# GEOGRAPHY

**(New Samacheer kalvi 6th to 10 std)**




# ஆட்சியர் கல்வி

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# கல்வியை இலவசமாக்குவோம்!

## ஆட்சியர் கல்வி

**Whatsapp வழியே தரமான கல்வி**

- UPSC (IAS,IPS,IFS,,) TNPSC தேர்விற்கு வாட்ஸ் ஆப் வழியாக பயிற்சி தினமும் ஆடியோ வடிவில் பாடம் நடத்துவோம். உங்களுக்கு pdf அனுப்பி தேர்வுகள் நடத்தப்படும்.

- கோச்சிங் சென்டர் செல்லாமல் வீட்டிலிருந்தே படிக்கலாம். அக பார்வையாளர்கள் மாற்றுத்திறனாளிகள் இதன் முலம் பயன் பெறலாம்.

- மற்றவர்கள் இதனை பயன்பெற உங்கள் பகுதியில் ஒரு மரக்கன்று நட்டு அல்லது பறவைகளுக்கு உணவளித்து அதனை "9500399670" என்ற எண்ணுக்கு புகைப்படம் எடுத்து வாட்ஸ்அப் முலம் அனுப்பவும்







**COMBINED CIVIL SERVICES EXAMINATION- I**

Group - I Services (Main Examination)

( Degree Standard)

PAPER – III - General studies

**UNIT-I : GEOGRAPHY OF INDIA WITH SPECIAL REFERENCE TO TAMILNADU**

Location - Physical features - Major Rivers - Weather & Climate - Monsoon, Rainfall - Natural resources:- Soil, Water, Forest, Minerals and Wild life - Agricultural pattern – Livestock - Fisheries - Industries; Major industries - Growth and Development - Social- Cultural geography - Population : Growth, Density and Distribution - Racial, linguistic and major tribes.

Oceanography - Bottom relief features of Indian Ocean, Arabian sea and Bay of Bengal.

Basics of Geospatial Technology: Geographical Information System (GIS) and Global Navigation Satellite System (GNSS).

Map: Geographical landmarks - India and its neighbours.

**Current Affairs**

**UNIT II: ENVIRONMENT, BIODIVERSITY AND DISASTER MANAGEMENT**

**Ecology*:*** Structure and function of Ecosystem – Ecological succession - Biodiversity conservation: Types – Biodiversity Hot Spots in India – Biodiversity : Significance and Threats – *In situ* and *Ex situ* conservation measures – Roles of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), International Union for Conservation of Nature (IUCN) & Convention on Biological Diversity (CBD).

**Environmental Pollution and Management:** Air, Water, Soil, Thermal and Noise pollution and control strategies – Solid and Hazardous waste management - Environmental Impact Assessment *(*EIA*)*: Steps in EIA process – Environmental Clearance – Environmental Auditing.

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**Climate Change:** Global Environmental Issues and Management – Changes in monsoon pattern in Tamil Nadu and India – Environmental consequences of climate change and mitigation measures – Clean and Green Energy – Environmental Sustainability.

Environmental Laws, Policies & Treaties in India and Global scenario - Natural calamities and Disaster Management – Environmental Health and Sanitation.

## COMBINED CIVIL SERVICES - I

Group I Services

(Preliminary Examination)

General Studies - Degree standard

**TOPICS FOR OBJECTIVE TYPE**

**UNIT – III: Geography** - Earth and Universe - Solar system - Atmosphere hydrosphere, lithosphere -Monsoon, rainfall, weather and climate - Water resources - rivers in India - Soil, minerals & natural resources-Natural vegetation-Forest & wildlife-Agricultural pattern, livestock & fisheries-Transport & communication-Social geography – population-density and distribution-Natural calamities – disaster management-Climate change - impact and consequences - mitigation measures-Pollution Control.

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**Combined Civil Services Examination –II**
**(Interview Posts and Non-Interview Posts)**
**General Studies (Preliminary Examination)**
**Topics for Objective Type**

## UNIT- III: GEOGRAPHY OF INDIA

**(i)** Location – Physical features - Monsoon, rainfall, weather and climate - water resources - Rivers in India - Soil, minerals and natural resources - Forest and wildlife - Agricultural pattern.

**(ii)** Transport - Communication.

**(iii)** Social geography – Population density and distribution - Racial, linguistic groups and major tribes.

**(iv)** Natural calamity – Disaster Management – Environmental pollution: Reasons and preventive measures – Climate change – Green energy.

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# குறிப்பு

இப்புத்தகம் தமிழ்நாடு அரசின் பள்ளிக்கல்வித் துறை இலவச பாடநூல் வழங்கும் திட்டத்தின் கீழ் வெளியிடப்பட்ட பிரதியின் தொகுப்பு. போட்டித் தேர்விற்கு தயாராகும் மாணவர்களின் நலனுக்காக தேர்வு பாடத்திட்டத்திற்கேற்ப தொகுத்து வழங்கப்பட்டுள்ளது.

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**THANKS**

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Department of School Education

**Untouchability is Inhuman and a Crime**

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# GEOGRAPHY CONTENTS


| S. NO | CHAPTER NAME | PAGE NO. |
|---|---|---|
| 1 | The Universe & Solar System | 8 |
| 2 | Lands & Oceans | 24 |
| 3 | Resources | 37 |
| 4 | Asia and Europe | 49 |
| 5 | Globe | 77 |
| 6 | Understanding Disaster | 94 |
| 7 | Interior of the Earth | 100 |
| 8 | Landforms | 112 |
| 9 | Population & Settlement | 121 |
| 10 | Resources | 130 |
| 11 | Tourism | 141 |
| 12 | Rocks & Soils | 157 |
| 13 | Weather & Climate | 168 |
| 14 | Hydrologic Cycle | 178 |
| 15 | Migration & Urbanisation | 186 |
| 16 | Hazards | 196 |
| 17 | Lithosphere-1 Endogenic Processes | 205 |
| 18 | Lithosphere-2 Exogenic Processes | 215 |
| 19 | Atmosphere | 228 |
| 20 | Hydrosphere | 240 |
| 21 | Biosphere | 250 |
| 22 | Man & Environment | 258 |
| 23 | Mapping Skills | 268 |
| 24 | Disaster Management Responding to Disasters | 278 |
| 25 | India- Location, Relief and Drainage | 285 |
| 26 | Climate & Natural Vegetation of India | 301 |
| 27 | Components of Agriculture | 315 |
| 28 | Resources & Industries | 335 |
| 29 | India- Population Transport, Communication & Trade | 353 |
| 30 | Physical Geography of Tamil Nadu | 370 |
| 31 | Human Geography of Tamil Nadu | 391 |
| | | |
| | | |
| | | |
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Unit 1

# The Universe and Solar System



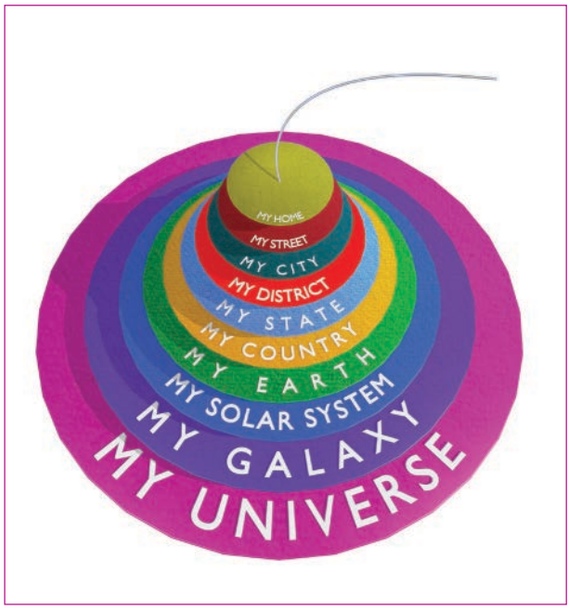
## Learning Objectives

- To know about the formation of the universe.
- To differentiate between the members of the Solar System.
- To understand the motions of the Earth and its effects.
- To learn about the different spheres of the Earth and their interaction with each other.

BXLPGZ

## Pathway:

**This lesson focuses on the universe and the members of the solar system. It also deals with the motions of the Earth and their resultant effects. It also talks about the four spheres of the Earth.**




**Teacher :** Students, do you all know where you reside?

**Students :** Yes, teacher.

**Teacher :** (Points out a student) Iniya, do you know your address? Can you tell me your full address?

**Iniya :** Yes teacher. My address is Iniya, 24, Bharathiar street, Thirunagar, Madurai - 625 006.

**Teacher :** Good. Iniya, where is Thirunagar?

**Iniya :** Thirunagar is in Madurai.



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**Teacher :** Children, tell me where Madurai is?

**Students :** It is in Tamil Nadu.

**Teacher :** Good. Where is Tamil Nadu?

**Students :** In India ...teacher.

**Teacher :** Now tell me where India is?

**Students :** India is in the continent of Asia, teacher.

**Teacher :** Excellent! Can anyone tell me where is the continent of Asia?

**Students:** Yes teacher. It is on the Earth.

**Teacher :** Ok children, tell me where the Earth is located.

**Students :** ( Remain silent and after sometime they reply in chorus) No. We don't know.

**Teacher :** Now, let me explain. The Earth is the third planet in the Solar System. The solar system is in the galaxy. It is named as the Milkyway Galaxy. There are millions of such galaxies in the Universe.

**Iniya :** Teacher, shall I say the address of our Earth?

**Teacher:** Address of our Earth? It's interesting Iniya. Tell us the address.

**Iniya:** Miss. Earth,
No.3. Solar System,
Milkyway Galaxy,
Universe.

(Everyone clapped and the teacher appreciates Iniya.)

**Teacher :** That was very good Iniya. Now let us know about the solar system, galaxy, the Universe and all other bodies in detail in this lesson.

Numerous stars and celestial bodies came into existence by a massive explosion called **Big Bang**. These celestial bodies together are called **The Universe**. It is also referred to as the **Cosmos**. The stars that you see are so far away that they appear to be small, but they are really huge in size.




The study of the Universe is called **Cosmology**. The term Cosmos is derived from the Greek word 'Kosmos'.

## 1. Universe




The Universe is a vast expanse of space. Most astronomers believe that the Universe came into existence after the Big Bang explosion that took place about 15 billion years ago. The universe consists of billions of galaxies, stars, planets, comets, asteroids, meteoroids and natural satellites. These are collectively called as celestial bodies, which are located far away from each other. A Light year is the unit used to measure the distance between the celestial bodies.

### Galaxy

It is a huge cluster of stars which are held together by gravitational force. Most of the galaxies are scattered in space, but some remain in groups.



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A light-year is the distance traversed by light in a year at a velocity of 300,000 km per second. Sound travels at a speed of 330 m per second.

The Milky Way Galaxy was formed about 5 billion years after the Big Bang explosion. Our solar system is a part of the Milky Way galaxy. Andromeda galaxy is the nearest to the Earth apart from the 'Magellanic Clouds' galaxy




## 2. The Solar System

The word 'solar' is derived from the Roman word '**sol**', which means 'Sun God'. The solar system is believed to have formed about 4.5 billion years ago. The solar system is a gravitationally bound system which comprises of the Sun, the eight planets, dwarf planets, satellites, comets, asteroids and meteoroids.

**Activity:**

Watch a show in the nearest planetarium. a) Share your experience in the class room. b) Make an album of interesting facts about the solar system.



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## The Sun



Sun

The Sun is at the centre of the solar system. Each member of the solar system revolves around the Sun. The Sun is so huge that it accounts for 99.8 percent of the entire mass of the solar system. The Sun is made up of extremely hot gases like Hydrogen and Helium.

The Sun is a star. It is self-luminous so it gives light on its own. The surface temperature of the Sun is about 6,000° C. It is the source of light and heat energy to the entire solar system. Sunlight takes about 8.3 minutes to reach the Earth.




1.3 million Earths fit inside the Sun. Imagine how big the Sun is.

## Planets

The word planet means **wanderer**. There are eight planets in the solar system. They are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. All the planets rotate anti-clockwise (from west to east) on their own axes except Venus and Uranus. The elliptical path in which the planets move around the Sun is known as orbit. The eight planets revolve in their respective orbits because of the gravitational pull of the Sun. They do not move out of their paths or away from the solar system.

BY5GKA

**GEO CONNECT:** The ancient Tamils knew that the planets went around the Sun. For example, in Tamil literature **Sirupanatruppadai**, the line 'வாள் நிற விசும்பின் கோள் மீன் சூழ்ந்த இளங்கதிர் ஞாயிறு' mentions that the Sun is surrounded by planets.

The four planets nearer to the Sun are called **Inner or Terrestrial Planets** (Mercury, Venus, Earth and Mars). The inner planets are comparatively smaller in size and are composed of rocks. The surface of inner planets has mountains, volcanoes and craters. The last four planets are called as **Outer Planets or Jovian Planets** (Jupiter, Saturn, Uranus, and Neptune). They are also called **Gaseous Giants**. An asteroid belt is found between Mars and Jupiter.

**Mnemonic to remember the order of planets:** My Very Educated Mother Just Showed Us Neptune.

### Mercury (The Nearest Planet)



Mercury

Mercury is the smallest and closest planet to the Sun. It is named after the Roman deity 'Mercury', the messenger to the Gods. It is an airless and waterless planet. It does not have an atmosphere and so experiences extremes of temperature. It has no natural satellites. Mercury can be viewed in the morning and evening with naked eye.



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### Venus (The Hottest Planet)



Venus

Venus is the second planet from the Sun. It is called **Earth's twin**, as it is almost the same size as the Earth. It has the longest rotation period (243 days) among the planets in the Solar system. It rotates in the opposite direction to all other planets except Uranus. It has no natural satellites like Mercury. It is named after the Roman goddess of love and beauty. It is often visible in the mornings and the evenings and so it is frequently called as the **Morning Star** and the **Evening Star**. After the Moon, it is the brightest natural object in the night sky.

**HOTS:** Even though Mercury is the nearest planet to the Sun, Venus is the hottest one. Guess why?

### Earth (The Living Planet)



Earth

The Earth is the third planet from the Sun and the fifth largest planet in the solar system. It is called 'blue planet' or 'watery planet' because three-fourth of the Earth is covered by water. The Earth is the only planet in the solar system which is not named after any Greek or Roman deity. It is the only planet known to support life. The polar diameter of the Earth is 12, 714 km and the equatorial diameter is 12, 756 km. The Earth revolves around the Sun at a speed of about 30 km per second. Life is possible on Earth because of the presence of land, air and water. The only natural satellite of the Earth is the Moon.




The distance between the Sun and the Earth is about 150 million kilometre. A flight flying at a speed of 800 km per hour from the Earth would take 21 years to reach the Sun.

### Mars (The Red Planet)



Mars

Mars is the fourth planet from the Sun and the second smallest planet in the solar system, after Mercury. It is named after the Roman God of war. It appears red in colour due to the presence of iron oxide on its surface. So, it is often described as **The Red Planet**. It has a thin atmosphere. It also has polar ice

On 24th September, 2014 Mangalyan (Mars Orbiter Mission - MOM), launched by the Indian Space Research Organization (ISRO), reached the orbit of Mars to analyze its atmosphere and topography. ISRO has now become the fourth space agency to reach Mars after the Soviet Space programme, NASA and the European Space Agency.



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caps like the Earth. Mars has two natural satellites namely Phobos and Deimos. Many orbiters and rovers have been launched to explore this planet.

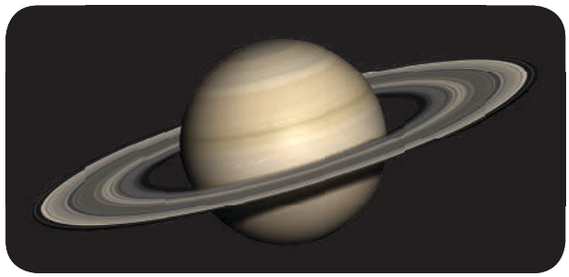
### Jupiter (the Largest Planet)



Jupiter

Jupiter is the fifth planet from the Sun and the largest planet in the solar system. It is named after the king of the Roman gods. It is the third brightest object in the night sky, after moon and Venus. It is the fastest spinning planet in the solar system. It is called a gas giant planet. Its atmosphere is made up of mostly Hydrogen and Helium like the Sun. It has the largest number of natural satellites. Io, Europa, Ganymede and Callisto are a few large satellites of Jupiter.

### Saturn (The Ringed planet)



Saturn

Saturn is the sixth planet from the Sun and the second largest planet in the solar system, after Jupiter. It is named after the Roman god of agriculture. Saturn has many rings around it. These rings are huge and are mostly made up of ice, rocks and dust particles.

Saturn has 62 natural satellites around it. Titan, Saturn's largest moon, is the only satellite in the solar system that has clouds and dense atmosphere composed of nitrogen and methane. The specific gravity of Saturn is less than that of water.

**HOTS:** If you could put Saturn in a large enough ocean it would float. Guess why?

### Uranus (The Somersaulting planet)

Uranus is the seventh planet from the Sun. It was the first to be discovered with a telescope by the astronomer William Herschel in 1781. It appears green due to the presence of methane. It is named after the Greek god of the sky. It rotates on its axis from east to west like Venus. Its axis is tilted so much that, it appears to orbit the Sun on its sides like a rolling ball. Uranus has 27 natural satellites, of which Titania is the largest.



Uranus

### Neptune (The coldest Planet)

Neptune is the eighth and the farthest planet from the Sun. There are strong winds in this planet. It is named after the Roman god of sea. Neptune has 14 natural satellites, the largest being Triton. Because of its distance from the Sun, Neptune is one



Neptune



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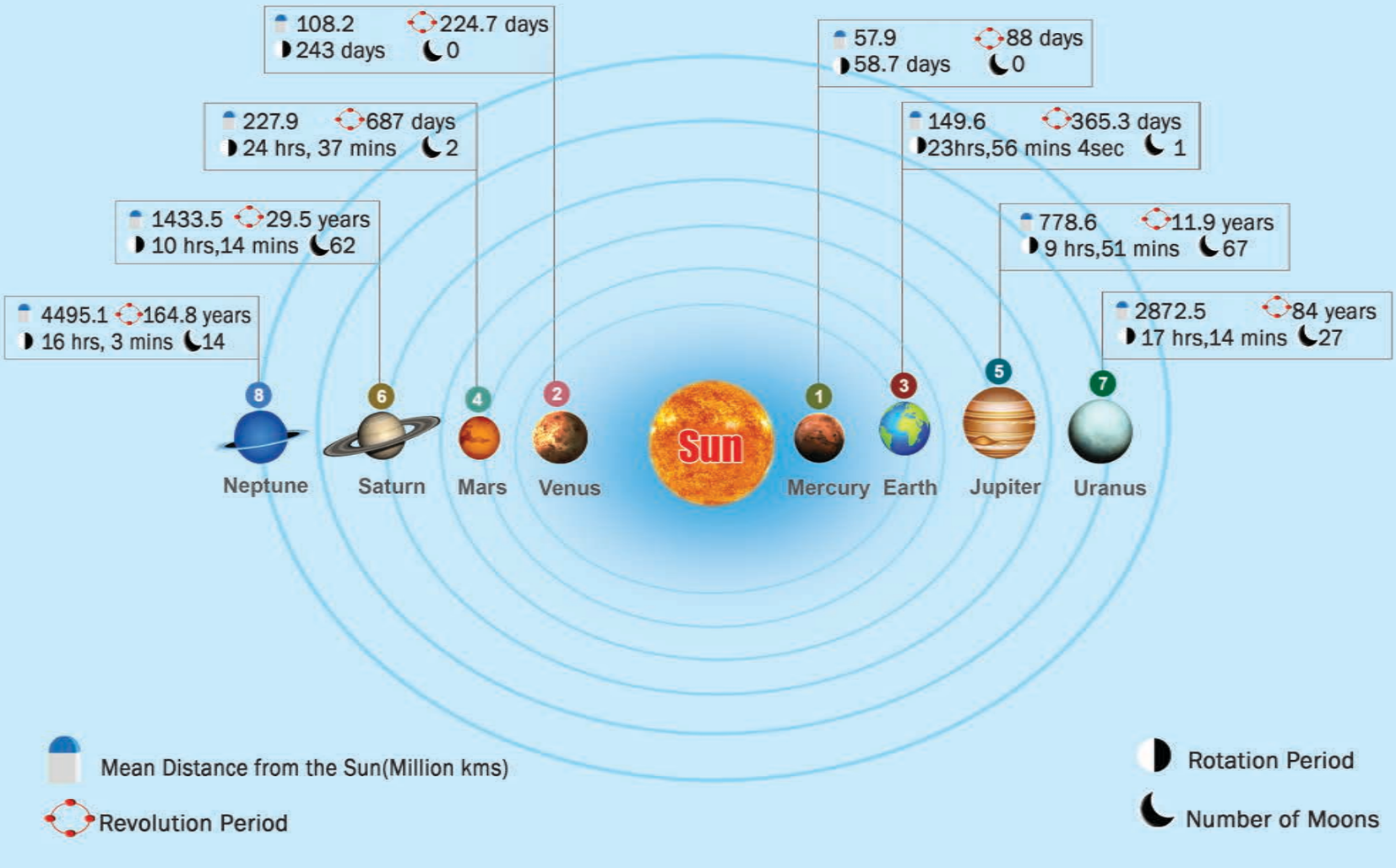
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# THE PLANETS AT A GLANCE




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of the coldest planets in the solar system. The striking blue and white features of Neptune help to distinguish it from Uranus.

### The Dwarf Planets

**HOTS:** Imagine you were on a space craft travelling at the speed of light from Earth, how long would it take to reach the Sun?

Dwarf planets are small celestial bodies found beyond the planet Neptune. They are extremely cold and dark. They are almost spherical in shape, but unlike planets they can share their orbit with other dwarf planets. The five dwarf planets of the solar system are Pluto, Ceres, Eris, Makemake and Haumea.

### The Moon - Earth's Satellite

Satellites are celestial objects, which revolve around the planets. The moon is the Earth's only satellite. It revolves around the Earth once in every 27 days and 8 hours. It takes about the same time for it to complete one rotation around its axis. It has no atmosphere. The surface of the moon is characterized by craters created by the impact of meteors. The distance between the moon and the Earth is about 3, 84,400 km. The size of the moon is one-quarter of the Earth. The Moon is the only celestial body where humans have landed.



**Moon**

**HOTS:** We see only one side of the Moon always. Why?

### Asteroids

Asteroids are small solid objects that move around the Sun. They are found as a belt between Mars and Jupiter. They are too small to be called as planets. They are also known as **Planetoids** or **Minor Planets**.

**Fact:**

ISRO launched India's first ever Moon mission, **Chandrayaan - 1** in 2008.

### Comets

A comet is a celestial object made up of a head and a tail. The head of a comet consists of solid particles held together by ice and the tail is made of gases. Halley's Comet is the most famous comet which comes close to the Earth every 76 years. It last appeared in 1986 and will next appear in 2061.



**Comets**

### Meteors and Meteorites

A meteor is a stone like or metallic body. When entering into the Earth's atmosphere, most of them burn. As they often appear as streaks of light in the sky, they are also known as **Shooting Stars**. Meteors which strike the Earth's surface are called meteorites.



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# 3. Motions of the Earth

Have you noticed the Sun in the morning, afternoon or evening? Is it in the same place throughout the day? No. It is seen in the east in the morning, overhead in the afternoon and in the west in the evening. Have you ever thought of the reason behind it? This is because of the constant moving of the Earth around the Sun. It seems that the Sun is moving, but it is not so. This is similar to what you experience when you are travelling in a bus or train. When you look out of the window, the trees, lamp posts and other objects seem to be moving, but actually it is you who are moving. To understand the motions of the Earth better, you need to be familiar with the shape and inclination of the Earth.

## Shape and Inclination of the Earth

The Earth is spherical in shape. It rotates on its axis, which is an imaginary line that runs from the North Pole to the South Pole passing through the centre of the Earth. The Earth's axis is always tilted or inclined from the vertical by an angle of 23½°. It makes an angle of 66½° with the plane of the Earth's orbit.

**Fact:**

The velocity of the Earth's rotation varies from 1670 km per hour at the equator to 845 km per hour at 60° N and S latitudes and zero at the poles.

## Rotation




It is the spinning movement of the Earth on its axis. The Earth rotates from west to east (anti-clockwise) and takes 23 hours 56 minutes and 4.09 seconds to complete one rotation. The time taken by the Earth to complete one rotation is called a day. The rotation of the Earth causes day and night. As the Earth is spherical in shape, only one half of it is illuminated by the Sun at a time. The other half remains dark. The illuminated portion of the Earth experiences day, whereas the darkened part of the Earth experiences night. The line which divides the surface of the Earth into a lighted half and a dark half is called the **Terminator Line**.

**Fact:**

The **Midnight Sun** is a natural phenomenon that occurs in the summer months in places north of the Arctic Circle or south of the Antarctic Circle, when the Sun remains overhead 24 hours a day.

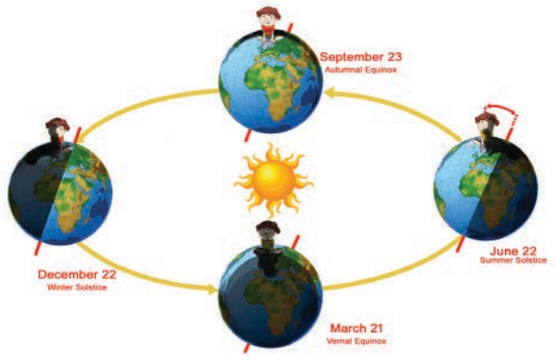
## Revolution

It is the movement of the Earth around the Sun on its elliptical path. The Earth takes 365 ¼ days for it to complete one revolution. It revolves around the Sun at a



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speed of 30 km per second. For the sake of convenience, we take it as 365 days and call it a year. The remaining quarter day is added once in every four years in the month of February. That is why February has 29 days once in four years. It is called a **Leap Year**. The inclination of the Earth on its axis and its revolution around the Sun cause different seasons.

**Activity:**

Circle the leap years: 2000, 2005, 2012, 2014, 2017, and 2020

The Northern Hemisphere is inclined towards the Sun for six months from 21st March to 23rd September while the Southern Hemisphere is tilted away from the Sun.

From Sep 23rd to March 21st the southern hemisphere is inclined towards the Sun and the northern hemisphere faces away from the Sun. The changing position of the Earth in its orbit during revolution gives the impression that the Sun is continuously moving north and south of the equator. The equator faces the Sun directly on 21 March and 23 September. These two days are called **Equinoxes**, during which the day and night are equal throughout the Earth.

**HOTS:** Priya is 12 years old. How many times she would have revolved around the Sun?

DO YOU KNOW?

**Perihelion** is the Earth's closest position to the Sun. **Aphelion** is the farthest position of the Earth from the Sun.

On 21st June, the Tropic of Cancer faces the Sun. This is known as **Summer Solstice**. It is the longest day in the Northern Hemisphere and longest night (shortest day) in the Southern Hemisphere. On 22nd December, the Tropic of Capricorn faces the Sun. It is called as **Winter Solstice**. It is the longest day in the Southern Hemisphere and longest night (shortest day) in the Northern Hemisphere.

**HOTS:** If the Earth is not inclined at $23\frac{1}{2}^{o}$ angle, what would happen to the Earth?

## 4. Spheres of the Earth

The Earth is the most suitable planet to support life. It has three major components that we call as the realms of the Earth- lithosphere, hydrosphere and atmosphere. The three components along with suitable climate make life possible on Earth. All living things exist in a narrow zone called the biosphere. Now let us have a close look at each of the spheres.



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## Lithosphere

The word lithosphere is derived from the Greek word **Lithos**, which means rocky. The Lithosphere is the land on which we live. It is the solid outer layer of the Earth consisting of rocks and soils.

## Hydrosphere

The word **Hydro** means water in Greek. The hydrosphere consists of water bodies such as oceans, seas, rivers, lakes, ice caps on mountains and water vapour in the atmosphere.

## Atmosphere

The word **Atmo** means air in Greek. Atmosphere is the envelope of air that surrounds the Earth. Different types of gases make up the atmosphere. The major gases are Nitrogen (78%) and Oxygen (21%). The other gases like Carbon dioxide, Hydrogen, Helium, Argon, and Ozone are present in meager amounts.

## Biosphere

The narrow belt of interaction among the lithosphere, the hydrosphere and the atmosphere, where life exists is known as Biosphere. **Bio** means life in Greek. It consists of distinct zones. Each zone has its own climate, plant and animal life. These zones are known as ecosystems.




The Gulf of Mannar Biosphere Reserve in the Indian Ocean covers an area of 10,500 sq.km in the ocean.

## Wrap Up

- The Universe was formed 15 billion years after the Big Bang explosion
- Many galaxies are found in the Universe.
- Our solar system is a part of the Milky Way Galaxy.
- The Sun is so huge that it accounts for 99.8 percent of the entire mass of the solar system.
- All planets rotate anti-clockwise on their own axes except Venus and Uranus.
- Asteroids are found as a belt between Mars and Jupiter.
- The rotation of the Earth causes day and night.
- The revolution of the Earth causes seasons.
- Summer solstice is the longest day in the Northern Hemisphere.
- The presence of land, water and air along with suitable climate makes life possible on Earth.




1. Galaxy - The cluster of stars
2. Asteroids - Irregular shaped rocks between Mars and Jupiter
3. Meteors - Space particles left behind by comets or asteroids
4. Comets - Frozen lumps of rocks, dust and gas.
5. Satellites - Celestial bodies that move around the planets.



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TN_GOVT_GEOGRAPHY_VI_Std_Ch1.indd 183 16-03-2018 20:09:16

6. Orbit - The path in which the planets move around the Sun.
7. Earth's axis - An imaginary line passing through the centre of the Earth from the North Pole to the South Pole.
8. Rotation - Spinning movement of the planets on their axes.
9. Revolution - The movement of the planets around the Sun in their orbit.
10. Equinox - The day on which day and night are of equal length.
11. Solstice - An occurrence when the Tropic of Cancer and Tropic of Capricorn faces the Sun vertically.
12. Rover - A space exploration vehicle which moves across the surface of a celestial body
13. Orbiter - A spacecraft which orbits a celestial body without landing on its surface.

## Exercises




### A. Fill in the blanks.

1. The Universe was formed after _____ explosion.
2. _____ is the unit used to measure the distance between two celestial bodies.
3. _____ is the centre of the solar system.
4. The word planet means _____.
5. _____ planet has many natural satellites.
6. India's first ever mission to the moon is _____.
7. Earth is inclined by ____ degrees.
8. The Equator faces the Sun directly on _____ and _____ .
9. At the time of Perihelion, the Earth is _____ to the Sun.
10. The line which divides day and night on the Earth's surface is _____ .

### B. Choose the best answer.

1. The movement of the Earth on its axis is called
   a. Revolution b. Seasons
   c. Rotation d. Circulation
2. The Tropic of Capricorn faces the Sun directly on
   a. March 21 b. June 21
   c. September 23 d. December 22
3. The galaxy in which our solar system is found is
   a. Andromeda b. Magellanic clouds
   c. Milky Way d. Starburst
4. The only celestial body where man has successfully landed
   a. Mars b. Moon
   c. Mercury d. Venus
5. Which of the following planets can float on water?
   a. Jupiter b. Saturn
   c. Uranus d. Neptune

### C. Circle the odd one out

1. Venus, Jupiter, Neptune, Saturn
2. Sirius, Andromeda, Milky way, Magellanic clouds



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TN_GOVT_GEOGRAPHY_VI_Std_Ch1.indd 184 16-03-2018 20:09:16

3. Pluto, Eris, Ceres, Io
4. Comet, Asteroids, Meteorites, Dwarf planets
5. Rover, Orbiter, Aeroplane, Space shuttle

## D. Match the following

| | | |
|---|---|---|
| 1. Hottest Planet | - | a. Mars |
| 2. Ringed Planet | - | b. Neptune |
| 3. Red Planet | - | c. Venus |
| 4. Somersaulting Planet | - | d. Saturn |
| 5. Coldest Planet | - | e. Uranus |

## E. i) Consider the following statements.

1. Venus rotates from east to west.
2. The Tropic of Cancer faces the Sun on June 21.
3. Mars has rings around it.

**Choose the correct answer using the codes given below.**

a. 1 and 2 b. 2 and 3

c. 1, 2 and 3 d. 2 only

## ii) Consider the following statements.

**Statement I:** Earth is called a watery planet.

**Statement II:** The rotation of the Earth causes seasons.

Which of the statement(s) is/are true?

a. I is true; II is wrong

b. I is wrong; II is true

c. Both the statements are true

d. Statements I and II are wrong.

## F. Name the following

1. Cluster of stars.
2. The nearest galaxy to the solar system.
3. The brightest planet.
4. The living sphere.
5. The year which has 366 days.

## G. Answer in a sentence or two.

1. Name the inner planets.
2. Pluto is no longer a planet. Reason out.
3. What is perihelion?
4. How many times in a year would you find the Sun overhead if you lived on 20°N Latitude?
5. Which celestial body shares its orbit with others? Give an example.

## H. Give reasons.

1. Why is Uranus called as the somersaulting planet?
2. The surface of the moon has many craters.
3. The velocity of Earth's rotation is zero at poles.

## I. Answer in detail.

1. Distinguish between inner and outer planets.
2. What are the effects of rotation and revolution?
3. Explain the characteristics of the various spheres of the Earth.



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TN_GOVT_GEOGRAPHY_VI_Std_Ch1.indd 185 16-03-2018 20:09:16

## J. Picture Study

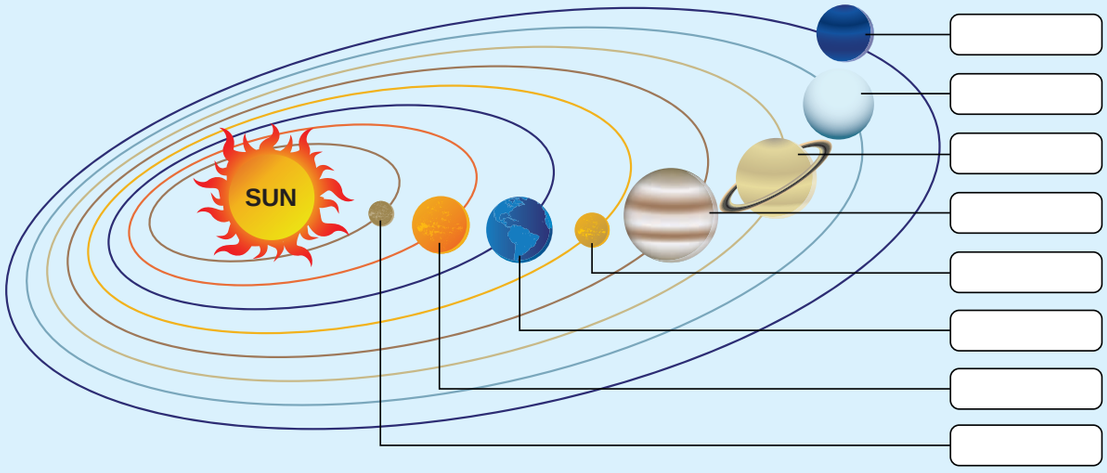
1. Study the picture and answer the given questions.

a. Which is the closest planet to the Sun?

b. Which is the largest planet?

c. Which is the farthest planet from the Sun?

d. Which is the second smallest planet?




2. Look at the picture and answer the questions given below.



a) Identify the planet

---

b) What is the colour of the planet?

---

c) Why is it of this colour?

---

---



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TN_GOVT_GEOGRAPHY_VI_Std_Ch1.indd 186 16-03-2018 20:09:17

## STUDENT ACTIVITY

### K. Solve the puzzle.

**Across**

2 A dwarf planet.

3 Equal days and nights.

7 I am a gas found in the Sun.

8 I appear once in 76 years.

**Down**

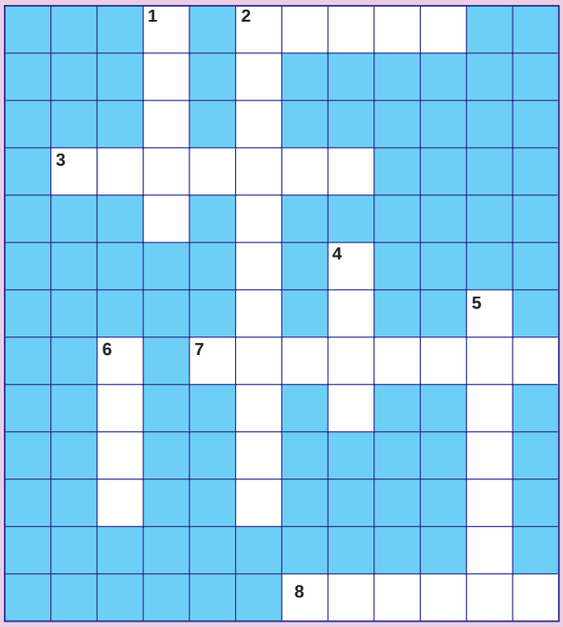
1 I am the morning star.

