximum temperature in the year?
- Which three months are the hottest in Ananthapuramu?
- Which three months are the coldest?
- What is the average maximum temperature in January in Ananthapuramu?
- From June through December, the average minimum monthly temperature keeps falling in Ananthapuramu. Does the average maximum monthly temperature also keep falling?
- What is the difference between the maximum and minimum temperature in May?
- What is the difference between the maximum and minimum temperature in August?
- Based on your answers to the above two questions, is there a larger difference between the maximum and minimum temperatures in the summer or in rainy season in Ananthapuramu?

Different Places have Different Temperatures

You know that different places have different temperatures. Do you know why they have different temperatures? There are many reasons. Now we'll take a look at some of the possible reasons.

Places that are near the sea and far away from the sea usually have different temperatures.

Temperatures differ on the top of a mountain and at its foot. And you already know that temperature changes as we go north or south from the Equator.

Places Near and Far from the Sea have Different Temperatures

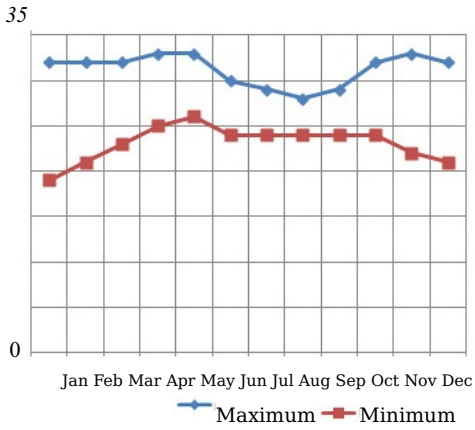
We have already seen the average temperatures of Ananthapuramu. Ananthapuramu is far away from the sea. Now let's look at the temperatures of a city that lies next to the sea: Visakhapatnam.

Table 2: (Average monthly temp. of Visakhapatnam)

Month	*Maximum,°C*	*Minimum, °C*
Jan	32	19
Feb	32	21
Mar	32	23
Apr	33	25
May	33	26
Jun	30	24
Jul	29	24
Aug	28	24
Sep	29	24
Oct	32	24
Nov	33	22
Dec	32	21

The average of maximum and minimum monthly temperatures are plotted on the Graph 2

Graph 2 (Average monthly temperature of Visakhapatnam)



- Which month has the lowest minimum temperature in Visakhapatnam? How much is it?
- Which is the hottest month in Visakhapatnam? How much was the average maximum temperature for that month?
- Compare the temperatures of Ananthapuramu and Visakhapatnam to answer the following:

In January, which place is colder?

In June, which place is hotter?

In which place, Ananthapuramu or Visakhapatnam, does the temperature remain more or less the same throughout the year?

Moderate and Extreme Climates

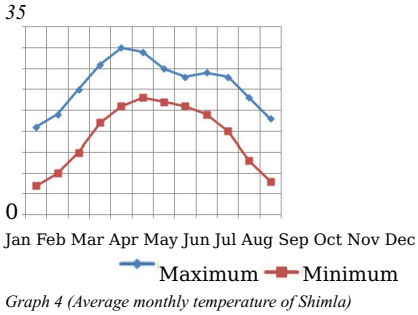
Why does the temperature in Visakhapatnam not change much throughout the year? Because it is on the seashore! It's difficult for the sun to heat up or cool down the sea. Since the sea doesn't get too hot or cold, the air above the sea also doesn't get too hot or cold. Therefore places near the sea usually have temperatures that remain fairly constant throughout the year. They have what is known as a moderate climate.

In contrast to this, Ananthapuramu is far away from the sea. There is no moderating influence of the sea in Ananthapuramu. In the summers the ground temperature rises very high and this heats up the air. In winters the ground temperature falls and the air is also cold. This is called an extreme climate (that is, one with great differences between maximum and minimum temperatures).

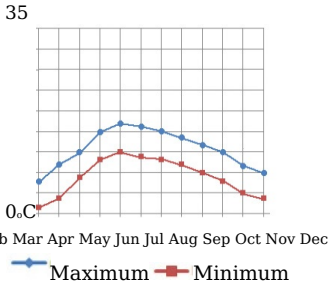
Height and Temperature

At the peak of summer some people go from the plains to hilly places such as Ooty or Shimla to avoid the heat. Even in the summer months the temperatures are low on high hills. The highest parts of a mountain generally have the lowest temperatures. Temperature decreases with elevation (height).

Graph 3 (Average monthly temperature of Delhi)



Graph 4 (Average monthly temperature of Shimla)



Look at the graphs showing the average monthly temperatures of Delhi and Shimla. You can see quite clearly that in each month of the year the temperature of Shimla is far lower than that of Delhi.

Delhi is at an elevation (height) of about 200 metres above sea level, while Shimla is at an elevation of about 2200 metres above sea level. Usually, for every 1000 meters increase in elevation, the temperature falls by about 6°C. Due to cooler temperatures, different kinds of plants grow on high hills and mountains.

Inversion of temperature

Sometimes, especially in mornings of winters, cool temperatures are found near the ground. You can see dew drops on the grass due to condensation. The cooler temperatures near the ground level are due to less amount of insolation received due to the shorter days and excessive radiation due to the longer nights. This is known as inversion.

- Can you think of any other reason for this state of temperature?
- What will happen if the inversion occurs?
- How many meters higher than Delhi is Shimla?
- Based on the difference in elevation, calculate the likely difference in temperature between the two places.
- Which month has the highest maximum temperature in Shimla? How much is it?
- Which month has the highest maximum temperature in Delhi? How much is it?
- In September the average maximum temperature in Shimla is _____°C while in Delhi it is _____°C.
- Which is colder: Delhi in January or Shimla in July?

Temperatures in Places Near and Far from the Equator

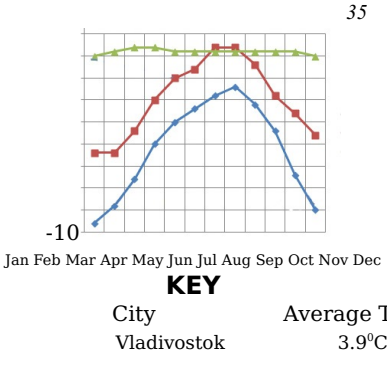
In Class VII we studied about Nigeria, which is situated on the Equator. We also studied about France which is more to the north. This year we will study about Arctic tundra, which is even farther north. We know that equatorial regions like Indonesia are quite hot throughout the year and they have no winter. As we go north or south from the equator it becomes colder, and there are separate summer and winter seasons. A look at the temperatures of places near and far from the equator will illustrate this clearly.

Find out the locations of Singapore, Shanghai and Vladivostok on the above picture

Graph 5 has the average maximum temperatures of three places: Singapore, Shanghai, and Vladivostok. In the last column of the Key, the average temperature for the whole year is shown. This is calculated by adding up all the maximum and minimum temperature readings for every month and then dividing by the total number of readings. Thus, we get to know the average temperature on an average day in the year. We might use this number to answer a question like, “Is Singapore, on average, warmer than Shanghai?”

Places near the Equator usually get more heat. Places farther away from the Equator often have lower average temperatures for the year.

Graph 5 Average maximum monthly temp. of Singapore, Shanghai, Vladivostak



KEY

City	Average Temp for the year
Vladivostok	3.9^{0}C

Shanghai 15.3^0
Singapore 27.8^{0}C

- Which of the three places shown in the graph is located near to the Equator?
- What is the average yearly temperature in that place?
- Does it usually get much warmer in the summer than in the winter there?
- Is summer in Vladivostok warmer than the winter in Singapore?
- Does it usually get warmer in July in Singapore or in Shanghai?
- Which of the three places on the graph has the most extreme climate?
- What is the warmest month in Shanghai?
- What is the average yearly temperature there?
- Which month has the lowest average maximum temperature in this place?

Temperature maps

India is a vast, sprawling country and the temperature varies in its different regions. If we want to find out which places are hotter and which are colder, we can use a temperature map.

Look in your Atlas to find the map of India that shows the average (mean) temperatures in January.

This average temperature is the average of the maximum and minimum temperatures for that month. In this map India has been divided into different sections, each marked with a different colour. By referring to the key you can find out the average temperature in January in each of these sections.

- Use the maps in your Atlas to find out the latitude and the average temperature in January of each of the following places: The first one has already been done for you.

Place	*Lat.*	*Temp. in January*
Vijayawada,A.P.	17° N	between 20 and 22.5°C
Agra, U.P.		
Madurai, T.N		
Nagpur, MH		

According to this map, there is no place in India that has an average January temperature higher than 30°C. (Remember, this is the average. There may be some January days in some places that do get hotter than 30°C.)

Look at the map and find out which parts of India usually have the highest average temperature (in January).

If you look north from this place on the map, is the average January temperature higher or lower?

Why is the North Cooler in winter?

Look at the following table. It shows sunrise and sunset in different cities in India on 10th January. Answer the questions below:

Place	*Sunrise*	*Sunset*
Hyderabad, A.P.	6:49	5:58
Agra, U.P.	7:09	5:42
Madurai, T.N.	6:37	6:12
Nagpur, MH	6:53	5:48
Visakhapatnam, A.P.	6:29	5:38
Kohima, Nagaland	6:02	4:40

- In which of these six cities does the sun rise first?
- In which of these cities does the sun set last?
- How long is the daytime in each of the six cities? (The daytime is the number of hours between sunrise and sunset.)
- Do the cities that are farther north have longer or shorter daytimes than the cities to the south?
- Based on your answers to the above questions, can you think of one reason why the north of India remains cooler than the south in winter?

Key words

1. Atmosphere
2. Equatorial regions
3. Condensation
4. Solar Radiation
5. Insolation

6. Angle of Incidence
7. Heat Balance
8. Maximum Temperature
9. Minimum Temperature
10. Tempe1rature Inversion
11. Global Warming

1. Correct the false statements – AS_1

a) If a place is closer to sea, irrespective of its distance from equator, it will always be cooler.

b) As you go up higher from the earth, it becomes warmer because sun is closer to you.

c) Sun heats the air first and then the earth.

d) Global warming is related to oxygen.

