CHAPTER 1

U5N6W9

Reading and Analysis of Maps

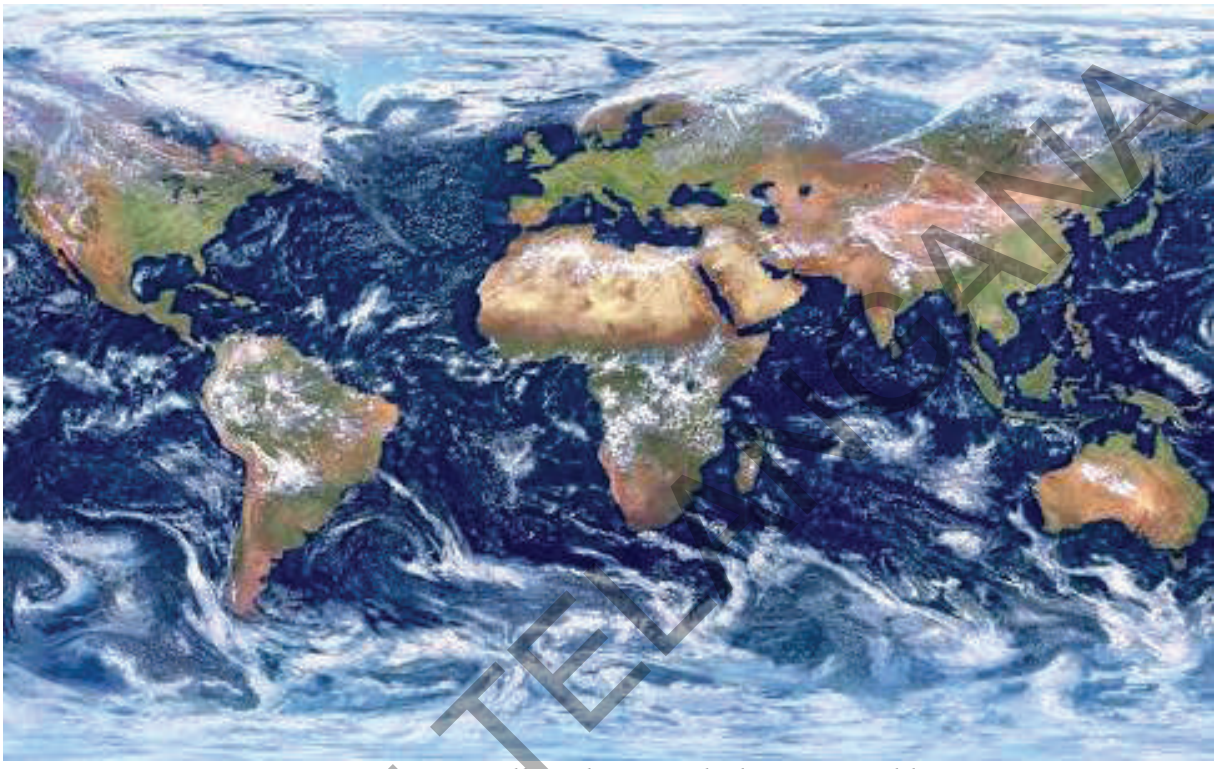
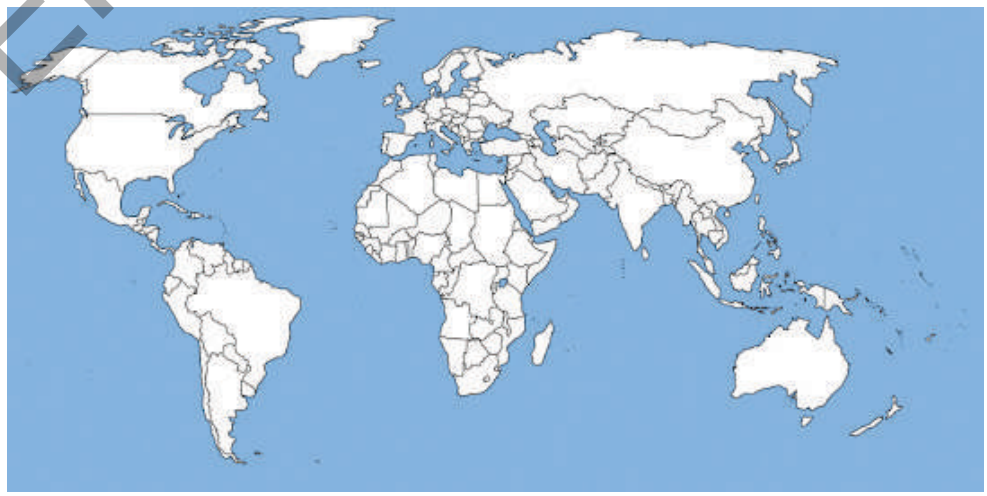


Fig 1.1: Satellite photograph showing World

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 related to different places. Can you point out 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) of the same place. Can you point out all the similarities and differences between the two?



Map 1: World Outline Map

A map, unlike a photograph, does not show any real features. A map is used by geographers to show features and information that we consider important about a place – 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 importance. A 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 different they were depending upon the purpose.

Maps Down the Ages

Map making in India: From the very prehistoric times people have been speculating about the cosmos - earth, rivers, seas, skies etc. Often this speculation was depicted visually; we have a prehistoric painting from Jaora, in Madhya Pradesh showing land, water and the skies. Cosmographic speculation continued in the Vedic and Puranic times when, it was thought that the earth had seven islands surrounded by seven seas arranged in a concentric circle with Mount Meru at the centre. India (Bharatavarsha) was located on one of the islands called Jambudvipa. Architects prepared elaborate plans for Vedic sacrificial altars and buildings and a few sketches of these have survived, especially from the medieval period. We also get references to a number of pictorial maps depicting places, especially pilgrim centres. Sailors who sailed along the sea coasts of the Indian Ocean too may have maintained elaborate maps or sketches of the coastline, giving location of ports, shoals, islands etc.