2 India's first moon mission.

4 I have two natural satellites.

5 I am the farthest planet.

6 An imaginary line passing through the centre of the Earth.



## References


1. John Widdowson (1999), Earthworks 2, 11-14 Geography Project, Hodder Education
2. James F. Petersen, Dorothy Sack, Robert E. Gabler, (2011), Fundamentals of Physical Geography, Brooks/Cole, Cengage Learning
3. H.J.Blij, Peter O Muller, Richard S. Williams, Jr., Physical Geography - The Global Environment, III Edition, Oxford University Press


## Internet Resources

1. www.nationalgeographic.org/encylopedia/seasons
2. www.slideshare.net
3. www.britannica.com
4. www.geography4kids.com
5. https://sangamtamilliterature.wordpress.com/thd_,ay;



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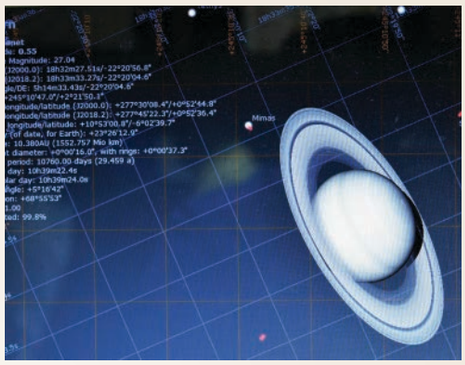
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# ICT CORNER

## Explore the Solar System!

Travel to the planets and stars and enjoy the adventure!

Lets explore universe on Stellarium



**Step 1:**

Download and install the 'Stellarium' app from the given link. Double click and open the "Stellarium" app

**Step 2:**

Click the "Location window" or F6. Then select your location using drop down boxes and view the placements of celestial bodies in the sky.

**Step 3:**

Click the "Date/Time window" or F5. Then set the date and time zone of your location.

**Step 4:**

Use the "Search window" or F3 and type any name of the solar system to explore them.Select and zoom in on the Earth and play with increase or decrease speed buttons to view its rotation.




Image 1



Image 2

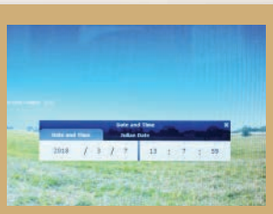


Image 3

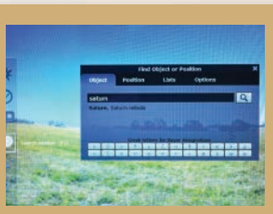


Image 4

**URL to download Stellarium app:**

http://stellarium.org/



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Unit 2

# Land and Oceans



## Learning Objectives

- To understand the continents and oceans.
- To learn about the characteristic features of different landforms and oceans.
- To know about the classification of landforms.
- To understand the oceans and its features.

BYN8NK

## Pathway

**This lesson focuses on land and oceans found on the Earth. It deals with the classification of landforms - first, second and third order landforms.**




The teacher enters the classroom with giant-sized envelopes. The students are enthusiastic to know the content of the envelopes. Teacher asks the children to sit in groups and explains the activity. Each group is given an envelope which contains seven jig-saws and a chart paper. The teacher asks them to paste the jig-saws (continents) close to each other leaving no gap between them. Teacher asks them to colour the remaining places in blue.

A group pastes the continents and comes first with the chart without any gaps in



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TN_GOVT_GEOGRAPHY_VI_Std_Ch2.indd 189 16-03-2018 20:10:33

between the continents. The teacher then puts the chart on the board and the children applaud.

"What kind of picture is this? Once I have seen one like this in the atlas, " says Yazhini.

"You are right. This is Pangea, the Super Continent, and the Sea around is Panthalasa. It was 200 million years ago, when these landmasses moved away from each other to gain the present position as continents and oceans." says the teacher.

"What makes it to move madam?" asks Nila.

"Nothing other than the internal heat of the Earth," says the teacher and continues, “this lesson deals about the continents and oceans in detail”

The Earth is covered by **water** which occupies **71** percent and **land** that occupies **29** percent of the Earth’s surface. The surface of the Earth is not even, because it has lofty mountains, deep oceans and other landforms. These landforms can be classified as

## 1. First order landforms

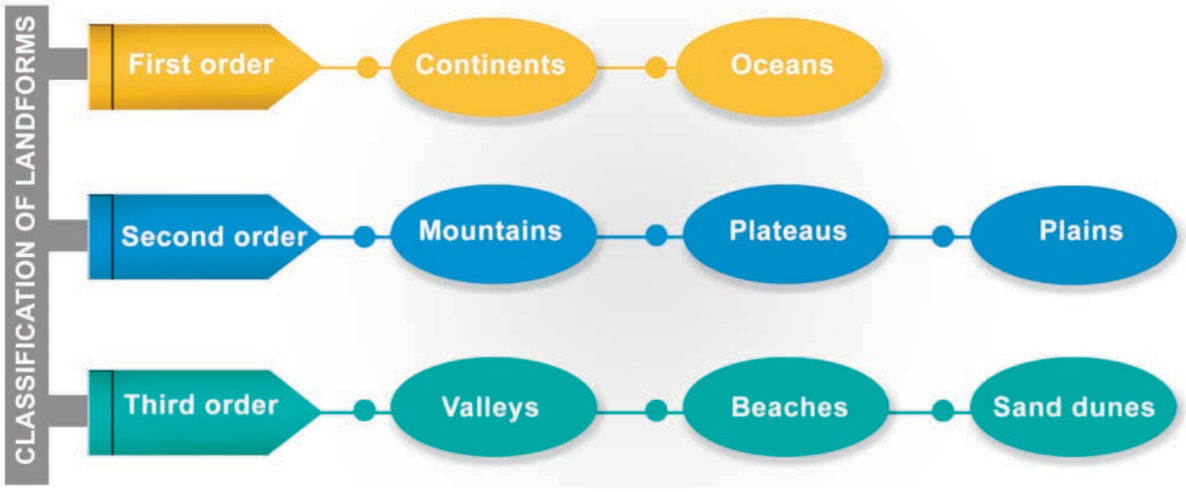
Continents and oceans are grouped as first order landforms. The vast land masses on Earth are called **Continents** and huge water bodies are called **Oceans.** There are seven continents. They are **Asia, Africa, North America, South America, Antarctica, Europe and Australia**. Asia is the largest continent, whereas Australia is the smallest one.

**GEO CONNECT:**

**Land classification - Sangam period**

1. **Kurinji** - Mountain and its environs
2. **Mullai** - Forest and its surroundings
3. **Marutham** - Agricultural land and its adjoining areas.
4. **Neithal** - Sea and its environs
5. **Palai** - Desert region

**Which of the above land form category do you belong to?**




**Classification of landforms**



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TN_GOVT_GEOGRAPHY_VI_Std_Ch2.indd 190 16-03-2018 20:10:33

Apart from continents, there are five oceans located on the Earth's surface. They are the **Pacific, Atlantic, Indian, Southern and Arctic Ocean**. Among these oceans, the Pacific Ocean is the largest and the Arctic Ocean is the smallest.

**Activity:**

**Required materials**

- A round plate
- 7 slices of one carrot
- A glass of water

**Procedure**

Write the abbreviations As, Af, NA, SA, An, Eu and Au on each slice in descending order of its size.

The teacher hangs a wall map of the world.

The students have the expansion of each abbreviation written on the board.

Students now try to place the slices on the plate matching the position of the continents in the map.

They pour some water.

The teacher shows the oceans.

Accordingly the students put their fingers in the respective places and repeat the names of the ocean stirring the water.

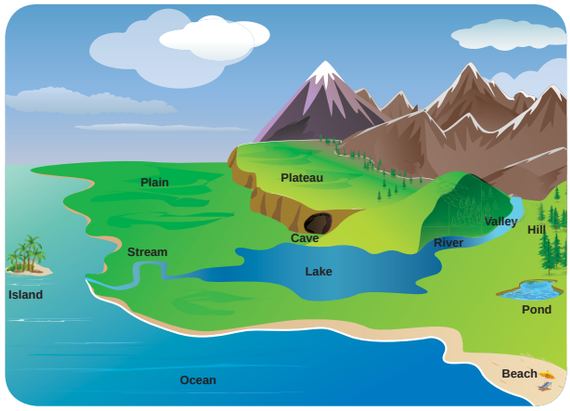
The students learn the position, comparative size of the continent and the position of oceans.

DO YOU KNOW?

**Isthumus :** A narrow strip of land which connects two large landmasses or separates two large waterbodies.

## 2. Second order landforms

The second order landforms are categorised as mountains, plateaus and plains.




**Second order Landforms: Mountains, Plateaus and Plains**

### 2.1 Mountains

A landform that rises 600 metre above its surroundings and has steep slopes is called a **mountain**. Mountains are found in isolation or in groups. If the mountains extend for a larger area continuously, it is called a mountain range. These ranges stretch for hundreds or thousands of kilometre. The **Himalayas** of Asia, the **Rocky** Mountains of North America and

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**HOTS:**

**December 11 International Mountain Day**

Prepare slogans, posters and placards to celebrate International Mountain Day.



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**Activity:**

Complete the given table with the help of an atlas. Follow the example.

| S.No. | Mountain Ranges | Peaks | Continents | Elevation (m) |
|---|---|---|---|---|
| 1. | The Himalayas | Everest | Asia | 8,848 |
| 2. | The Rockies | | | |
| 3. | The Andes | | | |
| 4. | The Alps | | | |
| 5. | The Eastern Ghats | | | |

the **Andes** of South America are such examples. The Andes mountain in South America is the longest mountain range (7,000 km) in the world. The highest point of a mountain is known as **peak**. Mt. Everest is the highest peak (8,848 m) in the world. Which country is Mt. Everest located in?

**HOTS:** You know the importance of conservation of forests. Do you think conservation of mountains is also equally important?

Mountains are the sources of rivers. They provide shelter to flora and fauna. Here, tourism is an important activity. During summer, people go to mountain regions to enjoy the pleasing cool weather. Udhagamandalam, Kodaikanal, Kolli hills, Yercaud and Yelagiri are some of the hill stations found in Tamil Nadu.

## 2.2 Plateaus

Plateaus are the elevated portions of the Earth that have flat surfaces bounded by steep slopes. The elevation of plateaus may be a few hundred metre or several thousand metre. **Tibetan Plateau** is the highest plateau in the world. So, it is called as the '**Roof of the world'**. The flat topped part of the plateau is called **Tableland**. The plateaus are generally rich in minerals. The **Chotanagpur Plateau** is one of the mineral rich plateaus in India. Therefore, mining is one of the major activities of the people living here. The **Deccan Plateau** in peninsular India is of volcanic origin.




Dharmapuri Plateau, Coimbatore Plateau and Madurai Plateau are found in Tamil Nadu.

## 2.3 Plains

Plains are a flat and relatively low-lying lands. Plains are usually less than 200 metre above sea level. Sometimes they may be rolling or undulating. Most plains are formed by rivers and their tributaries and distributaries. These plains are used extensively for agriculture due to the availability of water and fertile soil. They




The plains have been the cradle of civilisations from the earliest times. For example: the Indus in India, the Nile valley in Egypt are some of the early civilisations which developed and flourished.



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TN_GOVT_GEOGRAPHY_VI_Std_Ch2.indd 192 16-03-2018 20:10:34

are most suitable for human inhabitation. Hence, they are the highly populated regions of the world. The oldest civilisations like the Mesopotamian and the Indus civilisations developed in river plains. The Indo-Gangetic plain in North India is one of the largest plains in the world. The plains formed by river Cauvery and Vaigai are important plains found in Tamil Nadu. Coastal plains are the low lying lands adjacent to oceans and seas.

**Activity:**

Complete the given table with the help of an atlas. Follow the example.

| S.No. | Continents | Plateaus | Plains |
|---|---|---|---|
| 1. | Asia | Tibetan Plateau | Yangtze Plain |
| 2. | North America | | |
| 3. | South America | | |
| 4. | Australia | | |
| 5. | Europe | | |
| 6. | Africa | | |

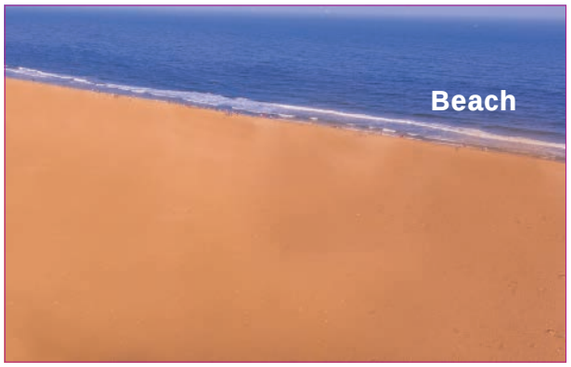
**Activity:**

- Make a model of different landforms.
- Prepare an album of people's activities in different landforms.

## 3. Third order landforms

Third order landforms are formed on mountains, plateaus and plains mainly by erosional and depositional activities of rivers, glaciers, winds and waves. Valleys, beaches and sand dunes are some examples of third order landforms.







**Erosion** is the process of removal of surface material from the Earth's crust. The eroded materials are transported and deposited on the low lying areas. This process is called as **Deposition**.

**HOTS:** When you are walking on the Marina beach in Chennai, which order of landform are you on?

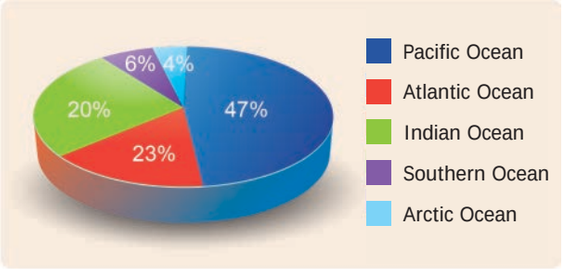


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TN_GOVT_GEOGRAPHY_VI_Std_Ch2.indd 193 16-03-2018 20:10:39

## 4. Oceans

The Earth looks blue when we see it from space. This is because, two-thirds of it is covered by water. The water is found in oceans and seas. Oceans are vast expanse of water. Seas are water bodies partially or fully enclosed by land. As you have studied previously, there are five main oceans in the world.




**Area of Oceans (%)**

### 4.1 The Pacific Ocean

The Pacific Ocean is the **largest and deepest ocean** on the Earth. It covers about one-third of the Earth's total area and spreads for about 168.72 million sq.km**.** It is bounded by Asia and Australia in its west and North America and South America in its east. It stretches from the Arctic Ocean in the north to the Southern Ocean in the south.

BZ6ZRV




**Pacific Ocean and its Marginal Seas**

DO YOU KNOW?

If **Mount Everest**, which is the highest point (8,848 metres) was plugged into the **Mariana Trench**, still there would be 2,146 metres of water left.

The depth in meters from mean sea level is denoted as **m**-

This ocean's shape is roughly triangular with its apex in the north at the Bering Strait which connects the Pacific Ocean with the Arctic Ocean. The Bering Sea, the China Sea, the Sea of Japan, Tasman Sea and the Philippine Sea are some of the marginal seas of the Pacific Ocean. Indonesia, Philippines, Japan, Hawaii, New Zealand are some of the islands located in this Ocean. The deepest point **Mariana Trench** is 10,994 m- and is located in the Pacific Ocean. A chain of volcanoes is located around the Pacific Ocean called the **Pacific Ring of Fire.**

DO YOU KNOW?

The Spanish navigator **Ferdinand Magellan** named the ocean **Pacific**, meaning calm or tranquil.



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TN_GOVT_GEOGRAPHY_VI_Std_Ch2.indd 194 16-03-2018 20:10:39

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TN_GOVT_GEOGRAPHY_V1_Std_Ch2.indd 195






16-03-2018 20:10:39

## 4.2 The Atlantic Ocean

The Atlantic Ocean is the second largest ocean on the Earth. It covers one sixth of the Earth's total area and spreads for about 85.13 million sq.km . It is bounded by North America and South America in the west and Europe and Africa in the east. Like the Pacific, it stretches from the Arctic Ocean in the north to the Southern Ocean in the south. The shape of the Atlantic Ocean resembles the letter **'S'**. The Strait of Gibraltar connects the Mediterranean Sea are important marginal seas of the Atlantic Ocean. St. Helena, Newfoundland, Iceland and Falkland are some of the islands found in this ocean.




**Atlantic Ocean and its Marginal Seas**

Atlantic Ocean with the Mediterranean Sea. The Atlantic Ocean is the busiest shipping route between the Eastern and Western hemispheres. The deepest point is the **Milwaukee Deep** in the **Puerto Rica Trench**. It has a depth of about 8600 $m^{-}$. The Caribbean Sea, the Gulf of Mexico, the North Sea, the Gulf of Guinea and the

**HOTS:** Why are the Red Sea, Dead Sea and Black Sea named so?

## 4.3 The Indian Ocean

The Indian Ocean is the third largest ocean on the Earth's surface. It covers an area of about 70.56 million sq.km. It is named after India. It is triangular in shape and bounded by Africa in the west, Asia in the north and Australia in the east. The Andaman and Nicobar Islands, Lakshadweep, Maldives, Sri Lanka, Mauritius and the Reunion Islands are some of the islands located in the Indian Ocean. Malacca strait connects the Indian Ocean and the Pacific Ocean.

**Palk Strait** connects the Bay of Bengal and Palk Bay.

The Bay of Bengal, the Arabian Sea, the Persian Gulf and the Red Sea are some of the important marginal seas of the Indian Ocean. The **Java trench** (7,725 $m^{-}$) is the deepest point in the Indian Ocean.




**Indian Ocean and its Marginal Seas**



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TN_GOVT_GEOGRAPHY_VI_Std_Ch2.indd 196 16-03-2018 20:10:39

- 6° Channel separates Indira Point and Indonesia
- 8° Channel separates Maldives and Minicoy islands
- 9° Channel separates Lakshadweep Islands and Minicoy islands
- 10° Channel separates Andaman and Nicobar Islands

## 4.4 The Southern Ocean

The Southern Ocean surrounds the continent of Antarctica and is enclosed by the 60°S latitude. It covers an area of 21.96 million sq.km. It is bordered by the southern parts of the Pacific, the Atlantic and the Indian Oceans. The Ross Sea, the Weddell Sea and the Davis Sea are the marginal seas of this Ocean. Farewell Island, Bowman Island and Hearst Island are some of the islands located in this ocean. The water in this ocean is very cold. Much of it is covered by sea ice. The deepest point in this ocean is **South Sandwich Trench** with a depth of 7,235 m.




**Southern Ocean and its Marginal Seas**

**HOTS:** When you travel from Japan to California, which ocean would you travel across?

## 4.5 The Arctic Ocean

The Arctic Ocean is the smallest ocean. It covers an area of 15.56 million sq.km. It lies within the Arctic Circle. It remains frozen for most of the year. The Norwegian Sea, the Greenland Sea, the East Siberian Sea and the Barents Sea are some of the marginal seas of this ocean. Greenland, New Siberian Island and Novaya Zemlya Island are some of the islands located in the Arctic Ocean. The North Pole is situated in the middle of the Arctic Ocean. The **Eurasian Basin** is the deepest




**Arctic Ocean and its Marginal Seas**



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TN_GOVT_GEOGRAPHY_VI_Std_Ch2.indd 197 16-03-2018 20:10:40

point in the Arctic Ocean, which is about 5,449 m in depth.

**Activity:**

Complete the given table with the help of an atlas. Follow the example.

| Sl.No. | Name of the Ocean | Area (million sq.km) | Trenches | Depth (m) |
|---|---|---|---|---|
| 1. | Pacific Ocean | 168.72 | Mariana | 10,994 |
| 2. | Atlantic Ocean | | | |
| 3. | Indian Ocean | | | |
| 4. | Southern Ocean | | | |
| 5. | Arctic Ocean | | | |

**HOTS:** When you arrange the continents in ascending order according to their size, which ranks third?

## Wrap-up

- The surface of the Earth is covered by 71 percent of water and 29 percent of land.
- The landforms are classified as first order, second order and third order landforms.
- Continents and oceans are the first order landforms.
- There are seven continents and five oceans on the Earth's surface.
- Mountains, plateaus and plains are the second order landforms.
- Valleys, beaches and sand dunes are the third order landforms.
- Many islands and marginal seas are found in the oceans.

### GLOSSARY

- **Island** - A land surrounded by water on all sides.
- **Bay** - A broad inlet of the sea where the land curves inwards.
- **Strait** - A narrow stretch of water linking two large water bodies.
- **Trench** - The deepest part of the ocean.
- **Peninsula** - The land surrounded by water on three sides.

## Exercises

### A. Choose the correct answer

**1. Which of the following is the smallest ocean on Earth?**

a. The Pacific Ocean
b. The Indian Ocean
c. The Atlantic Ocean
d. The Arctic Ocean

**2. The Malacca Strait connects**

a. The Pacific and Atlantic Oceans
b. The Pacific and Southern Oceans
c. The Pacific and Indian Oceans
d. The Pacific and Arctic Oceans

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TN_GOVT_GEOGRAPHY_VI_Std_Ch2.indd 198 16-03-2018 20:10:40

3. **Which of the following oceans is the busiest ocean?**
   a. The Pacific Ocean
   b. The Atlantic Ocean
   c. The Indian Ocean
   d. The Arctic Ocean
4. **The frozen continent is**
   a. North America  b. Australia
   c. Antarctica  d. Asia
5. **A narrow strip of water that connects two large water bodies**
   a. A Strait  b. An Isthmus
   c. An Island  d. A Trench

## B. Fill in the blanks.

1. The world's largest continent is _____
2. _____ is the mineral rich plateau in India
3. The largest ocean is _____
4. Deltas are _____ order landforms.
5. The Island continent is _____

## C. Circle the odd one out.

1. Africa, Europe, Australia, Sri Lanka
2. The Arctic Ocean, the Mediterranean Sea, the Indian Ocean, the Atlantic Ocean
3. Plateau, Valley, Plain, Mountain
4. The Bay of Bengal, the Bering Sea, the China Sea, the Tasman Sea.
5. The Andes, the Rockies, the Everest, the Himalayas

## D. Match the following

| A | | B |
|---|---|---|
| 1. The South Sandwich Trench | - | a) The Atlantic Ocean |
| 2. The Milwaukee Trench | - | b) The Southern Ocean |
| 3. The Mariana Trench | - | c) The Indian Ocean |
| 4. The Eurasian basin | - | d) The Pacific Ocean |
| 5. The Java Trench | - | e) The Arctic Ocean |

## E. i) Consider the following statements.

1. Plains are formed by rivers.
2. The 'South Sandwich Trench' is found in the Indian Ocean.
3. Plateaus have steep slopes.

**Choose the correct answer using the codes given below.**

a. 1 and 3  b. 2 and 3
c. 1, 2 and 3  d. 2 only

## ii) Consider the following statements.

**Statement I:** Mountains are second order landforms.

**Statement II**: The Mariana Trench is the deepest trench in the world.

Which of the statement(s) is/are true?

a. I is true; II is wrong
b. I is wrong; II is true
c. Both the statements are true
d. Statements I and II are wrong.



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TN_GOVT_GEOGRAPHY_VI_Std_Ch2.indd 199 16-03-2018 20:10:40

## F. Answer in a word

1. Which is the highest plateau in the world?
2. Name a second order landform.
3. Which ocean is named after a country?
4. Name the island located in the Arabian Sea.
5. What is the deepest part of the ocean called as?

## G. Answer in brief.

1. What is a continent?
2. Name the continents which surround the Atlantic Ocean.
3. What are oceans?
4. List out the names of continents according to their size
5. Name the oceans which surround North America and South America.

## H. Distinguish between

1. A Mountain and a Plateau
2. An ocean and a sea

## I. Answer the following questions in detail

1. Write down the classification of land forms.
2. Write a note on plateaus.
3. Plains are highly populated. Give reasons
4. Give the important features of the Pacific Ocean.
5. Write down the importance of oceans.

## J. Picture Study



1. Name the landform.
2. What order of a landform is this?
3. Which activity of river is this landform formed by?

## K. i) Activity

1. Trip to the nearby area to appreciate the physical features of any kind of landform.
2. Conduct a quiz on landforms and oceans.

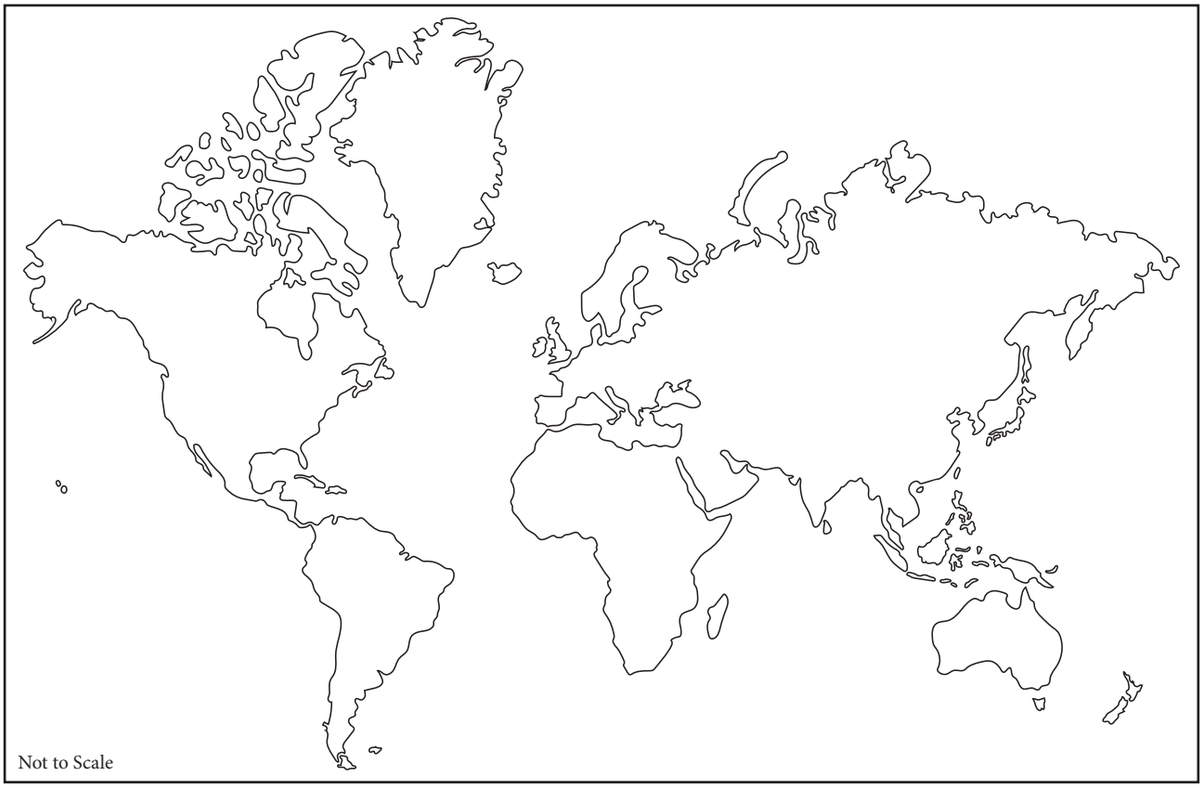
### ii) Activity

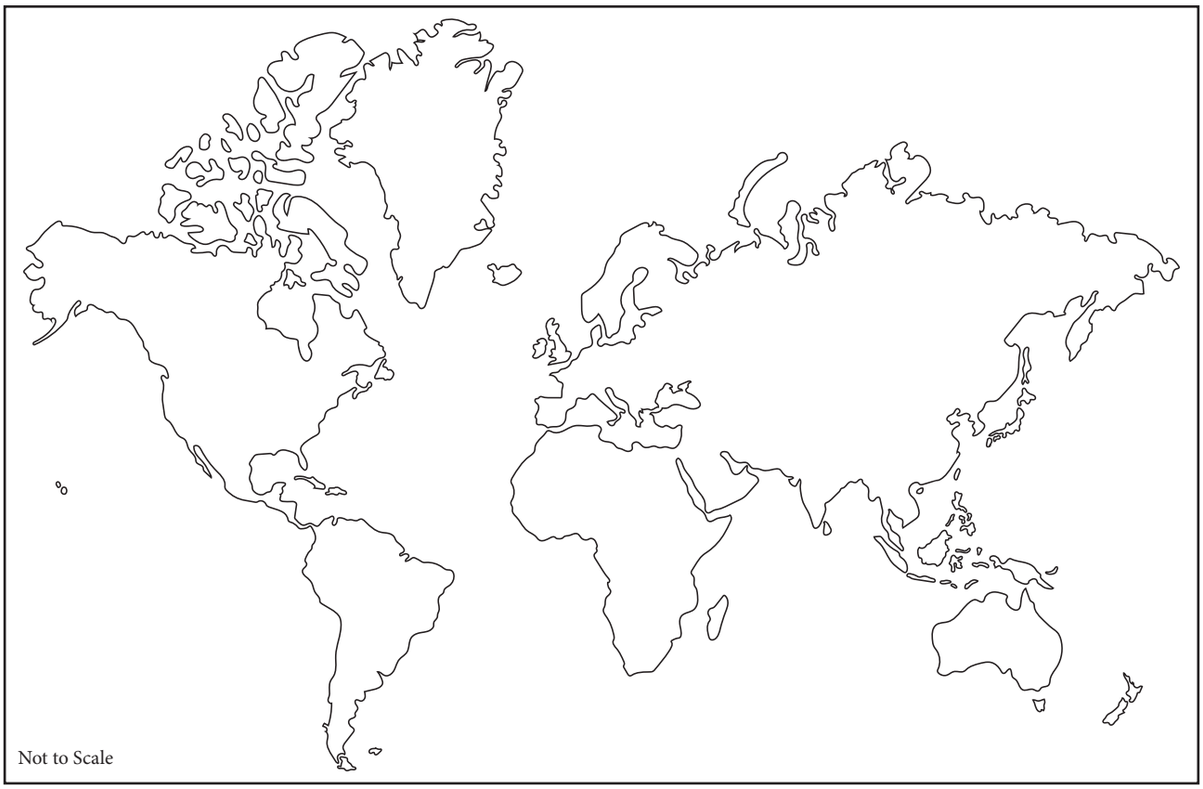
1. Give examples for the following using an Atlas.
   a. Bay: _____, _____, _____
   b. Gulf: _____, _____, _____
   c. Island: _____, _____, _____
   d. Straits: _____, _____, _____
2. Map reading (with the help of atlas)
   a. A sea in the east of India
   b. Continents in the west of Atlantic Ocean
   c. Continents in the south of Arctic Ocean
   d. A strait between India and Sri Lanka
   f. Oceans which surround Australia
   g. Find out the Isthumusses
   (Create more questions)
3. On the given outline map of the world, label the continents and mountain ranges.
4. On the given outline map of the world, label oceans, seas, isthumus and straits.



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## Map Activity






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TN_GOVT_GEOGRAPHY_VI_Std_Ch2.indd 201 16-03-2018 20:10:41

Unit 1

# RESOURCES



## Learning Objectives

- To introduce the meaning of resources
- To familiarize with the different types of resources
- To understand the need for conservation of resources
- To understand the meaning of economic activities.

ACCBMR

**Pathway**

This lesson focuses on the meaning, classification of resources and conservation of resources for sustainable living. It also provides an insight to the various economic activities and in particular it deals with the inter relation between the nature and human activities.

கேடறியாக் கெட்ட இடத்தும் வளங்குன்றா
நாடென்ப நாட்டின் தலை– குறள் 736

எந்த வகையிலும் கெடுதலை அறியாமல், ஒருவேளை கெடுதல் ஏற்படினும் அதனை சீர்செய்யுமளவிற்கு வளங்குன்றா நிலையில் உள்ள நாடுதான் நாடுகளிலே தலை சிறந்ததாகும்.

Kuzhali was lying in her bed to see if her father would enter her room. She wanted her report card to be signed. There was no symptom of coming of her father. She jumped out of her bed and ran to her mother in the kitchen.

**Kuzhali:** Amma where is Appa?

**Amma:** Today he has 'overtime' and he has left early.

**Kuzhali:** "Overtime" what is that?

**Amma:** Your father's boss wants him to manufacture a few more solar panels because they have some urgent orders.

**Kuzhali:** He should have told me last night. My progress report has to be signed.

**Amma:** Enough of that. Now go have your bath. I'll sign your report this time.

**Kuzhali:** Amma, thank you ma. One more question. What does he



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make the solar panels from?

**Amma:** Let me explain for you to understand. Silicon, extracted from sand, a natural resource, is used in making PV cells. These convert solar energy into electrical energy.

**Kuzhali:** Natural resource, what do you mean by it?

**Amma:** All things useful to man is resource. And if it is directly from nature we call it natural resource.

**Kuzhali:** Then what kind of work is Appa doing?

**Amma:** He is a manufacturer. He uses natural resources for manufacturing.

**Kuzhali:** Then, manufactured things be called as resources?

**Amma:** Yes, they are called as man made resources.

**Kuzhali:** Ok amma. It's getting late. Let me get ready.

**Activity: 1**

Circle the resources that are not necessary for gardening. Soil, Seeds, A piece of Land, Computers, Saplings, Flower Pots, Manure, Textbooks.

**Resource** is anything that fulfills human needs. When anything is of some use it becomes valuable. All resources have **value**. The value can be either **commercial** or **non-commercial**. **Commercial resources** have great economic value. (e.g.) Petroleum. The **Non-commercial resources** are very abundant in availability ( e.g.) Air.

**HOTS:**

Do all the items in your shopping list have commercial value?




Anything becomes a resource only when its use is discovered. The needs of human beings are ever changing. According to the ever changing needs, resources keep changing. **Time** and **Technology** are two important factors that determine whether a substance is a resource or not. for example: Sun's energy to generate electricity was made possible after the invention of solar panels (technology); and the receding of coal and petrol was in need of an inexhaustible resource (time).




**HOTS:**

Is the tilt of the solar panels same everywhere on Earth?

Resources can be **natural**, **man-made** and **human resources**.



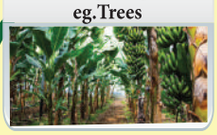
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# TYPES OF RESOURCES

## Based on Origin

**BIOTIC**
eg.Trees



**ABIOTIC**
eg.Water



## Natural resources

**PRIMARY**
eg. Hunting, Forest



## Based on Development

**ACTUAL**
eg.Lignite



**POTENTIAL**
eg.Wind Energy



## Man made resources

**SECONDARY**
eg.Sugar factory, Road



## Based on Renewability

**RENEWABLE**
eg.Solar



**NON-RENEWABLE**
eg.Coal



## Human resources

**TERTIARY**
eg. School,Scientist



## Based on Distribution

**UNIVERSAL**
eg.Water



**LOCALIZED**
eg.Kangaroo



## Based on Ownership

**INDIVIDUAL**
eg.House



**COMMUNITY**
eg.Pond



**NATIONAL**
eg.Rivers



**INTERNATIONAL**
eg.Ambergris





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TN_GOVT_GEOGRAPHY_VI_Std_Ch1.indd 145 06-08-2018 12:27:13

## 1.NATURAL RESOURCES:

All resources that have been directly provided by nature are called **Natural resources**. The air, water, soil, minerals, natural vegetation and wild life around us are all natural resources. The use of any natural resource depends on the place it is available, the form in which it is available and the technology necessary to avail it.



Sun

### CLASSIFICATION OF NATURAL RESOURCES

Natural resources can be classified into different groups depending on **origin, development, renewability, distribution, ownership etc**.

### A.ON THE BASIS OF ORIGIN:

On the basis of **origin,** resources can be classified into biotic and abiotic resources.

**i**. All living resources are biotic resources, plants, animals and other micro organisms are **biotic resources**.



**ii**. **Abiotic resources** are non-living things. Land, water, air and minerals are abiotic resources.

The biotic resources were mere substances till they were recognized by humans. According to the human needs the substances were collected by the ancient men and preserved for use. In the beginning ,man had only three basic needs- food, clothing and shelter. He collected things through **primary activities** such as hunting, food gathering, fishing and forestry. Later when food became scarce, they had to cultivate and that became agriculture and the cattle were also reared on their farms to fulfill their basic needs.



The abiotic resources were also sought after by the early men. They went in search of better landforms where they had enough water resources for agriculture and their cattle. They were in need of tools right from hunting to agriculture. Primarily the tools were only made of stones. Later man dug the earth for better abiotic resources and found copper first and iron later. He also mined precious metals simultaneously for making ornaments. Later mining became one of the leading primary activities and still holds an important place among the economic activities.