2. What's the difference between the highest temperature in Table 2 and the lowest temperature in Table 1? AS_3

3. Suppose, the temperature in Moscow was –8°C at 10 AM on 6 December. Twenty-four hours later it was 12°C higher. What was the temperature at 10 AM on 7 December? AS_5

4. Delhi and Mumbai are both situated on plains and their height above sea level is less than 300 meters. Why is there so much difference in their monthly average temperatures? In which months are the average temperatures in these two cities most similar? Can you explain? AS_1

5. Given below are the average monthly minimum and maximum temperatures of Jodhpur. Make a line graph of them. Which are the hottest and coldest months of the year? AS_3

Table: Average Monthly Maximum Temperatures in Jodhpur, Rajasthan (°C)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum	9	12	17	22	27	29	27	25	24	20	14	11
Maximum	25	28	33	38	42	40	36	33	35	36	31	27

6. Given here are the average maximum temperatures of three places: A, B, and C. Make graphs of them. What can you guess about each place by looking at the Table and graphs? AS_3

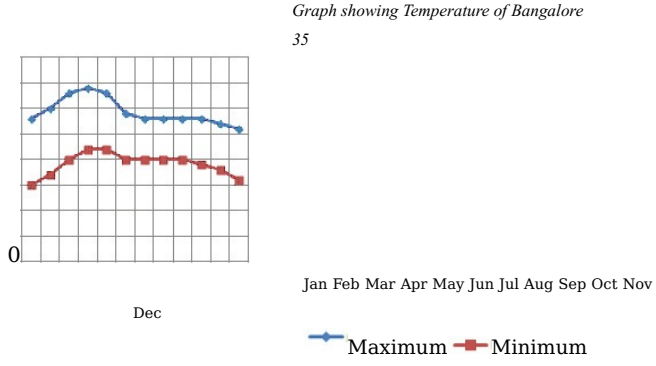
Place	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
A	23	26	33	38	41	39	34	33	33	33	29	25
B	-3	1	6	12	17	21	25	24	21	14	8	2
C	31	32	33	32	32	29	29	29	30	30	30	31

7. Give three possible explanations for the differences between the average temperatures in Thiruvananthapuram and Shimla in January (refer to your Atlas). AS_3

8. Between Bhopal, Delhi, Mumbai and Shimla, which two places show a similar temperature pattern? How can you explain the similarity between these two places? AS_1

9. Look at the graph of Minimum-Maximum temperature on the right and answer the questions below: AS_3

Graph showing Temperature of Bangalore



a) What is the average highest temperature in July?

b) How warm does it usually get in December?

c) How cool does it usually get in June?

d) Is there a bigger difference between night and day temp. in May or in August?

e) When is summer?

10. Nithin says thermal power is better to use, but Padmaja says that Solar Energy is better. Which of them do you support? Why? AS_4
11. Read the para under the title "Height and Temperature" of page no. 27 and comment on it. AS_2

3.Earth Movements and Seasons

Changing Seasons

Human beings live along with a large community of plants and animals. We can observe constant change in the course of the year - the flowering and fruiting of trees and plants changes in the animal activity in our surroundings. As months pass by you would have noticed that trees shed leaves, stand bare, new shoots come forth, they flower and fruit. You may have also noticed that in different times of the year you get different kinds of vegetables and fruits. In some months it is very hot and in some it is cold or wet.

- Can you relate what are the major seasons you have seen?
- Can you describe what happens in each – how hot it gets, how much it rains, what happens to the plants and trees and animals, what food you get to eat etc.
- Find out if there is anyone in the class who has lived in distant places where the seasons are different. Get them to describe what happens there.

Observe the picture given below carefully (Fig 3.1).

Fig 3.1: A tree in Lancaster USA in four seasons

- Do you think the trees observed in the pictures are same or different?
- What are the changes you can see in the trees?

In the first picture you can see that the tree and its surroundings are covered by snow (a kind of soft ice). In the third picture you can see the same tree sprouting leaves (there is no snow). In the second picture the same tree has fully grown leaves. In the last picture ripe red leaves are falling from the same tree. Do you know why these changes are occurring? Yes that's right, seasons.

Have you ever seen your surroundings covered by snow? You may have seen it flooded by water during rains but never snow. Some parts of the earth get so cold during some months that they get snowfall instead. This picture is of Ohio in USA. It snows heavily in the Northern countries during winter; in summer months it is not so cold but still much cooler than in our state. However, the funny thing is that in those countries the day is much longer in summer – so much so that you can see the Sun even at midnight!

Find out which country is called the 'land of midnight Sun' and locate it on the globe. Find out its latitude and compare it with the latitude of Andhra Pradesh.

Locate Australia, South Africa and Chile on the globe. These are also called the countries of the Southern Continents, that is continents that are South of the Equator. In these countries the cycle of seasons is different. They have winter when we have summer and when we have winter they have summer! In fact this is the pattern in all places in the south of the Equator.

- Look at the globe and find out the names of countries which are south of equator.

Asia : .....

Africa : .....

Europe : .....

North America : .....

South America :.....

Australia : .....

- Did you find any continent which is entirely to the North of the Equator?
- Did you find any continent which is entirely to the South of the Equator?
- Did you find any continent which is spread both to the North and South of the Equator?
- Can all students of the class write down three questions regarding this magic of seasons? We will try to find answers for them.

You are not the only ones with such questions. For thousands of years human beings have been curious about these matters and over time have worked out the answers. Let us try to understand why seasons happen, why we have some parts that are warm and some cold and why are the seasons opposed in the Northern and Southern hemispheres.

To understand these we have to understand the complex interaction between several factors. These are:

1) The spherical shape of the Earth and the curvature of its surface.
2) Daily rotation of the Earth on its own Axis.
3) The tilt of the Axis of rotation compared to the plane on which the Earth moves.
4) The Earth's movement around the Sun once a year (revolution).

1. Curvature of the Earth

You have already studied the impact of the spherical shape of the Earth and how this causes different distribution of heat over the Earth's surface, how the region around the Equator becomes warmer than those near the Poles.

2. Earth's Rotation on its Axis

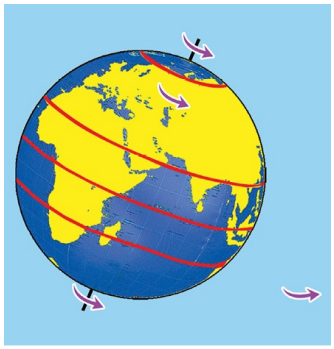
The Earth rotates or goes around just like a 'top' spins. What does it go around? It actually rotates around an imaginary line which joins the North Pole and the South Pole. This line is called the Axis of the Earth's rotation. All parts of the earth go around this line once a day. In other words the Earth takes about 24 hours to rotate or go around its own axis. It moves from the west to the east – if a globe is facing you it rotates from your left to the right side. You can see the Western portion moves towards the east.

When the Earth rotates, the air around us, the clouds and the birds move along with the Earth. That is why we don't feel the movement in the manner when we travel on a train or bus.

This is the reason why the Sun, the Moon and the stars appear to rise in the east and set in the west. This is, of course, an illusion created by the eastward spin of Earth.

The first and foremost effect of earth's rotation is the daily alternation of day and night, as portions of Earth's surface are turned first toward and then away from the Sun. This variation in the exposure to sunlight greatly influences local temperature and wind movements.

Fig 3.2: Rotation of the earth from west to east



Activity :

Take a globe and focus a torch light on it from a small distance. The torch illuminates one half of the globe. If you rotate the globe in front of the light, then also only half the circumference of the globe is illuminated.

Similarly, the Sun illuminates one-half of the earth at any given movement. The edge of the sun-lit hemisphere, called the circle of illumination, is a great circle that divides earth between a light half and a dark half.

What would happen if the earth did not rotate on its own axis? Then one portion of the earth which is in front of the Sun would constantly get Sun's heat and light and the other portion would remain cold and dark. This would make both portions unfit for life - the bright half would be too hot and the dark half would be too cold. Thus

rotation helps the entire earth to get heat and light on a daily basis.

3. Earth's 'Tilt' and Revolution Around the Sun

The earth revolves round the Sun while rotating round its own axis. That is, it spins like a top and at the same time keeps moving forward around the Sun. The motion of the earth round the Sun is called 'revolution'. Each revolution takes about 365 days and 5.56 hours. This is the length of a year on the Earth. How does this cause the formation of seasons on the Earth?

Had the Earth just gone around the Sun – it would have meant that all places would have had the same season throughout the year. The portions that get more sunshine would keep getting it throughout the year in the same way and the vice-versa. But this is not so because the Axis of Earth's rotation is inclined (slanting) and points in the same direction throughout the year. What do we mean by 'inclined axis'?

The earth goes around the Sun – on a regular path (also called Orbit) on a level plane in open space. This is called the Orbital Plane. The earth's axis of rotation does not stand vertical (that is forming a 90^0 angle) on this plane but is tilted on it so as to form a 66.5^0 angle. In other words it is tilted by 23.5^0 (90^0-66.5^0= 23.5^0). To understand this idea, look at the following pictures.

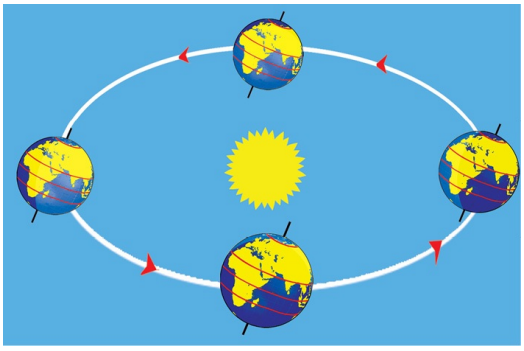


Fig 3.3: Seasons in the North and South hemisphere

Actually if we see the Earth from the sky, we will not be able to see any tilt or axis. It will appear just as the Moon or Sun appears to us – a round disc. The 'tilt' is the tilt of an imaginary line – the axis, and therefore can't be seen visually.

As earth revolves around the Sun, Earth's axis remains tilted in the same direction throughout the year. It keeps pointing to the Pole star (which can be seen in the Northern sky in the night) and this is called the Polarity of Axis.

In the pictures you can see what happens when the Earth goes around the Sun in this manner. During some months (June) the Northern Hemisphere is tilted towards the Sun while in some months the Southern Hemisphere faces the Sun. As a result when the Northern Hemisphere has summer, Southern Hemisphere has its winter. When six months later (December) the position changes, Northern Hemisphere has winter and Southern Hemisphere has summer. You can also see that in some months like March and September it is the Equator which faces the Sun directly and both the Northern and Southern Hemispheres get similar amount of energy from the Sun.

Fig 3.4: A view of the earth from the Moon

- Imagine that the Earth goes around the Sun but its axis is not tilted. How will it affect the change in seasons in Andhra Pradesh? How will it affect the change in seasons in the northern region whose photograph you saw in the beginning of the chapter?

Temperature Belts on the Earth

Let us see how this effect of the tilt of the Axis combines with the spherical shape of the Earth to influence distribution of solar heat over the Earth. We saw earlier that when the solar rays strike the Earth's surface, they fall straight in portions which face the Sun directly and fall at an angle as you move away from that portion.

The angle keeps increasing as we move towards the two Poles. As a result it is hotter in the areas which face the Sun directly and less hot in the areas that receive the Sun rays at an angle.

As a result of the tilt of the axis the area which faces the Sun directly keeps shifting throughout the year. In March the Sun shines directly over the Equator, while in June it shines directly over the Tropic of Cancer in the Northern Hemisphere. Then in September as the Earth travels further around the Sun, the Sun shines directly over the Equator. In December it shines over Tropic of Capricorn in the Southern Hemisphere.

Thus you can see that there is a belt within which the direct rays of the Sun fall at some time of the year or the other. This belt extending from the Tropic of Cancer to the Tropic of Capricorn is called the Tropical Belt. This belt gets the maximum heat energy from the Sun.

