UNIT 14  INDIA: PHYSICAL ENVIRONMENT

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14.1 INTRODUCTION

Physical environment of India is an important content area in geography at the secondary level. It mainly comprises topics like location and size of India, major physical features of India, drainage systems in India, monsoon, natural vegetation and their distributions, conservation of natural vegetation and wildlife. In this unit, we will provide you with a brief description on each of these topics. Each topic is followed by suggestive teaching-learning strategy which includes learning objectives, teaching-learning activities and assessment questions. This unit expects you to foster geographical skills among students by organising relevant activities pertaining to the different topics under physical environment of India and also help you acquire relevant information so that you can analyse and answer to problems related to the topics.

14.2 OBJECTIVES

After going through this unit, you will be able to:
- identify the location and size of India on the map of India;
- describe the major physical features of India;
- describe the drainage system in India;
- enumerate the characteristics of monsoon;
- discuss the natural vegetation and their distribution;
- explain why conservation of natural vegetation and wildlife is important;
- formulate learning objectives for the selected contents;
- plan suitable learning experiences;
- acquaint yourself with use of learning resources; and
- acquire skills of constructing assessment questions.

14.3 INDIA: LOCATION AND SIZE

14.3.1 Overview of the Topic

When it comes to size of our country, you may agree that it is a vast country. If you glance the size of our country on the globe, then you will realize that there are very few countries on the globe which are larger in size than India. Can you find out the countries which are larger in size than India? It is seventh largest country in the world. It has a land boundary of about 15,200 km and a coastline of about 7,516 km including coastline of mainland and islands of Andaman and Nicobar and Lakshadweep. It occupies geographical area of 32,87,263 sq.km. and accounts for about 2.4% of the total geographical area of the world.

Looking at the globe, you will notice that it lies entirely in the Northern hemisphere. The mainland of India extends between latitudes of 8° 4’ N to 37° 6’ N and 68° 7’ E to 97° 25’ E. You will further note that the Tropic of Cancer (23° 30’ N) divides the country into almost two equal halves. India has latitudinal and longitudinal extent of about 30°. India is bounded by Greater Himalayas in the northwest, north and north east. The Deccan peninsula is triangular in shape.
which is flanked by Arabian Sea in the west, Bay of Bengal in the East and Indian Ocean in the South. Can you find out some of the neighboring countries of our country? The topic on location and size acts as an advance organizer to study critically its relationship with other geographical elements like physical features, drainage system, monsoon climate, natural vegetation, wild life and population of India.

Fig. 14.1: India: Location and Extent

Source: NCERT (2005)

Check Your Progress

Notes:  a) Write your answers in the space given below.
         b) Compare your answers with those given at the end of this unit.

1) Mention the distances of land boundary and coastline of India.

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14.4 TEACHING-LEARNING STRATEGY

Teaching-learning strategy for this topic includes learning objectives, teaching-learning activities, and assessment questions.

14.4.1 Learning Objectives

Through this teaching-learning strategy, students will be able to:

- appreciate the vastness of the country;
- describe the relative and absolute location of our country;
- recall latitudinal and longitudinal extent of the country;
- explain the significance of central location of our country at the head of the Indian Ocean;
- state the length of land boundary and coastline of our country;
- describe the size of our country;
- order the place of our country with respect to area and size of other countries;
- explain the relationship between latitudinal extent and its influence on duration of day and night;
- indicate the reasons for selection of particular longitude as standard meridian for India;
- establish the relationship between longitude of a place and its time; and
- compute time based on given longitudes.

Learning Resources: The World (Political Map), Asia; (Political Map), India: (Political and Physical Map), Globe, Atlas, Worksheets, 3D-Models of Island, Bay, Peninsula, Charts showing different lines of latitudes, Chart explaining concept of latitude and longitude. Newspaper clipping on India’s relationship with neighbouring countries (issues emerging out of location and size),
14.4.2 Teaching-learning Activities

The following teaching-learning activities are suggested for this topic.

**Activity 1: Acquainting students with basic concepts:** In order to understand the location and size of India students need to have thorough understanding of concepts given below:

i) **Map:** It is a conventional representation of the earth surface or part of it drawn on a flat surface, drawn according to a scale. They are of different types- physical maps, political maps, wall maps, atlas maps. For teaching-learning process in classroom situation, we normally use wall maps. In order to teach a unit on India- Location and Size, we need to have 3D physical map of India along with India- Political Map. In Figure 14.2 there is an example of Political Map of India.

![Fig. 14.2: India: Political Map](image)

Source: NCERT (2005)

ii) **Globe:** It is a model (miniature form) of the earth. In order to show the exact position of our country on the earth surface we need to use globe. Map may not give us exact visual location and correct shape. On the globe, countries, continents and oceans are shown in correct size. See Figure 14.3.
iii) **Atlas**: A large number of maps bounded in a volume is called atlas. In order to know the relative and specific location of places, regions, continents and geographical features, we need to use atlas as it provides readymade coordinates of these features in index. Students in the classroom may be provided with several worksheets and atlas to carry out several activities.

iv) **Poles**: It is difficult to describe the location on a spherical body like the earth. In order to locate a place on the spherical earth we need to have certain points of reference and lines. Two extreme points on the earth surface are called poles. You may ask your students to notice a needle that is fixed through the globe in a tilted manner, this imaginary needle is called axis. Two points on the globe through which the needle passes are two poles- the North Pole and the South Pole. See Figure 14.4
v) **Equator**: It is an imaginary line on the globe dividing it into two equal halves. The northern half is known as the Northern Hemisphere and the southern half is known as Southern Hemisphere. It is a very important reference point to locate places on the earth. The value of equator is 0 degree (Figure 14.5).

![Figure 14.5 Important Lines of Latitudes and Heat Zones](image)

vi) **Latitude**: It conveys how far you are from the equator. It ranges from 0 degree at the equator to 90 degrees at the North and South Poles. If the value is close to 0 then the place is near to the equator and if the value is close to 90 that means the place is closer to poles.