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TN_GOVT_GEOGRAPHY_VI_Std_Ch1.indd 146 06-08-2018 12:27:14

### B.ON THE BASIS OF DEVELOPMENT:

ACL7PE

Based on the **level of development**, resources can be divided into actual and potential resources.

i. **Actual resources** are resources that are being used and the quantity available is known. (e.g.) Coal at Neyveli.

ii. **Potential resources** are resources that are not being used in the present and its quantity and location are not known. The technology to extract such resources is also yet to be developed. (e.g.) Marine yeast found in the Bay of Bengal and Arabian Sea.

DO YOU KNOW?

Marine yeast have greater potential than the terrestrial yeast. They can be used in baking, brewing, wine, bio-ethanol and pharmaceutical protein production.

### C. ON THE BASIS OF EXHAUSTIBILITY:

On the basis of **renewability** resources can be classified as renewable resources and non-renewable resources.

i. Resources once consumed can be renewed with the passage of time are called **renewable resources**. (e.g.) Air, Water, Sunlight. Misuse of such resources can also limit its available quantity. So, they have to be used wisely.

ii. Natural resources which are limited can be called **non-renewable** resources. They become exhausted after use and the time they take to replace does not match the life cycle. (e.g.) Coal, petroleum, natural gas and other minerals.

**HOTS:**

Find out what other resources can renew themselves?



**Neyveli lignite corporation**

The resources which cannot renew themselves are either scarce or totally absent. So man is in search of new resources and is conducting several researches. He confirms that a substance is a resource only after research. He tries to harness it and also searches the regions where it may be found in. They are potential resources. Wind energy is one such example. The places where the wind energy can be utilized are still unknown.



**Wind energy**



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TN_GOVT_GEOGRAPHY_VI_Std_Ch1.indd 147 06-08-2018 12:27:15
41

**HOTS:**

How did coal originate?

### D.ON THE BASIS OF DISTRIBUTION:

On the basis of distribution, resources can be classified into **localized resources** and **universal resources.**

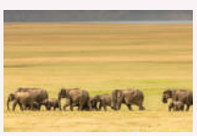
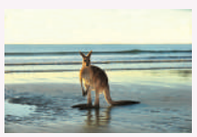
i. When resources are present in specific regions they are called **localized resources**. (e.g.) Minerals.

ii. Some resources are present everywhere Such resources are called **universal resources**. (e.g.) Sunlight and air.

**Activity: 2**

Which region / continent does each of these animals belong to?



### E.ON THE BASIS OF OWNERSHIP:

Based on **ownership** resources can be classified into Individual resources, Community-owned resources, National resources and International resources.

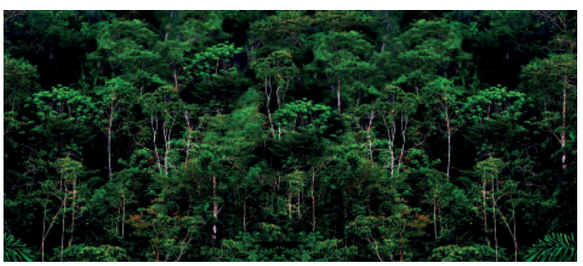
i. **Individual resources** are resources privately owned by individuals. (e.g.) Apartments.

ii. **Community-owned resources** are resources which can be utilised by all the members of the community. (e.g.) Public parks.



**Apartments**

iii. **National resources** are resources within the political boundaries and oceanic area of a country. (e.g.) Tropical forest regions of India.



DO YOU KNOW?

Tropical rain forests are called the 'World's largest Pharmacy' as 25% of the natural vegetation are medicinal plants. (e.g.) Cinchona.

iv. **International resources** are all oceanic resources found in the open ocean. Resources found in this region can be utilized only after an international agreement. (e.g.) Ambergris.

DO YOU KNOW?

Ambergris is an extract from the sperm whale. A pound (0.454kg) of sweet – smelling ambergris is worth US $63,000 and used in perfume industries.



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TN_GOVT_GEOGRAPHY_VI_Std_Ch1.indd 148 06-08-2018 12:27:16



**Ambergris**

## 2. MAN-MADE RESOURCES:

Natural resources are modified or processed by technology into **man-made resources.** (e.g.) sugarcane processed to get sugar. All structures built by man can also be called man-made resources. (e.g.) Bridges, Houses, Roads.

**Activity: 3**

What natural resources are necessary to lay a road?

This transforming of raw materials into finished goods is called **Secondary Activities**. Man's skills and ideas are the basic requirements for these activities.

## 3.HUMAN RESOURCE:

**Human resources** are groups of individuals who use nature to create more resources. Though human beings are basically natural resources, we classify



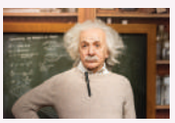
**Man-Made resources**

human beings separately. Education health, knowledge and skill have made them a valuable resource. (e.g.) Doctors, Teachers, Scientists. Tertiary activities are basically concerned with the distribution of primary and secondary products through a system of transport and trade (e.g) Banking, Trade and Communications. The quantity and quality of institutions and organizations involved in making the professionals decide the human resource of a country.

ACV3R2

**Activity:**

Identify the personalities and professionals







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TN_GOVT_GEOGRAPHY_VI_Std_Ch1.indd 149 06-08-2018 12:27:18
43

## Gandhian thought on Resources:



There is enough for everybody's need and not for anybody's greed. Mahatma Gandhi blamed "human beings" for depletion of resources because of

(i) over exploitation of resources
(ii) Unlimited needs of human beings. So, conservation is very important.

## Resource planning / Management

**Resource planning** is a technique or skill of proper utilization of resources. Resource planning is necessary because

(i) Resources are limited, their planning is quite necessary so that we can use them properly and at the same time we can save them for our future generation.
(ii) Resources are not only limited but also they are unevenly distributed over the different parts of the World.
(iii) It is essential for the production of resource to protect them from over exploitation.

## CONSERVATION OF RESOURCES:

Careful use of resources is called **conservation of resources.** Resources are being used at a very fast rate due to the rapid increase in population. So, natural resources are depleting fast; wisely using resources can control the depleting ratios.

Development is necessary without affecting the needs of the future generations. If the present needs of resources are met and the conserving of resources for the future are balanced, we call it **sustainable development**. Sustainable development can take place when

(i) The reasons of depletion are identified.
(ii) Wastage and excess consumption is prevented.
(iii) Reusable resources are recycled.
(iv) Pollution is prevented.
(v) Environment is protected.
(vi) Natural vegetation and wild life are preserved.
(vii) Alternative resources are used.

The easiest way to conserve resources is to follow the '3R's: **Reduce**, **Reuse** and **Recycle**.




RECAP

- Anything that fulfills human needs can be called a resource.
- Resources provided directly by nature are natural resources.
- All living things are biotic resources.
- All non-living things are abiotic resources.
- Collection of resources directly from nature is called primary activities.
- Actual resources are being used at present.



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TN_GOVT_GEOGRAPHY_VI_Std_Ch1.indd 150 06-08-2018 12:27:19

- Potential resources are not utilized at present.
- After consumption, resources can be renewed with the period of time is called renewable resources.
- Non-renewable resources are resources that have limited stock.
- Resources that found everywhere are Universal resources.
- Resources found in specific regions are called localized resources.
- Natural resources when processed to meet man's needs are called man-made resources.
- People are also referred to as resources.
- Tertiary activities are those which render services to production and distribution of goods.
- Careful use of resources is conservation of resources.
- when the present population's needs are fullfilled; the future generation's needs will be met without damaging the environment ,sustainable development take place.

## GLOSSARY

1. Manufacture – production.
2. Solar panel – A plate that can absorb solar energy.
3. PV cells – Photo voltic cells
4. Localized – Limited to specific areas.
5. Universal – found everywhere.
6. Open ocean – areas of ocean that does not belong to any country.
7. Depleting – reducing.
8. Conservation – saving for future use.
9. Sustainable – able to be maintained.
10. Tertiary – third level.

AD4YSP

## Exercises

### A) Match the following.

| A | B |
|---|---|
| Natural resource | Minerals |
| International resource | Sustainable development |
| Reduce, Reuse, Recycle | Air |
| Non-renewable | Manufacturing |
| Universal resource | Ambergris |
| Secondary activities | Forest |

### B) Fill in the blanks.

1. Sugarcane is processed to make _____.
2. Conservation of resources is _____ use of resources.
3. Resources which are confined to certain regions are called _____.
4. _____ resources are being used in the present.
5. _____ resources are the most valuable resources.
6. Collection of resources directly from nature is called _____.



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## C) Write short notes on the following.

1. Renewable resources.
2. Human resources.
3. Individual resources.
4. Tertiary activities

## D) Give brief answers for the following.

1. What are resources?
2. What are actual resources?
3. Define abiotic resources.
4. What is sustainable development?

## E) Give short answers for the following questions.

1. Differentiate universal and localized resources.
2. Though human beings are natural resources, why are they classified separately?
3. Compare national and international resources.
4. What is the difference between man-made resources and human resources?
5. Write the Gandhian thought on conservation of resources.

## F) Give detailed answers for the following questions. (100-120 words)

1. How are natural resources classified? Explain any three with examples.
2. How can resources be conserved?
3. What is resource planning and why is it necessary?
4. Explain the primary, secondary and tertiary activities.

## G) Statements and inferences.

1. **Statement:** Solar energy is the best substitute for thermal energy in tropical regions.

   **Inference 1:** Coal and petroleum resources are receding.

   **Inference 2:** Solar energy will never deplete.

   **Now choose the right answer.**

   a) Only conclusion 1 follows.
   b) Only conclusion 2 follows.
   c) Neither 1 nor 2 follows.
   d) Both 1 and 2 follow.

2. **Statement:** If you don't conserve resources, human race may become extinct.

   **Inference 1:** You need not conserve resources.

   **Inference 2:** You need to conserve resources.

   **Now choose the right answer.**

   a) Only conclusion 1 follows.
   b) Only conclusion 2 follows.
   c) Neither 1 nor 2 follows.
   d) Both 1 and 2 follow.

3. **Statement:** Man switched over to agriculture.

   **Inference 1:** Food gatherers experienced scarcity of food.

   **Inference 2:** Food gathered was not nutritious.

   **Now choose the right answer.**

   a) Only conclusion 1 follows.
   b) Only conclusion 2 follows.
   c) Neither 1 nor 2 follows.
   d) Both 1 and 2 follow.



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TN_GOVT_GEOGRAPHY_VI_Std_Ch1.indd 152 06-08-2018 12:27:19

H) Given are three suggestions to conserve resources: Write the 3Rs in suitable places.

1. Giving your childhood cycle to your neighbour _____.
2. Using a flush that consumes less water _____.
3. Melting used plastic to lay roads _____.

I) Cross word puzzle.

| 1 | 1 | | | 2 | | 3 | | | 4 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | 1 | | |
| | | | | | | | | | | |
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| | | | | | | | | | | |
| | | | | 2 | | | | | | |
| 3 | | | | | | | | | | |

| Across left to right | Down |
|---|---|
| 1. A development that balances time. | 1. A resource found everywhere. |
| 2. Energy from the sun. | 2. An international resource. |
| 3. All resources that belongs to country. | 3. A resource provided by nature. |
| **Across right to left** | 4. A resource restricted to specific areas. |
| 1. One of the 3Rs | |

J) Mark the following in the outline map of India.

1. Neyveli
2. Bay of Bengal
3. Arabian Sea
4. Forest region of Tamil Nadu
5. Indian Ocean
6. Iron mining in Kanjamalai(Salem)



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TN_GOVT_GEOGRAPHY_VI_Std_Ch1.indd 153 06-08-2018 12:27:19

K) Identify the different economic activities and fill the table given below.

| Sl. No. | Picture | Primary/ secondary/ tertiary | What activity is this? | Region in which it is found |
|---|---|---|---|---|
| 1 |  | | | |
| 2 |  | | | |
| 3 |  | | | |
| 4 |  | | | |

L) Teacher's Activities:

1. Observe "**Save Energy Day**" once in a month at school / class level.
2. Try making wall hangings with waste materials to decorate your school corridors.
3. Find out if there are any industries nearby your school. A field trip may be arranged.
4. Collect pictures based on

a.Fishing b.Hunting
c.Food-gathering d.Forestry
e.Mining f.Agriculture
g.Cattle-rearing h.Lumbering

**REFERENCE**

Human and economic geography- Goh Cheng Leong

## Internet Resource

https;//www.acciona.com/sustainable development



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TN_GOVT_GEOGRAPHY_VI_Std_Ch1.indd 154 06-08-2018 12:27:20

www.tntextbooks.in

Unit 1

# ASIA AND EUROPE



## Learning Objectives

- To understand the location, extent and political divisions of the continents of Asia and Europe
- To know about the physical features and drainage of these two continents.
- To understand the climate and natural vegetation of these continents.
- To discuss the economic activities and resources.
- To appraise the cultural mosaic of both the continents.
- To gain the skill of locating the given places on the map.

EQI4RP

**Students:** Good morning, Teacher.

**Teacher:** Good morning, students! Did you celebrate the English New Year well?

**Students:** Yes madam.

**Teacher:** Ok. English is the native of which country?

**Students:** Britain.

**Teacher:** Good. Do you know which continent is it located in?

**Students:** Europe.

**Teacher:** Very good. Which is our home continent?

**Students:** Asia.

**Teacher:** Exactly. In the first term, you have learnt about how many continents are in the world and their names. In this lesson, we are going to learn in detail about Asia and Europe. Let us explore these two continents.

This lesson disscusses about the location, boundaries, physical and political divisions of Asia and Europe. The major rivers, climate and natural vegetation are highlighted in this lesson. It also explains about how economic activities are determined by the resources.



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The cultural mosaics of Asia and Europe are great eye openers for learners in terms of European and Asian cultures.

## PART A. ASIA

Asia is the largest and the most populous continent in the world. It covers about 30 percent of the world's land area and about 60 percent of the world's population. Most of the land of Asia lies in the northern hemisphere. It has different types of physical and cultural features. Lofty mountains, plateaus, plains, islands and peninsulas are the major physiographic features of Asia. Many perennial rivers flow through different parts of Asia. These river valleys are the cradles of ancient civilizations (Indus valley, Mesopotamian and Chinese civilizations). Let us know more about our home continent.

### Location and Area

Asia extends from 10°11' South to 81°12' North latitudes and from 26°2' East to 169°40' West, longitudes. It spreads for an area of 44 million km$^2$.

### Boundaries

Asia is surrounded by the Arctic Ocean in the north, Pacific Ocean in the east, Indian Ocean in the south and the Ural Mountains, Caucasus Mountains, Red Sea, Mediterranean Sea, Caspian Sea and Black Sea in the west.

The Suez Canal separates Asia from Africa. The narrow Bering Strait separates Asia from North America.

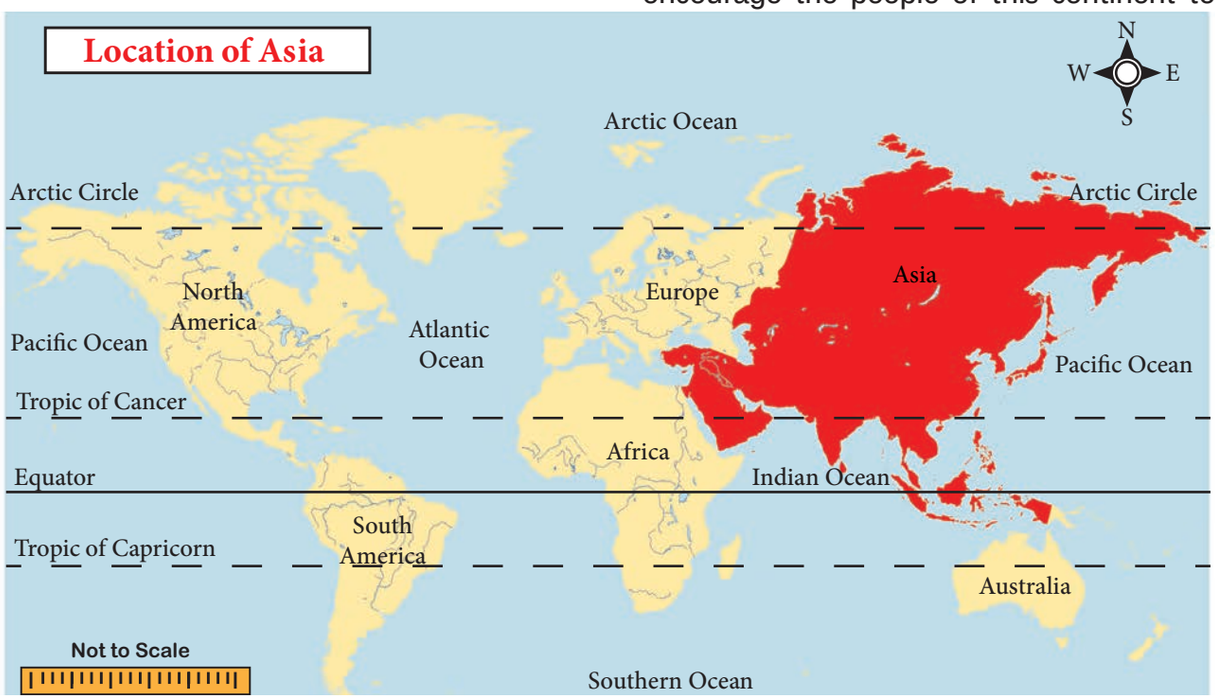
### Political Divisions

There are forty eight countries in Asia. The countries are grouped into several realms based on landscape and political status such as

1.East Asia 2.Southeast Asia 3.South Asia 4.Southwest and 5.Central Asia

### Physiographic Divisions

Asia is the land of long mountain ranges, snow capped high mountains, vast plateaus, extensive plains, river valleys and sea coasts. These diverse physical features encourage the people of this continent to






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# ASIA - POLITICAL




**Fact :**

There are 12 landlocked countries in Asia. Among these, only one is doubly landlocked which means it is surrounded entirely by other landlocked countries. Find out the doubly landlocked country.

involve in diverse economic activities. The physiography of Asia can be divided into five major groups. They are;

**1. The Northern lowlands**

**2. The Central High Mountains**

**3. The Southern Plateaus**

**4. The Great Plains and**

**5. The Island Groups**

## 1. The Northern Lowlands

The most extensive lowland in Asia is the **Siberian plain**. It extends from the Ural Mountains in the west to the Verkhoyansk Range in the east.

## 2. The Central Highlands

The central highlands stretches from Turkey to the Bering Strait. There are two knots found in Asia. They are **1. The Pamir Knot 2.The Armenian Knot.**




'Knot' refers to the convergence of mountain ranges

**The Hindukush range, the Sulaiman range, the Himalayan range** and **the Tian Shan range** radiate from the Pamir



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**Mountain Ranges radiate from the Pamir and the Armenian Knot**

Knot. The Hindukush range continues westward as the **Elburz,** whereas the **Sulaiman** range continues south west as the **Zagros** range. The Elburz and the **Zagros** converge at the Armenian knot. The **Taurus** and the **Pontine** ranges radiate from the Armenian knot. The other important mountain ranges are the great **Khingan**, the **Altai**, the **Verkoyansk** and the **Arakan yoma.** The Himalayan mountain range is the highest mountain range in the world Mt. Everest (8848 m) is the highest peak in Asia, as well as the world.

The lowest point in the world is located in **Dead Sea** in Asia. Intermontane plateaus are found in these mountain ranges. The important plateaus are

1. The **plateau of Anatolia** (Pontine to Taurus )
2. The **plateau of Iran** (Elburz to Zagros mt)
3. The **plateau of Tibet** (Kunlun to Himalayas )




Tibet is called the **'Roof of the world'** and it is also known as the **third pole** because of its cold weather, largest reserve of freshwater and inhospitable environment.

**HOTS :**

The Khyber Pass is located in the Sulaiman range, the Bolan Pass is located in Toba Kakar range. What is the importance of these two passes?



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### 3. The Southern Plateaus

The southern plateaus are relatively lower than the northern plateaus. The four important southern plateaus are the **Arabian Plateau** (Saudi Arabia), **Deccan Plateau** (India), **Shan Plateau** (Myanmar) and the **Yunnan Plateau** (China). Among these plateaus, the Arabian Plateau is the largest Plateau.

### 4. The Great Plains

The great plains are formed by the major rivers of Asia. They are the **West Siberian plain** (Ob and Yenisey), **Manchurian Plain** (Amur), **Great Plain of China** (Yangtze and Sikiang), **Indo-Gangetic Plain** (Indus and Ganga), **Mesopotamian plain** (Tigris and Euphrates) and **the Irrawaddy plain** (Irrawaddy).

### 5. The Island Groups

Numerous islands are found in the Pacific coast of Southeast Asia. **Kuril, Taiwan, Singapore** and **Borneo** are the important island groups.

The **Philippines, Japan islands** and **Indonesia** are the major archipelagos in Asia. Smaller archipelagos are also located in the Indian Ocean such as the islands of **Maldives** and **Lakshadweep** in the **Arabian Sea. Bahrain** is in the **Persian Gulf. Sri Lanka** is an island, which is located in the Bay of Bengal.




### Drainage

The rivers of Asia originate mostly from the central highlands. The **Ob, Yenise** and **Lena** are the major rivers that flow towards the north and drain into the Arctic Ocean. These rivers remain frozen during winter. On the other hand, South Asia has many perennial rivers (e.g.) **Brahmaputra, Indus, Ganga** and **Irrawaddy** which originate from the snow covered high mountains that do not freeze during winter. The **Euphrates** and **Tigris** flow in West Asia. **The Amur, Huang He, Yangtze**

**Major Rivers of Asia**

| S. No | Name of the River | Origin | Outflow | Length in Km |
|---|---|---|---|---|
| 1 | Yangtze | Tibetan plateau | East China sea | 6,350 |
| 2 | Huang He | Tibetan plateau | Gulf of Pohai | 5,464 |
| 3 | Mekong | Tibetan plateau | South China sea | 4,350 |
| 4 | Yenisei | Tannuala Mountain | Arctic Ocean | 4,090 |
| 5 | Ob | Altai Mountain | Gulf of Ob | 3,650 |
| 6 | Brahmaputra | Himalayas | Bay of Bengal | 2,900 |
| 7 | Indus | Himalayas | Arabian sea | 3,610 |
| 8 | Amur | Confluence of Shika and Argun rivers | Tatar Strait | 2,824 |
| 9 | Ganga | Himalayas | Bay of Bengal | 2,525 |
| 10 | Irrawaddy | North Myanmar | Bay of Bengal | 2,170 |



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and **Mekong** rivers flow in the south and south eastern parts of Asia. **Yangtze** is the longest river in Asia.



**River Yangtze**

DO YOU KNOW?

The Three Gorges dam has been constructed across the river Yangtze. It is the largest power station dam in the world. It fulfills ten percent of power needs of China.



## Climate

Asia exhibits a variety of climate. The northern part of Asia experiences severe long winter and cool summer. **(Winter -37°C** and **Summer 10°C).** Precipitation is in the form of snow **(250 mm to 300 mm)**.The north eastern part of Asia experiences cold winter and warm summer and a moderate rainfall of **50 mm to 250 mm**.

The south, south east and eastern parts of Asia are strongly influenced by monsoon winds. Summer is hot and humid while winter is cool and dry. The summer monsoon winds bring heavy rainfall to India, Bangladesh, Indo-China, Philippines and Southern China **(1500 mm to 2500 mm)**. In India, **Mawsynram (11871 mm)** receives the highest rainfall. So, this place is called the wettest place in the world.

The areas found in and around the equator have uniform climate throughout the year. There is no winter. The average temperature is **27°C** and the mean rainfall is **1270 mm**.

**HOTS :**

There is no winter in the equatorial region. Why?

The west and central parts of Asia have hot, dry climate. The temperature is very high during the day and very low during the night. Rainfall varies from **25 mm to 200 mm**. The West coastal fringe of Asia (along the Mediterranean Sea) receives **rainfall in winter** and is warm in summer.

Deserts are found along the western part of Asia. The major hot deserts are the **Arabian** (Saudi Arabia) and **Thar** (India and Pakistan) **deserts**. The cold deserts of Asia are **Gobi** and **Taklamakan**. The largest desert in Asia is the Arabian Desert.

## Natural Vegetation

Natural vegetation depends upon **rainfall, temperature** and **soil**. As Asia stretches from the equator to poles, all types of vegetation are found here. Some rare species are found in Asia. **(Orang-Utan, Komodo Dragon, Giant panda )**. The Asian flora and fauna are listed below:



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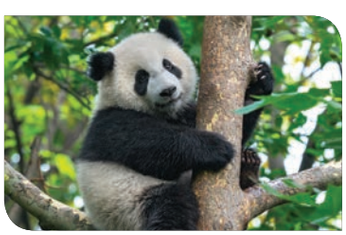
## The Natural Regions (Flora & Fauna)

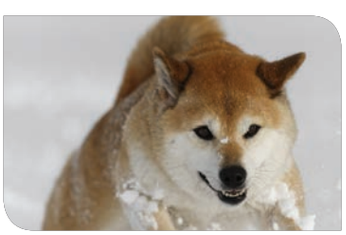
| Sl. No | Climate | Location | Flora | Fauna |
|---|---|---|---|---|
| 1 | High Temperature, High rainfall | Indonesia, Malaysia, Singapore Sri Lanka | Evergreen trees - Mahogany, Rubber, Rosewood, Sal | Rhinoceros, Tiger, Babirusa, Orangutan, Komodo Dragon |
| 2 | Summer rainfall, Dry winter | India, Vietnam, Cambodia, Thailand, Southern China | Deciduous trees – Teak, Sandal wood, Bamboo | Tiger, Elephant, Indian Cobra, viper |
| 3 | Extreme temperatures | Arabian desert, North, North West India | Cactus, Dates (Oasis), Thorny shrubs, Babul tree | Bactrian Camel, The Sand grouse, desert oryx |
| 4 | Dry winter, Warm summer | East China, Japan, North and South Korea | Cherry, Apricot, Plum | Giant Panda, Japanese macaque |
| 5 | Warm Summer and winter rainfall | Israel, Lebanon, Turkey, Syria | Figs, Olives, Citrus fruits | Lynx, Jackrabbit |
| 6 | Long and dry winter, short and cool summer | Siberia, Himalayas | Coniferous trees - Pine, Fir, Spruce | Siberian Tiger, Brown bear, Wolf |
| 7 | Permanent snow cover | Beyond the snow line | Lichen, mosses Grass | Polar bear, Lemming, Reindeer, Arctic fox |


**Orang-Utan**


**Tiger**


**Bactrian Camel**


**Panda**


**Wolf**


**Lynx**



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**Fact :**

A Desert is a large area that gets very low rainfall and very few plants and animals. There are two types of deserts found in Asia, Hot and cold deserts.




Rub'al Khali desert is the largest, continuous sandy desert in the world.It is found in the southeastern part of Saudi Arabia.

## Resource Base and Economic Activities of Asia

### Mineral Resources

Asia has a variety of mineral deposits. It holds an important place in the production of **Iron, Coal, Manganese, Bauxite, Zinc, Tungsten, Petroleum, Tin** etc. **Oil** and **Natural Gas** found in the west Asian countries. One third of the world's oil is produced in Asia. Among the west Asian countries, **Iran** has a considerable wealth of mineral resources. The important minerals found in Asia are:

**Iron Ore:** Asia has the largest deposits of iron ore in the world. **China** and **India** are the important iron ore deposit countries of Asia. **Turkey, Philippines, Malaysia, Thailand, Myanmar** etc., are a few other countries that have iron ore deposits.

**Coal:** Coal is a **fossil fuel.** Asia has the largest deposits of coal in the world. **China** and **India** are the largest producers of coal in Asia.

**Petroleum:** Petroleum is a **mineral oi**l. The largest petroleum reserves are found in South West Asia. The important petroleum producing countries are **Saudi Arabia**, **Kuwait, Iran, Bahrain, Qatar** and **UAE. South China, Malaysia, Brunei, Indonesia, India, Russia** are the other important petroleum producing countries in Asia.



**Coal mine in India**

**Bauxite** is found in India and **Indonesia**. **India** is the largest producer of **Mica** in the world. **Tin** is found in **Myanmar, Thailand, Malaysia** and **Indonesia**.

### Agriculture

Only about 18 percent of the total area is cultivable in Asia. Agriculture is the chief occupation of the people here. The river valleys in the South, South East and East Asia have rich alluvial soil. Agriculture is intensively practised in the riverine plains of Asia. However, some areas are not suitable for agricultural practices. **India** has the largest area of **arable lands** in Asia. Most of the west Asian countries cultivate their crops where the ground water level is nearer to the surface. Iraq practices agricultural activities based on the availability of rainfall and supply of water from Euphrates and Tigris rivers.



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**Rice** and **Wheat** are the staple food crops in Asia. China and India are the leading producers of rice in the world. Other important rice producing countries are **Myanmar, Japan, Bangladesh** and **Thailand**. Monsoon Asia is suitable for rice cultivation because of the abundant rainfall, fertile plains and availability of labour. **Thailand** is called the **Rice bowl** of South East Asia.




**Banaue rice terrace:** The Banaue rice terraces were built 2000 year ago by the Ifugaos people in the Philippines. It is located approximately about 1524 m above sea level.



**Wheat** is grown in the **temperate** regions of Asia. **Russia, India, China** and **Pakistan** are the leading producers of wheat in Asia. Millets like **Bajra, Jower, Ragi and Sorgham** are grown in the drier parts of Asia. These are widely cultivated in **India, Pakistan** and a few **gulf countries**. Apart from these, **pulses, spices** and **oil seeds** are also cultivated in various parts of Asia.

**Jute and cotton** are the important natural fibres cultivated in Asia. One third of the world's cotton is produced by Asia. The major cotton producing countries are **India**, **China, Russia** and **Kazakhstan**. **India, Pakistan, China** and **Bangladesh** are the leading producers of **jute**.

The tropical wet and dry climate is suitable for **sugarcane** cultivaiton in Asia. **India, Indonesia** and **Philippines** are the major producers of sugarcane. **Coffee, Tea, Rubber, Palm trees** and **Cocoa** are the important plantation crops. **India, Sri Lanka, Thailand, Vietnam, Malaysia** and **Indonesia** are importantan producers of plantation crops. **Malaysia** and **Thailand** are the leading producers of **natural rubber.**

**Dates** are produced in west Asia, among the countries Iran is the largest producer of dates in the world.



**Cocoa Tree**

## Fishing

Fishing is an important economic activity in Asia. It is prevalent in open seas as well as inland water bodies. **China** and **Japan** are the leading fishing nations. In **Cambodia, Tonle Sap** lake is one of the world's richest sources of fresh water fishing. Bay of Bengal is the major fishing ground for India, Sri Lanka, Myanmar and Bangladesh. Fishing is the mainstay of the national economy in **Maldives**. **Pearl fishing** (Bahrein) is popular in the eastern **coast of Arabia**.



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## Industrial Regions

In **China,** Manchurian, Shanghai-Wuhan, Peking—Shenyang, Guangdone-Hongkong regions are the major industrial regions. In **Japan,** the major regions are Tokyo, Yokohama and Osaka-Kyoto regions. In **India**, Mumbai, Ahmedabad, Coimbatore, Bengaluru and Chottanagpur are the important industrial regions.

## Trasport

Transport is the backbone of the economic development of a region. Many Asian countries are developing their transport network for their economic progress. Roadway is the most common mode of transport in Asia.

## Roadways

The Asian Highway connects Tokyo in the east to Turkey in the west, Russia in the north to Indonesia in the south and the total length of road is 1,41,000 km. It passes through 32 countries. The Asian Highway 1(AH 1) is the longest highway among the Asian Highway Network (20557 km). It connects Tokyo to Turkey. The Asian Highway 43 (AH 43) runs from Agra in India to Matara in Sri Lanka (3024 km).

## Railways

The **Trans - Siberian Railways (9258 km)** is the longest rail route in the world. It is a **transcontinental railway** line which connects **Leningrad** and **Vladivostok**. T**he Trans Asian Railway links Singapore** and **Istanbul** in Turkey. The **Shinkansen, bullet train** is the world famous super express train that runs between **Osaka and Tokyo** in Japan at a speed of 352 km/h. The Indian railway network is the second largest railway network in Asia.

## Waterways

The **Cape of Good Hope** route connects **Europe** to **South Asia**. The **Trans Pacific route** connects the ports of eastern Asia to the ports of western American countries. **The Suez Canal route** passes through the heart of the world trade route and connects Europe with South and Southeast Asia. **Tokyo, Shanghai, Singapore, Hong Kong, Chennai, Mumbai, Karachi** and **Dubai** are the important seaports in Asia.



**Shanghai Port**

# CULTURAL MOSAIC OF ASIA

## Population

Asia is the most populated continent in the world. Approximately six-tenth of the world's population lives in Asia. The population is unevenly distributed because of various physical features. **China** and **India** alone covers three fifth of Asia's population. Apart

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from these two countries, **Bangladesh, Indonesia, Japan, Pakistan** and **Philippines** have more than 100 million populations. The population density in Asia is **143 persons per Km²**. India, Japan, Bangladesh and Singapore have high population density. River plains and industrial regions have high density of population, whereas low density is found in the interior parts of Asia.

**HOTS :**

Few countries in Asia have high population. Give reasons.




**ANKORWAT:** It is a world heritage site. It was built by king Suriya Varma II in 1100 AD (CE) at Cambodia. **'Ankorwat' means 'the city of temples'** in Khmer language. It is the largest Hindu Temple in the world.



## Religion & Language:

**Hinduism**, **Islam**, **Buddhism** **Christianity** and **Sikhism** are the major creeds in Asia. The minor creeds **Zoroastrianism, Jainism, Shintoism, Confucianism** and **Taoism** are also practised in Asia. **Mandarin, English, Indonesian, Japanese, Arabic, Korea, Vietnamese** and **Hindi** are the most widely spoken languages in Asia.

## Art and Architecture:

Asia is the home land of three civilizations.(Mesopotamian, Indus valley and Chinese civilizations).These three contributed to the architectural works at an early stage.

Among the seven wonders of the world, two are **located in Asia (The Tajmahal in India, The Great wall of China)**.The people of Yemen built a **mud skyscraper** thousands of years ago. **Ankorwat** in Cambodia, **Buddhist Temple** in East and Southeast Asia, Mosques in west Asia and the temples and forts in India are fine examples of Asian architecture.

## Food:

**Rice, Wheat, Maize** and **Barley** are the staple food in Asia. Dairy products, fruits and nuts are also consumed. In East Asia, bread and noodles are the staple food where rice is not available. **Tea**, **Coffee** and **green tea** are the chief beverages. In West Asia, meat, herbs and olive oil are the prime ingredients in their food.

## Dance and Music:



**kabuki**

In Asia, **Yangee**, **Dragon Dance**, **Kabaki** are popular in East Asia **Ram**



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**Thai** in Thailand, **Bhangra, Kathak** and **Bharathanatyam** in India are also important dances in Asia. **Sufi music** and **Arabic classical music** are common in west Asia. **Tinikling** is the national dance of Philippines.

### Festivals:



**Mid Autumn festival**

The **mid autumn festival / moon festival** in China, Taiwan and Vietnam. **Holi** and **Mahara Sankaranthi / Pongal** in major parts of India and **Sukkoth** in Israel are the important **harvest festivals** of Asia. The **snow sculpture festival**, **Chinese New Year**, **Thaipusam, Diwali, Taiwan Lantern festival, Songkran, winter light festival** are also some of the famous festivals in Asia.

### Land of contrasts

Asia is the biggest continent. It has different types of land features such as mountain, plateau, plain, valley, bay, island etc. It also has different climatic conditions from the equator to polar region. Apart from this, many races, languages, religions and cultures are followed by people who live in Asia. So, Asia is called '**the land of contrasts**'.

## Part – B Europe






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**Europe** is the sixth largest continent in size and the third largest in population in the world. It has diverse landforms and people. It is the birth place of **western civilizations** (Roman and Greek), **democracy** and **Industrial Revolution**. It is the most developed continent in the world. Let us explore the continent.

## Location and size

Europe spreads from **34° 51' North** latitude to **81° 47' North** latitude and from **24°33'** West longitude to **69° 03' East** longitude. The **Prime Meridian 0°** longitude passes through **Greenwich** in England.

Europe is found in the northern hemisphere and it covers an area of 10.5 million sq.km. It is surrounded by the Arctic Ocean in the North, the Black Sea and Mediterranean Sea in the south, the Atlantic Ocean in the west and the Ural mountains in the east. So it looks like a **giant peninsula**.

**HOTS :**

Europe is called as the 'Peninsula of Peninsulas', Justify.

## Political Divisions

### EUROPE - POLITICAL






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**European Union :**

The European Union (EU) is an economic and political union of 28 member countries for their welfare. It has own flag and the common currency, the Euro (€).

**Fact :**

**The Netherlands :** About 25 percent of the Netherlands lies below sea level. So they have built dikes. They have reclaimed new land from the sea with the help of dikes. These reclaimed lands are called polders.



## Physical Divisions

Europe has diversified physical features such as mountains, plains, plateaus, peninsulas, bays, islands and river basins. It can be divided into four physical divisions.