June 21	– Sun on the Tropic of Cancer
March 21, Sept. 23	– Sun on the Equator
December 22	– Sun on the Tropic of Capricorn

On March 21 and September 23 throughout the world day and night are equal in size, so these are called **equinoxes**.

As we move northwards or southwards of the Tropical Belt we reach a region where it gets warm in summers but also very cold in winters. This is the Temperate Zone. The northern portions of this region get snowfall in winters.

- Find out if Andhra Pradesh is in the Tropical Belt or in the Temperate Belt.
- Will the Sun shine directly on our heads in Andhra Pradesh during any month? If yes, in which month?
- Find out in which belt is Delhi and if it will get snowfall in winters.

If you move further north or south of the Temperate Belt you will reach the Polar Region. The seasons in this region are very peculiar. This region is away from the Sun during winter months – and does not even get any sunshine in the day! That is, for six months there is no Sun on the Poles. The next six months it constantly faces the Sun throughout the 24 hours of a day - there is no night or darkness! A place which has six months of day and six months of night! Even during the 'day' it gets very slanting rays of the Sun. The Sun does not rise high in the sky but only stays just above the sunrise point (also called the horizon). So it never gets very hot. So for six months it is freezing cold – so cold that an entire ocean – the Arctic Ocean remains frozen throughout the year. So cold that the soil becomes frozen like a hard rock and roots of trees can't penetrate them. So trees just can't grow in this region. When the Sun appears for six months, the snow melts, part of the sea too melts. Small plants like moss, lichen and some flowering plants grow.

Fig 3.5:
Northern Lights, visible in Northern polar region, occur during the seasons when the sun does not rise above the horizon

Key words

1. Seasons 2. Curvature of the Earth 3. Earth's Tilt
4. Snow Fall 5. Temperature belts 6. Horizon

1. Do you think there is any correlation between the crops grown in your region and the seasons? Find out by

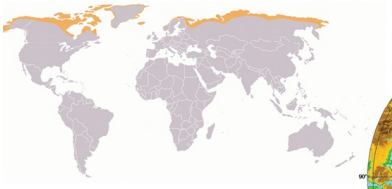
discussing with your elders and friends and write a short essay on it. AS_4

2. Why do you think Andhra Pradesh does not receive any snowfall during winter months? AS_1
3. We have a rainy season. How do you think it is related to the movement of the Earth and the pattern of Sun's rays? Does it occur in the summer or winter or in the season in between? AS_1
4. Collect information about time of Sunrise and Sunset for different months of the year in your place (you can look up the local newspaper for this). Calculate the duration of day and night – how many hours every day – for every month. Do you see any pattern in this? AS_3
5. Explain the idea of rotation of the Earth to your parents or sisters or brothers. Write down their questions or doubts and try to answer them. AS_4
6. Imagine that the Earth does not rotate but goes around the Sun around the year. What difference will it make to the seasons and distribution of temperature? AS_4
7. Identify a country in the Temperate Belt in both Northern and Southern Hemisphere. Compare the seasons in those countries and your place. Which will be warmer in May-June and which will be cooler in December-January or in March or September? AS_5
8. What are the six seasons of Indian climate? AS_1
9. Read the first paragraph of this chapter and answer the following question: AS_2

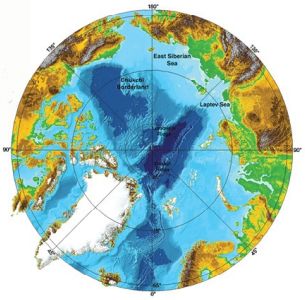
What is the impact of seasons on the lives of human beings?

4.THE POLAR REGIONS

In this chapter you would be reading about a region which is entirely different from any place we have so far seen in VI and VII classes. This region has continuous nights and continuous days for many months. There is no daily sunrise and sunset like we have in our country. Can you imagine such a place? This region is very cold. So cold that only ice and snow can be seen - ice on land, ice on the streams, ice on the rivers and even the whole sea is frozen (recollect Chapter 2 of VI Class where you have answered frozen continent).



Map 1: Polar Region on world map



Map 2: Closer view of Polar Region

Where is the Polar Region?

You have seen the north pole and south pole on the globe. The region which lies near the poles is called the “polar region”. You will be reading about the northern polar region in this chapter. Look at Map 1. It shows the north pole and its surrounding regions. The entire polar region has been shaded lightly. Notice the boundary of this region. This is known as the ‘Arctic Circle’.

- Which continent parts fall within this region?

The northern part of the continents within the polar region is known as the Tundra. Tundra means very cold. Since the Tundra region gets very little sunlight, it has a unique type of vegetation known as the ‘Tundra Vegetation’.

- Try to recall what happens as we move away from the equator.

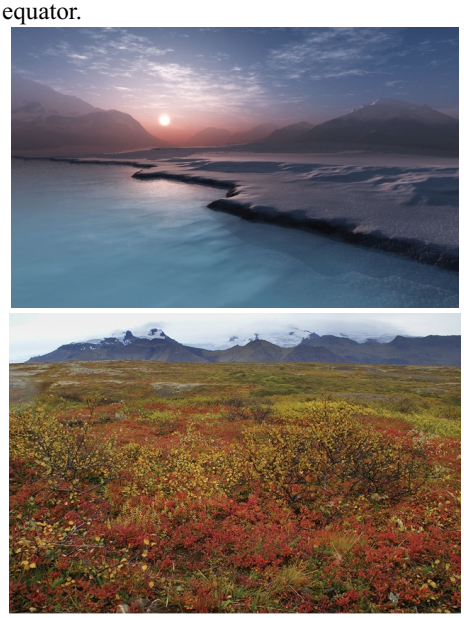


Fig 4.1 & 4.2: Look at the two pictures above. Can you guess which one shows winter? Which one has plants?

Seasons in the Tundra

In the Tundra region it is extremely cold. It is difficult to even imagine the cold in the Tundra. In our country, the sun rises and sets everyday. But this does not happen in the tundra. It is almost dark throughout November, December and January, since the sun does not rise at all. This is the winter of the Tundra, and it is bitterly cold during these months.

You know that when it is extremely cold, water freezes to become ice. In this extreme cold, the water of the rivers, lakes, seas freezes. Strong cold winds blow and there is snowfall.

Due to the severe cold, dark and icy conditions, all the plants die. Even birds and animals leave this region and migrate elsewhere. The whole region becomes dark, deserted and desolate.

Summer

The sun begins to shine in the tundra around February-March. In the beginning, the sun shines for a maximum of an hour and a half and then sets. Gradually, it lengthens to 2 hours, 6 hours, 8 hours, 16 hours, and finally 24 hours! Then for all most three months from May to July, the sun never sets, it shines all 24 hours. But the sun does not rise overhead; it just hovers a little above the horizon (The horizon is the place where the earth appears to meet the sky). Since the sun does not go high up in the sky, it is never very warm.

Even in the three months of summer, it is cold. But it is comparatively less cold than the winter months. Due to the relatively warm weather, some of the ice melts. The rivers which are frozen during the winter melt and begin to flow. The lakes fill up, and huge chunks of ice break off and float into the ocean as icebergs.

The land which was frozen and desolate in winter comes alive with colour during summer. When summer approaches, many multi coloured plants, lichens, grass, shrubs and berries sprout all around. They bear flowers and fruits of different colours. Many birds and animals come to feed on them.

Vegetation

- Did you see any tree in the pictures on the previous page?

Due to the cold, the upper soil surface of the region is frozen into a rock-like state all through the year. This is called 'permafrost'. As there is little soil, only some small plants can grow. The underground soil being hard, it is difficult for trees to grow. Even if they do manage to grow, the trees get damaged and uprooted with the strong winds and storms. So, most of the tundra region is tree-less.

- Mention five points about the summer in tundra.
- Fill in the blanks

- The sun does not appear during the month of _____ and_____
- At this time, the water_____ and the plants_____

- How do the people of tundra get light in winter?

The People: Eskimos

Fig 4.3: A photograph of people in Polar region, 1930

Fig 4.4: A very old photograph of Siberian Yupik woman holding walrus tusks

The Arctic is a region of vast, treeless plains, icy seas, and barren, rocky islands. This harsh, cold land is the home of the Eskimos. They live in the scattered settlements in Greenland, Canada, Alaska, and Siberia. For thousands of years, the Eskimos were isolated from other people. They lived by hunting and fishing and they developed a way of life well

suited to their homeland.

The Eskimos' traditional way of life developed to meet the challenges of the Far North. This section describes that way of life, which the Eskimos followed until recently.

The most commonly accepted meaning of 'Eskimo' is "snowshoe-netter." There are two main groups referred to as Eskimos: Inuit and Yupik. Inuit in their language means "the people" or "the originates". The Eskimos are descendants of Siberia, now a part of the Russia in northern Asia.

Eskimo languages have been spoken for thousands of years, but they were not written down until modern times. There are three main languages - Aleut, Yupik, and Inupik. Inupik, spoken from northern Alaska to Greenland, has the most speakers, and it has many dialects. The differences among the dialects are small. Dialects of Yupik are spoken in south-western Alaska and Siberia.

The Eskimos first entered North America about 5,000 years ago, crossing the Bering Straits from Asia. They moved rapidly across the Canadian North to Greenland. Some Eskimo groups then moved westward again, to the Bering Sea area. Today the Eskimo population is not large, but it is growing. About 2,000 Eskimos live in Siberia, 30,000 in Alaska, 22,500 in Canada and 43,000 in Greenland. Some Eskimo communities are on the edge of the forests of the Far North. But most are on the treeless tundra, or Arctic plain that lies north of the forests.

- Why do you think people probably always did not live in the tundra region?

Group Life

The Eskimos live in fairly small groups. There are villages of over 500 people on the northern Alaska Coast. In the eastern region (Greenland, Baffin Island, and Labrador), a typical group might have 25 to 45 people. Eastern groups move from place to place throughout the year, following a fairly fixed order of seasonal activities. They spend winter near the coast, hunting seals and fishing. In summer, they move inland to hunt caribou and gather berries. Sometimes they cover a circuit of more than 1,100 kilometres. They cross snow and ice on sledges pulled by dogs, and they travel on water in open boats called umiaks.

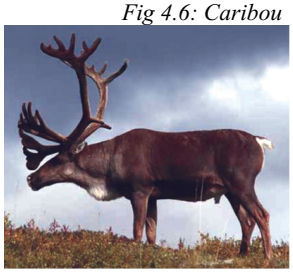
Fig 4.5:
Harpoon-a weapon to hunt seals

Close co-operation is important if the members of an Eskimo group are to survive in their harsh land. Group members would work together in activities such as hunting. For example, in eastern groups ten to twelve hunters would be needed to harpoon sealsat their breathing holes in the winter sea ice. Much larger groups - over 100 people - would work together to hunt caribou and large sea mammals such as whales. Some activities are carried out by individuals and small family groups - tracking bears, fishing with nets and gathering berries.

Hunting and Fishing

Because they depend on hunting and fishing to live, Eskimos are highly skilled at these activities. Caribou hunting is essential for nearly all Eskimo groups. Caribous are hunted in the inland during summer and early autumn. In some places caribous are driven by lines of people into lakes or narrow streams, where they are speared, shot with bows and arrows, or even harpooned. Sometimes, Eskimos set up piles of stones in long lines. To the caribou, the stones look like people in the distance. The caribou would turn away from the lines of stones and be caught.