![Figure 14.6: Latitudes and Longitudes](image)
vii) **Longitude:** In order to know the place, it is important to know something more than the latitude of that place. You may recall that in co-ordinate geometry in order to plot a point we require a set of two co-ordinates ‘x’ and ‘y’, where ‘x’ refers to latitude and ‘y’ refers to longitude. Longitude conveys how far you are east or west from the given line of reference running from the North Pole to the South Pole.

viii) **Parallels of Latitudes:** All parallel circles from the equator up to the poles are called parallels of latitudes. All parallels north of the Equator are called ‘north latitudes’ and similarly south of the Equator are called ‘south latitudes’.

ix) **Major lines of latitude:** Besides the equator (0°), the North Pole (90°N) and the South Pole (90°S), there are four important parallels of latitudes-

   1) Tropic of Cancer (23 ½ °N) in the Northern Hemisphere.
   2) Tropic of Capricorn (23 ½ °S) in the Southern Hemisphere.
   3) Arctic Circle (66 ½ °) north of equator.
   4) Antarctic Circle (66 ½ °) south of equator.

x) **Lines of Longitudes:** The lines of references running from pole to pole are called longitudes.

xi) **Standard Meridian:** The longitude of 82½ ° is treated as the Standard Meridian of India. The local time at this meridian is taken as the standard time for the whole country. It is known as the Indian Standard Time (IST).

xii) **Prime Meridian:** The meridian, passing through Greenwich, where the British Royal Observatory is located, is called the Prime Meridian. Its value is 0° longitude and from it we count 180° eastward as well 180° westward. The Prime Meridian divides the earth into two equal halves, the Eastern Hemisphere and the Western Hemisphere.

**Eastern Hemisphere:** The area lying between the Prime Meridian and the 180° east Meridian.

**Western Hemisphere:** The area lying between the Prime Meridian and the 180° west Meridian.

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Fig. 14.7: Hemisphere: Northern, Southern, Eastern and Western
xiv) **Heat Zones of the Earth**: The global area bounded by the Tropic of Cancer and the Tropic of Capricorn which receives maximum heat is called Torrid Zone. The area bounded by the Tropic of Cancer and the Arctic circle in the Northern Hemisphere and the Tropic of Capricorn and the Antarctic Circle have moderate temperatures and is called Temperate Zones. The areas falling under this zone experience moderate temperatures. Areas lying between the Arctic Circle and the North Pole in the Northern Hemisphere and the Antarctic Circle and the South Pole in the Southern Hemisphere are called Frigid Zone. These areas are very cold because in this region the Sun does not rise much above the horizon and its rays are always slanting.

![Fig. 14.8: Important Lines of Latitudes and Heat Zones](image)

**Activity 2**

**Learning through Map**: You may gather information from students on the relationship between globe and map and initiate a discussion on the location of India. You need to discuss two related concepts of location, i.e. absolute and relative. You may ask questions pertaining to extreme latitudes and longitudes of India. You may ask names of the neighbouring countries of India. You may ask several questions pertaining to the size of our country. You with the help of political map of India may ask students to categorize states according to size (based on visual). As a teacher, you may explain the concept of absolute and relative location to students and provide them several exercises to find out location with the help of atlas.

**Absolute Location**: It describes the location of the place based on a fixed point on the earth. The most common way is to identify the location using co-ordinates such as latitude and longitude. An example of an absolute location using latitude and longitude of New Delhi, capital city of our country is 28.37°N and 77.12°E. Latitude is always written first. Latitude and longitude are indicated by degrees, minutes and seconds (DMS).
**Relative Location:** It refers to the position of a place or entity based on its positive with respect to other locations. For example, the location of New Delhi, the capital city of India is located around 400 km south east of Amritsar. Relative location can be expressed in terms of direction, distance, travel time or cost.

**Activity 3: Interpretation of Data/Graph:** You may provide a table/graph related to countries and their geographical areas, most populous countries and their size of population. Students may be asked to interpret these tables and graphs. Students may even be asked to prepare graphs based on the given data.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Area (in Lakh Sq Km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Russia</td>
<td>17.09</td>
</tr>
<tr>
<td>2</td>
<td>Canada</td>
<td>9.98</td>
</tr>
<tr>
<td>3</td>
<td>USA</td>
<td>9.62</td>
</tr>
<tr>
<td>4</td>
<td>China</td>
<td>9.59</td>
</tr>
<tr>
<td>5</td>
<td>Brazil</td>
<td>8.51</td>
</tr>
<tr>
<td>6</td>
<td>Australia</td>
<td>7.69</td>
</tr>
<tr>
<td>7</td>
<td>India</td>
<td>3.28</td>
</tr>
</tbody>
</table>

**Table 14.2: World: Most Populous Countries (2015)**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>World</td>
<td>7,256,490,011</td>
</tr>
<tr>
<td>1.</td>
<td>China</td>
<td>1,367,485,388</td>
</tr>
<tr>
<td>2.</td>
<td>India</td>
<td>1,251,695,584</td>
</tr>
<tr>
<td>3.</td>
<td>United States</td>
<td>321,368,864</td>
</tr>
<tr>
<td>4.</td>
<td>Indonesia</td>
<td>255,993,674</td>
</tr>
<tr>
<td>5.</td>
<td>Brazil</td>
<td>204,259,812</td>
</tr>
<tr>
<td>6.</td>
<td>Pakistan</td>
<td>199,085,847</td>
</tr>
<tr>
<td>7.</td>
<td>Nigeria</td>
<td>181,562,056</td>
</tr>
<tr>
<td>8.</td>
<td>Bangladesh</td>
<td>168,957,745</td>
</tr>
<tr>
<td>9.</td>
<td>Russia</td>
<td>142,423,773</td>
</tr>
<tr>
<td>10.</td>
<td>Japan</td>
<td>126,919,659</td>
</tr>
</tbody>
</table>

Activity 5

Project Work:

i) You may ask students belonging to several states to write an account of location and size of their states and explain the significance of location with respect to climate, vegetation, soil, economic activities and people.

ii) You may ask them to collect information about neighbouring countries of India and provide an account of bilateral relationships with these countries.

iii) You may discuss the role of water bodies (specifically the Indian Ocean, Bay of Bengal and Arabian Sea) in the national development.

iv) You can design several questions on calculation of time based on longitude.