1. **The North Western Highlands**
2. **The Central Plateaus/High land**
3. **The Alpine Mountain system**
4. **The North European plains**

### 1. The North Western highlands

This region includes the mountains and plateaus of Norway, Sweden, Finland, Scotland and Iceland. This region has the most beautiful **fjord coast**. It was created by glaciations in the past. This region has a lot of lakes, which serve as reservoirs for producing hydroelectricity. Norway and Sweden are the largest producers of hydroelectricity in the world.

**Fact :**

**Fjord :** A fjord is a narrow and deep sea inlet between steep cliffs. It helps in the following ways.

1. It reduces the speed of wind, irrespective of its direction.
2. The force of sea waves are also controlled.

Hence, areas with fjords are best suited for natural harbours.



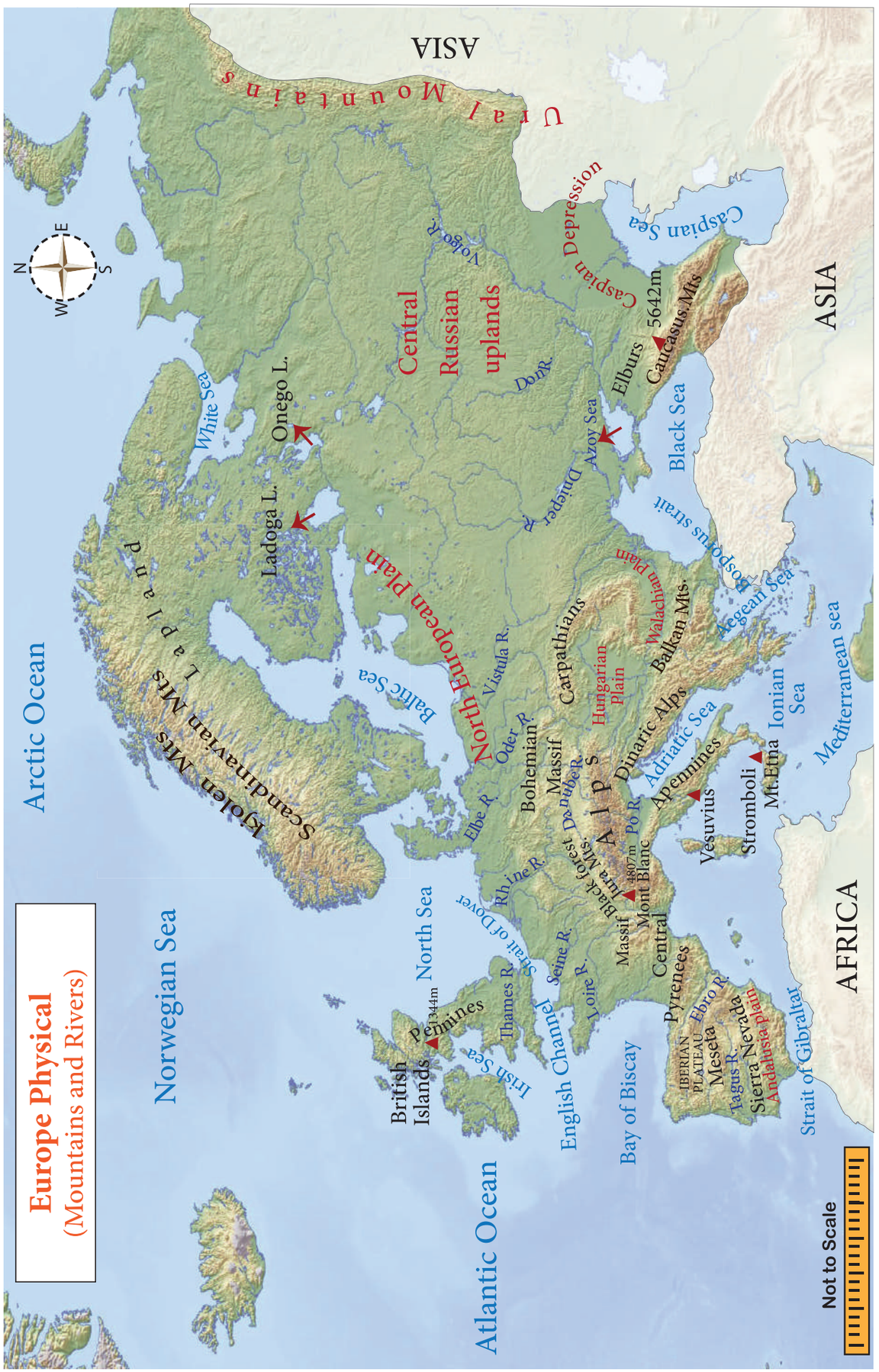
**Fjord coast in Norway**

### 2. The Central Plateaus

The plateaus are found in east west direction across central Europe. Many rivers in Europe such as, the Danube, the Volga and the Tagus originate from this plateau. The important plateaus of this region are The **Pennines** (England), The **Meseta** (Spain), **The Central Massif** and **Jura** (France). The **Black forest** (Germany) in these region has rich mineral resources. The **Pennines** is called the **backbone of England**.



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R. River Mts. Mountains L. Lake m. Metres



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**Black forest:** The lush and dark coloured fig and pine trees give black colour to this region.

### 3. The Alpine Mountain System:

The alpine mountain system consists of a chain of young fold mountains found in the southern part of Europe. The important mountain ranges are **the Sierra Nevada**, the **Pyrenees, the Alps, the Apennines, the Dinaric Alps, the Caucasus** and **the Carpathian**. The Pyrenees forms a natural boundary between Spain and France.

The highest peak in Europe is **Mt. Elburz** (5645 m) in the Caucasus range. The **Mont Blanc** (4,807 m) found in the Alps is the second highest peak in the Alpine System.



**Mont Blanc**

There are several active volcanoes found in the Alpine mountain system. **Mt. Etna**, **Mt. Vesuvius** and **Mt. Stromboli** are the important volcanoes found in Europe.Earthquakes are common in this region. The Stromboli is called the '**light house of the Mediterranean**'.

**The Matterhorn :** The pyramid-shaped Matterhorn mountain is located in the Swiss Alps a height of 4478 m. It is popular for its shape.



### 4. The North European plain

The north European plain stretches from the Atlantic Ocean in the west to the Ural mountains in the east. On the north, it is surrounded by the Baltic Sea and on the South by the alpine mountain. It is narrow in the West and wide towards the East.

Major European rivers such as the Seine, the Rhine, the Danube and the Don criss-cross this region and deposit their alluvium.

The **Andalusian Plain, The Hungarian Plain** and **the Wallachian Plain** are also found in this region. It has rich deposits of coal and iron ore. The north European plain is densely populated region and cities like **Paris, Moscow** and **Berlin** are located here.

### Drainage

The rivers play an important role in the development of Europe. These rivers are used to irrigate farmland and also help to produce electricity.



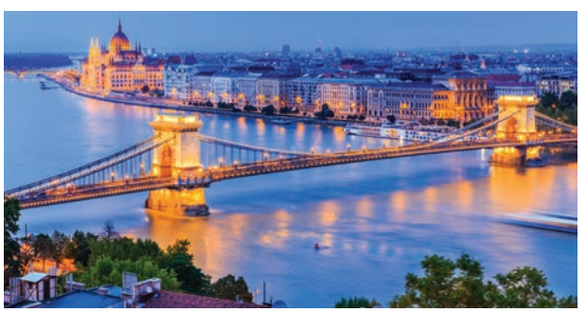
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### The Important Rivers in Europe

| S. No | Rivers | Length (Km) | Source | Out flow |
|---|---|---|---|---|
| 1 | Volga | 3,692 | Valdes plateau | Caspian Sea |
| 2 | Danube | 2,860 | Black forest | Black Sea |
| 3 | Dnieper | 2,145 | Valdai Hills | Black Sea |
| 4 | Rhine | 1,230 | Alps (Switzerland) | North Sea |
| 5 | Rhone | 813 | Swiss Alps | Mediterranean Sea |
| 6 | Po | 652 | Cottian Alps | Adriatic Sea |
| 7 | Thames | 346 | Kemble | North Sea |

Source w.w.w.worldatlas.com

Most of the rivers originate in the Alps and the central plateau of Europe. These rivers are useful for inland navigation in central and Eastern Europe. The **Volga** is the longest river in Europe. The river **Danube** passes through nine countries in Europe.



**River Danube**

**HOTS :**

Why are European rivers suitable for inland navigation?

## Climate

The climate of Europe varies from the subtropical to the polar climate. The **Mediterranean climate** of the south has warm summer and rainy winter. The western and northwestern parts have a mild, generally **humid climate,** influenced by **the North Atlantic Drift**. In central and eastern Europe, the climate is humid **continental-type.** In the northeast, subarctic and tundra climates are found. The whole of Europe is subject to the moderating influence of prevailing **westerly winds** from the Atlantic Ocean.




**Climate Divider:** The Alps mountain separates the Mediterranean climate from the cold climate of the north.

**Fact**

**North Atlantic Drift** is a warm ocean current which brings warmth to the western Europe. The westerly wind further transports warmth across Europe.

## Natural vegetation

The natural vegetation of Europe can be classified as follows:



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1. **Tundra**
2. **Taiga or Coniferous**
3. **Mixed Forest**
4. **Mediterranean Forest**
5. **Grassland**

The Arctic and northern Scandinavian highland have Tundra type of vegetation made up of lichens and mosses.



**Coniferous Forest**

Coniferous or Taiga vegetations are found to the south of the Tundra region in Norway, Sweden, Finland, Germany, Poland and Austria. **Pine, fir, spruce** and **larch** are the important tree varieties of taiga forest.

The mixed forest comprising of **birch, beech, poplar, oak** and **maple trees** found in the western part of Europe particularly in western France, Belgium, Denmark, Britain etc. **Mediterranean trees like cypress**, **cork, oak, olive** and **cedar** are found along the borders of the Mediterranean Sea. Eastern Europe is covered by grasslands (Steppe).

## Resources Base and Economic Activities of Europe

Availability of resources, efficient educated work force, research, contact with other nations and innovations have transformed Europe into a modern and economically developed continent in the world.

Europe is an industrially developed continent in the world. It has great diversity in its topography, climate and soil. These interact to produce varied patterns of agricultural activities such as **Mediterranean agriculture, Dairy farming, mixed livestock** and **crop farming and horticulture** (Truck Farming)



**Tulip Flower Garden**

**Wheat** is the dominant crop throughout Europe. **Barley, Oats, sugar beet, rye, potatoes** and **hay** are also common crops. Corn (maize) is an important crop in the lower Danubian lowlands and southwestern European Russia, France and **Italy. Rice** (northern Italy) and **citrus fruits, olive trees** (Spain, Sicily) depend on irrigation.



**Olive tree**

The northernmost countries grow few cereals (mainly oats) and concentrate on animal husbandry, especially cattle and dairying. Mixed farming and the use of well-



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tried crop rotations are widely practised. **Viticulture** is mostly practised in Italy, France and Germany.



**Vineyard**

As for industrial crops, European Russia, Ukraine, and Belarus are large producers of **flax** and **hemp, sugar beets** and **sunflower seeds**. T**obacco** is grown in Belarus and is also important in Bulgaria, Italy, and Macedonian Greece.

European Russia, Sweden and Finland are the major producers of softwood and hardwood. Fishing is a large industry in Norway, Iceland, Russia, Denmark, the United Kingdom, the Netherlands etc., The **Dogger Bank** in North Sea is an important fishing ground in Europe.

### Industries

Europe produces a significant portion of the world's steel and iron ore. Shipbuilding, motor-vehicle and aircraft construction are widely distributed all over Europe. Europe is also a large producer of pharmaceutical drugs.

A wide range of small-scale industries (i.e., those that produce nondurable goods) is found throughout Europe. Some countries have a reputation for specialty goods, as in the case of English, Italian, and Dutch bicycles, Swedish and Finnish glass, Parisian perfumes and fashion goods and Swiss precision instruments.

## Cultural Mosaic of Europe

Europe is the third most populous continent, after Asia and Africa. The population of Europe was 742 million in 2018, which accounted for 9.73% of the world's population. The population density in Europe is 34 persons / $km^2$.

High population density is often associated with the coalfields of Europe. Other populous areas are sustained by mining, manufacturing, commerce, offering large market, labour forces and productive agriculture. Monaco, Malta, San Marino, and the Netherlands are the most densely populated countries; Iceland and Norway have very low density of population. In general, population is scantiest in the mountain regions, some highlands, arid parts of Spain and the Arctic regions of Russia. Monaco has the highest density of population in Europe (26,105 persons / $km^2$) as well as in the world. Iceland has a very low density of population (3 persons/ $km^2$).

### Religion & Language

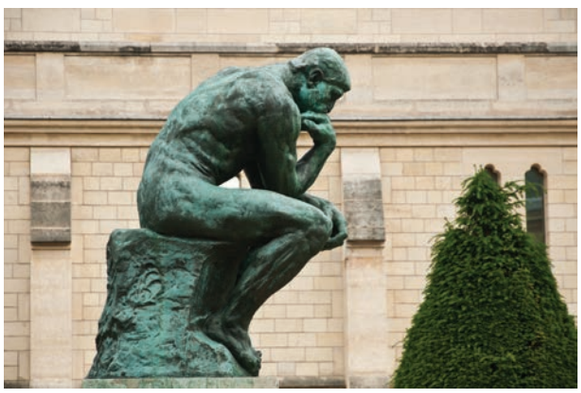
Europe is a continent of great linguistic and cultural difference. English, Spanish, Portuguese, French, Italian and Slavic are the broadly spoken languages in Europe. Christianity is the major religion in Europe. A considerable number of Hindus, Muslims and Jews are spread throughout Europe. More than 90 percent of the people belong to the Caucasoid race.



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TN_GOVT_GEOGRAPHY_VI_Std_Ch 1.indd 162 22-11-2018 19:40:24

## Art and Architecture

European art and architecture mostly reveals the ordinary human being and is popular all over the world. **Acropolis, the Colosseum, the statue of David, The thinker, Eiffel tower, Big Ben, Pisa Tower** and **Mona Lisa** are some of the master pieces of art and architecture in Europe.



**The Thinker**



**Big Ben in London**



**Eiffel Tower**



**The Colosseum**

## Food and Festivals

Bread, fish, meat, potatoes and dairy products are the staple food in Europe. The Europeans celebrate both religious and holiday festivals. Christmas, Easter, Good Friday, the Saint Day, Redentore, Tomatina and Carnival are the important festivals of Europe. They play Rugby, foot ball, basket ball, ice hockey and skiing. Bull fighting in Spain is the world's attractive game.



**Tomatina Festival**

## A Comparison of Asia and Europe

Asia and Europe are integrated geographically and separated politically. Europe is the giant peninsula of Asia. Both the Himalayas (Asia) and the Alps (Europe) were formed during the same geological period. The Steppe grass lands and coniferous forests are spread over



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TN_GOVT_GEOGRAPHY_VI_Std_Ch 1.indd 163 22-11-2018 19:40:29

several hundred kilometres from Europe to Asia. Generally, the plains are found in the northern part and the mountains in the southern part in both the continents. The two continents are the homeland of ancient civilizations. From the ancient period, these two continents had trade relationship through the silk route and the spice route. Despite the various geographical similarities, these two continents have striking differences.

| Asia | Europe |
|---|---|
| 1. It is the largest continent, both by area and population. | 1. It is the smallest continent by area and the most developed. |
| 2. It extends from 10° 11′ S to 81° 12′ N latitudes. That is, from the equatorial region to the polar region. | 2. It extends from 34° 51′ N to 81° 47′N latitudes. That is, from the sub-tropical region to the polar region. |
| 3. It is located on the eastern hemisphere | 3. It is located at the centre of the earth. |
| 4. The Bering Strait separates Asia and North America. | 4. The Strait of Gibraltar separates Europe from Africa. |
| 5. The Arabian, Indo China, India and Korea are the important peninsulas in Asia. | 5. The Scandinavian, Iberian, Italian and Balkan are the important peninsulas in Europe. |
| 6. The important parallels such as the Equator, Tropic of Cancer, Arctic Circle pass through it. | 6. Only the Arctic Circle passes through it. |
| 7. All kinds of climatic conditions are found here. It also enjoys the distinctive monsoon type of climate Southern Asia receives summer rainfall. | 7. It lies largely in the temperate zone. It enjoys the distinctive Mediterranean type of climate. Southern Europe receives winter rainfall. |
| 8. Both hot and cold deserts are located here. | 8. There are no deserts here. |
| 9. It has a variety of mineral deposits . | 9. Mineral resources are limited, except for coal & iron. |
| 10. Plantation crops such as tea, rubber and dates are largely cultivated in Asia. | 10. Citrus fruits, olives and grapes are cultivated mostly in Asia. |
| 11. A majority of people in Asia are involved in primary activities. | 11. A majority of people in Europe are involved in secondary and tertiary activities. |



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## Recap

- Asia is the largest and the most populous continent in the world. It is divided into five physical divisions.
- From the equator to the poles, all types of climate are found in Asia.
- The treeless polar region to dense equatorial forest are found in Asia.
- Iron ore, coal, petroleum, Bauxite, mica, tin, zinc etc. are the chief minerals found in Asia.
- Rice, wheat, sugarcane, jute, cotton, tea, coffee and dates are the important crops.
- Asia is the birthplace of all religions.
- Europe is the sixth largest continent. It is divided into four physical divisions.
- The European rivers play a Vital role to the country economy.
- Europe experiences a cool temperate climate.
- Mixed farming is the most widely practised type of agriculture in Europe.
- Coal and Iron ore are a cheap minerals found in Europe.
- Christianity is the major religion in Europe.

## Glossary

- Beverage – a drink other than water
- Perennial – Continuing throughout the entire year
- Monsoon wind – The seasonal wind of the Indian ocean
- Tundra – A vast, flat, treeless Arctic
- Riverine – Situated beside a river
- Staple food – food that makes up the dominant part of people's diet
- Irrigation – The artificial application of water to land
- Husbandry – The care, cultivation and breeding of crops and animals
- Viticulture – The cultivation of grapevines
- Steppes – a large area of flat unforested grassland in Siberia.
- Polder – A piece of low lying land reclaimed from the sea
- Race – a group of people who have similarities in biological traits.
- Horticulture – the art of garden cultivation and management (vegetables, fruits and flowers)

## Exercise

### I Choose the best answer.

1. Which is not the western margin of Asia?
   (a) Black Sea
   (b) Mediterranean Sea
   (c) Red Sea
   (d) Arabian Sea

EQRZTC

2. The Intermontane _____ plateau is found between Elbruz and Zagros.
   (a) Tibet (b) Iran
   (c) Deccan (d) The Yunnan



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3. Equatorial climate :

(i) Uniform throughout the year.

(ii) The average / mean rainfall is 200 mm.

(iii) The average temperature is 10°C.

(iv) Of the statements give above,

(a) i alone is correct

(b) ii and iii are correct

(c) i and iii are correct

(d) i and ii are correct

4. Match list I correctly with list II and select your answer from the codes given below.

| List – I | List – II |
|---|---|
| A. Malaysia | 1. Figs |
| B. Thailand | 2. Rubber |
| C. Korea | 3. Teak |
| D. Israel | 4. Cherry |

**Codes**

| A | B | C | D |
|---|---|---|---|

(a) 2, 3, 4, 1

(b) 4, 3, 2, 1

(c) 4, 3, 1, 2

(d) 2, 3, 1, 4

5. India is the leading producer of _____.

(a) Zinc (b) Mica

(c) Manganese (d) Coal

6. The natural boundary between Spain and France is _____.

(a) The Alps (b) The Pyrenees

(c) The Carpathian (d) The Caucasus

7. The western and north-western Europe enjoys mild and humid climate.

**Choose the correct option:**

(a) These regions are found near the equator

(b) It is influenced by the North Atlantic Drift

(c) It is surrounded by mountains

(d) All of the above

8. Which of the following statements is incorrect?

(a) Europe produces electricity from hydel power

(b) All the rivers of Europe originate in the Alps

(c) Most of the rivers in Europe are used for inland navigation

(d) The rivers of Europe are perennial in nature

9. Choose the incorrect pair.

(a) The Meseta - Spain

(b) The Jura - France

(c) The Pennines - Italy

(d) The Black Forest - Germany

10. Which country in Europe has a very low density of population?

(a) Iceland (b) The Netherlands

(c) Poland (d) Switzerland

## II Fill in the blanks.

1. The Taurus and the Pontine ranges radiate from the _____ knot.
2. The wettest place in the world is _____
3. Iran is the largest producer of _____ in the world.
4. Europe connected with south and south east Asia by _____ sea route.



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TN_GOVT_GEOGRAPHY_VI_Std_Ch 1.indd 166 22-11-2018 19:40:29

5. The national dance of Philippines is _____.
6. The second highest peak in Europe is _____.
7. The type of climate that prevails in the central and eastern parts of Europe is _____.
8. The important fishing ground in North Sea is _____.
9. The density of population in Europe is _____.
10. The river _____ passes through nine countries of Europe.

## III Match The Following

| | | | |
|---|---|---|---|
| 1. | Mesopotomian Plain | - | Highest Rainfall |
| 2. | Mawsynram | - | Norway |
| 3. | Rice Bowl of southeast asia | - | Spain |
| 4. | Fjord Coast | - | Euphrates & Tigris |
| 5. | Bull Fighting | - | Thailand |

## IV Let us learn

1. Assertion (A): Italy has dry summers and rainy winters

Reason (R): It is located in the Mediterranean region

(a) Both A and R are individually true and R is the correct explanation for A

(b) Both A and R are individually true but R is not the correct explanation for A

(c) A is true, but R is false

(d) A is false, but R is true

2. Places marked as 1, 2, 3 and 4 in the given map are noted for the following plains.




ASIA

A. Indo – Gangetic plain
B. Manchurian plain
C. Mesopotamian
D. Great plains of China

Match the plains with the notation on the map and select the correct answer using the codes given below.

**Codes:**

| | A | B | C | D |
|---|---|---|---|---|
| (a) | 2 | 1 | 4 | 3 |
| (b) | 2 | 1 | 3 | 4 |
| (c) | 1 | 2 | 3 | 4 |
| (d) | 1 | 4 | 3 | 2 |

3. In the given outline map of Asia, the shaded areas indicate the cultivation of



ASIA

(a) sugarcane (b) Dates
(c) Rubber (d) Jute



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## V Answer in Brief

1. Name the important intermontane plateaus found in Asia.
2. Write a short note on monsoon climate.
3. How does physiography play a vital role in determining the population of Asia?
4. Name the ports found is Asia.
5. Asia is called the 'Land of Contrasts'- Justify.
6. Name the important mountains found in the Alpine system.
7. What are the important rivers of Europe?
8. Name a few countries which enjoy the Mediterranean type of climate.
9. Give a short note on the population of Europe.
10. Name the important festivals celebrated in Europe.

## VI Distinguish

1. Intermontane plateaus and southern plateaus.
2. Cold desert and hot desert
3. Tundra and Taiga.
4. The North western highlands and the Alpine mountain range.

## VII Give Reasons

1. Asia is the leading producer of rice.
2. Asia is the largest and most populous continent in the world.
3. Europe is called 'a giant peninsula'.
4. Although Western Europe is located in the high latitudes, it has a moderate climate.

## VIII Answer in Paragraph

1. Give an account of the drainage system in Asia.
2. Describe the mineral sources found in Asia.
3. What are fjords? How do they protect harbours from bad weather conditions?
4. Describe the climatic divisions of Europe.

## IX Map Skill

**Mark the following in the outline map of Asia and Europe.**

**Asia** : Ural mountain, Himalayas, Pamir knot, Gobi Desert, Arabian Peninsula, Deccan plateau, River Yangtze, River Ob, Aral Sea and Lake Baykal.

**Europe** : The Pyrenees, Black forest, Apennines, Hungarian Plain, Caucasus Mountain, River Volga, River Danube, Strait of Gibraltar, Lake Ladoga, North Sea

## X Activity

1. Complete the following.

I belong to ____ district. My district is famous for the following: 1. ____, 2. ____ and 3. ____. The boundaries of my districts are ____ in the north, ____ in the east, ____ in the south and ____ in the west. It spreads for an area of ____ $km^2$. There are ____ taluks and ____ villages in my district. ____, ____, ____ are the important



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TN_GOVT_GEOGRAPHY_VI_Std_Ch 1.indd 168 22-11-2018 19:40:30

mountain / plain / plateaus (If all, mention all features). The rivers ____, ____, ____ criss – cross my district. ____, ____, ____ are common trees and wildlife such as ____, ____, ____ are found here. ____, ____, ____ are important minerals available in my district. Based on this ____, ____ industries are located here. The major crops are ____, ____, ____. (Coastal districts may write the variety of fish). The total population is ____. We celebrate ____, ____, ____ festivals.

2. If you get a chance to settle in Europe, which country would you choose? List out the reasons why?

3. Choose any region is Asia. In the map of Asia, mark its distribution of natural vegetation and wildlife.Paste related pictures.

## Reference


1. Douglas L. Johnson, Viola Haarmann, Merril L. Johnson, David L. Clawson (2012), World Regional Geography, A Development Approach, PHI Learning Private Limited, New Delhi, India.
2. JohnCole, (2010), Geography, of the world's Major Regions, Routledge, London.
3. Majid Husain (2017), Indian and world Geography McGraw Hill Education (India) Private Limited, New Delhi, India.


## Web Links

1. https://www.whatarethe 7continents.com
2. www.natural history on the Net.com
3. www.worldatlas.com
4. www.internetgeographynet
5. www.worldometers.info



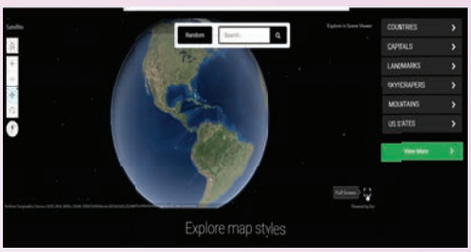
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## ICT CORNER

### Geography - Asia and Europe

Through this activity you will know about in their proper location on the map of Asia and Europe.



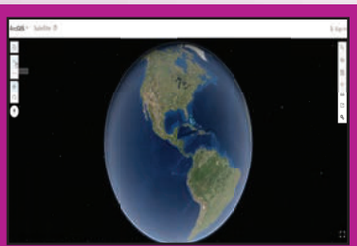

**Steps:**

Step -1 Use the URL or scan the QR code to open the activity page.

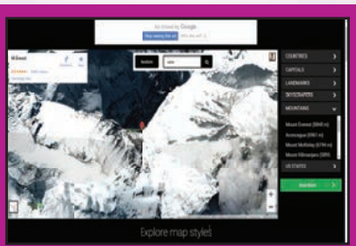
Step -2 Click the "Search" box and text Asia and Europe.

Step -3 Click the "+" "-" button to zoom in and out.

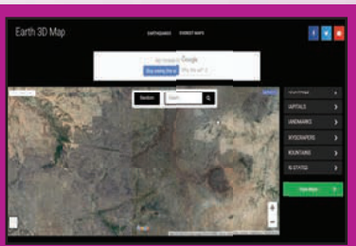
Step -4 Click the "Full screen" option to appear full screen mode.



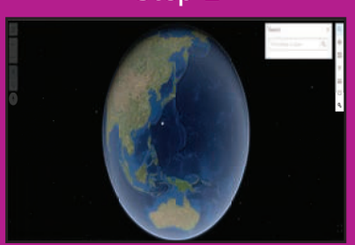
Step 1



Step 2




Step 3



Step 4

*Pictures are indicatives only.

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**Browse in the link**

Web: http://earth3dmap.com/#?l=asia (or) scan the QR Code



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# Unit 2

# GLOBE



## Learning Objectives

EQX973

- To understand the four cardinal directions.
- To learn about the shape of the Earth.
- To understand about the model of the Earth - the globe.
- To understand the significance of lines of latitudes and longitudes.
- To know how standard time is calculated around the world.

Surya and Poovendhan are very good friends who study in the sixth standard and live in a beautiful village called Thirunandriyur. Surya lives in South Street, while Poovendhan lives in North Street. Every day they go to school together. One day.....



**Surya:** Why are you coming so late, Poovendha?

**Poovendhan:** Please bear with me, Surya! Come, let's go.

**Surya:** What took you so long?

**Poovendhan:** You live on South Street. But, I have to come from the North Street, which is so far away from here. That's why I'm late.

**Surya:** Yes, that's true. But wherever we live, don't you remember that we all live on planet Earth?

**Poovendhan:** Yes! Yes! I do remember, Even our **Ponni Miss** taught us about the **Solar System**.



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**Surya:** But, I have a doubt ….

**Poovendhan:** Tell me, what is it?

**Surya:** We can see our house, the things around us, the people, animals and birds with our eyes. But, why can't we see our Earth as a whole?

**Poovendhan:** Haven't you seen it?

**Surya:** No, I haven't. Have you ever seen it?

**Poovendhan:** Yes, in our school only.

**Surya:** Did you say, in our school?

**Poovendhan:** Yes, on our **Ponni Miss'** table. Big and spherical!

**Surya:** Oh! Yes! Like a ball on a stand?

**Poovendhan:** Exactly! That is our Earth

**Surya:** But…….. But, our teacher said that our **Earth** is in the **Milky Way Galaxy.** But you say that our Earth is on our teacher's table. I am so confused. Come, let's go and ask Ponni Miss.

The bell rang as they reached school. They attended the morning assembly and went to the classroom. During the social science period, Surya asks Ponni Miss to clear his doubts.

**Surya:** Good morning, Miss.

**Teacher:** Good morning.

**Surya:** Madam, you told us on the other day that our Earth is in the Milky Way galaxy.

**Teacher:** Yes, it is true. This is the model of the Earth.

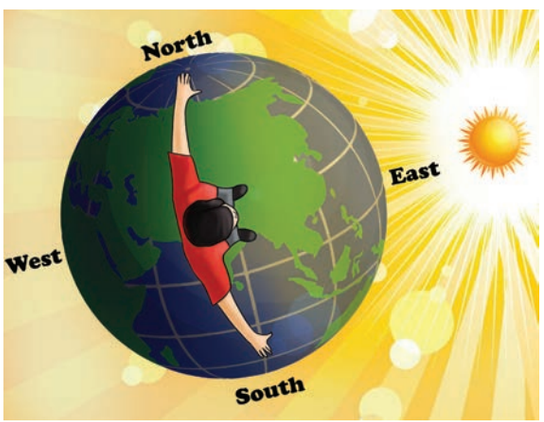
**Surya:** A model of the earth, Madam? Please explain!

**Teacher:** Sure, Surya.

The teacher asks all the students to sit down and starts explaining.

## Directions

The directions on the ground are always shown with respect to the North. If we know the **North**, then it is easy to find the other directions, namely **South, East** and **West**. These are the four **cardinal directions**.




We know that the Sun rises in the East and sets in the West. If we stand facing the sun in the morning, then we face the east. The west is towards our back. The left hand points towards the north and the right hand points towards the south. We should always keep this in mind.

## Globe

We live on the planet Earth, which is found third from the Sun. Since the Earth is huge and we live on a very small area, we are not able to see the Earth as a whole. But, when we travel to space, we can see the Earth as a whole.



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TN_GOVT_GEOGRAPHY_VI_Std_Ch 2.indd 172 22-11-2018 18:55:24



So, in order to see the shape of the Earth as a whole and to know its unique features, a three dimensional model of the Earth was created with a specific scale.

DO YOU KNOW?

The surface area of the Earth is 510.1 million square kilometres.

The Earth which is spherical, is flat at the poles and bulges at the Equator. The Earth cannot be compared with any other geometrical shape as it has a very unique shape. Hence, its shape is called a **geoid** (earth shaped).

The Earth moves around the Sun. It also rotates from the West to East on its axis at an inclination of 23 ½°. The globe is also inclined at an angle of 23 ½°. The axis is an imaginary line. It is not actually found on the Earth.

DO YOU KNOW?

- The first globe was created by the **Greeks** in the year 150 AD(CE).
- The Indian astronomer **Aryabhatta**-I has mentioned in his book. **'Aryabhatta Sidhantha'**. **'The stars in the sky seem to move towards the West because of the Earth's roation on its axis'**.

## Lines on the Globe

There are imaginary lines which are drawn on the globe horizontally and vertically to find a location and calculate distance and time. These imaginary lines are called lines of **latitudes and longitudes.**

DO YOU KNOW?



**Ptolemy**, a Greco – Roman mathematician, astronomer and geographer, was the first person to draw the lines of latitude and longitude on a map.

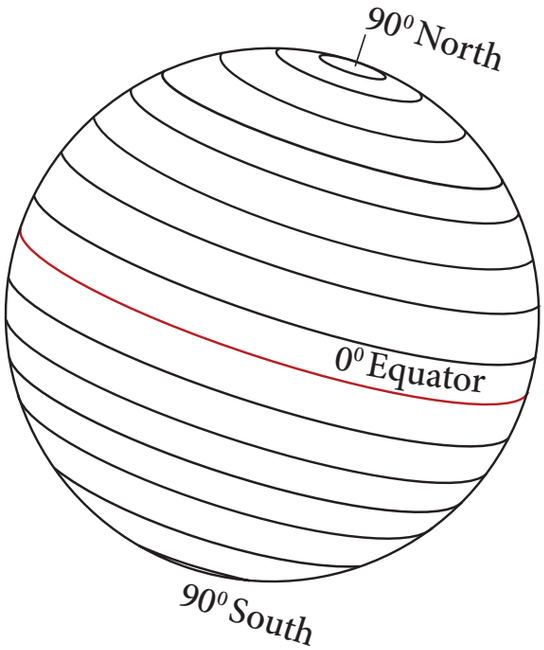
In his book, **'Geographia'** a detailed description about the Earth's surface, its size and circumference and many locations based on the lines of latitude and longitude are given.

## Latitudes

The imaginary lines which are drawn horizontally on East - West direction on the Earth are called the lines or **parallels** of **latitudes**. The 0° line of latitude which divides the Earth into two halves is known as the **Equator**. From the Equator, **parallel** lines are drawn towards the North and South poles at equal intervals. The latitudinal extent between **1°** line of latitude on Earth is **111 km**.



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Since the Earth is geoid shaped, the length of the lines of latitude decreases from the Equator towards the South and North Poles. The 90° North and South Poles are not found as lines, but as points.

The lines of latitude that are drawn horizontally between the Equator and the North Pole are called **'Northern latitudes'** and those which are found between the Equator and the South Pole are called **'Southern Latitudes'.** The lines of latitude consist of **89** parallels in the Northern Hemisphere and **89** parallels in the Southern Hemisphere, **one** at the Equator and the **two** poles are found as points. Totally, there are **181 parallels** found on earth.

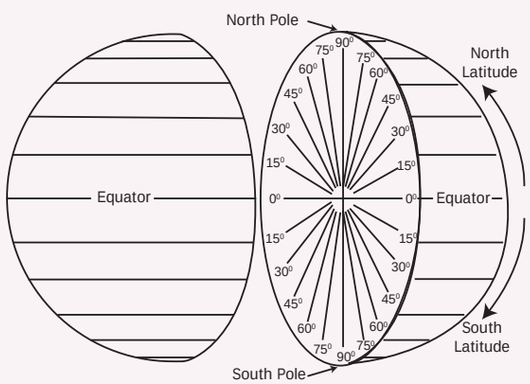



The Equator is the longest of all lines of latitude. Hence, it is also known as **'The Great Circle'.**

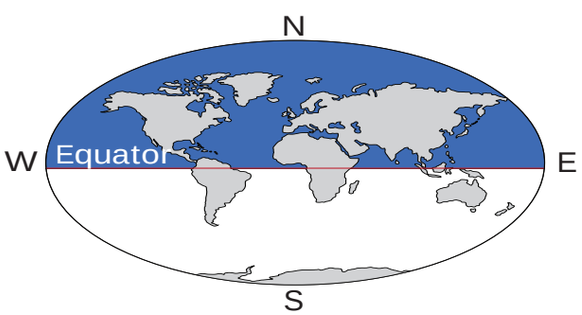
## Activity :



Draw a circle on a paper. Draw a horizontal line across the middle of a circle. Keeping this line as 0°, draw lines on both sides with an equal interval of 15° with the help of a protractor. The lines you have drawn are lines of latitudes.




## Northern Hemisphere

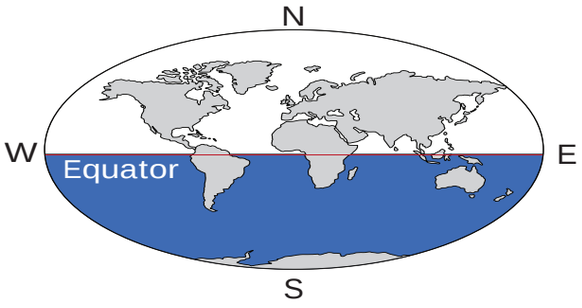





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The area of the Earth found between the Equator ($0^0$) and the North Pole (90°N) is called the **Northern Hemisphere**.