Fig 4.6: Caribou



For some groups, fishing is as important as hunting. Fish are netted in deep muddy waters or through holes in the ice. They are speared in shallow, clear waters at their weirs - low dams of stones placed across streams. Fish are chased into the weir by people wading in the stream and are caught by skilled hunters with three pronged spears. Eskimos also use barbless bone hook on short lines to fish through holes in the ice in winter or from the edge of the ice in spring. Seals are harpooned from the edges of ice floes or from kayaks (kayaks are small canoe like boats made of animal skins stretched over a wooden frame).

Fig 4.7: Woman cooking in Cape Schmidt area of Russia

Food

Meat, fat and fish make up a large part of the Eskimo diet. Vegetables are scarce. Food is not wasted. But as the Eskimos depend on hunting and fishing, hunger and even starvation are common when fish and meat are not plentiful. Meat and fish caught in summer are stored in shallow pits. These pits are dug down to permafrost and covered with piles of stones to keep out hungry animals.

Wood to make fires for roasting or baking is scarce in most of the Eskimo area. Meat and fish are often eaten raw. Raw meat or fish are frozen and cut into thin strips, which are dipped in whale or seal oil. Some meat, especially meat from large sea mammals, is eaten in a partly decayed state (the tough meat becomes tender and easy to digest). If food is cooked, it is almost always boiled, using the heat from oil lamps.

Shelter

The Eskimo word "igloo" means shelter. It can refer to any kind of house, not really the dome shaped snow houses that many people associate with the word.

In summer, most Eskimos live in tents made of animal skins. In western Alaska, very large winter tents are made by placing heavy walrus skins over wood frames. On the northern coast of Alaska, dome-shaped houses are built of logs and whale ribs. The dome is raised over a depression in the ground and is covered with frozen turf. In Greenland houses are built of stone slabs.

Fig 4.8: Inuit people from Alaska Qamutik, 1999

Snow houses are used only in the eastern and central regions. They are made from blocks of packed snow (not ice), built into a dome. Small snow houses with short tunnel entrances are used while travelling. Larger snow houses are used as winter residences. Long tunnel entrances provide storage space in these larger homes. The entrance tunnel opens into the house below the floor level.

In the rear half of the house and on both sides of the door, there are snow benches about one metre high. The rear bench is covered with animal skins and is used for sleeping. The side benches support racks for drying clothes, food supplies, and seal-oil lamps that provide light and heat. Sometimes, two large snow houses are joined together by tunnels. Some snow houses are lined with seal skins that are sewed together and suspended from the top of the dome.

- In what ways are the resources available in their surroundings used for making houses?
- How is the house impacted by the climate?

Clothing and Crafts

The Eskimos wear boots called mukluks, trousers and hooded jackets called parkas - all made of animal skins. There are differences in details of clothing for men and women. The man's parka has long flaps in front and behind. In winter, the Eskimos wear two layers of clothing. Caribou fawn skin is preferred in winter because it is soft and warm. Coastal

groups prefer seal skin in late spring and summer. It has the advantage of being waterproof, but it has the disadvantage of being very stiff. Clothing is often embroidered and has decorative fringes. Cut-outs of different-coloured animal skins are pieced together to form patterns on parkas.

Fig 4.9: Inupiat people from Alaska, taken in 1912

The Eskimos decorate tools and objects of everyday use. Such decoration makes people's possessions very personal. Bone, ivory, wood and soft stone called soapstone are used to make small figures of people and animals as well as weapons and tools. Tools are carefully carved to fit the hand of the user. In the Pacific and far western areas, masks are carved of wood, painted and decorated with feathers and animal skins.

Religious Beliefs

Eskimo religion shows deep concern for life, health, sickness, starvation and death. The Eskimos believe that spirits control these things. All Eskimos groups believe in a supernatural power called Sila and spirits (such as Sedna, the goddess of life, health and food). They believe that people and animals have souls that live after death. But each group has certain beliefs and rituals of its own. Each person, family or group has taboos or bans, forbidding certain actions, such as eating a particular kind of food. Each group has some major ceremonies, performed at birth and death or when hunting is very poor or very successful. Shamans (people skilled in performing rituals) are believed to help establish and keep contacts with the spirit world. Shamans use trances, drama and magic tricks in their performances.

Recreation

Wrestling, racing, harpoon throwing contests and other vigorous athletics activities are popular. Games of skill are sometimes essential parts of religious rituals as are storytelling, singing, drumming and dancing. Parties and social visits are often occasions for huge feasts of meat and fat.

Contacts with the Outside World

The first Europeans to be seen by Eskimos were Vikings from Iceland, who established a settlement in Greenland. Contact between the Eskimos and the Icelanders began about the year 1200 and continued until about 1400.

Other Europeans began to explore deeper into the Eskimo area after
1576-78, when the English mariner Martin Frobisher visited Baffin Island. Danish, Norwegian, and English explorers sailed into the seas of the Far North to find the fabled North west Passage to China. By 1728, the Russians had arrived in Siberia and northern Alaska. Contact with the Europeans began in earnest as explorers tried to find the North west Passage from the Pacific Ocean as well as from the Atlantic. But some Eskimo groups in the northern Arctic islands did not have much contact with outsiders until the late 19th century.

After 1850, the arrival of the Europeans and American whalers and fur traders brought many changes. Eskimos worked for the whalers and sold furs to the traders. The outsiders in turn provided a steady source of metal tools and rifles. Because of the new tools and weapons and the new demand for furs, animals were hunted and killed in greater numbers. In some areas, animals such as caribou and seals were hunted almost to extinction.

The outsiders brought new diseases to which the Eskimos had no immunity, or natural resistance. Smallpox, tuberculosis, influenza, whooping cough, pneumonia, mumps, scarlet fever, and diphtheria were the most dangerous of these diseases. After the late 1800's, large numbers of Europeans began to live year-round in the Arctic and these diseases became very serious.

The pattern of relation between the Eskimos and outsiders has been described as "boom and bust". Waves of outsiders have brought brief periods of wealth, education, and employment. This was followed by periods of poverty and disorganisation. Peak periods have been those of whaling (1859 to 1910), the modern fur trade (1925 to about 1950), the building of military and defence bases (mid-1950s), the building of urban centres (mid 1960s), and oil exploration and development (the 1970s).

Each wave of activity has drawn the Eskimos into contact with different social and economic forces. The once isolated northlands have been opened up by air travel, highways, powerful modern ships, and satellite communications. These changes have produced great strains on the Eskimo way of life.

Fig 4.10: Walrus hunting in Chukota during the 2000s

- Do you think lives of people in Tundra have changed for better or worsened because of their interaction with outside world? Give reasons for your answer.
- Look at the pictures in this chapter. How has that dress and hunting changed?

Key words

1. Arctic circle 2. Tundra vegetation 3. Icebergs
4. Eskimos 5. *Kayaks* 6. Igloo

Improve your learning

1. Re-write the false statements with correct facts: AS_1
   a) Animal body parts were used only in clothing.
   b) Major part of the food includes vegetables.
   c) Popular games amongst the people in Tundra are closely related to their daily lives.
   d) Contact with people from outside impacted their health.
2. Based on what you studied about equator regions in Class VII how is polar region different? AS_1
3. What are the ways in which life of people in Tundra are dependent on climate of the region? Describe in the context of following aspects: AS_1

Food	**Dress**	**Travel**	**Shelter**

4. In this chapter there are many aspects that are very different from the place where you live. Look at the subheadings in this chapter and make a list of them. Now create a wall paper with illustrations and descriptions comparing life in your location with that in the Tundra. AS_6
5. Imagine one entire day (24 hours) when the sun does not set and another day when there is no sun, What changes will you make in your daily lives? Write a short note on them. AS_4

5.FORESTS:USING ANG PROTECTING

- Some of you in the class may be familiar with a nearby forest – its trees, plants, animals, rocks, streams, birds and insects. Describe to the class the forest in detail and what you do there.
- Have you ever been to a forest to collect firewood, leaves or fruits and tubers? Tell everyone in the class about it and also make a list of all the things people in your area collect from the forests. How are they used?
- You have read about forests and people living in the forests in the previous classes. Can you recall some of them and talk about people who live in the forests?
- Can each of you draw a picture of a forest and compare them?
- Our folk tales and Puranas and stories repeatedly mention forests. Can you relate in the class some such stories about forests?
- Many forests are sacred and are worshipped by the people. Some forests are famous as the abode of some gods and goddesses. Find out about them and tell everyone in the class about them.

What is a Forest?

Forests mean many things to different people. Some people are afraid of forests thinking that it is the abode of wild animals, snakes, insects and dangerous places like deep gorges, cliffs and rocks. Others have no such fear and walk around the forests as if it were their home and even play in the forests. To some, forests are sacred places whose deities are worshipped. To yet others, it is a place from where they get raw materials like timber, bamboo or beedi leaf or hunt animals and sell them in the market.

Similarly, different people use forests differently. Some people live in simple shelters in the forests and grow a few vegetables etc and gather fruits and tubers and hunt small animals. Some others use the forests to graze their animals – sheep, goat, cows etc. Some others cultivate by making small clearings or podu in the forests. You have read about them in Class VI in the chapter about Kunavaram Hills. Some others use the forests by cutting down trees and bamboos and selling to paper or furniture factories in the towns. Yet others look at forests as places which can be converted into fields, tourist resorts or dams for storing water.

Of course, we need to remember that human beings are not the only people who use forests. Trees, plants, grasses, birds, insects, animals, fishes - countless beings thrive in and use the forests. So when we think of the forests we need to think about them too.

- What is a forest? There can be many ways of defining a forest. Write a definition of forests.
- Then discuss jointly in the class and write down points which seem to be correct to most students.

How we define a forest will depend upon how we look at them. For example, one easy definition can be ‘a large tract of land covered by trees’. While this may be a useful definition, it has several limitations. For example, we need to ask how large a tract? What do we mean by covered by trees? How thickly covered? Should we differentiate between a forest and a plantation which can also be ‘covered by trees’? Can a forest be complete without its undergrowth, animals, birds and insects? There can be many more questions like this about any definition.

Nevertheless, we have to work with some common understanding of what is a forest – perhaps we can say that most forests have many of these features:

1. A large tract – stretching several kilometres in length and breadth
2. A tree cover and undergrowth (bushes, plants, grasses and creepers) which grow with little interference from human beings
3. Considerable bio-diversity – where many kinds of plants and animals live and breed naturally without interference

4. In India at least, most forests are inhabited by people who have been living in them by adapting themselves to the conditions of the forests but without changing them too much.

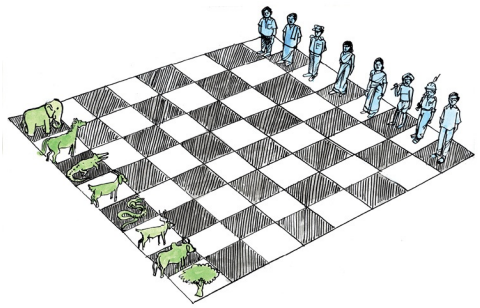


Fig 5.1: Write a caption on the above cartoon in the contest of forest?