Activity 6: Map Skills:

i) You may ask your students to locate the following features on an outline map of India using meaningful conventional symbols and colours.

   i) Andaman and Nicobar Islands
   ii) Lakshadweep Islands.
   iii) Tropic of Cancer
   iv) Palk Strait
   v) Bay of Bengal
   vi) Standard Meridian of India

   You may also ask them to find out details about their geographical co-ordinates/extent.

ii) You may ask your students to find out the places located on the Tropic of Cancer and the Standard Meridian of India and specify their geographical co-ordinates.

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Fig. 14.11: World: Most Populous Countries

iii) You may ask your students to shade the state/UT on an outline political map of India and with the help of atlas describe the absolute and relative location of their states.

### 14.4.3 Assessment Questions

1) What is a globe?
2) What are the poles?
3) What is equator?
4) Differentiate between longitudes and latitudes.
5) On an outline map of India, find out the standard meridian of India.
6) What is prime meridian?
7) Differentiate between absolute location and relative location.

### 14.5 MAJOR PHYSICAL FEATURES OF INDIA

#### 14.5.1 Overview of the Topic

The major physiographic divisions of India includes The Himalayan Mountains, The Northern Plains, The Peninsular Plateau, The Indian Desert, The Coastal Plains and the Islands. The Himalayan mountains stretch over the northern borders of India. They cover a distance of about 2,400 km. The width of the Himalayan Mountains range from 400 km in Kashmir to 150 km in Arunachal Pradesh. Some of the highest peaks of the Himalayan Mountains are Mt. Everest, Kanchenjunga, Nanga Parbat, Annapurna, Nanda Devi, etc. The Himalayas has three important ranges – Himadri, Himachal, and Shiwaliks. The Northern Plains consist of three major river systems, namely- the Indus, the Ganga, and the Brahmaputra along with their tributaries.

The Peninsular Plateau is located to the south of the Northern Plains. It has two parts: the Malwa Plateau in the north which slopes towards north and Deccan Plateau in the south. To the north west of the Malwa Plateau lies the Indian Desert, a region made up of rocks and sand. It also lies towards the western margins of the Aravali Hills. The Coastal Plains comprise the Western Coastal Plains and the Eastern Coastal Plains. The Western Coastal Plains which is narrow strip is divided into Konkan coast and Malabar Coast. The Eastern Coastal Plains is wider and divided into Northern Circas and Coromandal Coast. India has two groups of islands. Lakshadweep islands group lies close to the Malabar Coast of Kerala. Andaman and Nicobar islands are elongated chain of islands located in the Bay of Bengal extending from north to south. All these regions complement each other. The mountains are the major sources of water and forest wealth. The northern plains are the granaries of the country. The plateau is the storehouse of minerals. The coastal region and islands provide sites for fishing and port activities. The topic provides inputs for studying relationship of these physical features with other geographical components like climate, natural vegetation, soils, minerals, natural and human resources, economic activities (primary, secondary and tertiary).
Check Your Progress

Notes: a) Write your answers in the space given below.
       b) Compare your answers with those given at the end of this unit.

4) What are the major physiographic divisions of India?
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5) What are the important ranges of the Himalayas?
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6) Name the major Plateaus constituting the Peninsular Plateau.
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14.6 TEACHING-LEARNING STRATEGY

Teaching-learning strategy for this topic includes learning objectives, teaching-learning activities, and assessment questions.

14.6.1 Learning Objectives

Through this teaching-learning strategy, students will be able to:

- identify and locate the major physiographic divisions of India;
- describe broad ideas and familiarity about various physiographical regions of the country;
- state the major landforms features and the underlying geological structure;
- explain the association of various landforms with various rocks and minerals;
- describe unique features of various physiographical divisions of the country;
- estimate the complementary nature of these physiographic divisions;
- compare and contrast the characteristics of various physiographical regions; and
• express the reasons responsible for occurrence of these physiographical regions.

**Learning Resources:** Physical Map of India, Atlas, Worksheets, and Chart showing Plate Movements, Images, Working model of Plate Tectonics and available E-resources.

### 14.6.2 Teaching-learning Activities

**Activity 1: Learning through Map:** The topic on physiographic division can be suitable transacted with the help of 3D physical wall map of India, political wall map of India and an Atlas supported by several outline maps. By this time since the students have already learnt about locational setting of India they are well versed with the boundaries and extent of our country. The locational setting will provide them with a frame for further study. You may hang both the wall maps in the classroom in such a way that they are visible to all the students. You may initiate a discussion on finding out the differences in two set of maps that is political and physical. List out the differences……

i)  
ii)  
iii)  

You may bring their attention to the Map, specifying altitude in meters above the mean sea level and is shown by graded colours. Let students recognize the importance of color scheme used on a physical map of India. Through discussion try to describe the features of mountains, plains and plateaus with respect to their altitude, extent, direction. You may invite students near the wall map and ask them to explore various features of Himalayas like name of several peaks. Ask them to correlate it with India- Political map and let them find out names of Himalayan States. You may ask them to explore the shape of Himalayas whether it is straight, curve, concave or convex. Whether it is a continuous elongated stretch or scattered and broken ranges. You may raise point wise questions related to location of different mountain ranges of Himalayas like Karakoram, Hindukush; height of these ranges, average height, highest peak, important valleys, and rivers originating and flowing through this region. After exploring information about rivers, mountains, hill stations, peaks, land features, valleys and importance of the Himalayas, you can proceed to the Great Plains of India- its extension, major rivers, towns and cities located on the bank of these rivers, tributaries of these rivers and importance of the plain.

• To obtain information on the Deccan Plateau., What questions would you ask to students? Do specify.
Activity 2: Learning concepts through 3- models/images/dictionaries: You must have noticed that the topic contains several terms like Duns, Pass, Valley, Peak, Range, Hills, Gorge, and Canyon, fold mountains, etc. It may happen that there is insufficient explanation of these terms and concepts in textbook. In such a situation, you can either rely on e-content obtained from National Repository of Open Educational Resources (NROER) of NCERT, other internet resources, or you can also ask your students to have access to subject related illustrative dictionaries. Once these concepts and terms are understood by the students then they can relate this knowledge with major concepts. You can ask your students to observe these images and record their observations; you can provide those parameters for observations, what all they have to record. You may also ask them to search for similar examples.