## Southern Hemisphere




The area of the Earth from the equator (0°) to the South Pole (90°S) is called the **Southern Hemisphere**.

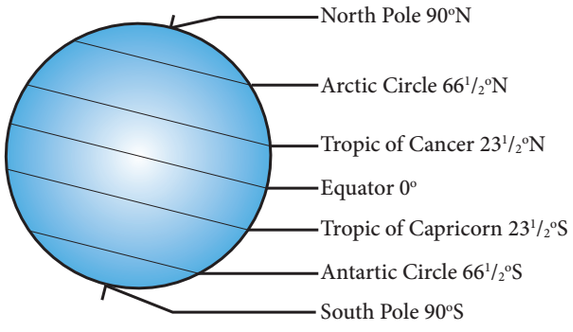
The location of any country or place is based on this division of the hemispheres.

### HOTS

Based on the latitudinal extent, in which hemisphere is India located?

## Important lines of latitude

The earth rotates on its axis at an inclination of 23½°. It also revolves around the sun while rotating. Based on the angle at which the sun's rays fall on the earth, certain lines of latitude gain significance.

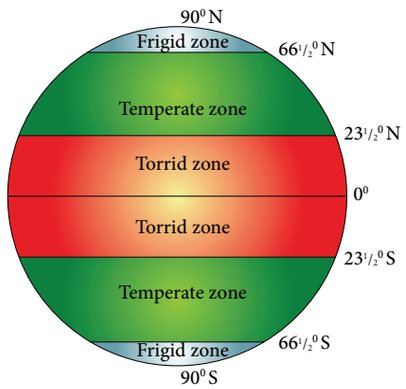



### DO YOU KNOW?

- 0°**N** and **S** – 23½°**N** and **S** lines of latitudes are called – **Low latitudes**
- 23½°**N** and **S** – 66½°**N** and **S** lines of latitudes are called – **Middle Latitudes**
- 66½°**N** and **S** – 90°**N** and **S** lines of latitudes are called – **High Latitudes**

**(Source :** A Dictionary of Geography – Susan Mayhew, Oxford University Press, Fifth edition -2015)

The Sun's rays do not fall equally on all parts of the earth. They fall vertically over the Equator and slanting towards the poles. Thus, all the places on earth do not have the same amount of temperature. Based on the amount of heat received from the Sun, the lines of latitude help in dividing the earth into different climatic zones.




## Torrid Zone

The region from the Equator towards the Tropic of Cancer (23½°N) and the Tropic of Capricorn (23½°S) is called the Torrid Zone. The Sun's rays fall vertically over this region and the average temperature is very high. Hence this region is known as the **Torrid Zone.**



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## Temperate Zone

From the Tropic of Cancer (23½°N) to the Arctic Circle (66½°N) and from the Tropic of Capricorn (23½°S) to the Antarctic Circle (66½°S), the Sun's rays fall slantingly. Moderate temperature prevails in this region. Hence, this region is called **Temperate Zone.**

## Frigid Zone

From the Arctic Circle (66½°N) to the North Pole (90⁰N) and from the Antarctic Circle (66½°S) to the South Pole (90°S), the Sun's rays fall further inclined, through out the year. The temperature is very low. Hence, this region is known as **Frigid Zone.**

**DO YOU KNOW?**

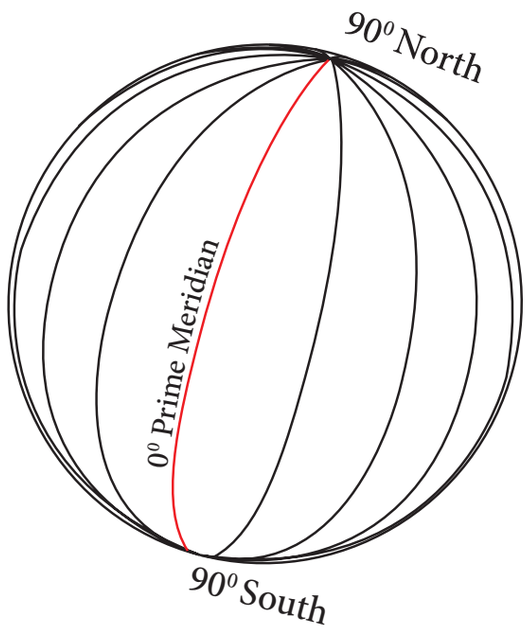
Some lines of latitude are also called by the following names in Tamil.

| | | |
|---|---|---|
| Latitude | - | ahalangu (அகலாங்கு) |
| Longitude | - | nettangu (நெட்டாங்கு) |
| Equator | - | nilanaduvarai (நிலநடுவரை) |
| Tropic of Cancer | - | kadagavarai (கடகவரை) |
| Tropic of Capricorn | - | magaravarai (மகரவரை) |

(Source: Ariviyal Kalanjiyam, The Tamil University)

## Longitudes

The imaginary lines drawn vertically connecting the North Pole and the South Pole are called lines or meridians of longitude. These lines of longitude are seen as semi circles. The 0° line of longitude is called the **Prime Meridian**. There are 180 lines of longitude towards the East and West from the Prime Meridian. So, there are totally **360 lines of longitude**. These lines converge at the poles. The 180° W and 180° E line of longitude are the same line.




The lines of longitude that are found between the Prime Meridian and the 180° East line of longitude are called **'Eastern Longitudes'** and the lines of longitude that are found between the Prime Meridian (0°) and the 180° West line of longitude are called **'Western Longitudes'**. Two opposite meridians form a great circle

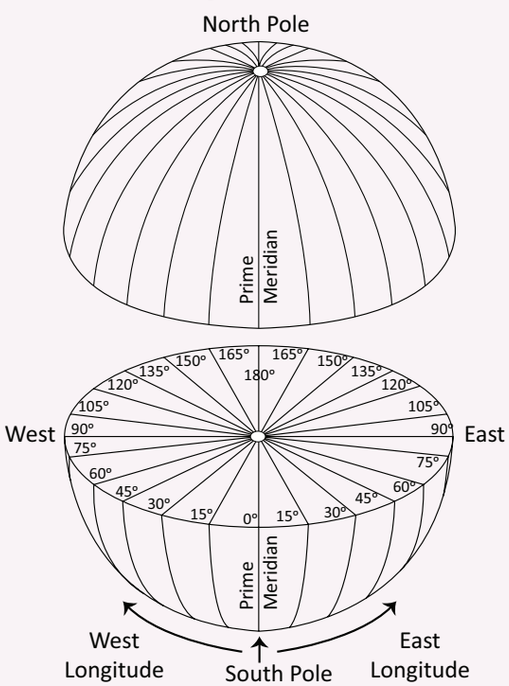
**DO YOU KNOW?**

The lines of longitude are found as semi circles covering 111 km at the Equator, 79 km at 45° latitude and no space between the lines at the poles.

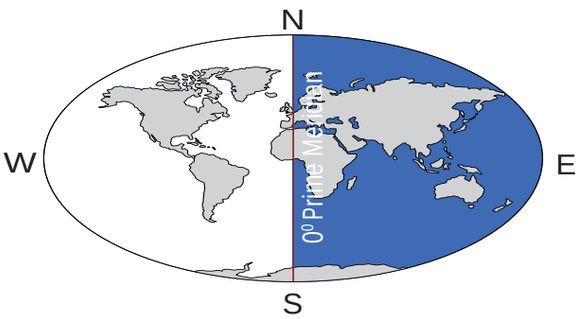
## Activity :



Take a ball and a thin iron wire. Pierce the ball with the wire from one end to the other end through the middle. Remove the wire. Draw circles around the points. Name the northern most point as North Pole and the southern most point as South Pole. The angle of a circle is 360°. Mark points on the circle at an interval of 15° using a protractor. Then draw lines joining these points on the top and bottom of the ball. The lines that you have drawn are lines of longitudes.

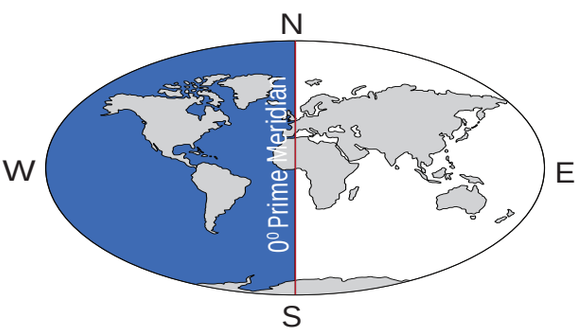



## Eastern Hemisphere




The part of the Earth between the 0° line of longitude and the 180° East line of longitude is known as the **Eastern Hemisphere.**

## Western Hemisphere




The part of the Earth from 0° line of longitude to 180° West line of longitude is called as **Western Hemisphere.**

## Activity

Based on the longitudinal extent, in which hemisphere is our country located? Look at the globe and answer.

## Significant Lines of Longitude

### Greenwich Meridian

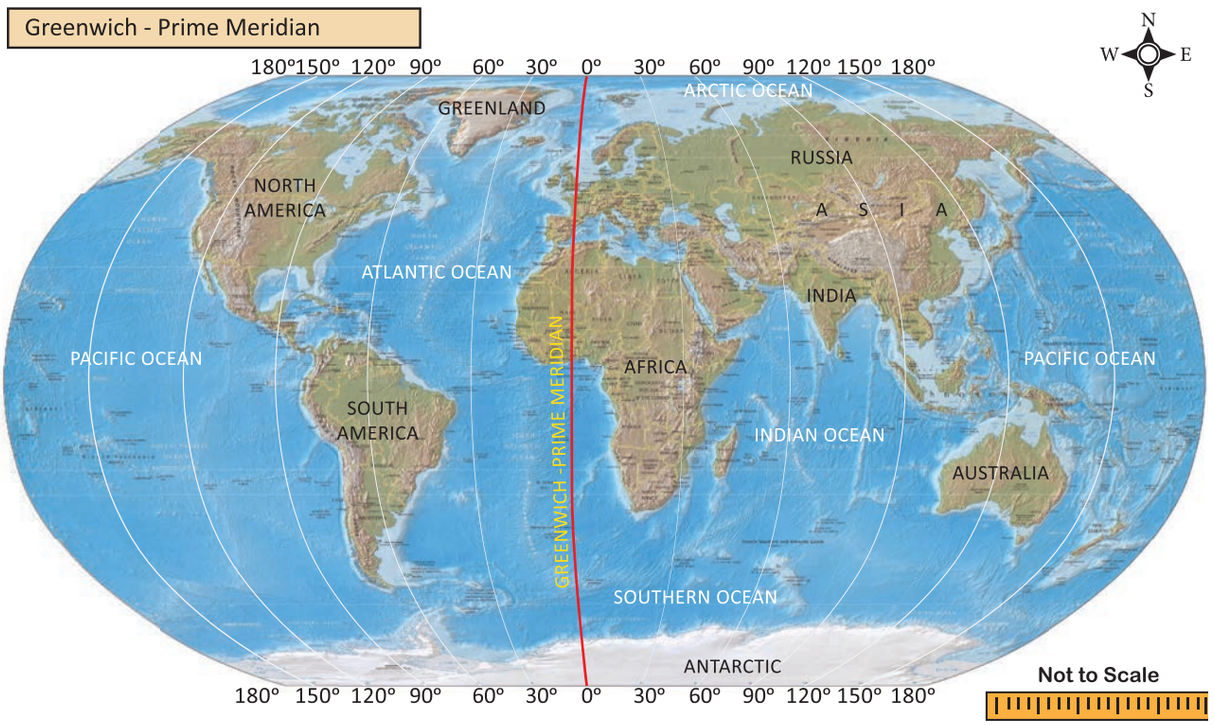
The Royal Astronomical Observatory is located at Greenwich near London in England. According to the International Meridian Conference held in 1884 in



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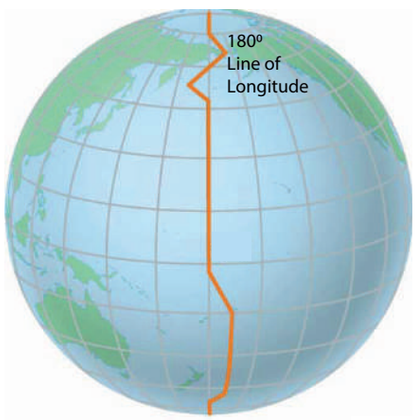



Washington DC in the U.S.A. all nations agreed on choosing the Greenwich Meridian as the international standard meridian (0°). This line of longitude is called the Prime Meridian and it is also known as the **Greenwich Meridian** because it passes through Greenwich.




## International Date Line

The 180° line of longitude has been fixed as the International Date Line, drawn on the Pacific Ocean between Alaska and Russia through Bering Strait. If a person crosses this line from the West to East, he loses a day. On the other hand, when he crosses from the East to West, he gains a day. Based on this, the date is fixed for different countries or regions of the world.

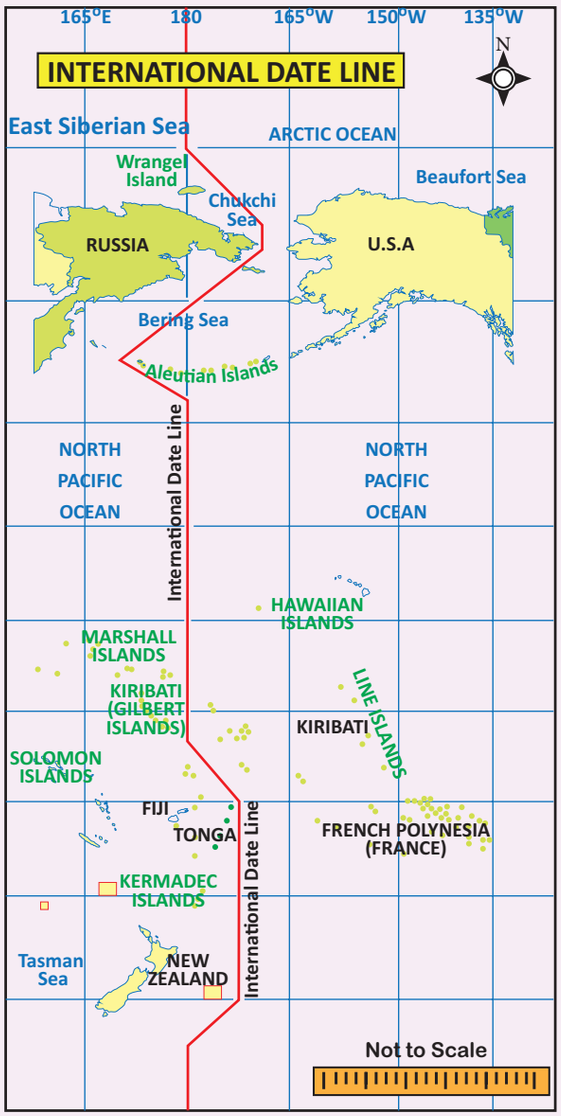





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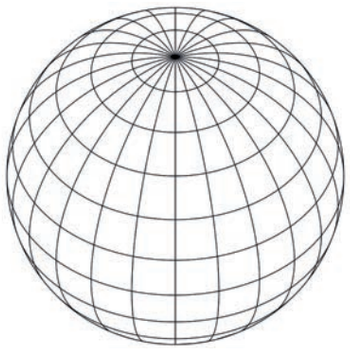
DO YOU KNOW?

The International Date Line is not straight. If the line is drawn straight, two places in the same country would have different dates. So the International Date Line is found zigzag in certain places to avoid confusion.




## Earth Grid

The imaginary lines of latitude and longitude form a grid like pattern on the surface of the earth, known as the **'Earth grid'** or **'Geographic grid'.**



**Earth grid**

To locate a place exactly on earth, the latitudinal and longitudinal extensions are required.

## Longitude and Time

As many as **360 lines of longitude** are drawn to connect the North and South Poles around the Earth 180° on the Eastern Hemisphere and 180° on the Western Hemisphere. Time is calculated on the basis of the lines of longitude.

### Fact

- The Earth takes one day to rotate on its axis.
- 1 day = 24 hours
- 1 hour = 60 minutes
- 24 hours = 24 x 60 = 1440 minutes
- The angle of the earth = 360 °
- 360 ° = 360 Longitudes
- 360 ° = 1440 minutes
- So 1 ° = $\frac{1440}{360}$ = 4 minutes
- In 4 minutes = 1°rotation
- In 60 minutes = $\frac{60}{4}$ = 15° rotation
- So, in an hour (60 minutes) the earth rotates 15°



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## Local Time

When the sun is overhead on a particular line of longitude, it is 12 noon at all the places located on that line of longitude. This is called local time.

The Sun is overhead on a line of longitude only once in a day. So the local time differs for every line of longitude.

When the Sun is overhead the Greenwich Meridian at 12 noon, it is the local time of that place. The world time is calculated by this standard line of longitude. It is known as the **Greenwich Mean Time (GMT).**

For example, if the time is 12 noon at Greenwich Meridian, it is **12:04 p.m.** at 1°E line of longitude and **11:56 a.m.** at 1°W line of longitude. So, as one moves towards the east from any meridian the time increases. And if one moves towards the west from any meridian, time decreases.

DO YOU KNOW?

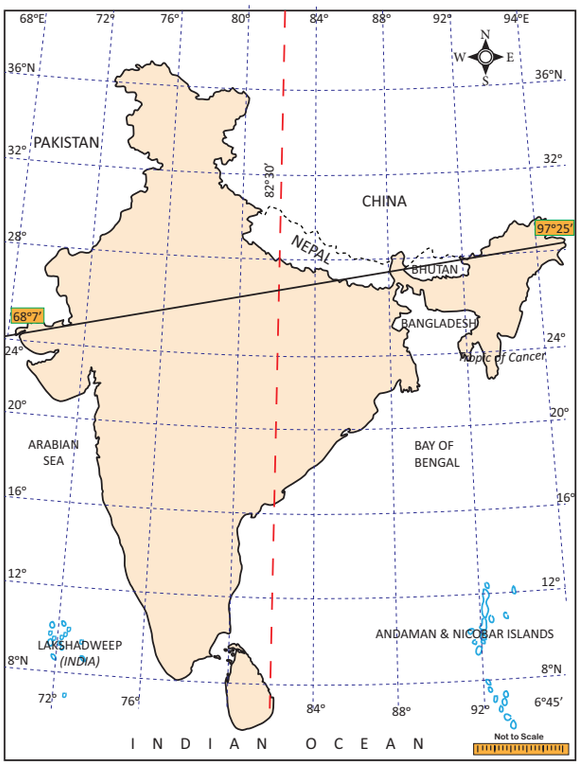
1. The word meridian is derived from the Latin word **'Meridianus'.** It means mid day. **(Medius – Middle, dies – day)**. So, meridian means the position of the Sun found overhead at a place at noon.
2. **a.m**. means 'anti Meridiem' **(anti – before)** – Before Noon.
3. **p.m**. means 'post Meridiem' **(Post – after/later)** – After noon.

## Standard Time

Local time is calculated when the sun is overhead at noon. Many lines of longitude may pass through a country. Countries may or may not observe a common time. The standard time of a country or a part of it is calculated keeping a particular meridian as a standard one.

The meridians are selected in multiples of 15° or 7 ½°. It is done in such a way that the variation of standard time from the Greenwich is expressed either as 1 hour or ½ an hour.

## Indian Standard Time




INDIAN STANDARD MERIDIAN

The longitudinal extent of India is from 68°7′ E to 97°25′ E. As many as twenty nine lines of longitude pass through India. Having 29 standard time is not logical. Hence 82½° E line of longitude is observed as the Prime Meridian to calculate the Indian Standard Time **(IST)**.

DO YOU KNOW?

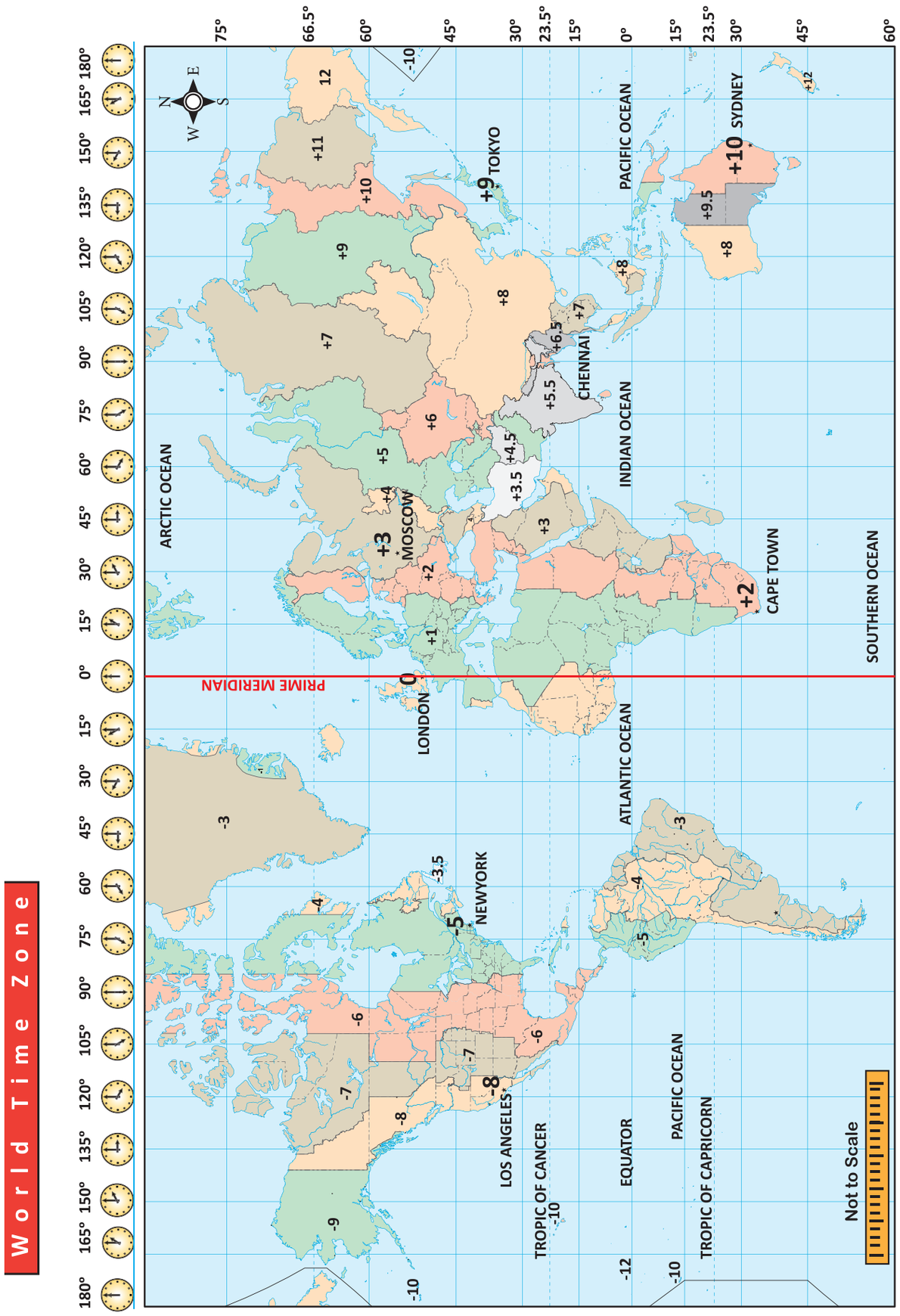
The 82½° E line of longitude passes through **Mirzapur** near **Allahabad in Uttar Pradesh**. This is located at an equal distance from **Ghuar Mota** in **Gujarat** and **Kibithu** in **Arunachal Pradesh**.



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## Time Zones






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The world has 24 time zones. Some countries have a great longitudinal extent. So they have more than one standard time. Example: Russia has 7 time zones.

**Activity:**

1. What is the difference in time between the GMT and IST?
2. If it is 5 a.m. at New York City, USA. what would be the time at New Delhi, the capital of India?
3. If it is 12 Midnight at London, what would be the time in India?
4. The standard time of Sydney city in Australia is found to be at a difference of _____ hours from that of the GMT.
5. Mr. Senthamizh travels by flight from Chennai to London. He boarded the aeroplane at 9a.m After 12 hours of travel, at what time (GMT) would he have reach London?

We saw about the lines of latitude and longitude drawn on the globe. Besides these, physical land forms, seas, oceans, countries etc., are also found on the globe

**Wrap up**

1. The imaginary lines drawn horizontally from the East to West on the globe and maps are called lines of latitude or parallels.
2. The imaginary lines drawn vertically from the North to South on the globe and maps are known as lines of longitude or meridians.
3. The 0° line of latitude is called the Equator.
4. The 0° line of longitude is called the Greenwich Meridian or the Prime Meridian.
5. The part of the Earth from the Equator (0°) to North Pole (90°) is called the Northern Hemisphere and from the Equator (0°) to South Pole (90°) is called the Southern Hemisphere.
6. The part of the Earth from the Greenwich Meridian (0°) to 180° East line of longitude is called the Eastern Hemisphere and from Equator (0°) to 180° West line of longitude is called the Western Hemisphere.
7. Lines of latitude are circles which are drawn at a distance of about 111 km. The poles are shown as points.
8. Lines of longitude are drawn as semi circles. The distance between the lines of longitude at the Equator is 111 km. It is found at a distance of 79 km at 45° latitude and they converge at the poles.
9. Lines of latitude do not merge, while lines of longitude converge at the poles.
10. Time is calculated on the basis of the lines of longitude. The 180° line of longitude is the International Date Line.



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## Glossary

1. Globe – A model of the earth
2. Lines of Latitude / Parallels – Imaginary lines drawn horizontally on the Earth from the East to West
3. Lines of Longitude / Meridians – Imaginary line drawn vertically on the Earth from the North to South
4. Geoid – The shape of the Earth
5. Hemisphere – Dividing the earth on the basis of 0° lines of latitude and longitude with regard to directions
6. Equator – The line of latitude drawn horizontally at the centre of the Earth
7. Tropic of Cancer – 23 ½° N line of latitude
8. Tropic of Capricorn – 23 ½° S line of latitude
9. Arctic Circle – 66 ½° N line of latitude
10. Antarctic Circle – 66 ½° S line of latitude

## Exercises

### I Fill in the blanks.

1. The line of latitude which is known as the Great Circle is _____.
2. The imaginary lines drawn horizontally on Earth from the West to East are called _____.
3. The 90° lines of latitude on the Earth are called _____.
4. The Prime Meridian is also called _____
5. The world is divided into _____ time zones.

### II Choose the best answer

1. The shape of the Earth is _____
   a) Square  b) Rectangle
   c) Geoid  d) Circle
2. The North Pole is
   a) 90° N Latitude
   b) 90° S latitude
   c) 90° W Longitude
   d) 90° E longitude

   ER1VUZ
3. The area found between 0° and 180° E lines of longitude is called
   a) Southern Hemisphere
   b) Western Hemisphere
   c) Northern Hemisphere
   d) Eastern Hemisphere



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4. The 23 ½° N line of latitude is called _____

   a) Tropic of Capricorn

   b) Tropic of Cancer

   c) Arctic Circle

   d) Antarctic Circle

5. 180° line of longitude is

   a) Equator

   b) International Date Line

   c) Prime Meridian

   d) North Pole

6. The Sun is found overhead the Greenwich Meridian at

   a) 12 midnight

   b) 12 noon

   c) 1 p.m.

   d) 11 a.m.

7. A day has _____.

   a) 1240 minutes

   b) 1340 minutes

   c) 1440 minutes

   d) 1140 minutes

8. Which of the following lines of longitude is considered for the Indian Standard Time?

   a) 82½° E

   b) 82½° W

   c) 81½° E

   d) 81½° W

9. The total number of lines of latitude are

   a) 171

   b) 161

   c) 181

   d) 191

10. The total number of lines of longitude are

    a) 370

    b) 380

    c) 360

    d) 390

## III Circle the odd one

1. North Pole, South Pole, Equator, International Date Line.
2. Tropic of Capricorn, Tropic of Cancer, Equator, Prime Meridian.
3. Torrid Zone, Time Zone, Temperate Zone, Frigid Zone
4. Royal Astronomical observatory, Prime Meridian, Greenwich Meridian, International Date Line.
5. 10° North, 20° South, 30° North, 40° West

## IV Match the following.

| A | B |
|---|---|
| 0° line of latitude | Pole |
| 0° line of longitude | International Date Line |
| 180° line of longitude | Greenwich |
| 90° line of latitude | Equator |



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## V Examine the following statements

1. The Earth is spherical in shape.
2. The shape of the Earth is called a geoid.
3. The Earth is flat.

**Look at the options given below and choose the correct answer**

a) 1 and 3 are correct

b) 2 and 3 are correct

c) 1 and 2 are correct

d) 1,2 and 3 are correct

## VI Examine the following statements

**Statement I :** The lines of latitude on Earth are used to find the location of a place and define the heat zones on Earth.

**Statement II :** The lines of longitudes on Earth are used to find the location of a place and to calculate time.

**Choose the correct option**

a) Statement I is correct; II is wrong

b) Statement I is wrong; II correct

c) Both the statements are correct

d) Both the statements are wrong

## VII Name the following

1. The imaginary lines drawn horizontally on Earth.
2. The imaginary lines drawn vertically on Earth.
3. The three dimensional model of the Earth.
4. India is located in this hemisphere based on lines of longitude.
5. The network of lines of latitude and longitude.

## VIII Answer briefly

1. What is a geoid?
2. What is local time?
3. How many times would the sun pass overhead a line of longitude?
4. What are lines of latitude and longitude?
5. Name the four hemispheres of the Earth.

## IX Give reasons

1. The 0° line of longitude is called the Greenwich Meridian.
2. The regions on Earth between North & South lines of latitude (66 ½°) and poles (90°) is called Frigid Zone
3. The International Date Line runs zigzag.

## X Answer in detail

1. What are the uses of globe?
2. How are the hemispheres divided on the basis of lines of latitude and longitude? Explain with diagrams.
3. What are the significant lines of latitude? Explain the zones found between them.
4. Explain: Indian Standard Time.

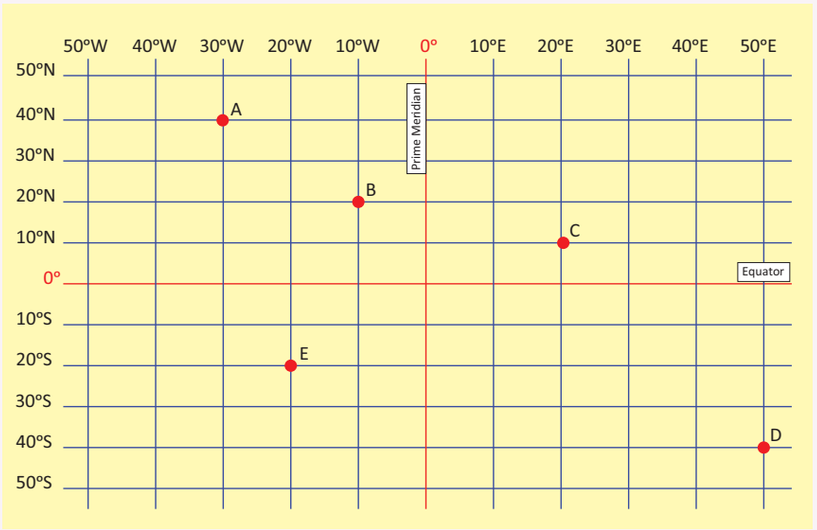


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## XI Activity

There are five positions marked on the grid given below. Look at them carefully and fill the blanks with reference to the lines of latitude and longitude. The first one is done for you.

1. The latitudinal and longitudinal reference of point A 40° N 30° W




*Earth Grid*

2. The latitudinal and longitudinal reference of point B _____
3. The latitudinal and longitudinal reference of point C _____
4. The latitudinal and longitudinal reference of point D _____
5. The latitudinal and longitudinal reference of point E _____

## Reference


1. Goh Cheng Leong, Certificate Physical and Human Geography (2009), Oxford University Press, New Delhi, India.
2. A Dictionary of Geography – Susan Mayhew, Oxford University Press, Fifth edition -2015.
3. அறிவியல் களஞ்சியம் (தொகுதிகள்), தஞ்சை தமிழ்ப் பல்கலைக்கழக வெளியீடு.
4. The earth shape and gravity (1965) Oxford Degman Press.
5. Strahler, Physical Geopraphy 4th Edition (1965) New York MC Graw – Hill Book Co.


## Web Links

1. https://www.britannica.com
2. https://www.latlong.net



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## ICT CORNER

### Geography - Globe

Through this activity you will know about the globe model.



**Steps:**

Step -1 Use the URL or scan the QR code to open the activity page.

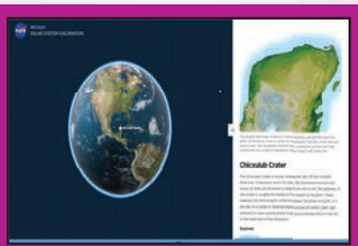
Step -2 Click the red "hot spot" area to see the main landmarks of the globe.

Step -3 In the view box Click the "Core" option to view the Earth's inner layers.

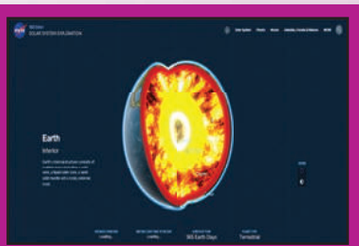
Step -4 Drag and rotate the Globe you can rotate the Globe.



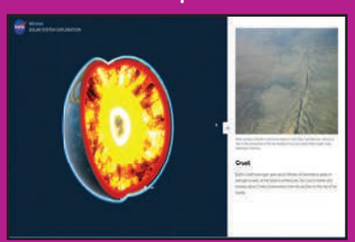
Step 1



Step 2



Step 3



Step 4

*Pictures are indicatives only.

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**Browse in the link**

Web: https://solarsystem.nasa.gov/planets/earth/overview/
(or) scan the QR Code



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www.tntextbo

Unit 3

# Understanding Disaster



## Learning Objectives

- To understand the meaning of disaster.
- To know about the types of disasters.
- To know a few key concepts in Disaster Management and orient them to the words used in media.
- To understand Tsunami and flood.
- To understand about Forecasting, Emergency Operation Centre etc.,

ER758Q

This lesson explains about the various natural disasters and man-made disasters. It also deals with the precautionary and mitigation measures taken to avoid the loss of lives and materials.

Disaster is a very common phenomenon in the human society. It has been experienced by people since time immemorial. Though its form may be varied, it has been a challenge for society. The latest development which has been discovered in the World Disaster Reports recently is that, the disasters have increased in frequency and intensity. India is one of the most disaster prone countries in the world. It has some of the world's most severe droughts, famines, cyclones, earthquakes, chemical disasters, rail accidents and road accidents. The high density of population in the developing countries, especially in the high risk coastal areas, results in millions of people getting affected by natural disasters, especially in recurring disasters like floods, cyclones, storm surges, etc.

## Disaster

'A disaster is a serious disruption of the functioning of a society involving human and material loss. Disaster is broadly classified into natural and man-made disasters.



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# Natural Disasters


Earthquake


Volcanoes


Tsunami

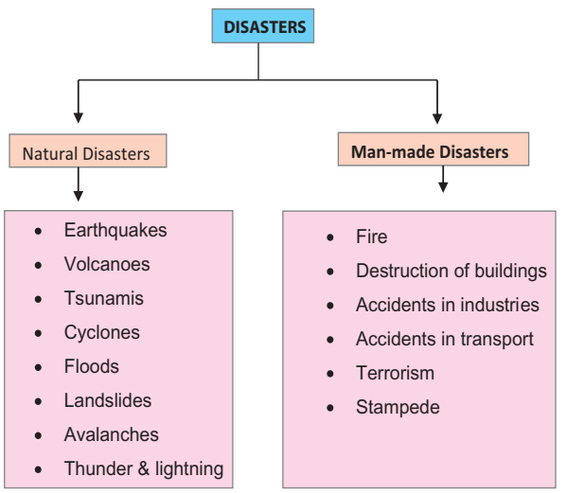

Cyclones


Floods


Landslide


Avalanches


Thunder & lightning




## Earthquake

The sudden shaking of the earth at a place for a short spell of time is called an earthquake. The duration of the earthquake may be a few seconds to some minutes. The point where an earthquake originates is called its '**focus**'. The vertical point at the surface from the focus is called '**epicentre**'.

## Volcanoes

Volcanoes are openings or vents where lava, small rocks and steam erupt onto the earth's surface.

## Tsunami

Tsunami are waves generated by earthquake, volcanic eruptions and underwater landslides.

## Cyclones:

A low pressure area which is encircled by high-pressure wind is called a cyclone.

## Floods

An overflow of a large amount of water, beyond its normal limits, especially on the rainfed areas is called a flood.

## Landslide

The movement of a mass of rocks, debris, soil etc., downslope is called a landslide.