People living around the forests use them for a variety of purposes for food, for wood for building cottages and making agricultural tools, fuel, grazing animals, for worship, solitude etc. People living far away from forests too have been using the forests for many things like wood, medicines etc. which they buy in the market. Thus many people earn their livelihood by collecting forest produce and selling them. Later on we shall see how these different uses of forests often come into conflict with each other and how

these conflicts are handled.

- Do you think it is important to have forests? What will happen if all the forests are cleared and used up for growing crops, building factories or mines or houses for people to live? Can't we live without forests? Discuss in your class.

Location and Types of Forests

Where do forests grow? This is a difficult question to answer. Several thousand years ago forests grew almost everywhere where there was soil, sunshine and rain. Thus forests did not grow only in the Arctic regions or high up in the snow covered Himalayas or sandy or rocky deserts, or on sandy sea coasts. Leaving aside such places, forests grew almost everywhere. However, as human beings took to agriculture and living in villages and towns, forests were cut down for agriculture, mines, plantations, industries, etc. Slowly by the beginning of 20th century, forests were confined to only tracts that were not useful for agriculture. Regions that were hilly, swampy, rocky etc. or which were too cold or far away from population centres retained forest cover.

- Which is the nearest forest area from your village or town? Find out why this area still has tree cover and has not been converted into fields or habitations or mines.

Forests can be classified on the basis of different criteria. For example, we can classify them on the basis of how dense or sparse the vegetation is. We can have 'very dense forests, dense forests, open scrub forests, degraded forests etc. This classification helps us to understand where we have thick forest cover and where it is in a degraded situation. Another way of classifying forests is by looking at the type of vegetation that grows in them. Different kinds of trees grow in places which have a particular climate – combination of rainfall, temperature and cycle of dry, wet and hot months etc. For example, some trees like coniferous trees like pine will only grow in very cold climates which also have snowfall. Some trees like teak grow in regions of moderate rain and warm temperatures. The density of the trees will also depend upon the nature of rainfall and temperature.

Let us learn about some main kinds of forests.

1. Evergreen Forests: Regions which get very high rainfall and also have a very warm climate like in Equatorial regions or regions like Kerala and Andamans in India have evergreen forests. These are dense forests with a very large variety of trees, plants, creepers, etc. These forests are always green as the trees shed their old leaves but get new leaves very soon. While one kind of tree sheds its leaves another tree remains green. This is because they get moisture and warmth to grow constantly. *Jamun*, canes, bamboos, *kadam* etc are some characteristic trees of these regions. We do not have such forests in Andhra Pradesh.

Fig 5.2: (top) Evergreen forest in Western Ghats, Anaimudi, (bottom) Snow covered Deodar forest in Gulmarg Himalayas

There are also different kinds of evergreen forests in the Himalayas. These are pine forests which remain green throughout the year. However, they have leaves which are very thin and in the shape of needles. These trees don't bear flowers but produce cones and hence are called coniferous trees. These trees grow in areas with snowfall. Hence these trees have the needle like leaves which do not allow the snow to rest on them. The tree itself is shaped in such a way that the snow slips down the sides and falls on the ground (just like sloping tiled roofs of houses).

2. Deciduous Forests: These grow in regions where it rains in only some months and is warm and dry during most of the year. The trees shed their leaves during very dry months. Water evaporates through the leaves, and the trees try to conserve moisture by getting rid of the leaves during the dry months. New leaves come with the onset of rains so that the trees can produce food for themselves. Most of the forests of Andhra Pradesh fall in this category as we get less rainfall and that too in some months and it is very hot during most of the year.

In our state we have two kinds of deciduous forests – ones which receive more rain and ones which receive less rain. The deciduous forests which receive more rain have the following kind of trees – *Vegi*, *Ageisa*, *Maddi (Arjuna)*, *Bhandaru*, *Gittegi.* In our state such forests are found in Srikakulam and Visakhapatnam districts and East Godavari agency areas.

In areas with less rainfall we have trees like *Maddi*, *Teak*, *Velaga*, *Aegis*, *Yepi*, *Chiguru*, *Billu*, Neem, *Dirisena*, *Buruga* and

Moduga. Such forests are more widespread in our state and can be found in Y.S.R. Kadapa and Kurnool districts.

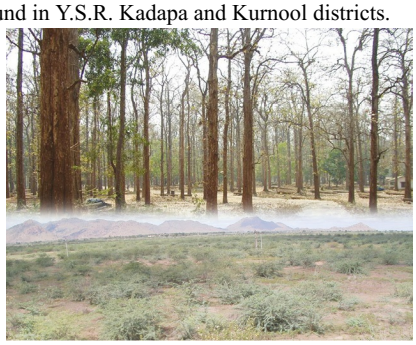


Fig 5.3: (top) Teak forest in summer in Chattisgarh, (bottom) Babul forest in Rayalaseema

3. Thorny Forests: These grow in very dry areas with little rainfall and high temperatures. Most of the trees are thorny. The common trees are *Babul (Thumma)*, *Balusu, Regu*, Sandal, Neem etc. They are located in Y.S.R. Kadapa, Chittoor, Anantapur and Nalgonda Districts.

Fig 5.4: Thorny bushes

You may recall that these are the districts with very little rainfall nearing desert conditions. Thorny trees have very tiny leaves and thorns which help to conserve water. The forests are also not dense and have open spaces and more undergrowth with fewer trees.

4. Littoral (sea coast) and swamp forests: These grow mostly in the sea coasts on sandy beach and marshy lands and on lands affected by tidal waves. Here the trees are adapted to salt waters and the flow of tidal waves (tidal waves typically submerge these areas for some hours of the day and recede, thus alternating salt water flooding and drying).

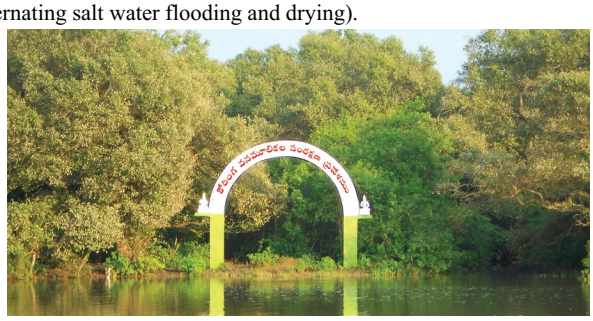


Fig 5.4: Mangrooves - Koringa in East Godavari District.

These are also called mangrove forests – the trees have developed some unique features to survive in this difficult environment.

Uppu ponna, *Boddu ponna*, *Urada*, *Mada*, *Tella Mada*, *Gundu mada*, *Kadili* and *Bella* are some of the typical vegetation of this region.

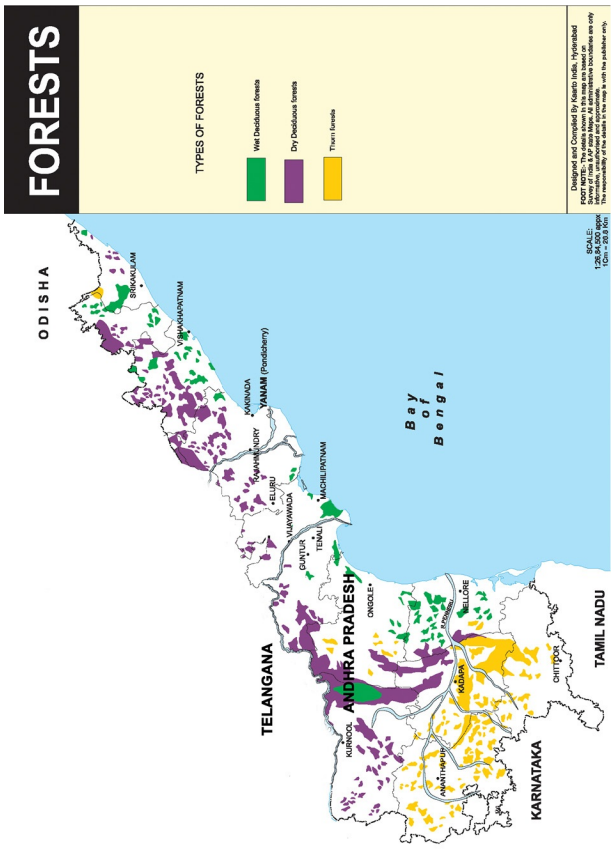
- Find out how the mangrove trees adapt to the special conditions of sea coasts.
- You may remember reading about Equatorial forests in Nigeria. What are the main differences between the forests of Andhra Pradesh and the Equatorial forests?
- Look at the map of Andhra Pradesh given in the next page showing the distribution of forests. Find out if your district has any forest and if yes what kind of forest.

Status of Forests in Andhra Pradesh

You read about some of the important kinds of forests in our state. But how large are our forests? Are they increasing or decreasing? Let us find out.

About 64,000 sq kilometres of the state are declared as forest by the government. This is about 23% of all land in the state. However, all this is not really forested as only about 16% of our land has tree cover to qualify as forest. This means that is about 7% of our forest lands are open grounds and with very few trees. Even this forest cover is dwindling due to felling, encroachment, mining etc. Every year about one hundred sq kilometres of forests are lost in our state.

- Is this a satisfactory situation? Discuss in your class?



Tribal people and Forests

It is difficult to imagine forests in our country without the people who live in them and use them. Forests provide the critical resource for the very poor in our state to make a living. In North Coastal Region, for example, 20% of the people who use the forests collect head loads of Fuel wood and carry them to markets for sale. On the other hand in Rayalaseema districts most people depend upon the forests for grazing sheep and goats. In Coastal region about 50% people depend upon such collection of forest produce. You would have made a long list of forest produce people collect, but the full list is much, much longer with about more than sixty items on it!

Of the people who depend upon forests for their livelihood, the tribal people are the most important. For thousands of years tribal people have lived in these forests, protected them and earned their livelihood from them. You have read about them in the earlier classes.

Even today 60% of tribal people in our state live in forests. How do the tribal people use the forests? You may remember how the Konda Reddys of Kunavaram hills use the forests around them – for podu cultivation, collection of forest produce like food items, (fruits, tubers etc), items for sale like beedi leaves, medicinal plants, bamboo, tamarind, etc.

Unlike in plain villages, tribal people don't have the notion of private property in land and all clan members use the forest with the consent of the village elders. Each family has customary right over the land they cultivate and will shift to in the coming years. Since the podu keeps shifting every few years there is no fixed record of ownership of land. Also, when population increases and new families are formed, the village elders give them permission to clear new plots of land. In the days before the British rule, the tribal people treated the forests as their own. But it was a sacred land to them, which they used without causing damage to it or the animals in it. Even when they hunted animals or cleared forests for podu fields, they took care to ensure the regeneration of animals and trees. Thus they both cared for and used the forests, just as a peasant family takes care of its fields.