Activity 3: Teaching with documentary/multimedia: These days a lot of animated multimedia-material is available in the market. In case you have such material then you must be thorough in your planning and you have to customize your lesson. You need to have your discussion points listed out before the presentation, during the presentation and at the end of the presentation.

Activity 4: Map Skills: As a teacher, you may also help your students sharpen their map skills. You may ask them to locate the following geographical features on an outline map of India.

i) Mountain Ranges: the Karakoram, the Zaskar
ii) Hill Ranges: the Aravallis, the Shiwaliks, the Nilgiri, the Cardamom hills.
iii) Mountain Peaks: K2, Kanchenjunga, Anai- Mudi, Gurushikhar.
iv) Plateaus: Malwa, Deccan Plateau, Chotanagpur plateau
v) Eastern Ghats, Western Ghats, the Indian Desert.

Students may be guided to use proper conventional symbols and colours to mark these features.

Activity 5: Project Work: You may inform your students that these are major geographical divisions of the country. These major regions are further divided into meso and micro regions. Ask students to find the meso and micro region in which their school is located. Ask them to write an account of Physiography of their own region. Let students explore the altitude of their place from several sources like one can be railway station. Let students paste images from some special geographical features of their own region.

14.6.3 Assessment Questions

1) Name the major physiographic divisions of India.
2) On the outline map of India, mark the physical features of India. Use appropriate colours.
3) What are the important ranges of the Himalayas?
4) What are major river systems of the Northern Plains?
5) Differentiate between the Malwa Plateau and the Deccan Plateau.
6) Differentiate between Western Coastal plains and Eastern Coastal Plains.
14.7 DRAINAGE SYSTEMS IN INDIA

14.6.1 Overview of the Topic

The drainage systems of the country can broadly be classified into two river systems - The Himalayan Rivers and the Peninsular Rivers. A river along with its tributaries may be called a river system. Indus river system comprise the Indus and tributaries. The Indus rises in Tibet near Lake Manosarowar. The tributaries of the Indus are – the Zaskar, the Nubra, the Shyok, the Jhelum, the Chenab, the Ravi, the Beas, and the Sutluj. The tributaries of the Ganga either rise in the Himalayas or in the Peninsular Plateau. The Yamuna, the Ghaghara, the Gandak, and the Kosi rise in the Himalayas. The Chambal, the Betwa, and the Son, rise in the Peninsular Plateau. The River Brahmaputra rises in Tibet east of Manosarowar lake very close to the sources of the Indus and the Satluj. The Peninsular Rivers like the Mahanadi, the Godavari, the Krishna, the Godavari, the Krishna, and the Kaveri flow eastwards and drain into the Bay of Bengal. The Narmada and the Tapi flow westwards into the Arabian Sea.

India has many lakes. The Dal Lake in Kashmir is famous for its tourist attraction, The Sambhar lake in Rajasthan is a salt water lake. There are lakes in the coastal areas like the Chilika lake, the Pulicat lake and the Kolleru lake. These river systems are very important in terms of water resource availability. They play a significant role in the economy due to their use in irrigation, navigation and hydro-power generation.

Check Your Progress

Notes: a) Write your answers in the space given below.
   b) Compare your answers with those given at the end of this unit.

7) What is a river system?

8) Where do the tributaries of the Ganga rise?

9) Which is a salt water lake?
14.8 TEACHING-LEARNING STRATEGY

Teaching-learning strategy for this topic includes learning objectives, teaching-learning activities, and assessment questions.

14.8.1 Learning Objectives

Through this teaching-learning strategy, students will be able to:

• classify the drainage system of our country;
• describe the features of different drainage systems of the country;
• explain the causes of river pollution in our country;
• discuss the issue of minimizing river pollution in our country;
• indicate the importance of rivers to the regions they occupy;
• discuss the role of rivers in the economy; and
• explain the role of rivers in the evolution of human society.

Learning Resources: Physical Map of India, Drainage Map of India, Worksheets, Newspaper Clippings (Riverine Pollution, Inter-linkages of Rivers, Inter-state water disputes, Government Efforts for Cleaning of Rivers). Pictures (several prominent lakes of the country, Riverside inhabitants of different regions)

14.8.2 Teaching-learning Activities

Activity 1: Teaching with Wall Map: In the Unit 8, you were acquainted with maps as learning resources. In order to teach a unit on Drainage System you need to carry 3D physical map of India or specifically drainage map of our country. Students already know that the region of the Himalayas is covered with snow throughout the year. They also know that the rivers and the tributaries of River Indus, the Ganga and the Brahmaputra rise either in the Himalayas or beyond it. You may initiate a discussion in the classroom by asking sequential questions to get different reasons for these rivers being full of water throughout the year. You may ask them the situation which is other way round like rivers originating from hills and mountains which are not snow fed. From where do these rivers get water? While dealing with major river systems you can use physical map to great extent. Ask your students to identify and locate the source of the river or head of the river, what can be the reason for its origin, name the hill/peak from where that particular river originates. What is the elevation of that place? In which direction the river is flowing. Identify its major tributaries. Ask students to correlate the maps with political maps of India. Ask them to find out the towns and cities located on the bank of these rivers. Initiate a discussion on river and role in economy. Further you may hold a discussion on cities and rivers.

Activity 2: Project Work: You may ask your students to prepare a detailed account of river present in their locality. While preparing report, they must note the source of the river, place from where it originates, length of the river, tributaries of river, impact of river on life of people in that region. Whether that river merges with some other big river or terminates in Ocean/ or some other water body. What is the quality of water of that river? Whether it is good to drink water from that river? Are there any towns/cities located on the bank of that river? (Remember that students must be able to make distinction between canal and river and they
write an account of river and not the canal). Does the river have large multipurpose dam/ small dam/canals etc? Does the river contain water throughout the year or in some months? Does flood occur in that river?

Activity 3: Project Work: You may ask your students to collect information of ‘Namami Gange Yojana’ of Union Government which integrates the efforts to clean and protect the Ganga River in comprehensive manner and hold discussion in your class.