Map 2 : Round World surrounded by water as conceived in Mahabharata

Map 3 : Seven Dwipas of the World as conceived in Ancient India

The understanding of latitudes and longitudes helped in fixing location of various places. We find Aryabhata using

these concepts in the Fifth century CE. It is not clear if and when these were used in map making.

In the Mughal times Indian map makers were introduced to the methods of Central Asian map makers and an atlas was prepared in Jaunpur in the seventeenth century by Sadiq Isfahani. He used latitudes and longitudes to determine location of places in his maps. By the end of the Mughal period when the British began mapping India, we learn of a wide variety of maps in use. Unfortunately most of these maps are lost and only a few have survived.

Maps have a long history behind them. Some of the earliest surviving maps were made by Sumerians (present day Iraq) about

Fig 1.2: Sumarian clay tablet

four thousand years ago. These were imprinted on clay tablets. The Sumerian temples owned large tracts of land and they had to keep an account of income from the lands. That is why they tried to keep records of the lands with the help of maps.

Babylonians (also the people of present day Iraq) made some of the earliest 'world maps'; that is the world as they thought of it. We have given below one of the maps 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 Oceans.

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

Map 4: World after Hecataeus

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 as 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.

As you can see in the previous map, 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 4). 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 centres 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. These places were joined together with a line from north to south – this was the 'Meridian' (Noon line) or Longitude. They also tried to draw Latitudes by connecting 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 the 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 easy and 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 for a long time.

You may have noticed that most of these ancient 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 as much smaller than Sri Lanka as the sailors were more familiar with it.

These books of Ptolemy were used by the Arab scholars and sailors to prepare maps. One famous Arab map maker Al Idrisi prepared a world map for his king in 1154 C.E. 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.

Map 5: Map by Al Idrisi (1154 C.E.)

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 5). It places Arabia prominently in the centre of the map.

- Can you guess why? Turn the book around. Can you now locate India and Sri Lanka (which was shown much bigger than it is)?

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. Given below is a map made around those times.

Map 6: 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.

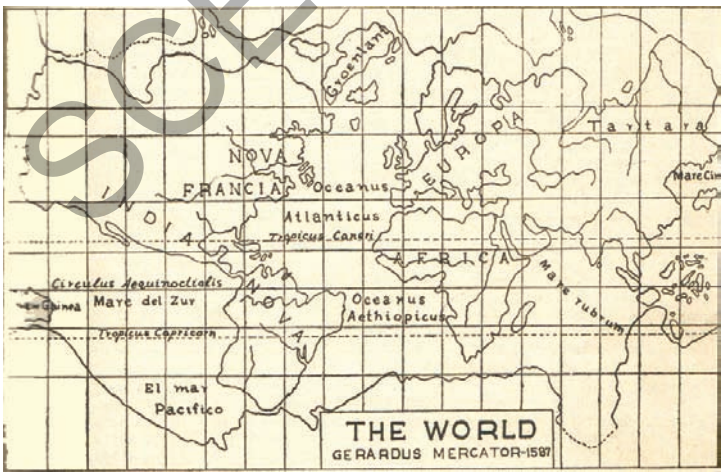
Around C.E. (common era)1480, Europeans rediscovered Ptolemy's books (but not the maps) and were stunned to learn about his accurate description of the location of places. They prepared some new maps based on them. You can see one such map here (map-7).

Map 7: Map based on the 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 came up. Fortunately, this period happened to be an age of discovery and exploration which popularised the 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 these explorations 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, its map makers made a major breakthrough in their work. The father of Dutch cartography was Gerardus Mercator (1512 C.E.-1594 C.E.), who examined the previous works and did about more original work on maps. Mercator's map projection is famously known as Mercator Projection. Most of the world maps we use are based on his projection.