## Avalanche

A large amount of ice, snow and rock falling quickly down the side of a mountain is called an Avalanche.

## Thunder and lightning

Thunder is a series of sudden electrical discharge resulting from atmospheric conditions. This discharge results in sudden flashes of light and trembling sound waves which are commonly known as thunder and lightning.



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## Man-made disasters


Fire


Destruction of buildings


Accidents in industries


Accidents in Transport


Terrorism


Stampede

### Fire

Massive **forest fires** may start in hot and dry weather as a result of lightning, and human carelessness or from other causal factors.

### Destruction of buildings

Demolition of buildings by human activites.

### Accidents in industries

Chemical, biological accidents that occur due to human error. (e.g.) Bhopal gas tragedy

### Accidents in Transport

Violation of road rules, carelessness cause accidents.

### Terrorism

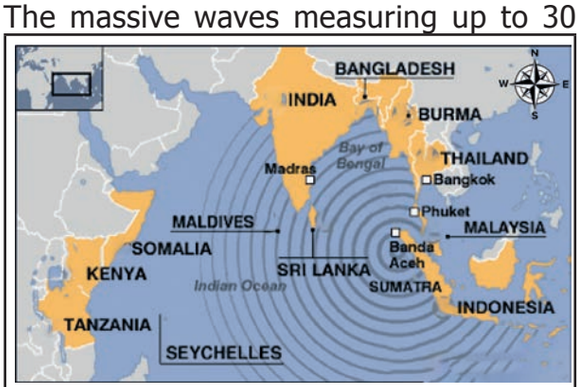
The social unrest or differences in principles leads to terrorism.

### Stampede

The term **stampede** is a sudden rush of a crowd of people, usually resulting in injuries and death from suffocation and trampling.

## Tsunami and floods

A killer Tsunami hit the south east Asian countries on the 26th of December, 2004. A massive earthquake with a magnitude of 9.1 -9.3 in the Richter scale epicentre in the Indonesian island of Sumatra. It triggered one of the biggest Tsunamis the world had ever witnessed. The massive waves measuring up to 30





Hindustan Times

MORNING AFTER CHRISTMAS...

Tsunami smashes Asia



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metres that killed more than 2,00,000 people of Asia. In India, over 10,000 people were killed by this disaster. Tamil Nadu alone accounted for 1,705 deaths. All the coastal districts were affected, Nagapattinam was the worst hit in the state of Tamil Nadu. Fishermen, tourists, morning walkers, children playing in beach and people living on the coast were unprepared for the waves. So they lost their life and the most of the loss of lives and damage to property was within 500 metres of the shore. After that the Indian government set up a Tsunami Early Warning System at Indian National Centre for Ocean Information Services (INCOIS), Hyderabad in 2007.

### Tsunami - Do's and Don'ts

- You should find out if your home, school etc., are in valunarable areas along sea shore.
- Know the height of your street above sea level.
- Plan evacuation routes and practise your evacuation routes.
- Discuss tsunamis with your family. Review safety and preparedness measures with your family.
- If you see the sea water receding, you must immediately leave the beach and go to higher ground far away from the beach.
- Don't go to the coast to watch the Tsunami.
- Dont try to surf the tsunami waves.
- Be aware facts about tsunami.

## Floods

Floods are high stream flows, which overlap natural or artificial banks of a river or a stream and are markedly higher than the usual flow as well as inundation of low land.

### Types of floods

**Flash floods:** Such floods that occur within six hours during heavy rainfall.

**River floods:** Such floods are caused by Precipitation over large catchment areas or by melting of snow or sometimes both.

**Coastal floods:** Sometimes floods are associated with cyclone high tides and tsunami.

### Causes of floods

- Torrential Rainfall.
- Encroachment of rivers bank.
- Excessive rainfall in catchment.
- Inefficient engineering design in the construction of embankments, dams and canals.

### Effects of floods

- Destruction of drainage system
- Water pollution
- Soil erosion
- Stagnation of water
- Loss of agricultural land and cattle
- Loss of life and spread of contagious diseases.

### Do's

- To find out if the settlement area is to be affected by flood or not.
- Keeping radio, torch and additional batteries, storing drinking water, dry foods items, salt and sugar. Safeguarding materials like



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kerosene, candle, match box, clothes and valuable things.

- Keeping umbrella and bamboo poles.
- Keeping first aid box and strong ropes to bind things.
- To dig canals from the farm land, to drain the excessive water keeping sand bags etc.,

### Don'ts

- Try to connect electricity once it is cut.
- Operate vehicles
- Swim against floods
- Avoid going on excursions.
- Neglect flood warning messages

### During floods

- Cut off gas connection and electricity.
- Keep sand bags on drainage holes and bathroom holes.
- Leave immediately through the known passage or prescribed passage
- Drink hot water.
- Use bleaching powder to keep your environment hygienic.
- Before using match sticks and candles, ensure that there is no gas leakage.
- Don't eat more food when you are affected by diarrhoea.
- Don't try to take anything that floats in flood.

## Disaster Risk Reduction (DRR)

Disaster Risk Reduction: The practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters. There are four key approaches to public awareness for disaster risk reduction. Campaigns, participatory learning, informal education, and formal school based interventions.

**CASE STUDY**

### Chennai flood – 2015



Chennai is one of the largest metropolitan cities in India, which lies on the south eastern coast. The north east monsoon along with tropical cyclone hits Chennai every year and gives heavy cyclonic rainfall. In 2015, November and December due to heavy rain, the devastating floods that hit Chennai and other parts of Tamil Nadu claimed more than 400 lives and caused enormous economic damage. The Government of India and Tamil Nadu have taken a lot of action to reduce loss of life and minimize human sufferings.

## Forecasting and Early Warning

Weather forecasting, Tsunami early warning system, cyclonic forecasting and warning provide necessary information which help in reducing risks during disasters.

School Disaster Management Committee, Village Disaster Management Committee, State and Central government institutions take mitigation measures



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together during disaster.

Newspaper, Radio, Television and social media bring updated information and give alerts on the vulnerable area, risk, preparatory measures and relief measures including medicine.

## Glossary

**Mitigation:** The lessening of the adverse impacts of hazards and related disasters.

**Forecast:** Definite statement or statistical estimate of the likely occurrence of a future event or conditions for a specific area.

**Rainfed:** Supplied primarily with rainwater.

**Magnitude:** A measure of the amount of energy released by an earthquake.

**Contagious:** Transmissible by direct or indirect contact .

**Catchment:** The action of collecting water, especially the collection of rainfall over a natural drainage area.

## Exercise

### I Answer in brief

1. Define Disaster
2. What are the two types of disasters? Give examples.
3. Write a short note on 'Thunder and lightning'
4. Chennai, Cuddalore and Cauvery delta are frequently affected by floods. Give reason.
5. Differentiate: Landslide – Avalanche

ERG1AD

### II Answer in a paragraph

1. What is flood? Explain the do's and don'ts during floods.

### III Activity

**Make a flood plan**

On a piece of paper, draw your village/town map roughly. Locate your home,school and playground on the map. Then draw the rivers/stream/lake and road, located nearest to your village/ town. Answer the questions listed below.

1. Which areas and roads would be mostly affected by flood?
2. Can you find out evacuation route?
3. If you live in a flood-prone area, what are the precautionary measures you have to take during heavy rains?
4. What are things that you should have in your 'Go- Kit' / 'Drive -away kit'?
5. Make a list of emergency numbers.

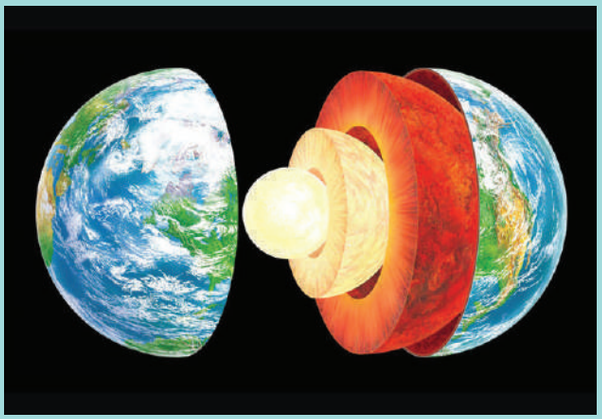
('Go-Kit' - A kit prepared by and for an individual or group who expects to develop it in alternative locations during emergency)



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# Unit -I

# Interior of the Earth



## Learning Objectives

To acquaint ourselves with

- To know about the interior of the earth
- To understand the role of plates
- To learn about earthquakes and volcanoes

VVRXM5

## Introduction

The earth, our homeland, is a dynamic planet. The earth's surface has lofty mountains, high plateaus, large plains and deep valleys etc. The earth's surface is constantly undergoing changes inside and outside. Have you ever wondered what lies in the interior of the earth? What is the earth made up of?

## Interior of the Earth

The structure of the earth may be compared to that of an apple. The earth too has shells like that of an apple. If we cut a section through the earth, we will get a view as shown in figure. On the basis of the study of earthquake waves the spherical earth is found to be three concentric layers. They are:

1. The crust,
2. The mantle and
3. The core.

## 1. The Crust

The crust is the outermost layer of the earth. Its average thickness varies from 5 to 30 km. It is about 35 km on the continental masses and only 5 km on the ocean floors. Despite greater thickness, the continental crust is less dense than the oceanic crust because it is made of both light and dense rock types. The oceanic crust is composed mostly of dense rocks such as basalt.

DO YOU KNOW?

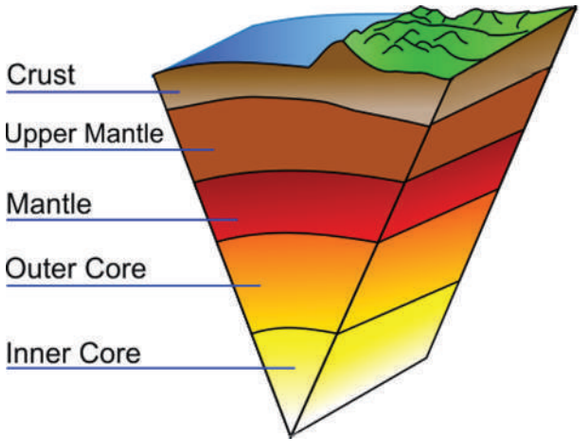
Earth is called as blue Planet. 71% of the earth is covered by water.

The crust comprises two of distinct parts. The upper part consists of granite rocks and forms the continents. It has the main mineral constituents of silica and alumina. So it is collectively referred to as Sial. It has an average density of 2.7g/cm$^3$.



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The lower part is a continuous zone of denser basaltic rocks forming the ocean floors, comprising mainly of silica and magnesium. It is therefore called Sima. It has an average density of 3.0g/cm³. The sial and the sima together form the earth's crust. Since the sial is lighter than the sima, the continents can be said to be 'floating' on a sea of denser sima.




## 2. The Mantle

The next layer beneath the crust is called the mantle. It is separated from the crust by a boundary called Mohorovicic discontinuity. The mantle is about 2,900 km thick. It is divided into two parts. (i) The upper mantle with a density of 3.4 – 4.4g/cm³. extends down to 700 km. (ii) The lower mantle having a density of 4.4– 5.5g/cm³ extends from 700 to 2,900 km.

## 3. The Core

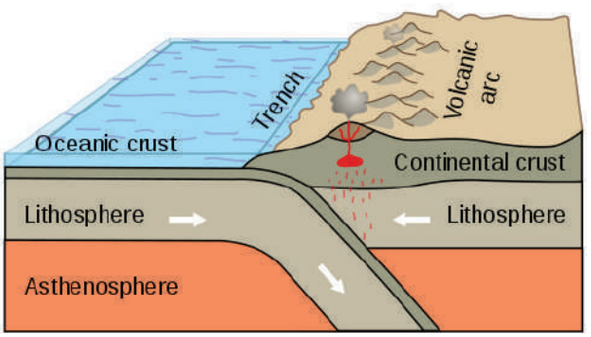
The innermost layer of the earth is called the core. It is also known as *barysphere*. It is separated from the mantle by a boundary called *Weichart-Gutenberg discontinuity*. The core is also divided into two parts. (i) The outer core, which is rich in iron, is in liquid state. It extends between 2,900 – 5,150 km. (ii) The inner core, composed of Nickel and Ferrous *(Nife)*, is solid in state. The central core has very high temperature and pressure. It extends from 5,150 km to 6,370 km. The average density of core is 13.0 g/cm³




- The crust forms only 1 per cent of the volume of the earth, 84 % consists of the mantle and 15 % makes the core.
- The radius of the earth is 6371 km.

## The Earth Movements

The lithosphere is broken into a number of plates known as the *Lithospheric plates*. Each plate, oceanic or continental moves independently over the asthenosphere.The movement of the Earth's lithospheric plates is termed as tectonic movements. The energy required to move these plates is produced by the internal heat of the earth. These plates move in different directions at different speed.




Lithospheric Plates

At places, these plates move away from each other creating wide rifts on the earth's surface. At some places, these plates come closer and collide. When an oceanic plate collides with a continental plate, the denser oceanic plate is forced below the continental plate. As a result of the pressure from above



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7th Social Science Geography Term_1 English Unit _1.indd 156 13-03-2019 3.33.48 PM

the rocks heats up and melt. The molten rocks rise again forming volcanic mountains along the continental edge. Alternatively, a trench may be formed between two plates. In some cases when two continental plates converge, neither plate can be forced under the other. Instead, folds may be created. Great mountain ranges like the Himalayas have been formed in this way.

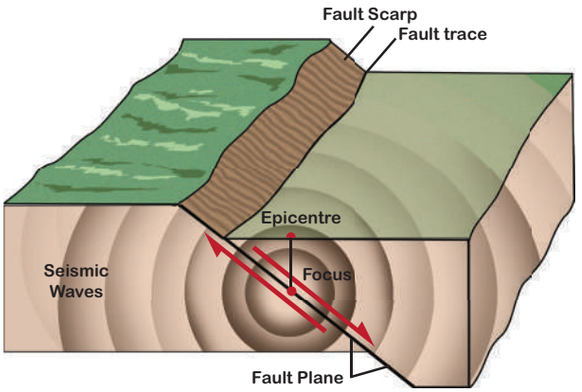
**Asthenosphere** - The asthenosphere is the part of the mantle that flows and moves the plates of the earth.

The movement of these plates causes changes on the surface of the earth. The earth movements are divided on the basis of the forces which cause them. The forces which act in the interior of the earth are called as Endogenic forces and the forces that work on the surface of the earth are called as Exogenic forces.

Endogenic forces sometimes produce sudden movements and at the other times produce slow movements. Sudden movements like earthquakes and volcanoes cause mass destruction over the surface of the earth.

## Earthquake

A sudden movement of a portion of the earth's crust which produces a shaking or trembling is known as an earthquake. Earthquakes may cause widespread damage to life and property. The point where these vibrations originate is called the focus of the earthquake. The point of the earth's surface directly above the focus is called the epicentre of the earthquake. From the focus, the earthquake vibrations travel in different directions in the form of seismic waves.




Earthquake

The earthquake waves are recorded by an instrument known as seismograph. The magnitude of an earthquake is measured by the Richter scale. The numbers on this scale range from 0 to 9.

- An earthquake of 2.0 on Richter scale or less can be felt only a little. An earthquake over 5.0 on Richter scale can cause damage from things falling. A 6.0 on Richter scale or higher magnitude is considered very strong and 7.0 on Richter scale is classified as a major earthquake.

## Causes of Earthquake

The chief cause of earthquake is the sudden slipping of the portion of the earth's crust along fractures or faults. The movement of the molten rocks underneath the surface produce strains which break the rocks apart. The sudden shifting of landmass causes upheavals in the crust of the earth sending vibrations or waves into the surrounding portions of the earth. Sometimes the surface of the earth itself cracks.

Another cause of earthquake is volcanic activity. A violent or explosive eruption often causes the earth in its vicinity to quake. Earthquakes are often common in most volcanic areas.



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7th Social Science Geography Term_1 English Unit _1.indd 157 13-03-2019 3.33.49 PM

## Effects of Earthquakes

Earthquakes may cause changes in the earth's surface. Vibrations often set landslides in mountainous regions.A greater danger in an earthquake is the falling of buildings. Most of the houses which collapsed were made of mud and bricks and proved to be death traps. Fire is another great danger. Underground water system is naturally disturbed by such movements.

DO YOU KNOW?

There are three types of earthquake waves:
1. P waves or longitudinal waves
2. S waves or transverse waves
3. L waves or surface waves

An earthquake which originates below or near the sea causes great disturbance in the water. The floods and waves cause great loss of life, sometimes more than the earthquake itself. Tsunami, a Japanese term, is the name given to the huge wave caused in the sea by an earthquake. Tsunamis are quite common along the coasts of Japan and other regions in the Pacific Ocean.

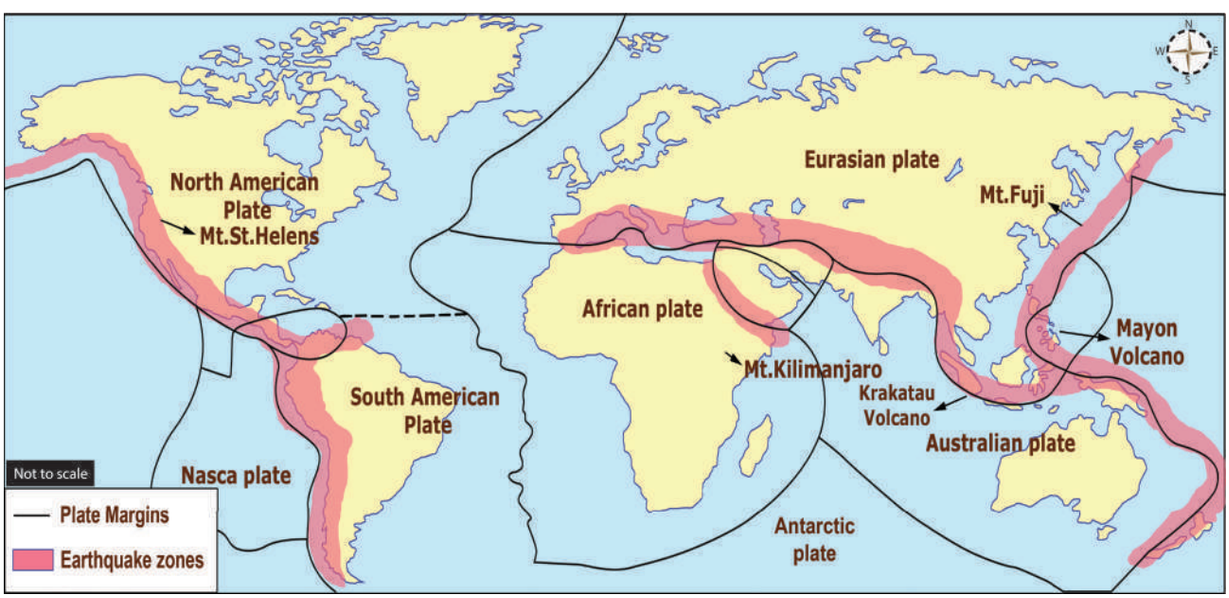
DO YOU KNOW?

**On 26th Dec 2004 TSunami in the Indian Ocean swept coastal area of Indonesia, India, Srilanka, Thailand etc., They caused immense damage to life and property in the coastal area**

## Distribution of Earthquakes

The world's distribution of earthquakes coincide very closely with that of volcanoes. Regions of greatest seismicity are circum-Pacific areas, with the epicenters and the most frequent occurrences along the Pacific Ring of Fire. It is said that about 68 percent of earthquakes occur in this belt. Another 31 % of earthquakes take place in the Mediterranean-Himalayan belt including Asia Minor, the Himalayas and parts of north-west China. The remaining percent of earthquakes are occur in Northen Africa and Rift valley areas of the Red sea and Dead sea.

In India, the Himalayan region and the Ganga-Brahamaputra valley are prone to earthquakes. A number of earthquakes have been experienced in this region. Some of them were




**World Distribution of Earthquakes**



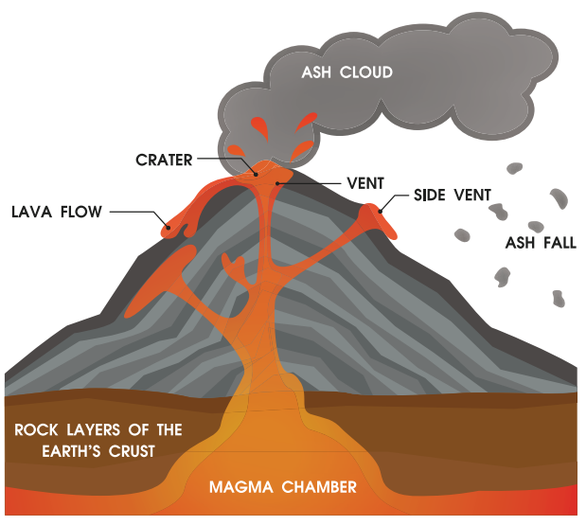
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very severe and caused extensive damage, e.g., the earthquake of Uttar Kashi in 1991 and Chamoli in 1999. The Deccan Plateau, which was supposed to be comparatively free from the dangers of the earthquakes, has experienced two severe earthquakes in the past, the Koyna earthquake in 1967 and the Latur earthquake in 1993.

## Volcanoes

A volcano is a vent or an opening in the earth's crust through which hot magma erupts from deep below the surface. The opening is usually circular in form. Volcanic eruptions may also take place through a long crack or fissure through which steam and other materials flow out.

8SDSC1




The molten rock material within the earth, together with gases, is called magma. After it rises to the surface, it is called as lava. In course of time, lava and other materials flow out of a volcano accumulate around the opening and form a conical hill or a mountain vent is an openning or mouth of a volcano. The top of this cone is usually marked by a funnel-shaped depression, which is called a *crater*. If the crater of a volcano is of great size and is shaped like a basin, it is called a *caldera*. Calderas are caused by violent explosions which blow away entire tops of great cones.

## Causes of Volcanic Activity

The temperature increases as the depth increases at the rate of 1°C for every 35 metres. There is also great pressure. At a depth of about 15 km the pressure is about 5 tonnes per $cm^2$ of rock. Under these circumstances, the interior of the earth is in a semi-molten state called magma. The magma, under great pressure has the capacity to dissolve great volume of gas; some gases are also combustible. This makes volcanic material burst forth through the weak spots in the earth's crust.

**Fact :** The scientific study of valcanoes are called **volcanology**. People who study valcanoes are called **volcanologists**.

## Nature of volcanic eruptions

Sometimes, magma rises slowly to the surface and spreads over a vast area. This is known as fissure eruption. Some plateaus and plains have been formed in this way, e.g., Deccan Plateau in India and the Colombian Plateau in North America. If the magma rises quickly to the surface, lava is thrown high into the atmosphere. Besides lava, ash, steam, gases and pieces of rocks are also thrown out. This type of eruption is known as explosive eruption. The terrible explosion on the island of Krakatoa ($27^{th}$ August 1883) in Indonesia is an example for explosive type of eruption.

Lava flow is affected by viscosity. For example, honey has high viscosity, so it flows slowly, whereas water has low viscosity, so it



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7th Social Science Geography Term_1 English Unit _1.indd 159 13-03-2019 3.33.50 PM

flows easily. The viscosity of lava is determined by the amount of silica and water in magma. Highly viscosity lava is rich in silica and has little water. Low viscosity lava has little silica, but a lot of water. It moves rapidly forming smooth flows.



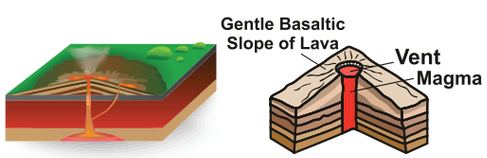

Barren island is situated in the Andaman Sea, and lies about 138 km northeast of the territory's capital. It is only in active volcano along the chain from sumatra to myanmar. Last eruption occurred in 2017.

## Types of Volcanoes

The shape of a volcano depends on the type of lava and the force of the eruption. On the basis of shape, there are three types of volcanoes. They are:

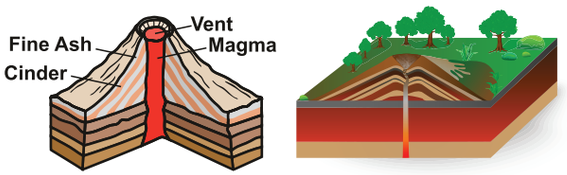
1. Shield volcano
2. Cinder-cone volcano
3. Composite volcano

**1. Shield volcano:** A shield volcano is formed by quiet eruption of lava with a low silica content. Such a volcano has a wide base and a cone with gentle slopes. Volcanoes of the Hawaii islands are of this type.



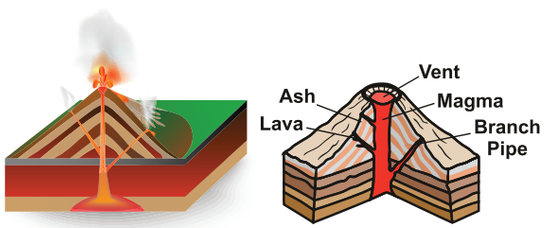

Shield Volcano

**2. Cinder-cone volcano:** Silica-rich magma traps gases inside the volcano until enough pressure is built to push the magma out of the earth's crust. When this type of volcano erupts, it shoots gases, ash, etc. with great force throwing them several kilometres up into the atmosphere. Such volcanoes have steep slopes and are made of cinder and ash. They are known as cinder-cone volcanoes. Many volcanoes of Mexico and Central America belong to this group.




Cinder - Cone Valcano

**3. Composite volcano:** Composite volcanoes are made of alternate layers of lava, cinder and ash. They are also called strato volcano. St. Helens is an example of composite volcano.




Composite Volcano

Volcanoes are also grouped according to their periodicity of eruptions such as active, dormant and extinct. These names refer to the state of activity rather than the types of volcanoes.

*Active* Valcanoes that erupt frequently are called active volcanoes. Most of the active volcanoes lie in the Pacific Ring of Fire belt which lies along the Pacific coast. There are about 600 active volcanoes in the world, such as Mt. Stromboli in Mediterranean Sea, St.Helens in USA, Pinatubo in Philippines. Mauna Loa in Hawaii (3,255m.) is the world's biggest active volcano.



Aatchiyar Kalvi
7th Social Science Geography Term_1 English Unit _1.indd 160 13-03-2019 3.33.51 PM

DO YOU KNOW?

Stramboli is known as the 'light house of Mediterranean sea'

*Dormant* volcanoes have shown no sign of activity for many years but they may become active at any time. It is also called Sleeping Volcano Vesuvius mountain of Italy, Mt Fujiyama in Japan, Mt. Krakatoa of Indonesia are famous examples of this types.

**Extinct** The top of extinct volcanic mountains have been eroded. Mt Popa of Myanmar and Mt. Kilimanjaro and Mt. Kenya of Africa are examples of extinct volcanoes.

## Distribution of Volcanoes in the world

Volcanoes are located in a clearly-defined pattern around the world. They are closely related to regions that have been intensely folded or faulted. There are about 500 active volcanoes and thousands of dormant and extinct ones. They occur along the coastal mountain ranges, as off-shore islands and in the midst of oceans, but there are a few in the interior of continents. The volcanic belts are also the principal earthquake belts of the world. There are three major zones of volcanic activities in the world. They are:

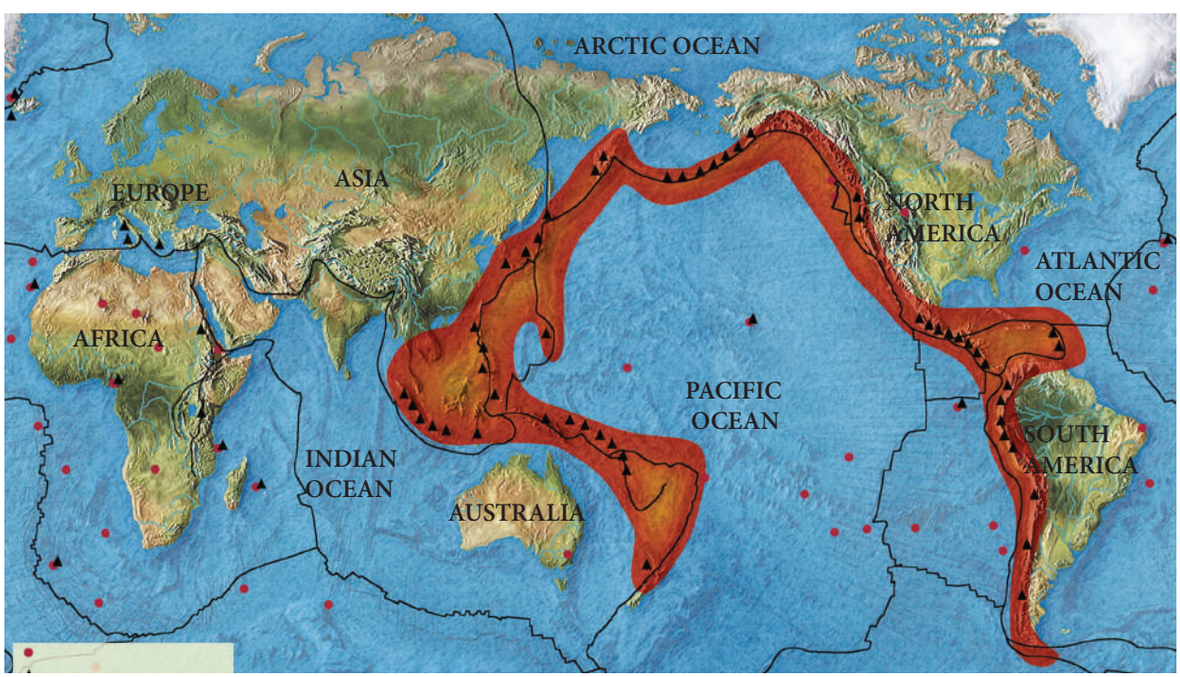
1. The Circum – Pacific belt
2. The Mid continental belt
3. The Mid Atlantic belt

### 1. Circum Belt

This is the volcanic zone of the convergent oceanic plate boundary. It includes the volcanoes of the eastern and western coastal areas of Pacific Ocean. This zone is popularly termed as the Pacific Ring of Fire which has been estimated to include two-thirds of the world's volcanoes.

### 2. Mid continental belt

This is the volcanic zone of convergent continental plate boundaries that includes






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7th Social Science Geography Term_1 English Unit _1.indd 161 13-03-2019 3.33.51 PM

the volcanoes of *Alpine mountain chains*, the *Mediterranean Sea and the fault zone of eastern Africa*. The important volcanoes are Vesuvius, Stromboli, Etna, Kilimanjaro and Kenya. Surprisingly, the Himalayas have no active volcanoes at all.

## 3.Mid Atlantic Belt

This belt represents the divergent boundary of plates located along the mid-Atlantic ridges. Volcanoes of this area are mainly of fissure eruption type. Iceland is the most active volcanic area and is located on the mid-Atlantic ridge. St. *Helena* and *Azores* Island are other examples.

## WRAP UP

- The Earth's interior structure is compared with that of an apple
- The crust is the outer-most layer of the earth.
- The upper part of the earth crust is SIAL.
- The lower part of the earth crust is SIMA.
- The mantle is about 2900km thick.
- The lithosphere is broken into a number of plates known as the lithospheric plates
- The earthquake waves are recorded by an instrument known as seismograph.
- Tsunami is caused by an underwater earthquake.
- A volcano is a vent or opening in the earth crust.
- The Shape of a volcano depends on the type of lava and force of the eruption.
- There are three major zone of volcanic activity in the world.

| Glossary | | | |
|---|---|---|---|
| 1. | **Core** | The inner most layer of the earth | கரு |
| 2. | **Mantle** | The second layer beneath the crust | கவசம் |
| 3. | **Mohorovicic discontinuity** | Boundary that separated the mantle from the crust | மோஹோரோவிசிக் எல்லை |
| 4. | **Land slide** | Downward movements of rock debris of the mountain | நிலச்சரிவு |
| 5. | **Seismograph** | Instrument to measures the magnitude of an earthquake | சீஸ்மோகிராப் |
| 6. | **Tsunami** | Sea waves caused by an underwater earthquake or a volcanic eruption under sea. | ஆழிப்பேரலை |
| 7. | **Vent** | An opening a the earth surface from which volcanic material is emitted | எரிமலைத் துளை |
| 8. | **Magma** | The molten state of rocks | பாறைக்குழம்பு |
| 9. | **Lava** | The solidified form of magma after it reaches the surface of the earth | எரிமலைக்குழம்பு |
| 10. | **Viscosity** | A liquids resistance to flow | பாகுத்தன்மை |



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## Evaluation

### I. Choose the correct answer

1. Nife is made up of _____ .
   a. Nickel and ferrous
   b. Silica and aluminum
   c. Silica and magnesium
   d. Iron and magnesium

KNZM1W

2. Earthquake and volcanic eruption occur near the edges of _____.
   a. Mountain b. Plains
   c. Plates d. Plateaus

3. The magnitude of an earthquake is measured by _____.
   a. Seismograph b. Richter scale
   c. Ammeter d. Rotameter

4. The narrow pipe through which magma flow out is called a _____.
   a. Vent b. Crater
   c. Focus d. Caldera

5. Lava cones are _____
   a. mountains of accumulation
   b. mountains of deformation
   c. relicit mountains
   d. fold mountains

6. The top of the cone of a volcanic mountain has a depression known as the _____
   a. crater b. lopith
   c. caldera d. sill

7. _____ belt is known as the "Ring of Fire".
   a. Pacific b. Atlantic
   c. Arctic d. Antarctic

### II. Fill in the blanks

1) The core is separated from the mantle by a boundary called _____.
2) The earthquake waves are recorded by an instrument known as _____.
3) Magma rises to the surface and spreads over a vast area is known as _____.
4) An example for active volcano _____.
5) Seismology is the study of _____.

### III. Circle the odd one

1) crust, magma, core, mantle
2) focus, epicenter, vent, seismic waves
3) Uttar Kashi, Chamoli, Koyna, Krakatoa
4) lava, caldera, silica, crater
5) Stromboli, Helens, Hawaii, Fujiyama

### IV. Match the following

| | | | |
|---|---|---|---|
| 1) | Earth quake | - | Japanese term |
| 2) | Sima | - | Africa |
| 3) | Pacific Ring of Fire | - | Sudden movement |
| 4) | Tsunami | - | Silica and magnesium |
| 5) | Mt. Kenya | - | World volcanoes |



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## V. Consider the following statement and (√) Tick the appropriate answer

1. **Assertion (A):** There structure of the earth may be compared to that of anApple.

   **Reason (R):** The interior of the earth consists of crust, mantle and core.

a. A and R are correct and A explains R

b. A and R are correct but A does not explain R

c. A is incorrect but R is correct

d. Both A and R are incorrect

2. **Assertion (A):** The Pacific Ocean includes two thirds of the world's volcanoes.

**Reason (R):** The boundary along the Eastern and Western coast areas of the Pacific Ocean is known as the Pacific Ring of Fire.

a. A and R are correct and A explains R

b. A and R are correct but A does not explain R

c. A is incorrect but R is correct

d. Both A and R are incorrect

## VI. Answer in a word

1) Name the outer most layer of the earth.

2) What is SIAL?

3) Name the movement of the Earth's lithospheric plates?

4) Give an example of extinct volcano

## VII. Answer the following briefly

1) What is mantle?

2) Write note on the core of the earth?

3) Define Earthquake?

4) What is a Seismograph?

5) What is a volcano?

6) Name the three types of volcanoes based on shape.

## VIII. Give reason

1) No one has been able to take samples from the interior of the earth

2) The Continent crust is less dense than the oceanic crust

## IX. Distinguish between

1) SIAL and SIMA

2) Shield volcano and composite volcano

3) Active volcano and dormant volcano

## X. Answer the following questions in detail

1) Write about the effects of an earthquake?

2) Describe the classification of volcanoes based on the eruptions.

3) Name the major zones of volcanic activity and explain any one.

## XI. HOTs

1) The earth's interior is very hot. Why?

2) Are Volcones Destructive (or) Constructive?

3) How does volcaone make on Island?

## XII. Activity

1) On an outline map of the world, mark the Pacific Ring of Fire

2) Label the parts of volcano.

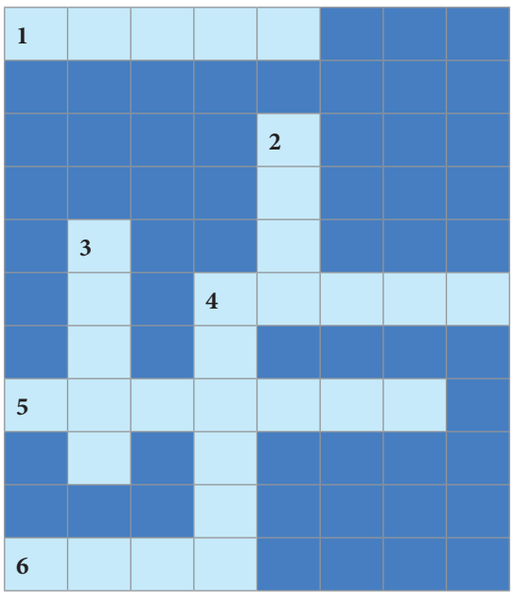
3) Prepare an album on earthquake and volcanoes.