Activity 4: Discussion: Collect information about ‘Indian Rivers Inter –Link’ project and make a presentation in your classroom.

Activity 5: Map Skills:
On an outline map of India mark and label the following
i) Rivers: the Ganga, the Satluj, the Brahmaputra, the Mahanadi and the Kaveri
ii) Lakes: the Chilka, the Sambhar, the Wular, the Pulikat, the Kolleru.

14.8.3 Assessment Questions
1) What are the major river systems in India?
2) Where does the Indus rise?
3) Where do the Brahmaputra and the Son rise?
4) The Tapi flows into ......................
5) Where is the Dal Lake?
6) Why do the rivers flowing from the Himalayas have water throughout the year?
7) On an outline map of India, mark and label the rivers – the Narmada, the Jhelum and the Krishna.

14.9 MONSOON: ITS CHARACTERISTICS

14.9.1 Overview of the Topic
Monsoon climate is found in large parts of India. It is a wind which changes its direction according to change of seasons. During summer it blows as sea breeze causing heavy rainfall over a large part of India blowing from south western direction over the Bay of Bengal and Arabian Sea. It causes relief rainfall owing to the presence of Western Ghats, the Himalayas and Poorvanchal mountains. During winter it blows as land breeze from north eastern direction, catches moisture from the Bay of Bengal and pours heavy rain in eastern coast due to the presence of Eastern Ghats. Thus monsoon is a rain bearing wind in our country.

Check Your Progress
Notes: a) Write your answers in the space given below.
     b) Compare your answers with those given at the end of this unit.
10) What is the important feature of monsoon climate?
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11) Differentiate between summer monsoon and winter monsoon.

14.10 TEACHING-LEARNING STRATEGY

Teaching-learning strategy for this topic includes learning objectives, teaching-learning activities, and assessment questions.

14.10.1 Learning Objectives

Through this teaching-learning strategy, students will be able to:

- describe the mechanism that leads to formation of Indian Monsoon;
- explain the seasonal variations in the climatic conditions in different parts of the country;
- describe the characteristics of dry spells and the break in monsoon;
- explain the concept of variability of rainfall; and
- discuss the reasons for monsoon as a unifying bond.

Learning Resources: Chart showing pressure belts, World political and physical map. India: Political and Physical Map. Distribution of Rainfall (map), newspaper clippings, collage.

14.10.2 Teaching-learning Activities

Activity 1: You must be familiar with the following terms before initiating the topic on ‘Monsoon’ in the classroom. These basic concepts are dealt in the Geography Course at the upper primary stage. You must try to reflect on relationships between various climatic controls and the Monsoon. Some of the concepts are presented below for your understanding.

Atmospheric Pressure:

The atmospheric pressure and winds are more significant as climatic controls and less as climatic elements. Contrasts in temperature leads to change in pressure which generate winds. Winds are climatic control which affects both temperature and humidity.

High Pressure and Low Pressure: There are two types of pressure systems:
i) High pressure

ii) Low pressure.

High pressure is also known as anticyclone. When it has an elongated oval shape, it is termed as ridge or wedge. Low pressure is also termed a depression, cyclone or a low. When elongated, it is known as trough.

**Pressure Belts and Winds**

On the earth’s surface there are seven pressure belts. The polar highs, the sub-tropical highs, the sub-polar lows form matching pairs in the Northern and the Southern Hemispheres. The three belts of the Northern Hemisphere are separated from those of the Southern Hemisphere by the equatorial belt.
Occurrence of Winds: Due to horizontal difference in pressure, there is generation of winds. The horizontal differences in the air density lead to the horizontal differences in the air pressure. This generates winds. The wind blows from areas of high pressure to areas of low pressure.

Ferrel's Law: According to this law, the winds turn towards their right in the Northern Hemisphere and to the left in the Southern Hemisphere. The winds are deflected from their true gradient course as a result of the Coriolis force which is generated by the rotation of the earth.

Coriolis force: The Coriolis force produced by the rotation of the earth has its effect on every moving object, whether it is an ocean current or a bullet fired from the gun. It is an effect which results from the rotational movement of the earth and movement of air relative to the earth. The Coriolis force is zero at the equator and maximum at the poles. In the northern hemisphere the Coriolis force acts to the right of the direction of wind and in southern hemisphere it acts to the left. That is why all winds in the Northern Hemisphere tend to move toward the right and those of the Southern Hemisphere to the left with respect to the rotating earth. This accounts for the act that in the Northern Hemisphere winds blow counter clock-wise around the centres of low pressure, but clock-wise in the Southern Hemisphere.

Pressure Gradient: The rate at which the horizontal pressure change is indicated by the pressure gradient. The rate of air-flow or the velocity of the wind is indicated by the steepness of the pressure gradient. Steepness and the velocity are directly proportional to each other.

Planetary Winds: The planetary winds are permanent winds which blow throughout the year from low latitude to the other in response to the latitudinal differences in air pressure. They blow over the vast areas of the continents and oceans. The two most significant winds for climate and human activities are the trade winds and the westerly winds.

Trade Winds: The trades are also termed tropical easterlies because in both hemispheres they blow from the east to the west from 30 degree North and 30 degree south toward the equator.

Westerlies: The westerlies blow from 35-40 degree to 60-65 degree North and South latitude. They originate in the northern parts of sub-tropical high-pressure cells and blow toward the poles.

Humidity: A state of the atmosphere in relation to its water-vapour content, and normally referring to relative humidity unless otherwise stated.

Relative Humidity: An index of the amount of water vapour present in the atmosphere. It is the actual vapour pressure expressed as a percentage of the saturated vapour pressure which would be possible at the same air temperature. Relative humidity is an attempt to measure the readiness with which vapour will condense from the air, and is concerned with two variables: the actual water vapour in a given mass of atmosphere and the temperature of that mass of air, since this determines the capacity of the air to hold the water vapour. The value of relative humidity varies inversely with temperature and therefore usually rises during the nights, because temperature falls, even though the amount of water vapour may remain constant. It is measured by a Hygrometer.
Type of Rainfall: Convectional, Orographic and Cyclonic/Frontal, and Windward and leeward slopes. (NCERT Geography textbooks for classes VII and XI may be seen for details.)