Map 8: World map by Gerardus Mercator in the 16th century

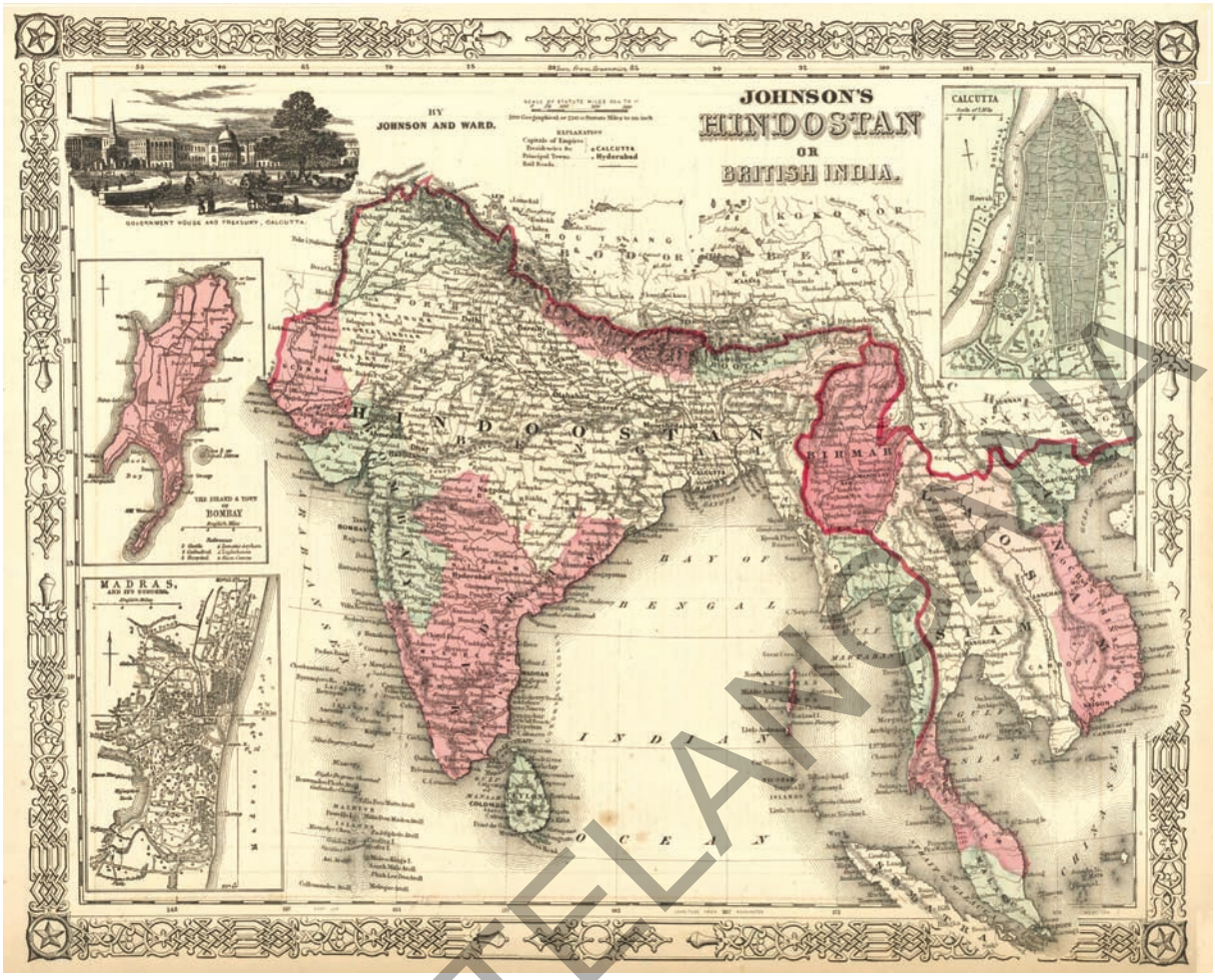
Projection in a Map

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 objects will get placed in the 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 did the sailors influence the making of maps in early times?
- Why do you think did the map makers place 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 the people living there. They sent scientific expeditions consisting of map



Map 9: An early map of India

makers and others to explore the different parts of the world and prepare maps. These teams fought their way into the interiors of continents. They crossed mountains, deserts, rivers and also gathered information. This information and the maps enabled the colonial powers to establish their rule over these areas and 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 Rennel was appointed the 'Surveyor General' and he prepared one of the first survey based maps of India. Look at the map of India (Map 9) created during the British period and compare it with a current map.

In 1802 C.E. 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 (Mt Everest 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 two World Wars. Many governments tried to keep these 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 this people for study and use today.

- Do you think this free access to maps is a good thing? Why?
- Why do you think did the colonial powers invest so much money to prepare detailed maps?