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## PUZZLE




**Across**

1. Point of origin of Earthquake
4. Molten rock under the surface
5. Waves triggered by deep ocean earthquake
6. Inner layer of the Earth

**Down**

2. Extinct volcano in Europe
3. Top layer of the Earth
4. Middle layer of Earth

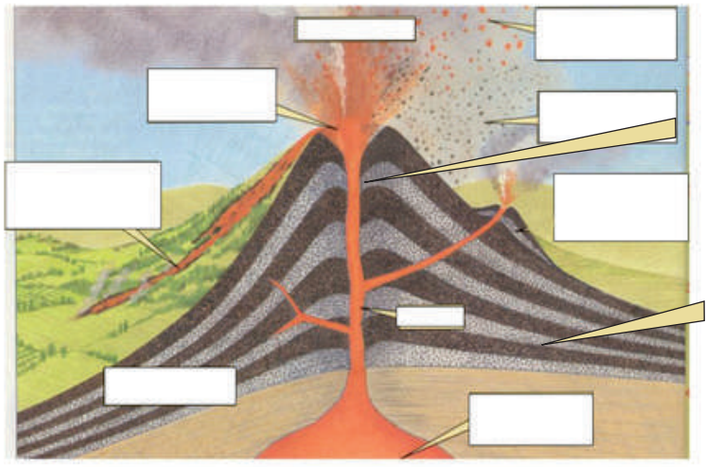
## WORLD MAP





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## LABEL THE PARTS OF VOLCANO



### Reference


Majid Husain, Physical Geography Anmol Publication Pvt Ltd

A Das Gupta, A.N. Kapoor, Principles of Physical Geography, S. Chand & Company Ltd., New Delhi

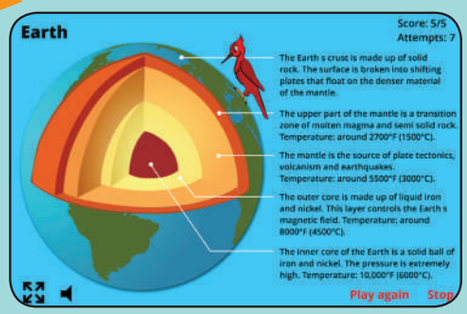
Goh Cheng Leong, certificate Physical and Human Geography, Oxford University press.

Savindra Singh (2015) physical Geography Pravalika publications Allahabad.


**ICT CORNER**

## Interior of the Earth

select full screen mode and play the game with descriptions




### PROCEDURE

**Step 1:** Open the Browser and type the URL given below (or) Scan the QR Code.

**Step 2:** Click on the Map to start

Step 3: select full screen mode and play the game with descriptions

**Interior of the Earth URL:**

http://world-geography-games.com/earth/index.html

*Pictures are indicative only

*If browser requires, allow Flash Player or Java Script to load the page.

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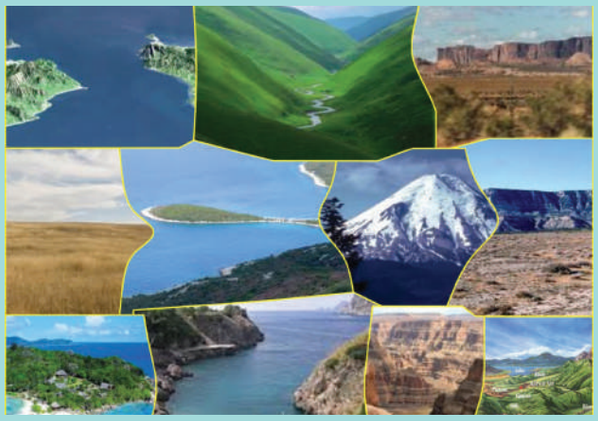


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# Unit -II

# Landforms



## Learning Objectives

To acquaint ourselves with

- To know the landforms which are created by river
- To describe the landforms which are created by glacial action
- To classify the landforms which are produced by wind action
- To identify the various landforms about sea wave
- To compile the landforms which are produced by the work of a river, glacier, wind and sea waves

XKLGQS

In the earlier class, we have learnt that the surface of the earth is not the same everywhere. The earth has an infinite variety of landforms named mountains, plateaus, plains, valley etc., Some parts of the lithosphere may be rugged and some flat. These landforms are a result of two processes – ***the endogenic process*** and ***the exogenic process***. The ***endogenic process*** (internal process) leads to the upliftment and sinking of the earth's surface at several places. The ***exogenic process*** (external process) is the continuous wearing down and rebuilding of the land surface.

***Gradation*** is the process of levelling of highlands through erosion and filling up of lowlands through deposition.

## Landforms

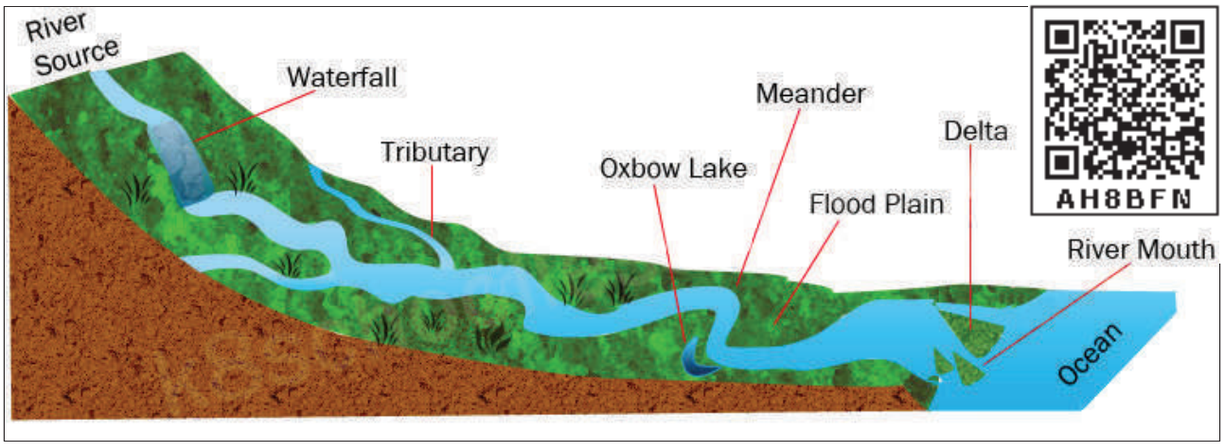
The landscape is being continuously worn away by two processes – ***weathering and erosion***. ***Weathering*** is the breaking and falling apart into small pieces of the rocks on the earth's surface. ***Erosion*** is the wearing away of the landscape by different agents like water, wind, ice and sea waves. The eroded material is carried away by water, wind, etc. and eventually deposited. This process of erosion and deposition create different landforms on the surface of the earth.

### River

The water flowing from its source to river mouth, along a definite course is called a ***River***. Rivers generally originate from a mountain or hill.



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**River Land forms**

The place of origin of the river is known as its ***Source***. The place where it joins a lake or sea or an ocean is known as the ***River mouth***.

The running water in the river erodes the landscape, which creates a steep-sided valley like the letter 'V' known as ***'V' shaped valley***.

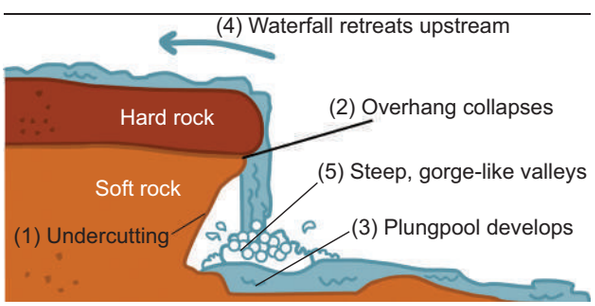


**'V' shaped valley**

DO YOU KNOW?

***Tributary:*** A stream or river that flows into and joins a main river.

***Distributary:*** A stream that branches off and flows away from a main stream.




Falling of river water over a vertical step in the river bed is called ***waterfall***. It is formed when the soft rocks are removed by erosion. E.g. Coutrallam falls across the river Chittar in Tamil Nadu.

DO YOU KNOW?

The highest waterfall is ***Angel Falls*** of Venezuela in South America. The other waterfalls are ***Niagara Falls*** located on the border between Canada and USA in North America and ***Victoria Falls*** on the borders of Zambia and Zimbabwe in Africa.

***Plunge pool*** is a hollow feature at the base of a waterfall which is formed by cavitation. ***Alluvial fan*** is a deposition of sediment occurs at which the river enters a plain or the ***foot-hills***.



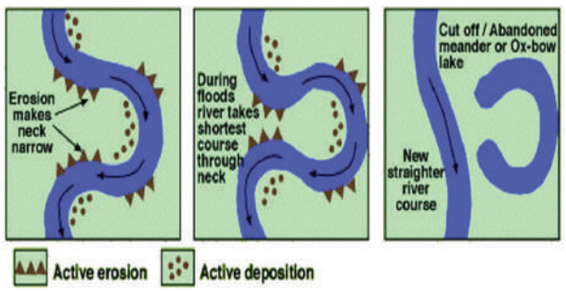
**Meanders**

As the river enters the plain it twists and turns forming large bends known as ***Meanders***. Eg. Meanders along the River Vellar near Sethiyathope in Cuddalore District, Tamil Nadu.



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Due to continuous erosion and deposition along the sides of the meander, the ends of the meander loop comes closer and closer. In due course of time the meander loop cuts off from the river and forms a cut-off lake, also called an ***Ox-bow lake***.



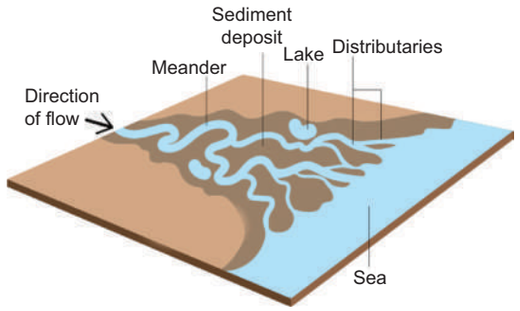

**Ox bow lake formation**

DO YOU KNOW?

The term **'Meander'** has been named on the basis of Meander River of Asia Minor (Turkey), it flows through numerous curves and turns.

At times the river overflows its banks. This leads to the flooding of the neighbouring areas. As the river floods, it deposits layers of fine soil and other material called ***sediments*** along its banks. This leads to the formation of a flat fertile ***floodplain***. The raised banks are called ***levees***.

As the river approaches the sea, the speed of the flowing water decreases and the river begins to break up into a number of streams called ***distributaries***. The velocity of the river becomes so slow that it begins to deposit its load. Each distributary forms its own mouth. The collection of sediments from all the mouths form ***Delta***. Deltas are excellent productive lands. They have more minerals which favour cultivation. E.g. ***Cauvery delta, Ganges delta, Mississippi delta.***




**Delta**

**Activity:**

Find out the names of a few rivers of the world that form a delta with the help of the Atlas.

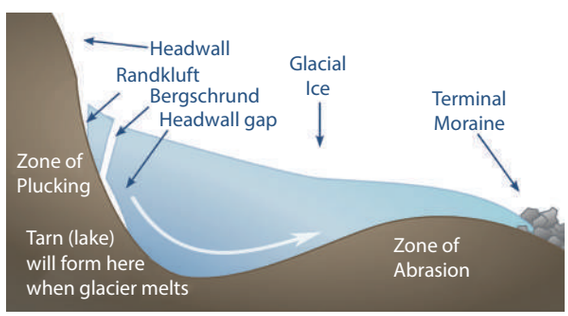
## Glacier

A large body of ice moving slowly down a slope or valley due to gravity is called a ***glacier***. Glaciers are grouped into ***Mountain or Valley Glaciers and Continental Glaciers.***

**Continental Glacier:** The glacier covering vast areas of a continent with thick ice sheets. E.g. ***Antarctica, Greenland***

**Mountain or Valley Glacier** is a stream of ice, flowing along a valley. It usually follows former river courses and are bounded by steep sides. *E.g.* ***The Himalayas and the Alps.***

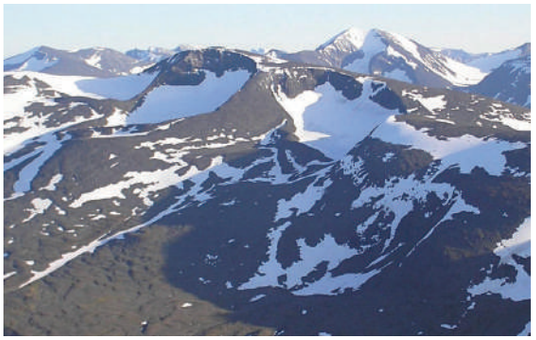
Glaciers erode the landscape by levelling soil and stones to expose the solid rock below. ***Cirque*** is a glacially eroded rock basin, with a steep side wall and steep head wall, surrounding an armchair-shaped depression. E.g. ***Corrie*** – Scotland (United Kingdom), ***Kar*** – Germany.




**Formation of a Cirque**



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**Cirque**

As the ice melts, they get filled up the cirque with water and become beautiful lakes in the mountains called as ***Tarn Lake*****.** When two adjacent cirques erode towards each other, the previously rounded landscape is transformed into a narrow rocky, steep – sided ridge called ***Aretes*****.**



**Arete**

***U' Shaped Valley*** is found beneath the glaciers which is deepened and widened by the lateral and vertical erosion. The material carried by the glacier such as rocks - big and small, sand and silt get deposited. These deposits form ***glacial moraines***.



**Moraine**

## Wind

Have you ever visited a desert? Try to collect some pictures of sand dunes. An active agent of erosion and deposition in the deserts is ***wind***. In deserts you can see rocks in the shape of a mushroom, commonly called ***mushroom rocks***.



**Mushroom Rock**

Winds erode the lower section of the rock more than the upper part. Therefore, such rocks have narrower base and wider top. An isolated residual hill, standing like a pillar with rounded tops are called ***Inselbergs*****.** E.g. Inselberg in the Kalahari Desert of South Africa.



**Inselberg**

When the wind blows, it lifts and transports sand from one place to another. When it stops blowing the sand falls and gets deposited in low hill – like structures. These are called ***sand dunes***. The crescent shaped sand dunes are called ***Barchans*****.**



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**Barchans**

When the grains of sand are very fine and light, the wind can carry it over very long distances. When such sand is deposited in large areas, it is called ***Loess***. Large deposits of loess are found in China.



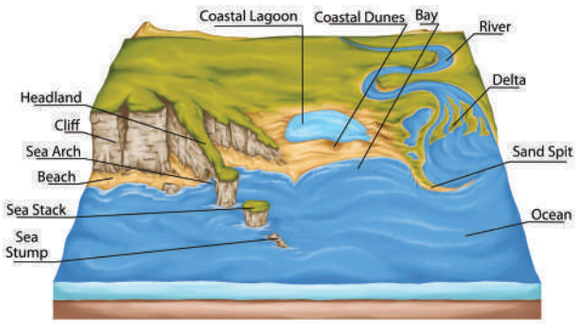
**Loess**




Northern China loess deposits are brought from the Gobi Desert.

## Coast

A part of the land adjoining or near the sea is called the **Sea coast**. The boundary of a coast, where land meets water is called the **Coast line**. The coastal areas are subject to change due to wave erosion and wave deposition.




**Coastal Landforms**

The erosion and deposition of the sea waves give rise to coastal landforms. ***Sea Cliffs*** are steep rock faces formed, when the sea waves dash against them. Sea waves continuously strike at the rocks. Cracks develop. Over time they become larger and wider. Thus, hollow like caves are formed on the rocks. They are called ***Sea Caves***.



**Sea Cliff**



**Sea cave**

As the cavities of sea caves become bigger and bigger only the roof of the caves remains, thus forming ***Sea Arches***. Further, erosion breaks the roof and only walls are left. These walllike features are called ***Stacks***.



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**Sea arch and Sea stack**

The sea waves deposit sediments of sand and gravel along the shores forming **Beaches**. **Sand bar** is an elongated deposition of sand or mud found in the sea, almost parallel to the coast.



**Beach and Sand Bar**

DO YOU KNOW?

The first longest beach in the world is the **Miami beach** in South Florida in U.S.A. The second longest beach in the world is the **Marina beach** in Chennai.



**Miami Beach**

***Lagoon*** is a shallow stretch of water partially or completely separated from the sea. E.g. Chilka lake in Odisha, Pulicat lake in Tamil Nadu and Andhra Pradesh and Vembanad lake in Kerala are the famous lagoons in India.



**Lagoon**

## WRAP UP

- The landscape is being continuously worn away by weathering and erosion.
- River, glacier, wind and sea waves are the major agents of exogenic forces.
- From its source to its mouth, the river is constantly reshaping the land and giving rise to different landforms.
- The river begins to break up into a number of streams called distributaries.
- Deltas are excellent productive lands which have more minerals.
- Glacier is large body of ice moving slowly down a slope due to gravity.
- Moraines are glacial deposition.
- Wind is the active agent of erosion and deposition in deserts.
- The sea waves deposit sediments of sand and gravel along the shores forming beaches.



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7th Social Science Geography Term_1 English Unit _2.indd 172 13-03-2019 3.34.29 PM

| Glossary | | | |
|---|---|---|---|
| 1. | **Gradation** | The process of leveling of highlands through erosion and filling up of lowland through deposition. | சமநிலைப் படுத்துதல் |
| 2 | **Weathering** | Breaking and crumbling up of rocks on the earth's surface. | பாறைச் சிதைவு |
| 3. | **River mouth** | The place where the river joins a lake or an ocean. | ஆற்று முகத்துவாரம் |
| 4. | **Tributary** | A stream or river that flow into and joins a main river. | துணை ஆறு |
| 5. | **Cavitation** | Intense erosion due to the surface collapse of air bubbles found in rapid flow of water. | குழிவு |
| 6. | **Meander** | Twists and turns forming large bends in the river. | ஆற்று வளைவு |
| 7. | **Delta** | The large of sediments a fan shaped by river deposition | ஆற்றுக் கழிமுகம் |
| 8. | **Cirque** | The arm chair shaped depression with steep wall side formed by glacial erosion. | பனி அரி பள்ளம் |
| 9. | **Barchans** | The crescent shaped sand dunes. | பிறைவடிவ மணற்குன்று |
| 10. | **Lagoon** | A shallow stretch of water partially separated from the sea. | காயல் |

## Evaluation

44E22E

### I. Choose the correct answer

1. _____ is a deposition of river sediments along the foot-hills.
   a) Plunge pool b) Alluvial fan
   c) Flood plain d) Delta
2. Courtallam falls is located across the_____ river.
   a) Cauvery b) Pennar
   c) Chittar d) Vaigai
3. The landform created by glacial deposition is
   a) Cirque b) Arete
   c) Moraine d) Tarn lake
4. Large deposits of loess are found in
   a) USA b) India
   c) China d) Brazil
5. _____ are not associated with wave erosion
   a) Cliff b) Sea arch c) Stack d) Beaches

### II. Fill in the blanks

1. The process of breaking and crumbling of rocks is _____.
2. The place where the river joins a lake or a sea is known as _____.



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3. Inselbergs are found in the _____ desert in South Africa.
4. A cirque is known as _____ in Germany.
5. The first longest beach in the world is _____.

## III. Match the following

| | | | |
|---|---|---|---|
| 1. | Breaking and crumbling of rocks – | - | Glacier |
| 2. | Abandoned meander loops | - | Barchans |
| 3. | Large body of moving ice | - | Lagoon |
| 4. | Crescent shaped sand dunes | - | Weathering |
| 5. | Vembanad lake | - | Oxbow lake |

## IV. Consider the following statement and tick ( ✔ ) the appropriate answer

1. **Assertion (A)**: The deltas are formed near the mouth of the river.

   **Reason (R)** : The velocity of the river becomes slow when it approaches the sea.

   a) Both A and R are correct
   b) A is correct and R is wrong
   c) A is wrong and R is correct
   d) Both A and R are wrong

   **Assertion (A)**: Sea arches in turn become Sea Stacks.

   **Reason (R)** : Sea Stacks are the results of wave deposition.

   a) Both A and R are correct
   b) A is correct and R is wrong
   c) A is wrong and R is correct
   d) Both A and R are wrong

## V. Answer the following

1. Define s erosion.
2. What is a plunge pool?
3. How are Ox – bow lakes formed?
4. Name the major landforms formed by glacial erosion.
5. Give a note on Mushroom rocks.
6. What is a lagoon? Give an example.

## VI Distinguish the following

1. Tributary and Distributary
2. 'V' shaped valley and 'U' shaped valley
3. Continental glacier and Mountain glacier

## VII Give Reason

1. The ends of the meander loops come closer and closer.
2. Flood plains are very fertile.
3. Sea caves are turn into stacks.

## VIII Answer in a paragraph

1. Explain different landforms produced by river erosion.
2. Describe the landforms associated with wind.
3. How are aretes formed?

## Activity

**1. Fill in the corresponding columns with reference to the landform features given below**

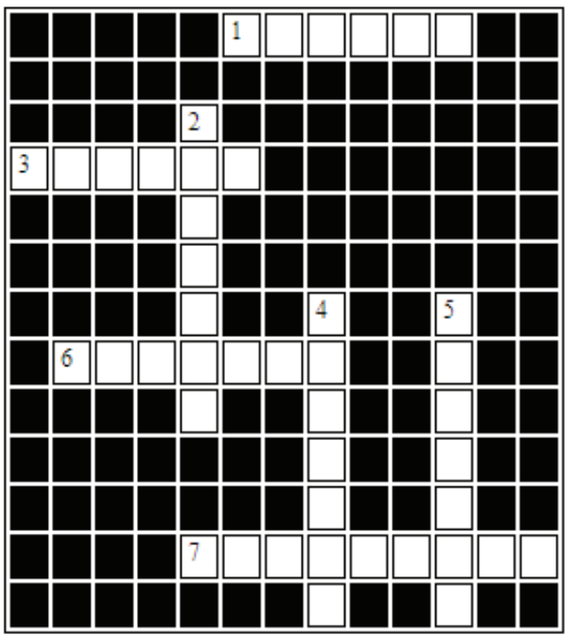
| S.No | Natural Agents | Landforms | |
|---|---|---|---|
| | | Erosion | Deposition |
| 1 | River | | |
| 2 | Glacier | | |
| 3 | Wind | | |
| 4 | Sea wave | | |

**[Barchan, 'V' Shaped valley, Cliff, Arete, Inselberg, Moraine, Alluvial fan, Lagoon]**



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## 2 Crossword Puzzle



### Across

1. Place of origin of the river.
3. Arm chair shaped glacial landform
6. Glacial Depositional feature
7. Vertical drop of water

### Down

2. Lagoon in Tamil Nadu
4. Loops along the river course
5. Wave depositional feature

3. Identify any one of the following features near your home town and write a note on them.
   1. Hill
   2. Waterfall
   3. River (or) stream
   4. Beach.

## Reference


1. Savindra Singh (2015), Physical Geography, Pravalika Publications,Allahabad.
2. Rajeev Gupta (2012), Physical Geography, Sonali Publications, New Delhi.
3. A. Das Gupta, A.N. Kapoor, Physical Geography, S. Chand and Company Ltd, New Delhi.
4. Nater Singh Raina (2012), Contemporary Physical Geography, Concept Publishing Company Pvt. Ltd, New Delhi.




ICT CORNER

## Landforms



**Through this activity you will know about different types of land in the world**

**PROCEDURE:**

**Step – 1** Open the Browser and type the URL given below (or) Scan the QR Code.

**Step - 2** Go to menu and select any types of land (Ex. Glacier)

**Step-3** Roll over the red dot on the map to the right to choose a glacier

**Landforms URL:**

http://www.harcourtschool.com/activity/types_of_land_2/index.html

*Pictures are indicative only

*If browser requires, allow Flash Player or Java Script to load the page.

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# Unit -III

# Population and Settlement



## Learning Objectives

- To know the population, races and their classification
- To learn about the different religions
- To know about the major languages
- To know the favourable conditions for settlement
- To understand the Rural and Urban settlement
- To recognize the classification of settlement

2EJHXR

## Introduction

Population Geography is a study of demographic phenomena which includes natality, morality, growth rates etc., through both space and time. Increase (or) decrease in population indicates population distribution and growth. The study of movements and mobility of population is called migration. Among the human people from place to place the ancient origin is grouped under major races such us language and religion.

## The Races

Race has been defined as a biological grouping within the human species. The race is a group of people with more (or) less permanent distinguishing characteristics that are inherited. The most widely found human racial types are based on visual traits such as head shape, facial features nose shape, eye shape and colour, skin colour, stature, blood groups etc.,

The major world Human races are

- Caucasoid (European)
- Negroid (African)
- Mongoloid (Asiatic)
- Australoid (Australian)

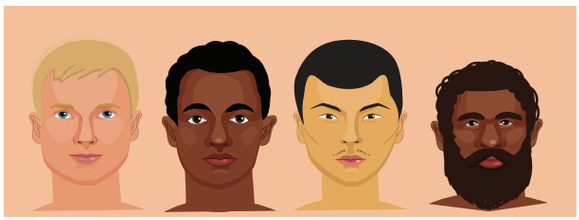
EB6CMM

## Causasoid

The Caucasoid is known as European race. This group is the one with fair skin and dark brown eyes, wavy hair and narrow nose. The Caucasoid are also found in Eurasia.



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DO YOU KNOW?

Human geography is the study of Man and his surroundings to the natural environment

## Negroid

Negroid have the dark eyes, Black skin, black wooly hair, wide nose, long head, and thick lips. They are living in different parts of Africa.

## Mongoloids

The mongoloid race is commonly known as the Asian-American race. The mongoloid have the light yellow to brown skin, straight hair, flat face, broad head and medium nose. Such people are found in Asia and Arctic region

## Australoids

Australoids have wide nose, curly hair dark skin, and short in height. They are living in Australia and Asia.

## Races of India

India is said to be one of the cradle lands of human civilization. The ancient Indus valley civilization in India was believed to have been of Dravidian origin in northern India. The Dravidian people were pushed south when the Indo-Aryan came in later. South India was dominated by the three Dravidian kingdoms of the chera, the cholas, and the pandyas. The Dravidian languages are Tamil, Telugu, kannada, Malayalam and Tulu almost all the Dravidians live in the southern part of India.

## Religion

Religion means a particular system of faith and worship, which brings human being with human society. Religion, is a symbol of group identity and a cultural rallying point.

## Classification of Religion

**a) Universalizing Religions**

Christianity, Islam and Buddhism.

**b) Ethnic Religions**

Judaism, Hinduism and Japanese Shintoism.

**c) Tribal or Traditional Religions**

Animism, Shamanism and Shaman.

| Religion | Place of worship |
|---|---|
| Buddhism | Vihara |
| Christianity | Church |
| Hinduism | Temple |
| Islam | Mosque |
| Jainism | Basadi |
| Judaism | Synagogue |
| Zorostrianism | Agiyari |

## Language

Language is a great force of socialization. Language, either in the written or oral form, is the most common type of communication. Language promotes the transmission of ideas and the functioning of political, economic, social and religious systems.



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Languages in the world




## Languages of India

India has many languages and culture. Each state has its own language though the national language is Hindi, 22 major language were spoken by about 97 percent population of the country. India follows Kashmiri, Urdu, Punjabi, Hindi, Rajasthani, Gujarati, Bengali and Assamese etc., these language are followed in North India. The main languages of the Dravidian family are Tamil, Telugu, Kannada, Malayalam etc., These languages are mainly spoken in southern India.

| Date | Event |
|---|---|
| 11th July | World population day |
| 21st February | International mother language day |
| Third Sunday in January every year | World Religious day |
| 21st May | The World cultural diversity day |

Today usage of language has changed. It is often used as communicational skill. With the different means of communication and fast moving world advancement in technology helps in understanding of different languages very easily with easy access to electronic media along with its pronunciations. These technologies have really brought the world closer.

## Settlement

Settlement is a place where people live and interact through activities such as agriculture, trading and entertainment. A rural settlement is a community, involved predominantly in primary activities such as agriculture, lumbering, fishing and mining. An urban settlement engages in predominantly in secondary and tertiary activities, such as industries, trade and banking. There is often a correlation between the functions, size of population and population density. A rural settlement tends to have a small population and low population density. Urban settlement often has a large population size and high population density.

**Site and situation** refers to the location of the actual settlement. The initial choice of a site for a settlement depends on how it is useful for meeting our daily needs, like water supply, availability of farmland, building material and fuel etc.,

## Old House Types



In the early periods of human settlement, houses were built using local materials. The form of the house was closely related to the environment. In the agricultural regions, houses were built with mud walls and the roof



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was made of stalks of paddy (or) other crops of grass (or) thatch. Local wood was used to provide frame for the roof. Such old houses had wide verandahs and an open air circulation. The size of the house depended on the economic status of its inhabitants.

## Patterns of Settlements

Settlements also be classified into Compact settlements and Dispersed settlement

## Compact settlements

Compact settlement is also known as nucleated settlement. In this type large a number of houses are built very close to each other such settlement develop along the river valleys and fertile plains, In India compact settlements are found in the northern plains and the coastal plains of peninsular India.

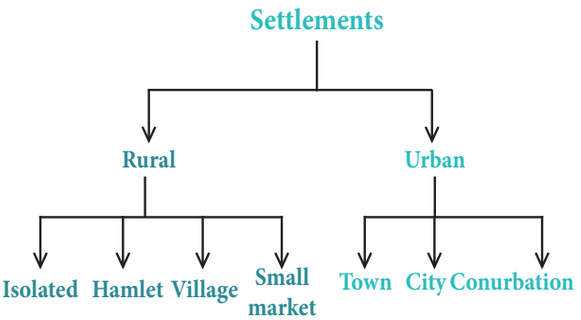


## Dispersed Settlements

Dispersed settlements are generally found in the areas of extreme climate, hilly tracts, thick forests, grasslands, areas of extensive cultivation. In these settlements, houses are spaced far apart and after interspersed with fields. In India this type of human settlement is found in the northern kosi tract, the Ganga delta ,the Thar Desert of Rajasthan and the foot hills of Himalayas and the Niligris.



## A hierarchy of settlements




## Rural settlement



Rural settlements are predominantly located near water bodies such as rivers, lakes, and springs where water can be easily available. People choose to settle near fertile lands suitable for agriculture, along with the provision of other basic needs. Hence, they prefer to live near low lying river valleys and coastal plains suited for cultivation. The availability of building materials like wood, stone and clay near settlements is another advantage, for settlements to be built.



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7th Social Science Geography Term_1 English Unit _3.indd 179 13-03-2019 3.35.04 PM

## Factors Influencing Rural Settlement

- Nature of topography
- Local weather Condition
- Soil and water resources
- Social organisation
- Economic condition

## Pattern of Rural Settlement

The pattern of settlement has been defined as the relationship between a house or building to another. A rural settlement pattern is a function of relief, climate, water supply and socio-economic factor. It is broadly classified under the following patterns, such as Linear, Rectangular, Circular, Star like pattern etc.,

In a **Linear settlement,** houses are arranged along the either side of a road,railway line, river (or) canal,the edge of a valley,etc., e.g. the Himalayas the Alps, the Rockies.



**Linear settlement**

The **rectangular settlements** are almost straight, meeting each other at right angles. Such a settlement is found in plain areas (or) inter montane plain. E.g.,Sutlej. Houses built around a central area are known as **Circular pattern of settlements.** Such settlement develop around lakes and tanks. The **Star like pattern of settlement** develops on the sites and places where several roads converge and houses spread out along the sides of roads in all directions.e.g. The Indo – Ganga plains of Punjab and Haryana



**Star like pattern**



**Circular pattern**




### Pilgrim settlement

Pilgrim settlement may come up around a place of worship(or) any spot with a religious significance. E.g. Thiruverkadu in Tamil Nadu.

## Wet Point Settlement

A wet point is a site with reliable supply of water from wells, tank, river, spring (or) pond in an area.



## Dry Point Settlement

A dry Point settlement is located in low-lying areas in the regions of excessive dampness. Dry point settlements are not affected by flooding, due to the landscape and the source of water. Such settlements are found in the coastal plains of Kerala and deltas along the east coast of India.



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## Urban Settlements

The settlements in which most of the people are engaged in secondary and tertiary activities are known as urban settlements. In other words, urban is related to cities and towns. The word urban is often used in terms of town, city, mega city, conurbation, megalopolis.

## Classification of Urban Settlements

The definition of urban area varies from are country to another. Some of the common basis of classification are

- Size of population
- Occupational structure
- Administration

R7S7CI

## Town

Town is a general name for an urban place, usually a settlement meeting a prescribed minimum population threshold. Population more than 5000 people. Based on the function that cities perform they can be classified into the following types of towns, such as administrative, cantonment, academic etc.,

## City

The term City is generally applied to large urban places with no strict definitions to separate if from smaller town. City is a nucleated settlement which multifunctional in character, including an established central business district. In India an urban place with more than one lakh population is considered as a city **(Population more than 1,00,000).**

## Mega city

A mega city is a very large city typically with a population of more than 10 million people. A mega city can be a single metropolitan area. E.g. Canton, Tokyo, Delhi, Mumbai are some of the examples of megacities.

DO YOU KNOW?

World Health Organization (WHO) suggests that among other things a healthy city must have

- A Clean" and "Safe" environment
- Meets the basic needs of "All" its inhabitants
- Involves the "Community" in local government
- Provides easily accessible "Health service.

## Megalopolis

The word megalopolis is given for a large conurbation, when two or more large cities whose total population exceeds ten million. The region made up of cities between Boston and Washington D.C is a well-known megalopolis. In India, Kolkata is the largest urban area which is a megalopolis. Gandhinagar, Surat, Vadodara, Rajput in Gujarat are the important megalopolis cities in India.

## Conurbation

A Conurbation is a region comprising of a number of cities, large town, and other urban areas that through population growth and physical expansion have merged to form one continuous urban (or) industrially developed area. West Midland in England, the Ruhr in Germany, Randstad in the Netherlands are example of conurbations. Mumbai in Maharashtra, Gurgaon, Faridabad in Haryana, Noida in Uttar Pradesh are the conurbation cities of India.



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## Satellite Town



A satellite town is a town designed to house the over population of a major city, but is located well beyond the limits of that city. Satellite towns are generally located outside the rural urban fringe. In India most satellite towns are purely residential in character. Satellite towns occasionally present a look of twin towns such as Dehri and Dalmianager in Rohtas district of Bihar. They may be connected with roads. For e.g. Patna, Barauni, Varanasi and Hajipur.

## Smart City




In an urban region, a city which is very much advanced in terms of infrastructure, real estate, communication and market availability is called a Smart City. The first ten smart cities of India are Bhubaneshwar, Pune, Jaipur, Surat, Ludhiana, Kochi, Ahmedabad, Solapur, New Delhi and Udaipur. Tamil Nadu has 12 major cities to be transformed as smart cities. They are Chennai, Madurai, Tirunelveli, Tiruchirappalli ,Thanjavur, Tiruppur, Salem, Vellore, Coimbatore, Thoothukudi, Dindigul and Erode.

| Rural | Urban |
|---|---|
| Rural areas have predominantly primary activities (agriculture) | Urban areas have domination of secondary and tertiary activities (Industries) |
| Sparsely populated | Densely populated |
| Villages and hamlet | Cities and towns |
| Agriculture works | Non Agricultural works |
| Simple and relaxed life | Fast and complicated life |

## Wrap up

- Races has been defined as a biological grouping within the human species, distinguished or classified according to genetically transmitted differences
- Caucasoid (European) Negroid (African) Mangoloid (Asiatic) Australoid (Australia) are the major classification of races
- Religion is classified into universalizing Ethnic and Tribal religion
- Language is a cultural form of enduring value and a culture can survive with the presence of language only
- Settlement is defined as a place in which people live and carryout various activities
- Settlement may be classified on basis of occupation as rural (village) and Urban (town)
- Compact settlements develops along river valleys and infertile plains
- Dispersed settlement are generally found in the areas of extreme climates, hill tracks, thick forest, grassland and in poor agricultural land.
- Smart city is a city which very much advanced in terms of infrastructure.