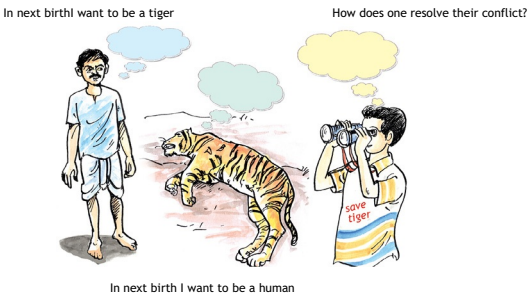
- Do you think it is possible for people to take care of forests and use them as well? What would they have done if someone had tempted them to cut trees and sell them in the markets?

During the last two hundred years after the establishment of the British Rule in our country, the tribal people gradually lost their control and rights over the forest. Since then, forests were rapidly cut down. This happened in two ways. Firstly, there was a great demand for wood for various purposes like building railways, ships, factories, mines, houses, furniture etc. Similarly, many industries like paper industry as you have read in Class VII need large quantities of pulp wood. As a result of these pressures, large tracts of forest were cut down and the wood sold out. In many areas, forests were cut down to create plantations of tea, coffee or rubber and later on of quick growing trees like eucalyptus or bamboo. Thus the total area under forests got reduced greatly.

- Do you think there is any difference between a plantation of eucalyptus trees or tea shrubs and a forest? Discuss in the class.

Secondly, the British government wanted to control the felling of forests in such a way that it could benefit most from it and also help protecting the remaining forests. They made laws in 1864 and 1878 to create the Forest Department which was given control over the forests. Similar laws were also passed by the Nizam government in the areas under its control. The laws restricted the traditional/ customary rights of the tribals and forest users by classifying forests as 'reserved' and 'protected' forests. Reserved

forests where forests in which no one could enter. ‘Protected’ forests could be used by people; they could take head-loads of wood and small forest produce for their own use and could graze their cattle. But, here too, there were many restrictions over cutting trees, grazing more than the limit set by the Forest Department etc.



Yet as we know a very large number of people lived in these forests and depended upon their use. The government at this point did not really care for them. When the government had to define the area under forest, it treated most of the land used by the tribals as forest belonging to the government. This was because unlike in the plains villages which had village land records, most of the tribals cultivated land without any ownership records. In the northern districts of Telangana, the Gonds cultivated settled agriculture, while the Kolams etc. practised podu cultivation on the hill slopes. Even the Gonds who practised a more settled type of agriculture were in the habit of leaving lands fallow and cultivating alternate lands in two-year cycle. The demarcation of Reserve Forests did not take notice of these practices and in one stroke, rendered many tribals without rights and led to forced evictions.

By one stroke the tribal people were rendered homeless in their own homes! To add to it, the government was eager to hand over the land to zamindars and cultivators from other areas so that they could settle down and cultivate the lands and pay revenue to the government. The evicted tribal people had to work for these landlords now. On the lands which the tribal people were allowed to cultivate, they had to pay very high revenue. Often they had to borrow money from moneylenders to pay this amount. In the end they had to sell off their lands to the moneylenders. Thus they again lost whatever land they had.

The Forest Department which was established in this period had the task of protecting the forests and planting new trees. It also had the responsibility of managing the 'harvesting of the forest', that is felling mature old trees and selling them to earn money for the government. The Forest Department officials usually belonged to distant rich communities who regarded the tribal people as ignorant and dangerous people and had no sympathy for them. They exploited the hapless tribal people, cheated them and constantly harassed them. In the name of forest conservation, large-scale evictions occurred in the 1920s and mopping operations continued till 1940. This created an atmosphere of unending insecurity for the tribal people.

The tribal people fought against this from the very beginning. In some regions like the North East they were able to win some protection from the government.

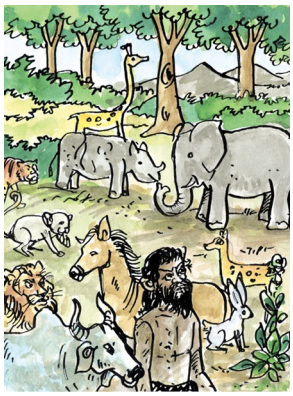
- List all the causes for decline of forests in the last 200 years. Do you think *Podu* cultivation was also responsible for this? Give your arguments.
- What was the difference between protection of forests by the tribal people and by the Forest Department?
- Why do you think the tribal people were not able to pay the land revenue demanded by the government?

At the time of independence our national leaders were debating whether it was better for tribal people to be left alone to lead their traditional lives in the forests or should they be made to adopt settled agriculture, modern education and industrial work.

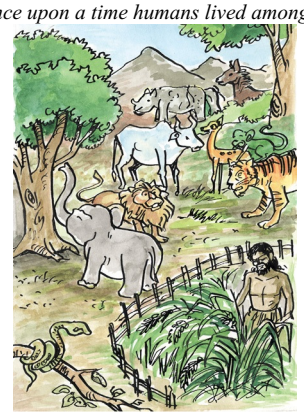
- Discuss in the class which way would have been better.

The change in 1988-90

By 1988 the government realised that the development of tribal people could not be thought of without giving them any rights over forests. They understood that the protection of forests was impossible without the active role of tribals. The National Forest Policy, 1988 declared that the primary task should be to associate the tribal people in the protection, regeneration and development of forests. It also wanted to provide gainful employment to the people living in and around forests. The government sought to involve village communities living close to the forests in their protection and the development of degraded forest land. It also prescribed right of use to village communities to meet their demand of forest produce and active participation in afforestation programmes. This was the beginning for an active cooperation between the forest/ village communities and the Forest Department for the revival, restoration and development of degraded forests. Thus a new policy was put into practice in 1988 which eventually led to the Joint Forest Management. It actually meant that the Forest Department and local communities will collaborate in regenerating degraded forests, planting trees. The communities were allowed to use the grass and other minor forest produce.

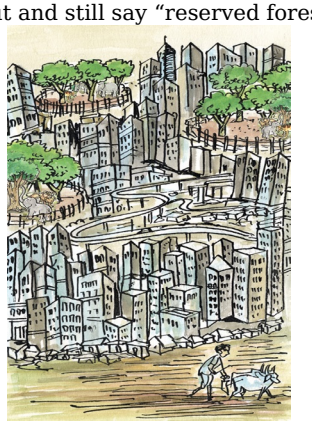


1. Once upon a time humans lived amongst us.



2. Then they began to fence us out.

3. They began building cities and more villages and now finally they have left no forest uncut and still say “reserved forest”.



4. Do you think animals feel protected from humans? Have you heard about protected forest?

In Andhra Pradesh this programme was renamed as Community Forest Management (CFM) programme. While this programme helped to bring together the Forest Department and the local communities, it only forced the tribal people to give up their earlier *podu* lands for forest regeneration. During the same time several Tiger Sanctuaries were established in the forests to protect wild life.

- Find out from your elders about their experience of CFM and also Social Forestry projects.
- Why do you think the government thought that forest was not important for tribal people's development?

Forest Rights Act, 2006

The tribal people had been protesting and fighting against these processes. Their cause was taken up by many non-governmental agencies which built a national campaign for tribal rights over forest. After prolonged debate the Parliament passed the Forest Rights Act in 2006. For the first time it was accepted that during the last 200 years gross injustice had been done to tribal people and others by denying them traditional rights over the forests which actually belonged to them. It also recognized that it was impossible to preserve the forests without restoring the rights of the tribes etc.

The Act gave three main reasons for passing the new law:

Firstly, to conserve the forests and at the same time ensuring livelihood and food security of the forest dwellers;

Secondly, the forest rights on ancestral lands and their habitat were not adequately recognised during the colonial period as well as in independent India. This resulted in historical injustice to the forest dwellers, who are integral to the very survival and sustainability of the forests; and

Thirdly, it has become necessary to address the long standing insecurity of land rights and access rights of forest dwellers including those who were forced to relocate their dwelling due to State development interventions (like dams or tiger reserves).

The Act confers on forest dwellers and other traditional users of forests, their traditional rights over the forests and also title to lands they use. If implemented properly, this Act can be used to undo the wrongs done to the tribal people over the generations.

- In what way do you think it makes up for the injustice done to the tribal people in the past 200 years?

Many people who are associated with the conservation of forests fear that this Act may cause further deforestation as the people may try to make use of forests for commercial purposes rather than traditional domestic purposes. On the other hand others feel that by making the forest dwellers who have been traditionally taking care of the forests the main protectors, we will be able to save the forests better.

- Discuss this in the class – do you think it is the correct way to redress the wrongs done to the tribal people? How will it help in protecting the forests? What other steps need to be taken for this?

Try to understand the Provisions of the Forest Rights Act

with the help of your teachers

a. right to hold and live in the forest land under the individual or common occupation for habitation or for self-cultivation for livelihood by a member or members of a forest dwelling Scheduled Tribe or other traditional forest dwellers;

b. community rights such as nistar...; (such as traditional rights for firewood, grazing etc.)

c. right of ownership, access to collect, use and dispose of minor forest produce which has been traditionally collected within or outside village boundaries;

d. other community rights of uses or entitlements such as fish and other products of water bodies, grazing...;

e. rights including community tenures of habitat and habitation for primitive tribal groups and pre-agricultural communities;

g. rights for conversion of *Pattas* or leases or grants issued by any local authority or any State Government on forest lands to titles;

h. rights of settlement and conversion of all forest villages, old habitation, etc...;

i. right to protect, regenerate or conserve or manage any community forest resource...;

k. right of access to biodiversity and community right to intellectual property and traditional knowledge related to biodiversity and cultural diversity;

Key words

1. Afforestation 2. Deforestation 3. Forest management
4. Forest Rights Act 5. Reserve Forest

Iprove your learning

1. Do you agree with the following statements? Give reasons for your agreement or contradiction. AS_1

- The notion of private property is important to protect the forest.
- All forests needs to be protected by human beings.
- Over the centuries most people living on earth have reduced their dependence on forest for their livelihood.

2. Create a timeline to show the major changes in use of forest over centuries. It may be necessary to look at your textbooks from previous classes. AS_3

Event	**Changes affecting tribal**	**life Impact on forest**
Emergence of agriculture		
Arrival of the colonial rulers		
Government rules		

3. Based on the details given in the above text, or from what you already know about the forests, compare the type of forest that is closest to your area of living on the following aspects: AS_4

Density of trees	**Types of trees found**	**Special features of trees**

4. Observe the map of forests in Andhra Pradesh and find out which district(s) has/have the maximum forest covered area? AS_5
5. A few children in a school participated in *Vanamahothsavam* programme and they planted some saplings. How do you respond to this? AS_6
6. Read the paragraph under the heading 'Forests of Andhra Pradesh' and answer the question:What suggestions do you have for increasing the forest cover in our state? AS_2
7. Locate the various places mentioned below different photographs of forests given in this chapter in an Atlas. What similarities and differences can you find among them? AS_5
8. What are the differences between Ever green forests and Deciduous forests? AS_1
9. Observe the pictures of page no. 59 and write a comment. AS_2

6.MINERALS AND MINING

Minerals in our houses

If you look around in your house you will find walls made of mud bricks or just mud joined with cement and sand. Your house may be whitewashed with white lime. Your floors may be paved with Kadapa stones. Pillars and rafters may be made of granite stones. Most of these are really minerals we get from the Earth – mud, sand, lime, Kadapa stones or granites. Again if you go around your house, you will find many objects made of metals like iron, copper, lead, chrome, aluminum etc. You may be wearing ornaments made of silver or gold. These are metals which have been separated or extracted from natural ores which are also minerals. We use fuels like petrol, diesel, kerosene: these too are extracted from mineral oils called crude petroleum. Other forms of fuels like coal and gas too are forms of minerals. In fact the groundwater which we get from wells or tube-wells is also a mineral. In other words almost anything which we obtain naturally from under the earth (which is not in the form of plants or animals) is a mineral.