- Find out about the lives of some of the great explorers like David Living stone, Stanley, Amudsan, 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 and development of countries. This requires planners to identify the resources available in a region and the problems faced by it. 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 using large pipes. Similarly, we can plan agricultural development, planning and setting up of new industries, building roads, hospitals and schools with the help of maps.

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

Maps are also used by companies to plan their business and work. For example, a mobile telephone company that wants to spread its network in an area will need the maps of villages, towns and 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 them? Make a list.
- Why do you think are maps useful to armies in times of war?

Reading Thematic Maps

You saw above that maps do not just show the names of places and the 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 only on 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 residential areas, 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

For representing the 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 a 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 will be the population map of your school! Don't target 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 an area. 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 the states and cities. The following table gives the population density of different states of India.

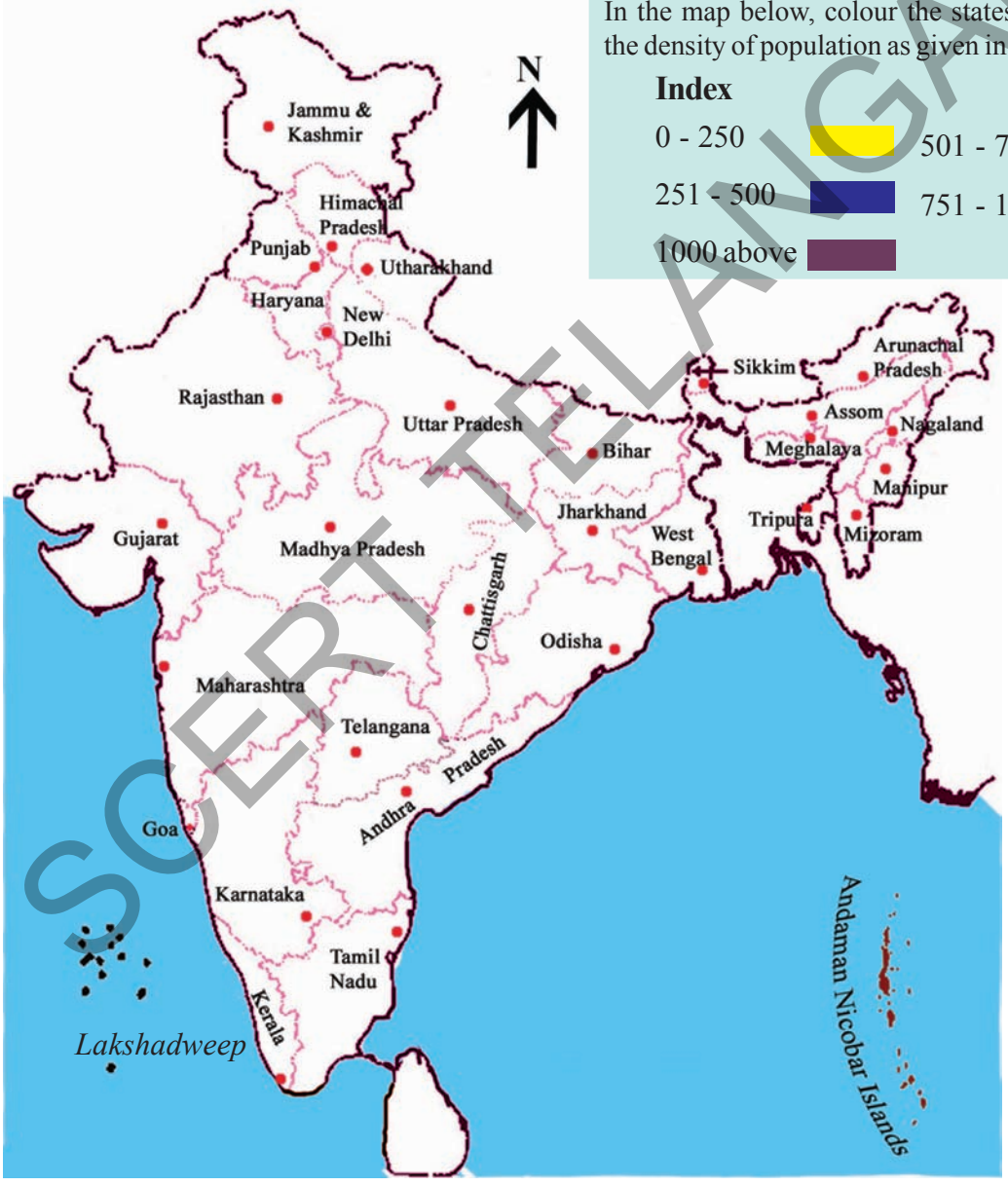
Density of Population year - 2011 (Census - 2011)