El Nino: El Nino is a warm ocean current, which occasionally replaces the normal cold Peru Current that moves north along the western coast of South America. The surge of warm ocean waters recurs every three to five years and lasts from six to eighteen months. (Between El Nino there are often periods of cooling surface waters in the same area called La Nina).

ENSO: El Nino event is closely associated with the pressure changes in the Central Pacific and Australia. This change in pressure condition over pacific is known as the southern oscillation. The combined phenomenon of southern oscillation and El Nino is known as ENSO (El Nino Southern Oscillation).

ITCZ - The Inter Tropical Convergence Zone (ITCZ) is low pressure zone located at the equator where trade winds converge, and so, it is a zone where air tends to ascend. In July ITCZ is located around 20 degree north – 25 degree north latitudes (over the Gangetic plains), sometimes called the monsoon trough. This monsoon trough encourages the development of thermal low over north and North West India. Due to the shift of ITCZ the trade winds of the southern hemisphere cross the equator between 40 degree and 60 degree E longitudes and start blowing from southern to northern due to the Coriolis force. It becomes southwest monsoon. In winter, the ITCZ moves southward and so the reversal of winds from northeast to south and southwest takes place. They are called northeast monsoons.

Breaks, Bursts and Pulsatory Movements- The south west monsoon is also characterised by breaks, bursts and pulsatory movements. Breaks are the spells of one or more weeks during the height of monsoon in eastern part of India. The Bursts is the sudden starting of the monsoon activity with its heavy cloud and rainfall. When the westerly jet stream shifts from the south of Himalayas to its north, the monsoon suddenly enters the Indo-Gangetic Plains. Pulsatory movements refer to alternate increase and decrease in the intensity of the monsoon winds with that of the rainfall that occurs.

Western Disturbance and Tropical Cyclone- The western disturbances which enter the Indian subcontinent from the west and northwest during the winter months, originate over the Mediterranean Sea and brought into India by the western jet stream. An increase in prevailing night temperature generally indicates an advance in the arrival of these cyclonic disturbances.

Tropical cyclones originate over the Bay of Bengal and the Indian Ocean. These tropical cyclones have very high wind velocity and heavy rainfall and hit the Tamil Nadu, Andhra Pradesh and Odisha coast. Most of these cyclones are very destructive due to high wind velocity and torrential rain that accompanies it.

Jet Stream: Interesting fact may be discussed related to jet stream; it was toward the end of World War II that the existence of Jet Stream in upper troposphere was made known to the meteorologists. The sequence of events leading to the knowledge of jet stream is quite interesting. When during the last phase of Second World War, the American bomber pilots tried to fly towards Japan at an altitude of about 13,000 metres, they encountered strong head winds which greatly reduced
their ground speed (sometimes to zero). But while returning to their bases in the east, they found that the speed became much faster and at times it even doubled because of a high velocity tail wind. Thus the pilots returning home from high-level missions brought back unique experiences of upper level winds blowing with terrific speed. Ultimately the formal discovery of so called jet stream was made.

The onset of monsoon is generally considered a highly complex phenomenon and there is no single theory which can explain it fully. In order to explain the causes of Indian Monsoon you need to have fair understanding about these probable causes.

It is still believed that the differentiated heating of land and sea during the summer months is the mechanism which sets the stage for the monsoon winds to drift towards the sub-continent. As discussed earlier, you must be aware of the terms and concepts related to ITCZ, Jet Stream, Pressure belts, Planetary winds Differential heating, Isobar, Isotherms, Isohyets, types of rainfall, windward and leeward slopes, adiabatic lapse rate, etc., before transacting Mechanism of Monsoon in the classroom.

Activity 2: Teaching through Maps and diagrams: You may initiate a discussion by highlighting peculiar characteristics of monsoon wind that is seasonal reversal of wind. In order to make students understand you need to project maps showing atmospheric conditions over the Indian subcontinent in the month of June and January. You may ask students to list out general features of temperature and rainfall during these months. You may also seek information about seasons in which these two months fall. You may ask students to mark the areas lying between 20° N & 20° S on a map of Indian subcontinent. You may make your students recall about the climatic conditions (especially temperature) existing in the month of June. You may make your students to note the presence of vast water bodies around the Indian peninsula. Further you can explore that if both landmass and water bodies are heated then which one will be heated first. What is the relationship between temperature, pressure and winds? With the help of brief description given earlier about the relationship among temperature, pressure and wind you may explain the movement (reversal of wind) due to differential heating and cooling of land and water.

In an instance you may try to explain ITCZ with the help of map and diagram showing winds. You need to focus on equatorial latitudes ask your students to name the winds which converges in this belt. You may make them understand the position of ITCZ and motivate them to come out with answers to the question like why there is movement of ITCZ. What is the association between ITCZ and apparent movement of the sun? What can be the probable reasons for origin of Monsoon winds?

Moving further, you may also make them aware about the location of Madagascar, Tibetan plateau, the Himalayas. You may make your students to estimate the climatic conditions (temperature and pressure) in these areas and let them relate with movement of winds.

You may have to make a distinction between pulsating winds and steady winds. You may have to discuss that why monsoons are pulsating winds due to different atmospheric conditions encountered by it. Your students can make an estimate
about the pressure conditions on land and sea in the month of June. Ask them to relate it with trade winds of the southern hemisphere. You make them realise that these south east trade winds originate over the warm subtropical areas of the southern oceans. They cross the equator and blow in a south-westerly direction entering in the Indian peninsula as the south west monsoon. You may ask the questions like if winds are travelling over the warm sea then will they be dry winds or moist winds. With the help of map you may have to explain that the monsoon arrives at the southern tip of Indian Peninsula by the first week of June. With the help of map try to mark the way it enters in two streams Arabian Sea branch and Bay of Bengal Branch. You may raise questions about why and how rainfall takes place in coastal Maharashtra, Karnataka and Assam in monsoon season. You may also make your students understand the importance of hills and mountains lying in the course of monsoon winds. You may raise several questions like why rainfall in the Ganga Valley decreases from east to west. Rajasthan and Gujarat gets scanty rainfall?