Renewable and non-renewable resources

Environmentalists differentiate between two kinds of resources – renewable and non-renewable. Renewable resources are those which can be regenerated – like wood. If we cut a tree we can plant another tree and hope that it will yield the same amount of wood after some years. However, if we use up a rock outcrop for preparing granite blocks and sell them off, can we plant another rock or make it in some way? Since it is not possible to regenerate these resource they are called non-renewable or finite resources. Most minerals are non-renewable. If we continue using them we will reach a stage when we will not have any more of it. Let us take the case of gold: it occurs in very limited quantities in deep mines. The only gold mine in India – the Kolar Gold Fields had to be closed down. Similarly coal or petroleum. There is only a limited amount of these available on the earth. If we finish them then there will not be any more of it. These are called non-renewable sources of energy.

- Can you imagine a world in which we cannot run motors or trains?
- Can you think of some mineral which renews itself and we can help to increase it?
- Can you think of some source of energy which will not diminish with our use of it, which will keep renewing itself even if we don't do anything?
- Classify the following natural objects into renewable and non-renewable resources. Put a tick (✓) against those which are minerals and cross (✕) which are not minerals. Bamboo, Coal, Sea water, Mud, Ants, Sand, Iron Ore, Diamond, Trees, Petroleum, Grass, Air, Marble rock, Fishes, Well water, Sunshine.

Renewable resource	Non renewable resource	Minerals
1 Bamboo		✕
2	Coal	✓
3		
4		

- Can you classify the following minerals into metallic, non-metallic and energy source? Iron ore, bauxite (aluminum ore), coal, copper ore, limestone, gypsum, mica, groundwater, petroleum, rock salt, sand, gem stones.

Metallic	Non- Energy	metallic resource
Iron ore		

Some important minerals and their uses

You may already know about the uses of some minerals like iron ore, sand, petroleum, limestone, coal etc. In modern industry we use many kinds of minerals. Hence, these minerals have become very important in our lives. Uses of some important minerals are given here. You can look up your library for more information and even check on the internet about them.

Bauxite: Aluminum is extracted from bauxite ores. Aluminum has become a very important mineral in our times because of its light weight. It is used in making aircrafts utensils, electric wires etc, and also extensively in packaging of food products.

Mica: It is a shiny mineral and is used extensively in electrical and electronic industry. It has many properties which make it useful – it comes in thin layers, and is a non-conductor of electricity and heat.

Chrome: It is used for preparing 'stainless steel' utensils. Since it does not corrode (unlike iron or copper) it is used both for cooking food and also for storing industrial liquids like acids.

Asbestos: It is a heat resistant mineral, which is used extensively in industry and also for household roofing. However, it is known to be very bad for health of those working on them, and its use is now being banned all over the world.

Barytes: This is a group of ores from which an element called Barium is extracted. Barium is used for industrial and medical purposes. Barytes is also used in drilling deep holes for petroleum and natural gas.

Feldspar: It is one of the raw materials used in making of glass and ceramic ware (like wash basins etc).

Mineral Resources of Andhra Pradesh

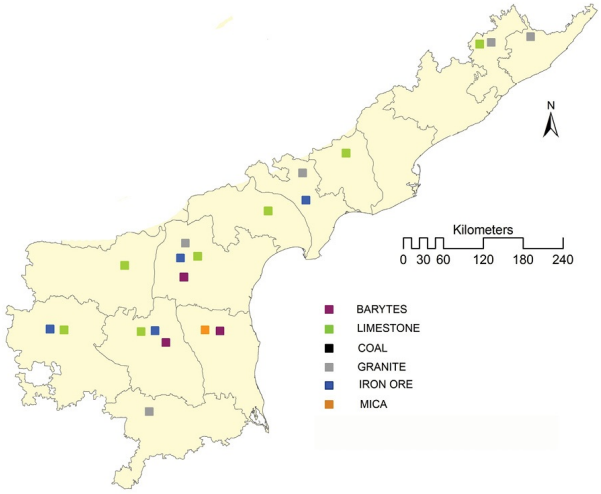
Andhra Pradesh is very rich in mineral resources. It is a large producer of granites of various colours, Kadapa stones, etc used in buildings. It also produces limestone and dolomite used in cement industry. While the Krishna Godavari basin has great potential for mineral oil and gas. AP is historically known for its famous diamond mines too and some of the largest diamonds in the world were found here.

Diamond mines are there in Kolluru of Guntur district and Vajra Karoor of Ananthapuram district. World famous Kohinoor diamond was first discovered at Kolluru of Guntur district.

In addition to these we have large deposits of asbestos, barytes, mica, feldspar, vermiculite, etc.

Look at the mineral map of Andhra Pradesh and fill this table:

District	Mineral
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....



Map1: Minerals of Andhra Pradesh

Mining the Minerals

Minerals can be taken out for use by humans through a process of mining or digging the earth. There are several ways of mining – we can just make a large pit and keep extracting the minerals. We can blast and remove granites, barytes etc. This is called 'open cast mining'. We can build underground tunnels to mine minerals that lie very deep. This is called underground mining. Just as we use a well or drill a tube well to get mineral water, we can drive very deep tube wells to get crude oil or natural gas. In many places this is done by drilling into sea bed like in Bombay High near Mumbai.

Most of the mining practices result in disturbing the surface area – it can mean cutting down forests, destroying fields and habitations, creating large pits or mounds. Mines also need large amounts of water to wash the minerals. This results in polluting the nearby rivers and water sources. This usually means that older use of the land cannot be continued and farmers or tribal people have to leave the land. Even people who live nearby face problems created by mining. At the same time mining employs a large number of people who come to live in nearby areas and build new townships. It thus provides livelihood for nearly ten lakh people in India and over one lakh people in Andhra Pradesh. The work of miners is also very hazardous, as they are constantly exposed to accidents besides breathing in poisonous substances which cause long term health damage.

- Look at the following pictures and guess which of them is open cast mine, underground mine and drill mining for oil (Fig. 6.1, 6.2, 6.3).



- If there is mining activity in your area find out about the people who work and live there and also about how it affects the environment around it. Also find out how many people benefit from it.

To whom do the Minerals Belong?

Minerals usually occur deep in the earth. They in fact do not belong to any particular owner but belong to all people of the country and have to be used in everyone's interest. That is why all mineral wealth of a state is considered the property of the government. The government uses the minerals keeping in mind the interests of all people of the country.

- How does the government use the minerals?

At the time of independence mines were mostly owned and operated by private owners and companies. They were interested only in getting as much as possible in short time and did not care for proper development of the mines or about the safety of the workers. In 1970s the government took over all mines. It owned and operated most of the mines and sold the minerals to various factories or traders or exported them. In this way it was able to control the extent of mining so that there is no over exploitation or use of methods which were dangerous or harmful to people, especially the workers. It could also ensure that the important minerals like fuels, precious metals etc., were mined for public benefit and were not under control of private companies which only cared for increasing their profits. However, the government was not able to bring in new and more sophisticated technologies for mining. It was not able to survey and find out about new deposits of minerals. Thus production of minerals stagnated. It was therefore felt that it is necessary for government to allow private companies to mine minerals and sell them, subject to the regulation and control of the government. A New National Mineral Policy was announced in 1993, and the government allowed private companies to lease mines and operate them. The companies were to pay a royalty to the government for the minerals they extracted and sold. In this way the government could retain regulatory control over the mining, get income from them and at the same time encourage private companies to invest money and bring in new technologies. However, the government continues to control mining of all minerals relating to atomic energy.

As a result of this policy there has been a boom in mining during the last twenty years. There has been a major increase in the number of mines, the minerals mined, and the employment in the mining sector.

On the other hand, there has also been uncontrolled mining by the private companies far in excess of the permits given to them and disregard for environmental and safety measures. Excess mining means that more quantity is mined than is sustainable on a long term. It also means that the minerals are taken away by companies without paying royalty to the government – thus the people to whom the minerals really belong to do not get anything. It can also be environmentally very harmful. For example when more sand is mined from river beds, it can affect the flow of the rivers causing flooding and early drying up. Similarly, the new mining companies do not want to do underground mining as it costs more money and instead prefer 'open cast mining'. This is much cheaper way of mining. But unless the pit and the mound of rubble which is created is properly disposed off it can create serious environmental problems like choking of rivers.

- Discuss the pros and cons of allowing private companies to mine our minerals. How do you think they can be regulated? How do you think the environmental concerns can be taken care of?
- If all people of the country are the real owners of the mineral resources, how can we ensure that they are used for the benefit of all?
- Do you think the generations to come, that is our children and our grand children too should be able to use these resources? How can we ensure that they are available to them too and not exhausted?

Singareni Coalfields (SCCL)

There are extensive coal deposits in the four districts of Khammam, Karimnagar, Adilabad and Warangal. These mines are operated by the Singareni Collieries Company Limited (SCCL). This company was initially set up by a private British mining company in 1886, which was purchased by the Nizam of Hyderabad in 1920. After independence, the government of India took over this company. Today SCCL is jointly owned by the government of India and state government of Telangana. SCCL is currently operating 15 open cast and 35 underground mines in 4 districts of Andhra Pradesh and employs around 65,000 people (2012).

The students and teachers of ZP High school, Kongatam of V.Kota Mandal, Chittoor district visited a coal mine in the famous Singareni Coalfields. Let's listen to them.

We reached Hyderabad from Chittoor. We boarded a bus to Kothagudem from Hyderabad bus stand. On reaching Kothagudem we visited the office of SCCL and took permission to visit the mines. We then travelled 40 Km from Kothagudem to Yellandu. Here again we went to the office of SCCL and took permission to go down the **No.21 Incline.**

Fig 6.4 : No. 21 Incline, entrance to the mine

We then crossed an iron bridge over a railway track on which a goods train was standing. We reached the entrance of the mine where the Safety Officer received us. The officer explained that coal is found as thick layers under the ground. If one dug from the ground level, first there will be some soil, after which there will be rocks and water. If we go further deep for about 200 or 300 feet we will reach the coal layer. In one area there can be several layers of coal separated by rock or loose soil.

Danger and Safety Measures

The safety officer also explained us that it was always a risk to go down as accidents may occur. A tunnel may fall down or get flooded by water or there can be fire and suffocation due to poisonous gases. He explained that the mine administration has developed elaborate safety arrangements to prevent such accidents and that we should also take necessary precautions. He also explained how to face such accidents with the help of the safety kit. We put on the safety kit and got ready to go down. We reported at muster point for online registration.