State	Density	State	Density	State	Density
Andhra Pradesh	309	Jammu & Kashmir	56	Odisha	269
Arunachal Pradesh	17	Jharkhand	414	Punjab	550
Assam	397	Karnataka	319	Rajasthan	201
Bihar	1102	Kerala	859	Sikkim	86
Chhattisgarh	189	Madhya Pradesh	236	Tamilnadu	555
Goa	394	Maharashtra	365	Telangana	307
Gujarat	308	Manipur	122	Tripura	350
Haryana	573	Meghalaya	132	Uttarakhand	189
Himachal Pradesh	123	Mizoram	52	Uttar Pradesh	828
		Nagaland	119	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

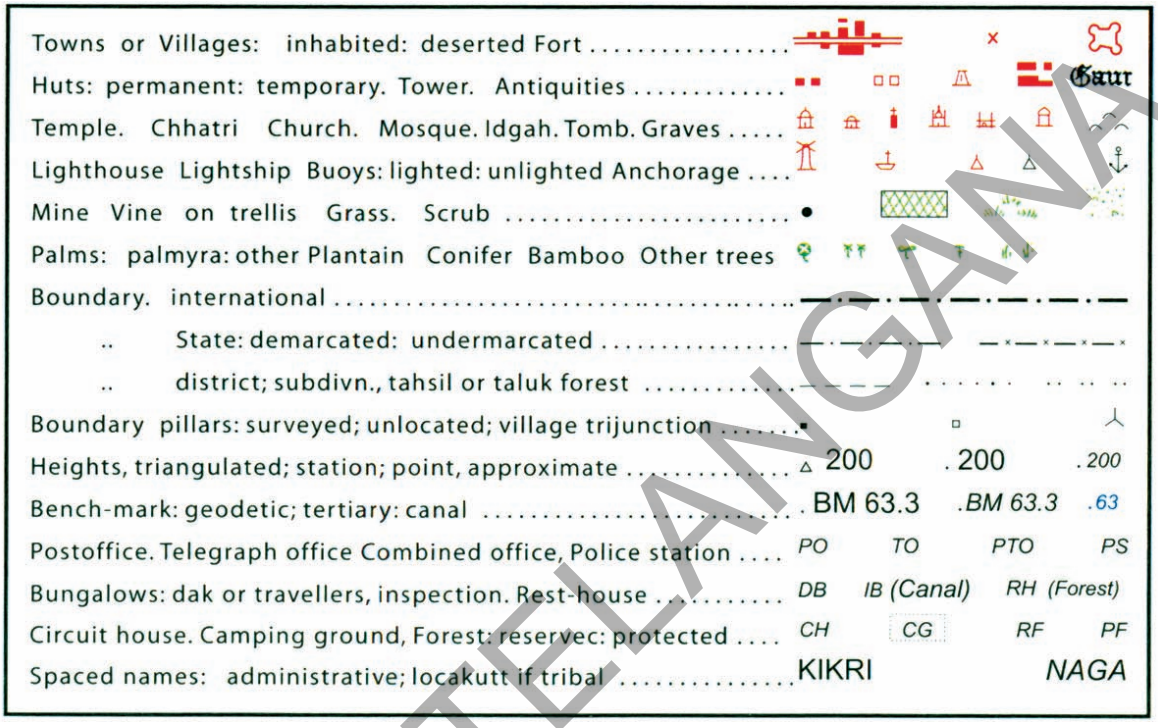


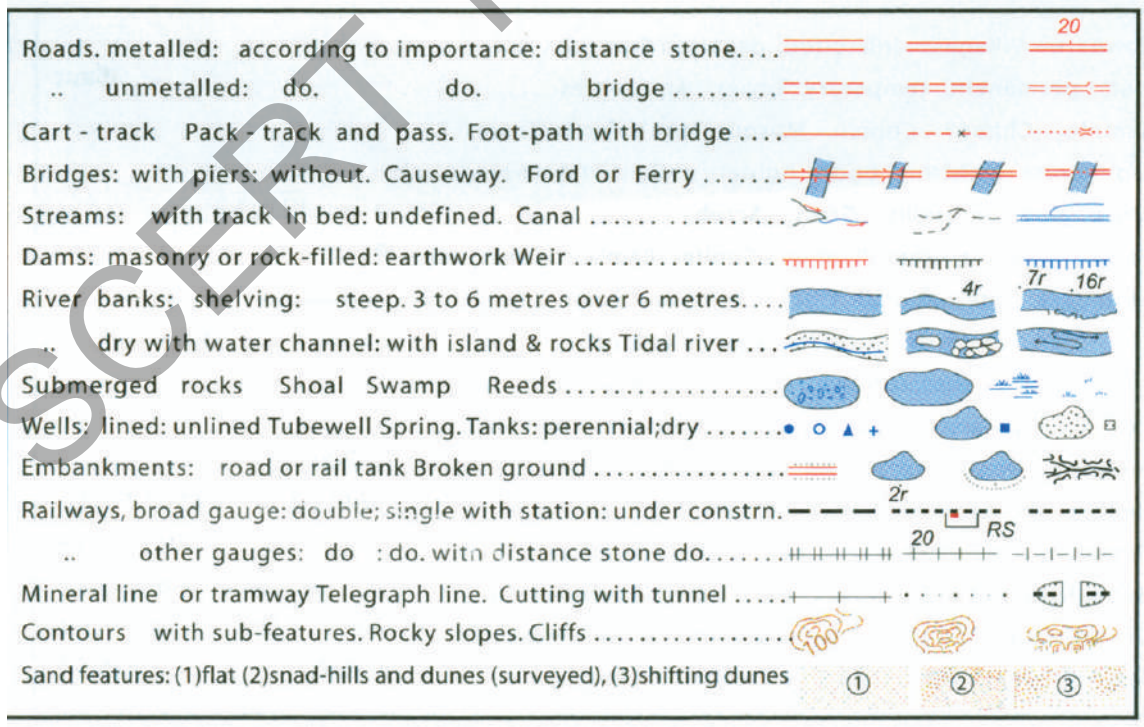
Map 10: India - Density of population

Note : As per the census 2011, the density of the population of Jammu and Kashmir is a consolidated of the newly formed Union Territories Jammu and Kashmir and Ladakh.

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.





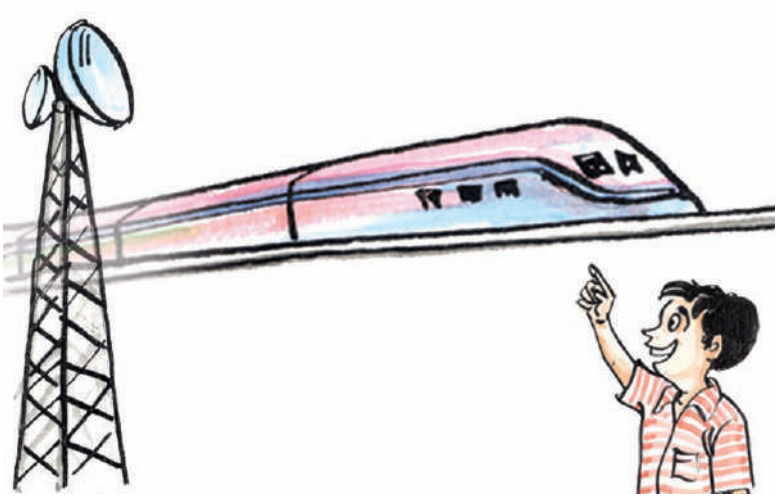


Fig 1.4: Thankfully they did not create symbols for these!

Representation of relief features on maps

Relief feature means the high and low areas 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 height of different places 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 the map joining places of same height – measured from the sea level. In other words, all the 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.

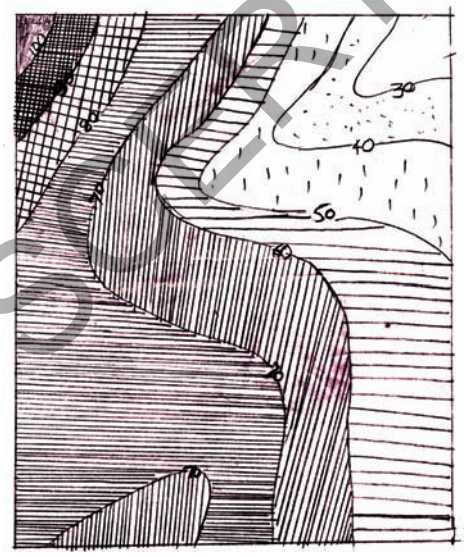


Fig 1.5: Map with intensity of patterns (Isopleth map)