You may have to explain the reasons for withdrawal of monsoon. You may ask students to estimate climatic conditions in the month of October- November. You may raise questions like why there is occurrences of cyclonic depressions over the Andaman sea. The impact of winter monsoon in the islands and Tamil Nadu coast.

**Activity 3: Map Interpretation:** You may ask your students to interpret the map to find out answers for the following questions: Why there is less than 60 cm rainfall in Western Rajasthan and adjoining parts of Gujarat, Haryana and Punjab. Why Leh in Jammu and Kashmir receives low rainfall and is termed as cold desert.

**Activity 4: Group Discussion:** You may plan a group discussion with students on the Unifying Role of Monsoon.

**Activity 5: Project Work:**

i) You may ask your students to prepare a collage from newspaper clippings collected during monsoon season and write a report in around 250-300 words. You may suggest several themes to your students like impact of monsoons on agriculture, human life, land and air transportation and services etc.

ii) You may ask your students to find out several cultural aspects like songs, dances, festivals and cuisines associated with monsoon season in your region.

**Activity 6 Map Skills:**

On an outline map of India show the following

i) The direction of south-west monsoon over India.

ii) Areas receiving less than 20 cm of annual rainfall.

iii) Areas receiving more than 400 cm of rainfall.

**14.10.3 Assessment Questions**

1) Differentiate between high pressure and low pressure.

2) How many pressure belts are there on the earth’s surface/

3) Explain Ferrell’s Law.
4) What are planetary winds?
5) What are westerlies?
6) Differentiate between El Nino and La Nina.
7) What is ITCZ?
8) Explain western disturbance and tropical cyclone.
9) Explain pulsatory movements of the monsoon.

14.11 DISTRIBUTION OF NATURAL VEGETATION IN INDIA

14.11.1 Overview of the Topic

India has a variety of natural vegetation owing to its terrain and climate. Except the high mountains and hills, the types of natural vegetation in any country are determined by the amount of rainfall. India has five types of forests, namely – Tropical Rain forests, Tropical Deciduous forests, Thorn forests and scrubs, Montane forests, and Mangrove forests. In regions with heavy rainfall (over 200 cms. Per annum) like the North Eastern states and South western Coast, we find tropical rain forests known as tropical Evergreen and Semi-Evergreen forest. The important trees of these forests are rosewood, mahogany, cane etc. In regions, with rainfall between 70 and 200 cms. Per annum like the Tarai region, North West Coast, Bihar, we find Tropical Deciduous forests. The important trees of these forests are teak, sal, shisham, sandal wood, etc. In regions with rainfall below 70 cms. Per annum like central and western parts of Rajasthan, we find Thorn forests and scrubs. The plants include scrubs, thorny bushes and cactus. Montane forests are found in the Mountains. The type of natural vegetation cover changes according to fall in temperature as one goes up the mountains. In the Himalayas, we find tropical vegetation up to a height of 500 meters, wet temperate type of forests between a height of 1000 and 2000 meters, temperate vegetation from 1500 to 3500 meters and alpine vegetation above 3600 meters above the sea level. Near the sea coast in the delta region the trees have adopted themselves to salt water and the effect of tides. We find Mangrove tidal forests in the Ganga Delta – the Sunderbans. There are many factors responsible for biodiversity in the country. There is a need of conservation of natural vegetation and several conservational strategies for natural vegetation.

Check Your Progress

Notes: a) Write your answers in the space given below.
   b) Compare your answers with those given at the end of this unit.

12) Name the essential factors which determine the type of vegetation.
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13) Where is Evergreen forest found?
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14) Give example of a tidal forest.
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14.12 TEACHING-LEARNING STRATEGY

Teaching-learning strategy for this topic includes learning objectives, teaching-learning activities, and assessment questions.

14.12.1 Learning Objectives

Through this teaching-learning strategy, students will be able to:

- identify the factors determining the natural vegetation;
- explain the reasons for distribution of natural vegetation in the country;
- analyse the relationship between climate and natural vegetation;
- list the natural vegetation belts;
- describe the features of different vegetation belts; and
- identify the trees of different vegetation belts.

Learning Resources: India: Distribution of Natural Vegetation (map), India: Physical map, India, soil map, India, Images of different species of trees. Images of different animal species found in different geographical regions.

14.12.2 Teaching-learning Activities

Activity 1: Discussion: You may make distinction in your classroom to discuss the concept of forest, natural vegetation. You may pick up the example of natural vegetation that exists in your region. Try to seek names of original species of their region. You can inquire about the distance of that place from equator whether the place is near or far. You may ask them to explore for elevation of that place from the mean sea level. You may also have an idea of climatic condition of that area. Ask them to correlate these factors. What do they comment. Build their construction to understanding of Natural Vegetation.
Activity 2: Teaching Through CD: You may use a video containing natural vegetation of different geographical region like tropical rain forests (evergreen and semi evergreen), tropical deciduous, desert and scrub vegetation and montane type of natural vegetation. You may ask children to note down their observations.

Activity 3: Teaching through Map: Hang the Wall map on Natural Vegetation in the classroom; you may project the map through Over Head Projector or Multimedia. With the help of legend let the children name the different natural vegetation belts of our country-

Analyzing and Correlating Maps: In order to have better understanding of natural vegetation you can teach association and relationship of location, relief and climate to understand the type of natural vegetation. You may ask your students to observe the maps given in their textbooks and to compare and correlate these to maps to find out associations. Based on observations you can explore and discuss the generalizations like if a place is located at a particular latitude and altitude and experience a particular type of temperature and rainfall, then in such a situation what kind of natural vegetation can be expected.

Activity 4 Project Work: You may assign project work to deal with the topic on natural vegetation. You may divide the class in six groups. Each group will prepare an account of one natural vegetation belt and collect sufficient material (maps, images, issues and concerns, geographical area (states/UTs) from magazines, open educational resources from internet. You may provide sufficient time for this project work. As a follow up, ask your students to make a presentation.