Fig 6.5: Safety instruments used by miners

- Can you name these instruments?
- What is the use of the stick?
- Why is there a light on the helmet?
- Did you identify the lamp in the picture? What purpose does it serve?

Now we reached the entrance of the mine. Actually this is a lift that carries people in and out of the mine. The two of us and the safety manager along with three miners entered the lift. The lift in-charge closed the sides and gave signals to Under Ground lift operator by ringing a bell using a code.

Fig 6.6: Picture of bell code board

Inside the mine

Our lift went down about 500 feet below the ground level. It was like going deep down a well. We

were gripped by fear as the lift rapidly slid down and we kept hearing water falling somewhere. The safety Officer who was with us explained: “It is ground water. You know that when we dig, we find water. We have to pump this water out, otherwise it will flood our mine tunnels. All the water is directed to a pool from which it is pumped out of the mine.” He further told us that the company has a Project and Planning Wing which takes care of designing these aspects of the mines. The lift stopped and we stepped into a narrow tunnel called mine shaft. As we walked we noticed electrical lines, hose pipes carrying water, a narrow rail track on the ground etc. When coal is mined it is loaded onto small wagons which are pulled on these rails till the lift from where it is taken to the ground level. Our guide pointed out that we were actually walking through a coal layer (also called ‘coal seam’) and that there was coal on both sides and above and below us! We were surprised to see walls of the mine to be bright and not black. Our guide explained that this is because they are painted with dolomite to prevent oxidation and degradation of coal and also to enhance reflection and give us light.

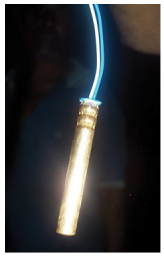
Blasting the coal

Fig 6.7: Dolomite painted coal wall

Now we were approaching to the coal drilling area or ‘face’. Every day the supervisors inspect the coal seam and give instructions for that day’s mining – where the mining is to be done, and what safety measures had to be taken. Different groups of people are assigned different tasks. One group was drilling holes with pneumatic air compressor to plant the explosive rods. Resin packets were inserted to keep them in place. These explosives will be set off (detonated) by an electrical device. Strong rock like coal is broken in this manner so that it can be cut and transported. This process is called ‘blasting’. It is a hazardous process as sometimes, the blast can bring down the entire mine face causing death of the miners. It has to be therefore done with great care and calculation.

Another group of miners was arranging wooden and iron supports to support the roof so that it may not fall down on the heads of the miners. One group was ready with flexible movable motor known as drilling machine. This would be used to cut the coal after the blast. Now the blasting hole is ready, as you can see in Fig 6.8.

When the entire preparation for blasting was complete, everyone withdrew to safe places. Then a warning whistle was blown and then the detonator was set off. Suddenly, the whole mine resounded with the boom of an explosion. The walls and the ground shook and it seemed as if an earthquake had hit the spot. There was smoke and dust everywhere. After some time the whistle sounded again and we moved once more towards the face. Slowly the dust settled. Two or three miners entered the dust cloud coughing. They walked over the coal that had fallen in the explosion using their rods to inspect the places from where the coal has fallen. At one spot the roof was weak so, it was supported with wooden beams and posts.



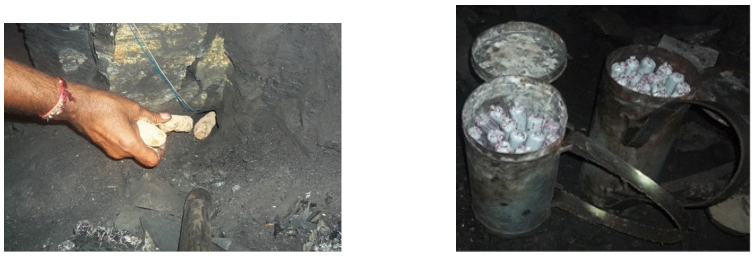


Fig 6.8:
(left) Detonator,
(right) Battery,
(bottom left) filling hole with explosives,
(bottom right) explosives

Transporting coal

In this mine coal is transported through conveyor belts. Earlier miners had to physically load the coal onto small wagons which carried the coal. Now dumper machines load the coal onto the conveyor belts which carry the coal to the ground level. Then the coal is graded and loaded onto trucks and railway wagons. Singareni mainly supplies coal to thermal power plants of the government. Remaining coal is purchased by other companies.

Welfare

Singareni Colleries provides quarters with roads, drinking water, utilization water. It gives electricity at nominal charges. It establishes schools and hospitals.

Safety and Health Checkups

Director General of mines safety monitors safety aspects and periodical medical examination. The workers underground are not only exposed to accidents, but constantly inhale coal dust which causes the dreaded 'Black lung disease', a form of TB. There are detailed guidelines for medical check up of the miners and their treatment. Employees below 45 years will have thorough routine checkups every 5 years. Employees above 45 years will have thorough routine checkups every 3 years. Miners with black lung disease are usually transferred to a different department over the ground.

New trends in Mining industry and miners

Recently there has been a great increase in demand for coal, especially for thermal power plants. However, our mines are not able to cater to this demand due to low productivity. Hence the SCCL is devising plans for increasing production by shifting to open cast mining. It has therefore set up about 15 open cast mines and introduced fully automatic machines through private contractors. These will be producing much more coal but employ very few people. It is also said that the coal reserves of these open cast mining areas will be exhausted in 10 to 15 years after which there can be no mining in this area.

Singareni coal mines open wounds

By Our Correspondent

Read a news report of 29 June 2009:

WARANGAL June 28: Singareni Collieries Company Limited (SCCL) has decided to adopt open cast mining (OCM), to meet the demand for coal. The decision could render 20,000 people homeless and affect 200 villages. The mines will also affect an estimated 3,000 hectares of forests.

“If the mining underground produces 1,500 tonnes of coal a day, open cast mines produce 10,000 tonnes per day and obviously at a much lesser cost,” said a senior SCCL official.

While that is so, the open cast mining will displace thousands of families, destroy scores of habitations and cause loss of livelihood to locals. According to the company official, the company will pay compensatory afforestation charges and develop forests on an equal amount of land where it has lopped off the jungles. It will pay Rs. 4.38 to Rs. 10.43 lakh per hectare, he said. The local people also complained that due to these mines which dig up the earth and create huge artificial hills of loose earth, rivers and streams are getting choked and ground water is getting polluted and there is acute scarcity of even drinking water.

- How do you think this dilemma can be resolved? Is it fair to produce coal at a low price when it causes the loss of livelihood, lands and damages the environment?

Mangampeta Barytes

Open Pit Mines

Fig 6.9: Barytes mine monument at Mangampet,YSR Kadapa District

Mangampeta is in YSR Kadapa district and has one of the largest reserves of barytes mineral in the world. The barytes reserves were discovered in 1960 and it has been mined since 1967. Nearly 1200 families lived in this village, which were shifted to a new site and rehabilitated by Andhra Pradesh Mineral Development Corporation (APMDC, a government company) which now owns and operates the mines. The Barytes mines are the pride of APMDC as it earns huge profits from these mines.

- Find out about the uses of Barytes from the box given in page 64. Why do you think demand for barytes is increasing?

The mines here are not underground but the open pit type. Look at Fig 6.9 to get an idea of how this mineral is mined. In the picture you can see a section that has been left un-dug. This is a monument of this mine and it also indicates how deep the mine is. Barytes available in the upper layers are of lower grade while those mined from a depth are of higher grade. Quality is determined by the grain size of the stone. Upper layer barytes are in grey colour while at lower levels it is white or cream white. Once the mineral deposit was discovered, it was tested in the labs and found to be of high quality. Surveys showed that it is available in very large quantities. A plan for mining barytes in the village was developed and the villagers who lived there were rehabilitated.

In the open pit mines almost all work is done by machines. Shovel, bulldozers are used to remove over burden or the top soil and rocks which are a waste. Six metre high benches are made (benches are vertical section of a mine from where the mineral is removed) next to a ten metre road. The road goes all the way down to the bottom of the pit connecting all the benches. Mineral and waste rocks are removed from the sides by blasting. This is loaded by huge machine dumpers onto ten tonne capacity tipper trucks. This is how one lakh tonne of barytes are mined in one month in Mangampeta.

Fig 6.10: Loading barytes in to a truck

- Describe what is happening in Fig 6.10. How many people do you think would be employed for this operation?
- Can you see the collection of underground water in the top left corner of the picture? What will happen to this water?

Every day 16,000 tonnes of waste material and 3,000 tonnes of barytes are mined and transported. It is a major challenge to dispose off the waste in such a way that it does not damage the environment too much. You must have seen a large whitish hill above the small building in Fig 6.9. This hill was made by the waste materials deposited from the mine. Compare the vegetation growing there and in the actual mine area. Plants and grasses adapted to this kind of soil have to be grown on them and watered constantly to the soil from flying and spreading all around.

Fig 6.11: Women drilling holes for blasting

Look at the women working in the mines in Fig 6.11. They are drilling holes for blasting with explosives. You can see the wires of the blast detonator. Do you see the women wearing any protective gloves or shoes? What are they wearing on their heads?

Fig 6.12: Crushing and packing plant

The ore is transported by the trucks to above the ground where it is crushed into fine powder and packed in large bags and sent off in trucks and railway wagons. See Fig. 6.12. This is the crushing and packing plant.

There are about 600 workers in this mine. Of these about 152 are regular employees of the APMDC who get regular salary and benefits as per government norms. The rest are contract workers and trainees who are paid minimum wages only.

- Compare the mining in the coal belt with the mining in Mangampeta. What are the similarities and what are the differences?

You must have got an idea of how we mine our precious resources, what kind of livelihood people get from it and how it is necessary to control the damage done to the environment by mining?

Key words

1. Minerals
2. Underground mining
3. Open pit mining
4. Renewable resources
5. Non renewable resources
6. Coal
7. Barytes

1. Create a flow chart showing the visit to the underground mining. AS_1
2. Create a table to classify major health challenges; precautions; and care taken towards protecting mine workers as follows: 1. While working in the mines 2. While being employed. AS_3
3. Janaki is currently a farm labourer. She wants to become a miner. Can you explain what changes will occur in her nature of work; employment scenario; health risks etc. AS_1
4. Narrate the difference in requirement of labour in mine while using machines and human labour. AS_1
5. How has been the contribution of mining to economy identified in this chapter? AS_1
6. See the map of Andhra Pradesh showing minerals in this chapter and identify the minerals found in your district.AS_5
7. Read the paragraph under the heading 'To whom do the minerals belong' and answer the following:
The minerals do not belong to any particular person but they belong to all people. How do you justify? AS_2
8. Look at the image below. There are two different statements made by two different people. What aspect of mining are they talking about? AS_1

We cannot live because of minerals ***We can notlive without minerals***

9. How are minerals helping the country in development? AS_6
10. Prepare a table showing different minerals and their uses.AS_3

1. Untitled-2