Contour Lines

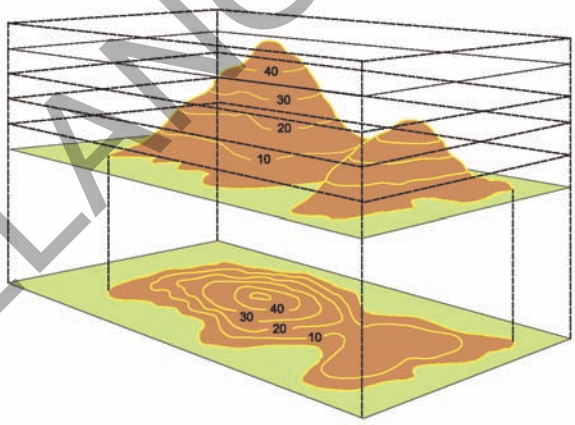


Fig 1.6: Hills

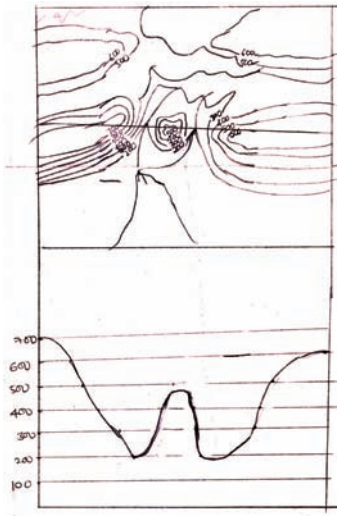


Fig 1.7: 'V ' shaped valley

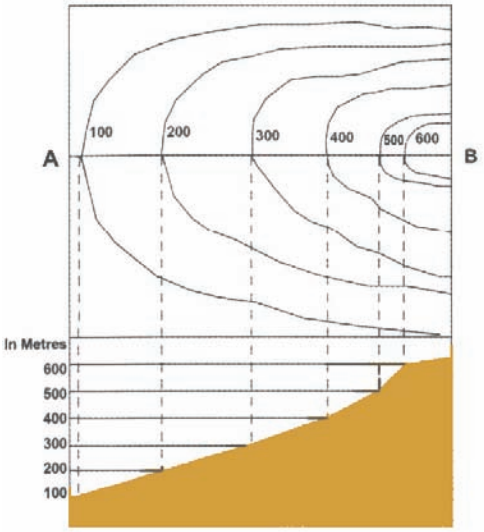


Fig 1.8: Gentle slope

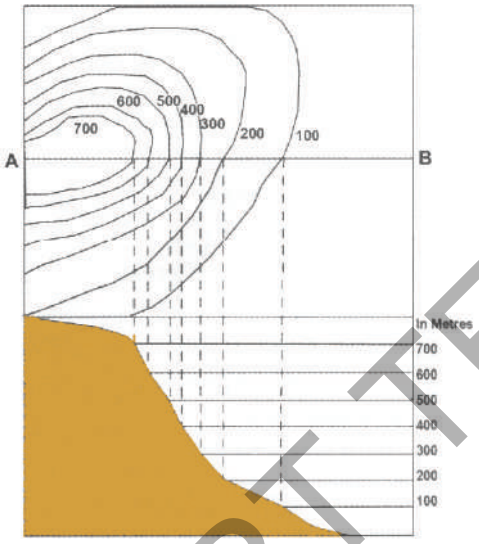


Fig 1.9: Steep slope

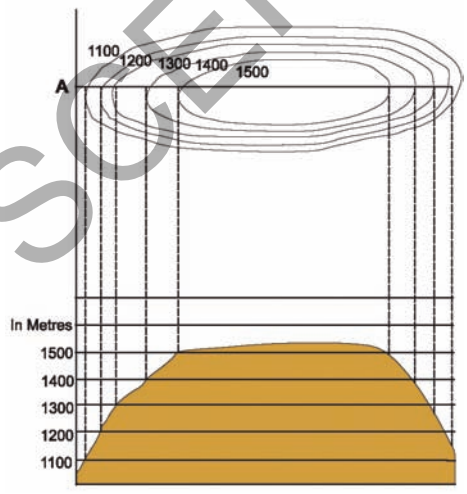


Fig 1.10: Plateau

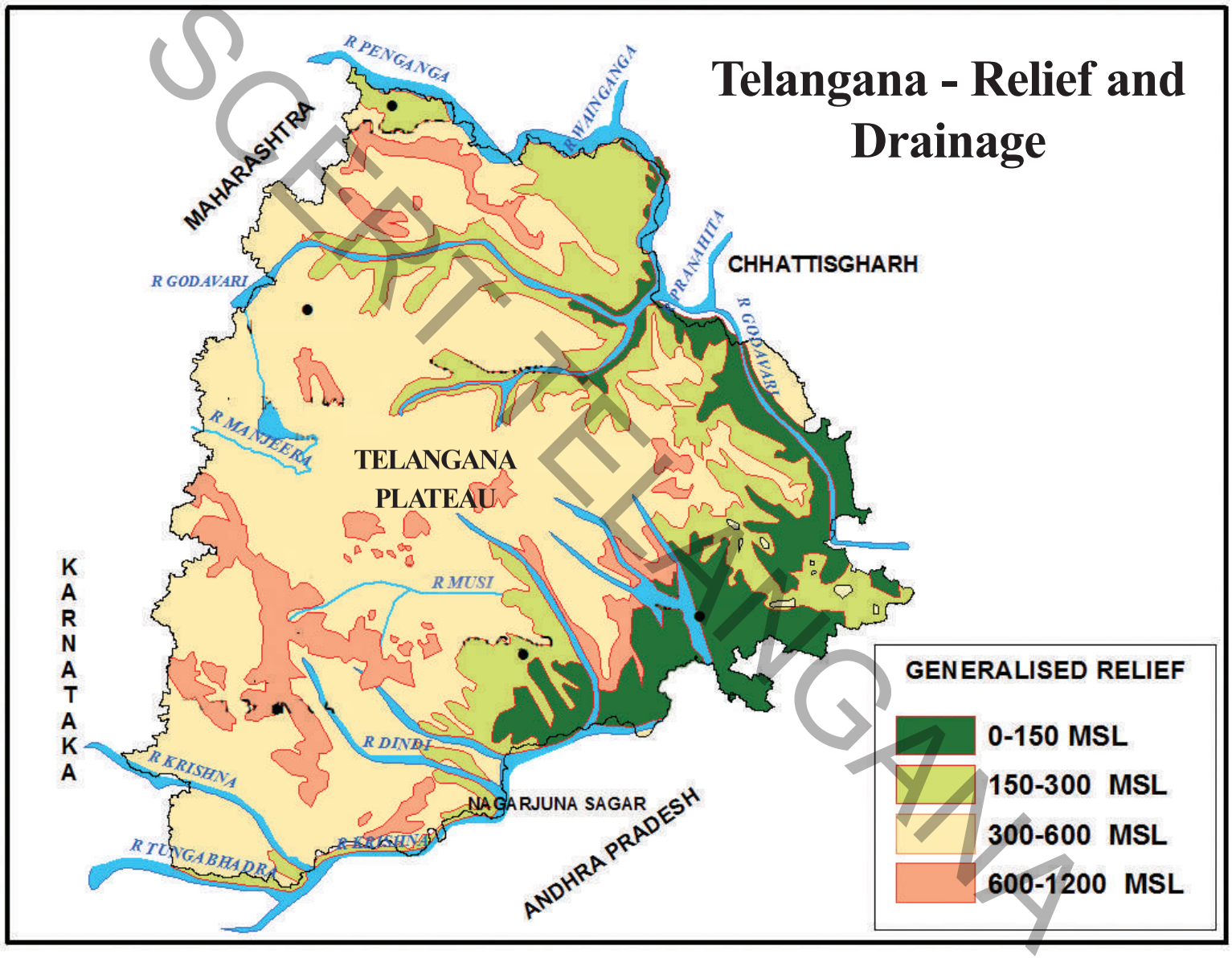
Contour lines are usually drawn at fixed intervals of height such as 20 metres, 50 metres, or 100 metres. Uniform contour interval is maintained between the lines on a given map.