Activity 5 Map Skills:
On an outline map of India, mark the following:
1) Areas of evergreen forests
2) Areas of Deciduous forest

14.12.3 Assessment Questions
1) Mention the factors which determine the natural vegetation of India.
2) What is the relationship between temperature and vegetation?
3) Name the important vegetation belts of India.
4) Distinguish between Evergreen and Desert forests.
5) Describe the mountain vegetation of the Himalayas.

14.13 NEED FOR CONSERVATION OF NATURAL VEGETATION AND WILDLIFE AND VARIOUS MEASURES

14.13.1 Overview of the Topic
There is urgent need for the conservation of natural vegetation to maintain balance in environment. This can be done by controlling reckless felling of trees, overgrazing in forests, forest fire, Jhuming, urbanization and shifting agriculture. Research Institutes are required to control the spread of plant diseases. Human made forests (Afforestation) are to be encouraged to produce trees for commercial
purposes and to increase people participation in forestation and social forestry. Various kinds of wild animals and birds are found in Indian forests. There is interdependent relationship of natural vegetation and wild life. There is a wide variety of animal life in our forests like carnivorous, herbivorous, birds, water animals and reptiles. Various kinds of animals and birds forests are known as wild life. Destruction of natural vegetation cover leads to destruction of wild life. As such there is a need for special effort to preserve wild life. National parks and sanctuaries have been developed in large number in addition to restriction on exploitation of forest wealth by human beings. In this topic there is a description of forest and wild life resources. Through this contents, the concern of vanishing forests is projected. The need of conservation of natural vegetation is brought forward with a scope of discussion on suitable measures for conservation of wildlife and natural vegetation.

Check Your Progress

Notes: a) Write your answers in the space given below.
   b) Compare your answers with those given at the end of this unit.

15) Why is conservation of natural vegetation needed?

16) What is meant by wild life?

14.14 TEACHING -LEARNING STRATEGY

Teaching-learning strategy for this topic includes learning objectives, teaching-learning activities, and assessment questions.

14.14.1 Learning Objectives

Through this teaching-learning strategy, students will be able to:

- describe the importance of natural vegetation and wildlife in our country;
- list out the vulnerable and extinct species in our country;
- discuss various measures for conservation of natural vegetation and wildlife;
- realize the importance of losing forest and wildlife resources;
• develop concern for depletion of resources; and
• sensitize public on the issue of conservation of forest and wildlife resources

Learning Resources: Newspaper Clippings, Images of endangered and extinct plants and animals. Posters of save animals, Movies, documentaries and short films.

14.14.2 Teaching-learning Activities

Activity 1: Brainstorming Session: Having learnt about natural vegetation in the previous section, it becomes necessary to raise the issue of decline in forest cover in India due to several reasons. You may also initiate a discussion that if forests are reduced at this rate, what will be its implications? You may raise a question that whether it is necessary to protect forest and wildlife. Student will come forward with their arguments in favour and against. You may also probe further that how wild life sanctuaries, national parks and zoological gardens help in conservation of wildlife resources. Teacher can use images pertaining to endangered and extinct species of plants and animals.

Activity 2: Students can be asked to collect data regarding poaching of tigers and other animals from newspapers, magazines, and Internet.

Activity 3 Project Work: Teachers can assign project work to prepare collage and posters on theme like conservation of natural resources and wildlife. Students need to express their ideas based on collage prepared.

Activity 4 Educational Tour: If there is any national park nearby your place take your students on an educational tour. Describe about the tour under the heads given below:
• Objectives of the tour
• Place of visit
• Activities to be taken up by students
• Preparations to be made by students
• Follow-up activities

Activity 4 Discussion: Teacher can initiate a discussion on a topic, ‘Rise in Population has led to increased demand of Resource Consumption and Environmental Degradation’. Students are expected to come out with their logical arguments based on available evidences.

Activity 5 Map Skills: On an outline map of India mark the areas of endangered wildlife species. Student may also mark the state/area which was in news for rampant forest fire.

14.14.3 Assessment Questions

1) Why is the conservation of forest an urgent need?
2) How can forests be conserved?
3) How do you contribute to social forestry?
4) Why is the preservation of wildlife important? What actions have been taken up for the preservation of wildlife?
5) Name the different protected areas of wild life.
6) On the given outline map of India mark the given National parks:
   Corbett, Gir, Periyar, Kaziranga, Simlipal

14.15 LET US SUM UP

In this unit, our major focus was on the topics such as location and size of India, major physical features of India, drainage system of India, monsoon and its characteristics, natural vegetation and their distribution, need for conservation of natural vegetation and wildlife. We presented a brief content of these topics. For each of these topics, we presented teaching-learning strategies which included learning objectives, teaching-learning activities which you may adopt, and assessment questions, which may be used to evaluate students’ performance on the topics. Teaching-learning strategies presented in this unit are suggestive ones. You could develop your teaching-learning strategies for these topics.

14.16 REFERENCES AND SUGGESTED READINGS


14.17 ANSWERS TO CHECK YOUR PROGRESS

1) The land boundary of India is about 15, 200 km and the coastline is of about 7,516 km.
2) The geographical area of India is 32, 87, 263 sq.km.
3) The Deccan peninsula is triangular in shape which is flanked by Arabian Sea in the west, Bay of Bengal in the East and Indian Ocean in the South.
5) The three important ranges of the Himalayas are Himadri, Himachal, and Shiwaliks.
6) The major Plateaus constituting the Peninsular Plateau are the Malwa Plateau in the north which slopes towards north and Deccan Plateau in the south.
7) A river along with its tributaries is called a river system.
8) The tributaries of the Ganga either rise in the Himalayas or in the Peninsular Plateau.
9) The Sambhar lake in Rajasthan is a salt water lake.
10) The important feature of monsoon climate is that it is a wind which changes its direction according to change of seasons.
11) Summer monsoon blows as sea breeze from south western direction and winter monsoon blows as land breeze from north eastern direction.

12) Temperature and moisture are essential factors determining the type vegetation in India.

13) The tropical evergreen forests are found in North Eastern states and South Western coast of India.

14) The Sunderbans is an example of tidal forest.

15) Conservation of natural vegetation is needed to maintain balance in environment.

16) Animals and birds found in forests are known as wild life.