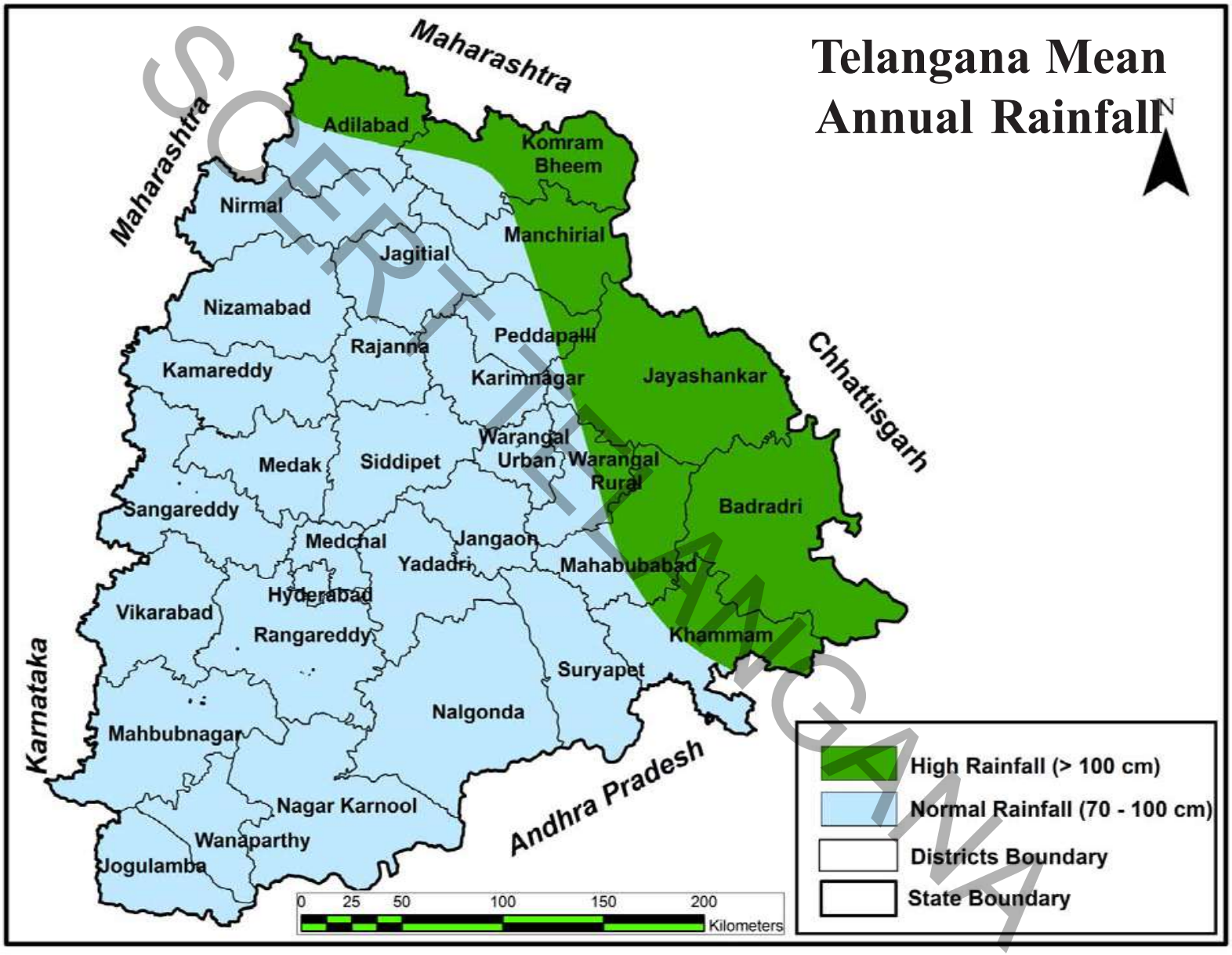
Contour lines give an indication of the slope of the land as well as the elevation above sea level. Wherever contour lines are far apart, it represents a gentle slope, closer lines represent steep slope and uniformly spaced lines represent uniform slope.

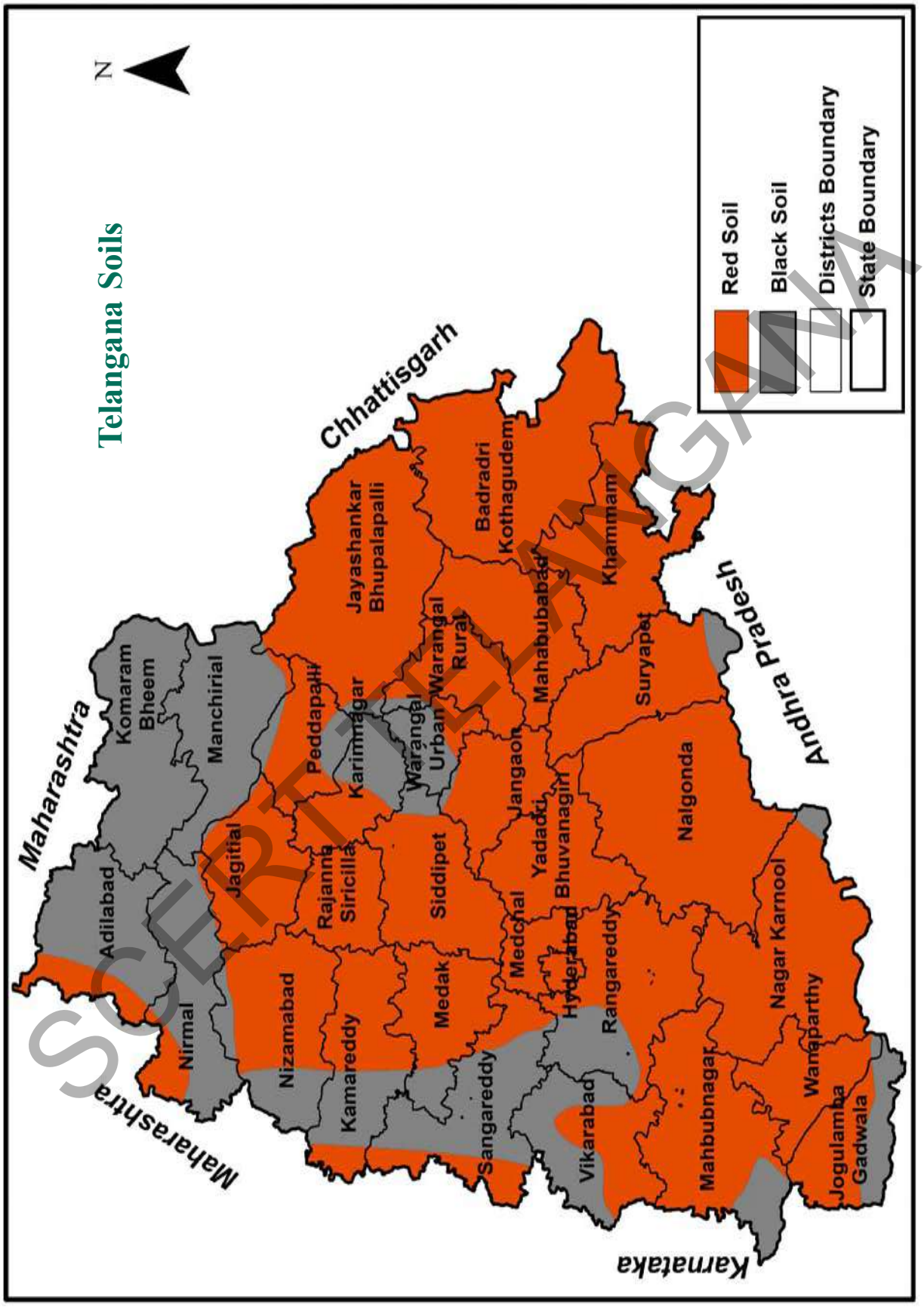
- In this book, there are different thematic maps i.e. Relief and Drainage (p.14), Mean Annual Rainfall (p.15), Soils (p.16), Forests (p.55) and Minerals (p.64). Now, make a table to identify the different information given for your district from the different types of maps mentioned above.

Atlas

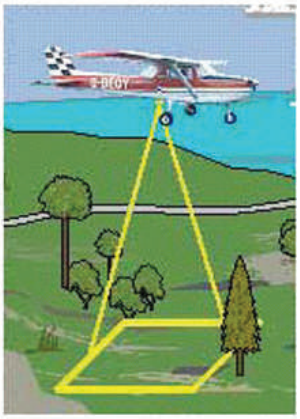
An atlas is a collection of maps – usually arranged according to different themes. Open the school Atlas and look at the list of all the maps shown in it. You can find out useful information about different places and use it to imagine the life of people living there. Can you imagine the life of people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







Aerial photography:



Aerial photography is the technique of taking of photographs of the ground from an elevated position, using aircrafts, helicopters, hot air balloons etc. Aerial photographs are not maps.

Satellite imagery:

Satellite imageries are the photographs of the earth taken by the artificial satellites launched into the space. These are used in many ways: map making, planning, meteorology, forestry, warfare etc.

You may be aware about the weather report in the daily newspapers and TV news channels. Try to collect, observe and interpret the weather map.

Keywords

1. Projection
2. Symbols
3. Geographer
4. Contour
5. Cartography

Improve your learning

A1F8S4

1. Study the school atlas carefully by looking at the various thematic maps.
2. Do you think the use of maps has changed from the time of ancient Greeks to now? In what way are they similar and different?

	In ancient Greece	At present
Similarities		
Differences		

3. Many people believe that the 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?
4. In what ways were the maps prepared by the British different from the one made by Ptolemy?
5. Read the paragraph "Use of maps in our times" on page 8 and answer the following question:

   What are the various purposes for which maps are used in our times?
6. Prepare a few questions to find out more about different types of maps.