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## Exercises

### I. Choose the correct answer

1. Caucasoid race is also known as _____ race
   a) European b) Negroid
   c) Mangoloid e) Australoid
2. _____ Race is Known as Asian - American Race
   a) Caucasoid b) Negroid
   c) Mongoloid d) Australoid
3. The official language of India is _____
   a) Marathi b) Tamil
   c) English d) Hindi
4. Rural settlements are located near _____
   a) Water bodies b) Hilly areas
   c) coastal areas d) desert areas
5. Arrange the following in terms of size
   1) City 2) Megalopolis 3) Metropolis 4) Conurbation
   a) 4,1,3,2 b) 1,3,4,2
   c) 2,1,3,4 d) 3,1,2,4

### II. Fill in the blanks

1. The Bushmen is found mainly in _____ desert in South Africa
2. Lingustic stock is a group of _____ family sharing features and its origin
3. In _____ settlements, where most of the people are engaged in secondary and tertiary activities
4. _____ towns are generally located outside the rural Urban fringe.
5. _____Settlement Come up around a place of Worship

### III. A. Match the following

| | A | | B |
|---|---|---|---|
| 1. | Caucasoid | – | Asian - American |
| 2. | Negroid | – | Australia |
| 3. | Mongoloid | – | European |
| 4. | Australoid | - | African |

### B. Match the following

| | A | | B |
|---|---|---|---|
| 1. | Sutlej-Ganga pain | – | Dispersed settlement |
| 2. | Nilgris | – | Star like pattern |
| 3. | South India | – | Rectangular pattern |
| 4. | Seacoast | – | Compact settlement |
| 5. | Haryana | – | Circular settlement |

### IV. Consider the following statement and (√) Tick the appropriate answer

1. **Assertion** (A): There are numerous languages spoken in the world

   **Reason** (R): The linguistic diversity in the world is vast.

   a) A and R are correct and A explains R.
   b) A and R are correct but A does not explain R.
   c) A is incorrect but R is correct.
   d) Both A and R are incorrect.

2. **Assertion** A: Thiruverkadu in Tamil Nadu is an example for pilgrim settlement

   **Reason** (R): Iron and steel industry is located there



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a) R is the correct explanation of A
b) R is not the correct explanation of A
c) A is wrong and R is correct a)
d) A and R are wrong

## V. Circle the odd one out

1. Fishing, lumbering, agriculture, banking
2. Himalayas Alps Rocky Ganga
3. Chennai, Madurai, Tirunelveli, Kanchipuram

## VI. Answer the following

1. What are the classification of Races?
2. What is language?
3. Describe the classification of religion.
4. Define settlement
5. On what basis Urban settlements are classified?
6. Write a note on smart city

## VII. Give reason

1. India has a huge crucible racial mixing races since pre historic times
2. Mumbai is a mega city
3. Himalayas have dispersed settlement.

## VIII. Distinguish between

1. Physical Geography and Human Geography
2. Language and Religion
3. Negroid and Mangoloid
4. City and town
5. Urban settlement and rural settlement

## IX. Answer the following in a paragraph

1. Write about the four major classification of races.
2. Write about the main features of religious life.
3. What are the factors influencing rural settlement?
4. What are types of rural settlement? Explain any three.

## X. Activity

Analyze

| | | |
|---|---|---|
| 1 | Where do you live? | Rural / Urban |
| 2 | Name the pattern of settlement | |
| 3 | Sources of water available in your area | |
| 4 | What is the important activity of your locality | |
| 5 | Name the types of transport available | |

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# Unit -I

# Resources



## Learning Objectives

- To know the importance of resources
- To describe the renewable resources
- To understand the non-renewable resources
- To identify the fossil fuel resources

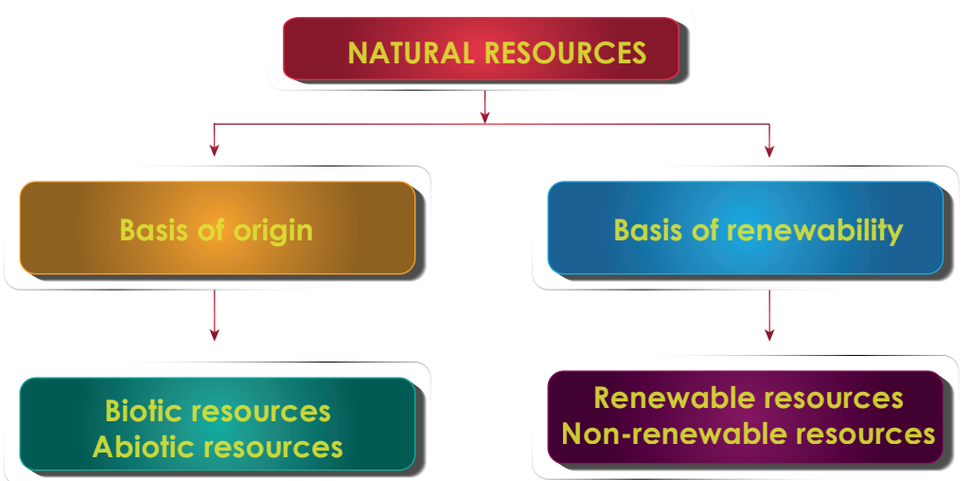
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## Introduction

A country's social, economic and political strength lies in the distribution, utilization and conservation of its resources. Anything which can be used for satisfying the human needs is called resource. Natural resources are resources that exist without action of humankind. Natural resources are obtained from environment. Many natural resources are essential for human survival. Resources always cannot be consumed in their original form, but they must be processed into usable commodities and usable things.

## Importance of resource

- Natural resources satisfy daily needs of man such as food, clothing and shelter.
- Natural resources also contribute immensely to boost up a nation's economy.






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On the basis of origin, resources may be divided into two types. They are:

1. Biotic resources
2. Abiotic resources

## 1. Biotic resources

Biotic resources are found in the biosphere which are obtained from living and organic materials. It includes forests, crops, birds, animals, fishes, man and materials that can be obtained from them. Fossil fuels such as coal and petroleum are also included in this category because they are formed from decayed organic matter.

## 2. Abiotic resources

Abiotic resources are the non-living parts of an environment. Examples of abiotic resources include land, water, air, sunlight and heavy metals including ores such as gold, iron, copper, silver etc.

On the basis of renewability, resources can be divided into two types. They are:

1. Renewable resources
2. Non - renewable resources

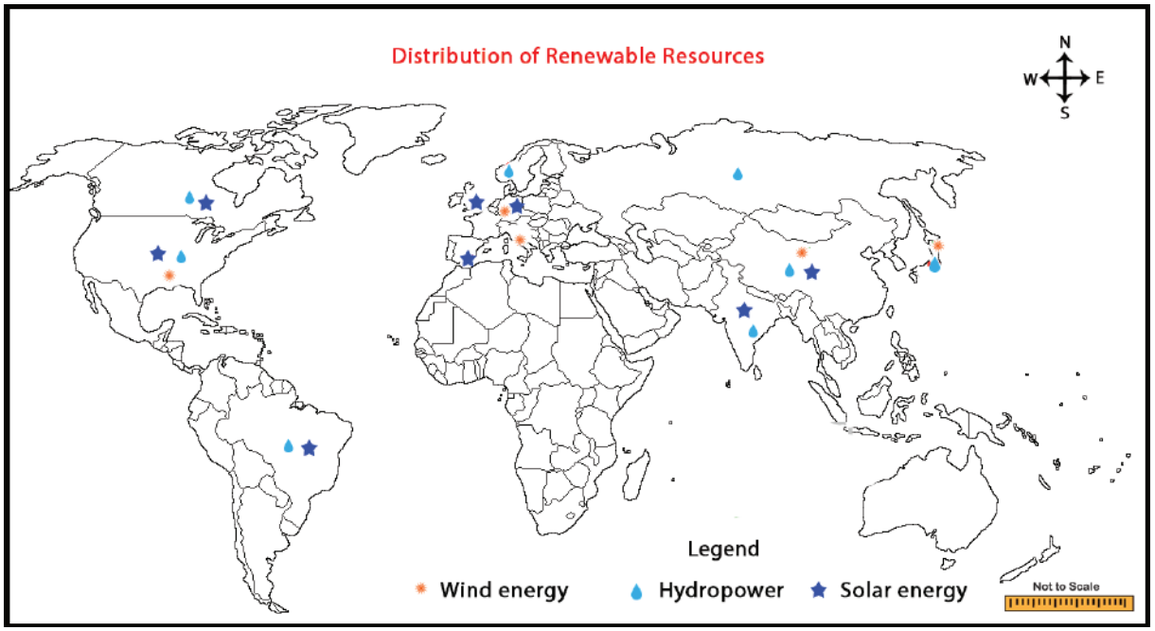
## 1. Renewable resources

A renewable resource is a resource which can be used repeatedly and replaced naturally. Renewable resources harvested and used rationally will not produce pollution. The use of renewable resources and energy sources is increasing worldwide.

**Example:** solar energy, wind energy, and hydropower.

## Solar energy

The sun produces energy in the form of heat and light. Solar energy is not harmful to the environment. Photovoltaic devices or solar cells, directly convert solar energy into electricity. Individual solar cell in group panel can perform small applications from charging calculator, watch batteries, to large such as to power residential dwellings. Photovoltaic power plants and concentrating solar power plants are the largest solar applications covering acres. India, China, Japan, Italy and States of America are major utilizers of solar energy in the world.






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DO YOU KNOW?

Kamuthi solar power project is one of the largest solar power projects in the world. It is situated in Ramanathapuram District in Tamilnadu. The Kamuthi solar power project was completed on 21st September 2016. Investment of this project is around 4,550 Crores. The installed capacity of this project is 648 MW.



Kamuthi solar power plant

## Wind energy

Wind power is clean energy since wind turbines does not produce any emissions. In recent years, wind energy has become one of the most economical and renewable energy technologies. The Classic Dutch windmill harnessed the wind's energy hundreds of years ago. Modern wind turbines with three blades dot the landscape today, turning wind into electricity. Major wind energy producing countries are United States, China, Germany, Spain, India, United Kingdom, Canada and Brazil.



Wind mill

## Major wind farms in India

| S. No. | Wind Forms | District | State | Installed Capacity (MW) |
|---|---|---|---|---|
| 1. | Muppandal | Kanyakumari | Tamil Nadu | 1,500 |
| 2. | Jaisalmer | Jaisalmer | Rajasthan | 1,064 |
| 3. | Brahmanvel | Dhule | Maharashtra | 528 |
| 4. | Dhalgaon | Sangli | Maharashtra | 278 |
| 5. | Damanjodi | Damanjodi | Odisha | 99 |

## Hydropower

Water is considered as a great source of energy. At present, water is used for producing hydroelectric power. Hydroelectricity is generated from moving water with high velocity and great falls with the help of turbines and dynamos. Hydroelectricity power is the cheapest and most versatile source of energy out of all the known energy. Hydroelectric power is a renewable resource. China, Canada, Brazil, United States of America, Russia, India, Norway and Japan are some countries producing hydroelectricity. China is the largest producer of hydro-electricity.



Itaipu Dam, Brazil and Paraguay



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| S. No. | Hydro - electricity project | Installed Capacity (MW) | State |
|---|---|---|---|
| 1. | Tehri Dam | 2,400 | Uttarakhand |
| 2. | Srisailam Dam | 1,670 | Andhra Pradesh |
| 3. | Nagarjuna Sagar Dam | 960 | Andhra Pradesh |
| 4. | Sardar Sarovar Dam | 1,450 | Gujarat |
| 5. | Bhakra Nangal Dam | 1,325 | Punjab |
| 6. | Koyna Dam | 1,960 | Maharashtra |
| 7. | Mettur dam | 120 | Tamil Nadu |
| 8. | Idukki dam | 780 | Kerala |

| S.No. | Name of the Project | Country | River | Installed Capacity in MW |
|---|---|---|---|---|
| 1. | Three gorges Dam | China | Yangtze | 22,500 |
| 2. | Itaipu Dam | Brazil and Paraguay | Parana | 14,000 |
| 3. | Xiluodu Dam | China | Jinsha | 13,860 |
| 4. | Guri Dam | Venezuela | Caroni | 10,235 |
| 5. | Tucurui Dam | Brazil | Tocantins | 8,370 |




Three Gorges Dam in China is the largest hydroelectricity project in the world. It's construction started in 1994 and ended in 2012. The installed capacity of the dam is 22,000MW.



Three Gorges Dam, China

## Non-renewable resources

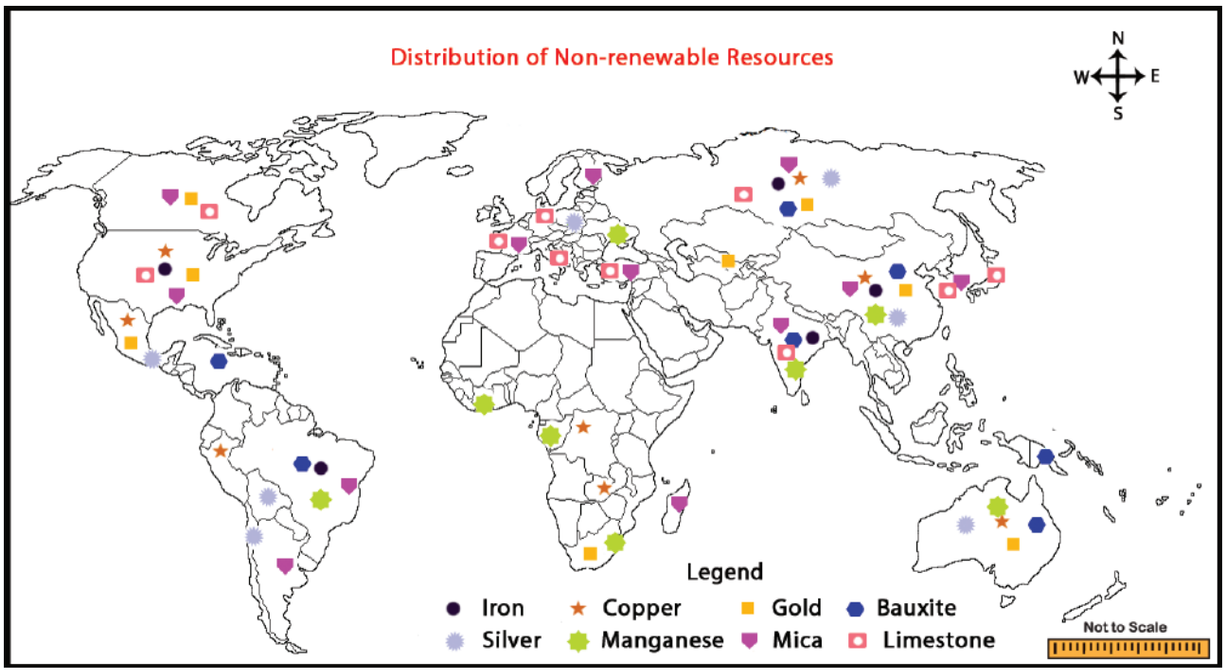
Natural resources that once consumed and cannot be replaced is called non-renewable resources. Continuous consumption of non-renewable resources ultimately leads to exhaustion. Examples of non-renewable resources include fossil fuels such as coal, petroleum, natural gas and mineral resources such as iron, copper, bauxite, gold, silver and others. Non-renewable resources can be divided into three types. They are:

- ❖ Metallic resources
- ❖ Non - Metallic resources
- ❖ Fossil fuel resources



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## Metallic resources

Metallic resources are the type of resources that are composed of metals. These are hard substances, which are the good conductors of heat and electricity. Example for metallic resources are iron, copper, gold, bauxite, silver, manganese, etc.

## Iron

Iron is the fourth most common element in the Earth's crust and the most widely available metal. Magnetite and hematite are the common ore for iron, which occurs normally in the rocks of the crust. Iron ore is the key raw material in making steel and 98% of the iron ore extracted is used to make Steel. Pure iron ore is very soft, but its strength is increased many folds by adding small amount of carbon and manganese. It's low cost and high earth strength makes it usable in engineering applications, such as the construction of machinery and machine tools, automobiles, construction of large ships, structural components of building, bridges etc.

Iron ore is mined in about 50 countries. Among the iron ore producing countries China, Australia, Brazil, India and Russia are the principal producers accounting for 85% of the world's total output of iron ore. These countries have 70% of the total reserves of the world. Jharkhand, Odisha, Madhya Pradesh, Chhattisgarh, Karnataka and Goa account for over 95 per cent of the total reserves of India. Iron ores found at Kanjamalai in Tamil Nadu.

## Copper

Copper is one of the first metals known and used by man. Copper ranks as the third most consumed industrial metal in the world after Iron and Aluminium. Copper is good conductor of heat and electricity. About three quarters of copper is used to make electrical wires, telecommunication cables and electronics.

Chile is the world's number one country in the production of copper. Other copper producing countries are Peru, China, United States, Congo and Australia.



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## Gold

It is a rare and precious metal. Hence, it has high demand in world markets. Formerly, it was used for minting coins, but now it is used for making ornaments and in dentistry. It is regarded as a symbol of prosperity and a form of wealth.

China is the world's largest producer of gold. Also, Australia, Russia, United States, South Africa and Canada are the major producers of gold. Among these countries, Australia has 9500 tons reserves of gold ore and it is world's leading country in gold ore reserves. Karnataka is the largest producer of gold in India. Kolar Gold Field is one of the deepest mines of the world.



Kolar Gold Field

## Bauxite

Aluminium is produced from bauxite ore. There are several ores that contain aluminium but bauxite contains more aluminium. Aluminium has wide range of uses compared to other metals. Aluminium is light in weight, tough and cheaper, which makes it popular metal for constructional purpose. It is mainly used in the construction of aircrafts, ship, automobiles, railway coaches and etc. Aluminium is a good conductor of electricity and heat, hence, it is used for making electrical cables. It is highly resistant to corrosion. By the addition of small quantities of other metals to aluminium, it creates superior alloy than pure aluminium. **E.g:** Duralumin.

Australia is the world's leading bauxite producer. Apart from that, China, Brazil, India, Guinea, Jamaica and Russia also play an important role in bauxite production. One fourth of the bauxite mineral deposits found in Guinea alone. Odisha, Gujarat, Jharkhand, Maharashtra, Chhattisgarh, Tamil Nadu and Madhya Pradesh are the main bauxite producing states in India. The bauxite deposits are mainly found in the Shervaroy hills of Salem district, Tamil Nadu.

## Silver

Silver is also a precious metal like gold. It has a wider variety of uses than gold. It is used in making jewellery, dentistry, photographic goods, electroplating industry and in the manufacture of luxury goods. About two-third of silver is used for monetary purposes. Like gold, silver also resists corrosion.

Mexico is the world's leading silver producer. Following Mexico, Peru, China, Russia, Australia and Chile produce more silver. More than 50% of silver is found only in South American countries.

## Manganese

Manganese is a steel-greyed, hard, shiny and brittle metal. The common ores of manganese are Pyrolusite Manganese, Psilomelane and Rhodochrosite. Manganese is essential for the production of good quality Steel. Manganese is used in making electrical batteries. It is also used as colouring material in bricks, pottery, floor tiles. Manganese compounds are used in making disinfecting liquids, bleaching powder, fertilizers etc.



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South Africa is the world's leading producer of manganese. The significant producers of manganese in the world are China, Australia, Gabon, Brazil and India. All these producers have large reserves of manganese and are significant exporters in the world.

## Non-metallic resources

Non-metallic resources can be described as the resources that do not comprise of metals. These are not hard substances, and are not good conductors of heat and electricity. Example for non-metallic resources are mica, limestone, gypsum, dolomite, phosphate, etc.

## Mica

Muscovite and Biotite are the common ores of Mica. It is one of the indispensable minerals used in electrical and electronics industry. It is used as an insulating material in electrical industry. In powder form, it is used for making lubricating oils and decorative wallpapers.

China is the world's top producer of mica. Russia, Finland, United States, Turkey and Republic of Korea also play a major role in the production of mica. About 95 per cent of India's mica is found in just three states of Andhra Pradesh, Rajasthan and Jharkhand.

## Limestone

Limestone is a sedimentary rock, composed mainly by skeletal fragments of marine organisms such as coral, foraminifera and molluscs. About 10% of sedimentary rocks are limestones. Mostly limestone is made into crushed stone and used as a construction material. It is used for facing stone, floor tiles, stair treads, windows sills and many other purposes. Crushed limestone is used in smelting and other metal refining process. Portland cement is made from limestone.

China produces more than half of limestone production in the world. Beside this, United States, India, Russia, Brazil and Japan also produce more Limestone. Madhya Pradesh, Rajasthan, Andhra Pradesh, Gujarat, Chhattisgarh and Tamil Nadu Produce over three-fourths of the total limestone of India. In Tamil Nadu, Large scale limestone reserve found in Ramanathapuram, Tirunelveli, Ariyalur, Salem, Coimbatore and Madurai districts.

## Fossil fuel resources

Fossil fuel resources are normally formed from the remains of dead plants and animals. They are often referred to as fossil fuels and are formed from hydrocarbon. When fossil fuels are burned, they become a great source of heat energy. Example for fossil fuel resources are coal, petroleum and natural gas.

## Coal

This is the most abundantly found fossil fuel that forms when dead plant matter is converted into peat. It is used as a domestic fuel, in industries such as iron and steel, steam engines to generate electricity. Electricity produced from coal is called Thermal Power. Coal is classified into four types based on carbon content. They are:

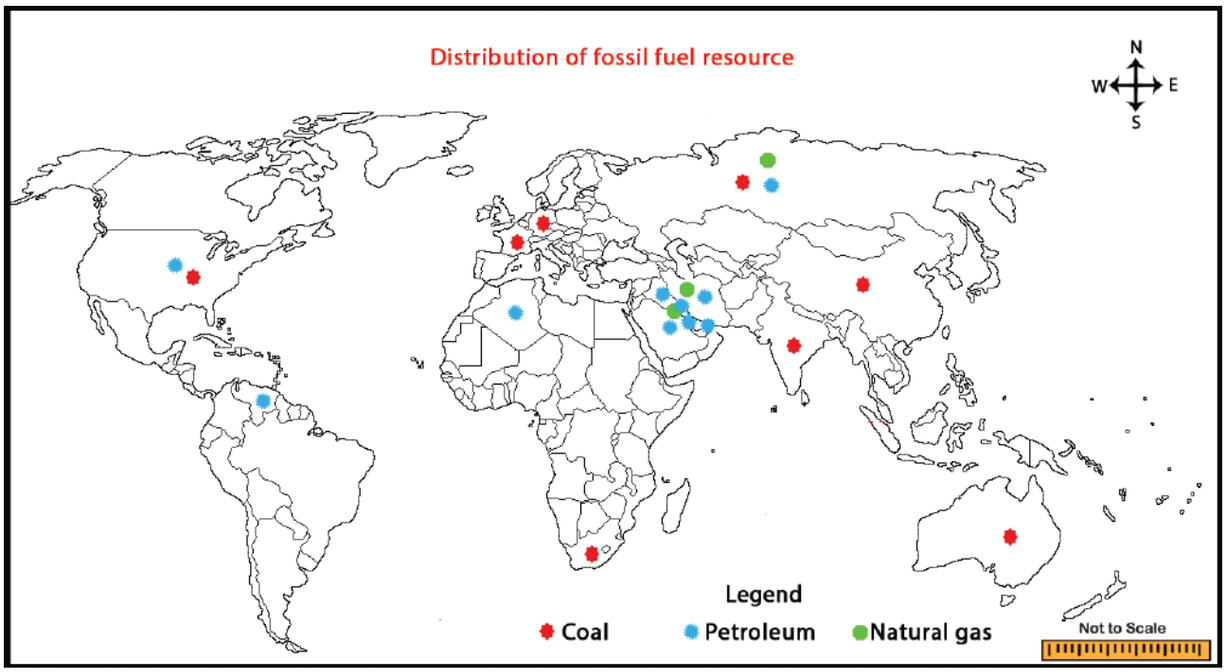
1. Anthracite
2. Bituminous
3. Lignite
4. Peat.

The leading coal producers of the world is China. Beside this, India, USA, Australia, Indonesia and Russia also produce more coal. The coal producing areas of India are Raniganj in West Bengal, Neyveli in Tamil Nadu, Jharia, Dhanbad, and Bokaro in Jharkhand.



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Neyveli coal field




Most of the coal deposite that we use now, where formed about 300 million years ago. Much of the earth was covered with steamy swamps. As the plants and trees are dead, their remains were buried underneath the swamps. Eventually, they were transformed into coal beneath the ground due to excessive heat and pressure.

## Petroleum

Petroleum is found between the layers of rocks and is drilled from oil fields located in Offshore and coastal areas. This is sent to refineries which process crude oil and produce variety of products like diesel, petrol, kerosene, wax, plastics and lubricants. Petroleum and its derivatives are called **Black Gold** as they are very valuable.

The chief petroleum producing countries are Saudi Arabia, Iran, Iraq and Qatar. The other major producers are USA, Russia, Venezuela, Kuwait, UAE and Algeria. The leading producers in India are Digboi in Assam, Bombay High in Mumbai and the deltas of Krishna and Godavari rivers.



Bombay High oil field

## Natural gas

Natural gas is found with petroleum deposits and is released when crude oil is brought to the surface. It can be used as a domestic and industrial fuel.



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More than 50% of the global natural gas reserves are found in United States of America, Russia, Iran and Qatar.

In India, Krishna and Godavari Delta, Assam, Gujarat and some areas of offshore in Mumbai have natural gas resources.

## Wrap up

- Natural resources are obtained from environment.
- Renewable resources can be used repeatedly and replaced naturally.
- Non-renewable resources once consumed, cannot be replaced.
- Solar energy is not harmful to the environment.
- Hydroelectricity is generated from moving water with high velocity and great falls with the help of a turbines and dynamos.
- Metallic resources are iron, copper, gold, bauxite, silver, manganese etc.
- Non-metallic resources are mica, limestone, gypsum, dolomite, phosphate, etc.
- Fossil fuels resources are normally formed from the remains of dead plants and animals.

| Glossary | | | |
|---|---|---|---|
| 1. | Biotic resources | obtained from living and organic materials | உயிரியல் வளங்கள் |
| 2. | Abiotic resources | obtained from non-living, non-organic materials | உயிரற்ற வளங்கள் |
| 3. | Hydroelectricity | generated from moving water with high velocity and great falls with the help of turbines and dynamos | நீர் மின் சக்தி |
| 4. | Metallic resources | resources that are composed of metals | உலோக வளங்கள் |
| 5. | Non-metallic resources | resources that do not comprise of metals | உலோகம் அல்லாத வளங்கள் |
| 6. | Duralumin | a hard, light alloy of aluminium with copper and other elements | துராலுமின் |
| 7. | Fossil fuel | formed from the remains of dead plants and animals | படிம எரிபொருள் |
| 8. | Thermal Power | Electricity produced from coal | அனல் மின் சக்தி |
| 9. | Black Gold | Petroleum and its derivatives | கருப்புத் தங்கம் |
| 10. | Precious metal | a metal that is valuable and usually rare | விலை மதிப்பற்ற உலோகம் |



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7th Social Science_Term_II_Geography_ Unit_1.indd 143 20-07-2019 1.53.08 PM

## Evaluation

### I. Choose the correct answer

1. Which one of the following is renewable resource?

   a) Gold b) Iron
   c) Petrol d) solar energy

T5X2H6

2. Where is the largest solar power project situated in India?

   a) Kamuthi b) Aralvaimozhi
   c) Muppandal d) Neyveli

3. Which is one of the first metals known and used by man?

   a) Iron b) copper
   c) Gold d) Silver

4. ----------is one of the indispensable minerals used in electrical and electronics Industry.

   a) Limestone b) Mica
   c) Manganese d) Silver

5. Electricity produced from coal is called----------

   a) Thermal Power b) Nuclear power
   c) Solar power d) Hydel power

### II. Fill in the blanks

1. ---------- is the largest producer of hydro-electricity.
2. Iron ores found at ---------- in Tamil Nadu.
3. ---------- is produced from bauxite ore.
4. ----------is used in making electrical batteries.
5. Petroleum and its derivatives are called----------.

### III. Match the following

| | | |
|---|---|---|
| 1. | Renewable resource | - Iron |
| 2. | Metallic resource | - Mica |
| 3. | Non-metallic resource | - Wind energy |
| 4. | Fossil fuel | - Sedimentary rock |
| 5. | Limestone | - Petroleum |

### IV. Consider the following statement and tick (✓) the appropriate answer

**1. Assertion (A) :** Wind power is Clean Energy.

**Reason (R) :** Wind turbines do not produce any emissions

a. A and R are correct and R explains A
b. A and R are correct but R does not explain A
c. A is incorrect but R is correct
d. Both A and R are incorrect

**2. Assertion (A) :** Natural gas is found with petroleum deposits.

**Reason (R) :** It can be used as a domestic and industrial fuel.

a. A and R are correct and R explains A
b. A and R are correct but R does not explain A
c. A is incorrect but R is correct
d. Both A and R are incorrect

### V. Answer the following

1. Define - Resource.
2. What are the uses of iron?
3. What are the major utilizers of solar energy in the world?
4. Name the types of coal based on carbon content.
5. Give a short note on Duralumin.

### VI. Distinguish the following

1. Biotic resources and abiotic resources
2. Renewable resources and non-renewable resources
3. Metallic resources and non-metallic resources



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7th Social Science_Term_II_Geography_ Unit_1.indd 144 20-07-2019 1.53.08 PM

## VII. Give reason

1. Aluminium has wide range of uses compared to other metals.
2. Water is considered as a great source of energy.

## VIII. Answer in a paragraph

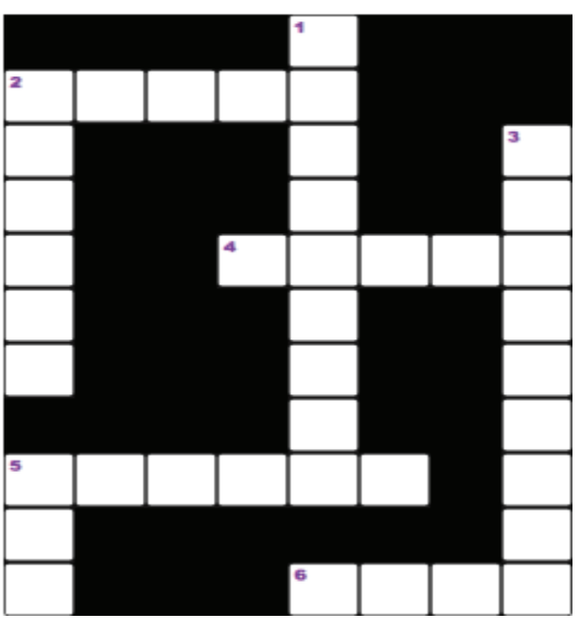
1. Explain the different types of renewable resources.
2. Describe the non-metallic resources.
3. What are the different types of fossil fuel resources? Explain them.

## IX. Activity

1. Mark the metallic resources on the given outline map of the world.



2. Crossword puzzle




**Across**

2. The leading coal producers of the world
4. Considered as a great source of energy
5. Precious metal like gold
6. Used as an insulating material in electrical industry

**Down**

1. Used in making electrical batteries
2. Good conductor of heat and electricity
3. The largest producer of gold in India
5. Produces energy in the form of heat and light

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# Unit -II

# Tourism



## Learning Objectives

- Define the concept of tourism
- Appreciate the basic and geographical components of tourism
- Understand the types of tourism
- Identify the places of tourist attraction in India
- Explain the places of tourist attraction in Tamil Nadu

Q8C5L3

## Introduction

The word tourist was derived from an old English word "tourian" which refers to a person who travels out of his usual environment for not more than one year and less than 24 hours. The purpose of travel may be religious, recreation, business, historical and cultural.

## The Basic components of Tourism

Tourism has become an important source of income for many regions and even for the entire countries of the world. Tourism is an essential part of the life of the society because of its direct impact on social, cultural, educational and economic sector of the nation and on their international relations too.

The three main components of tourism are

- Attraction
- Accessibility
- Amenities.

These three components are together known as A3 concept.

## Attractions

Attractions mainly comprise of two types such as:

- Natural attraction
- Cultural attraction

**Natural attraction** includes landscape, seascape, beaches, climatic condition and forests. **Cultural attraction** are historic monuments and other intellectual creations. Apart from this, cultural attractions also includes fairs and festivals.



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7th Social Science_Term_II_Geography_ Unit_2.indd 146 20-07-2019 1.53.27 PM

## Accessibility

Accessibility means reachability to a particular place of attraction through various means of transportation such as road, rail, water and air. Transport decides the cost of travel and the time consumed in reaching or accessing a specific attraction.

## Amenities

Amenities are the facilities that cater to the needs of a tourist.

1. Accommodations in terms of hotels, restaurants, cafes and other staying units.
2. Travel organizers, Tour operators and Travel Agents
3. Foreign exchange centres, passport and visa agencies
4. Sectors related to Travel Insurance, Safety and Security

## Types of Tourism

From the ancient times, travel is a fascination for mankind. Tourism can be divided on the basis of nature, utility, time and distance as indicated below.

- Religious tourism
- Cultural tourism
- Historical tourism
- Eco-Tourism
- Adventure tourism
- Recreational tourism

## Religious Tourism

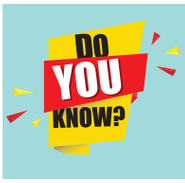
Religious tourism is one of the oldest type of tourism, wherein people travel individually or in groups for pilgrimage to a religious location such as temples, churches, mosques and other religious places. Religious tour to Kasi (Varanasi) by Hindus, to Jerusalem by Christians and to Mecca by Muslims are few of the examples for religious tourism.

## Historical Tourism

It focuses on visiting historically important places like museums, monuments, archaeological areas, forts, temples and so on. Angkorwat of Cambodia, Tajmahal of India and Pyramids of Egypt are some of the examples to quote for Historical Tourism.

## Eco-Tourism

Eco tourism typically involves travel to destinations where plants and animals thrive in a naturally preserved environment. Amazon rain forest, African forest safari, trekking in the slopes of Himalayas are the famous incredible Eco friendly attractions.




Gastronomy refers to an aspect of **cultural tourism.**

## Adventure Tourism

Adventure tourism is a type of tourism involving travel to remote or exotic places in order to take part in physically challenging outdoor activities. For e.g. sky dive in Australia, Bungee jumping in New Zealand, mountaineering in the peaks of Himalayas, rafting in the Brahmaputra River at Arunachala Pradesh.

## Recreational Tourism

This type of tourism aims at enjoyment, amusement or pleasure are mainly for 'fun activity'. Waterfalls, hill stations, beaches, and amusement parks are the attractive spots for recreational tourism.



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7th Social Science_Term_II_Geography_ Unit_2.indd 147 20-07-2019 1.53.27 PM

Apart from this, there are certain modern types of tourism, which got developed in recent years.

**They are**

- ❖ Annual Holiday tourism
- ❖ Industrial Tourism
- ❖ Seasonal Tourism
- ❖ International Tourism
- ❖ Group Tourism
- ❖ Sports Tourism
- ❖ Health Tourism
- ❖ Farm and Rural Tourism.

DO YOU KNOW?

**Inbound Tourism:** Touring within the native country.

**Outbound Tourism:** Touring in foreign countries

## International Tourism

International tourism is undertaken to visit the places of international importance and to gather knowledge about international culture and customs. For this, there are certain travel forms and formalities to be fulfilled by the tourists, such as passport, Visa, Foreign Currency, Air ticket, Travel insurance, and other immigration details.



Singapore

DO YOU KNOW?

VISA – A document issued to a person (or) a stamp marked on the passport of a person who wants to visit other country.

Tourist VISA - Recreation sight seeing

Student VISA – Higher education

Employment VISA – Work in a country

Medical VISA – Medical treatment in a reputed hospital of a country

## Basic Elements of Tourism attractions

Certain elements are fundamental to attract tourists as travel destinations. They are

- ❖ Pleasant weather
- ❖ Scenic beauty
- ❖ Historical and cultural monuments

## Geographical Components of Tourism

**1. Landforms** : Mountains, Plateaus, Canyons, Valleys, Caves, Cirques, Sand dunes, Coral reefs, Cliffs, etc.,

**2. Water** : Rivers, Lakes, Waterfalls, Hot springs and Geysers, Snow and Glacier, Water Currents, Tides and Waves.

**3.Vegetation :** Forest, Grasslands, Moors, Deserts etc.,

**4.Climate:** Sunshine, Clouds, Admirable Temperature, Rain and Snow.

**5.Animal life:-**

(a) Wildlife : Birds, Game Reserves, Zoos.

(b) Hunting and Fishing

**6. Settlement features:-**

(a) Towns, Cities, Villages

(b) Historical remains and Monuments



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7th Social Science_Term_II_Geography_ Unit_2.indd 148 20-07-2019 1.53.28 PM

**7. Culture:-**

Ways of life, traditions, folklore, arts and crafts.




**Game Reserves:** An area of land set aside for the protection of wild animals.

## Tourism Attractions in India

India is a country known for its gentle hospitality with spicy food and culture. Visitor friendly traditions with varied life style, culture, heritage, colourful fairs and festivals are abiding attractions for the tourists. All types of land form, varied climate, rich resources for eco and adventure tourism are the versatile specialty of India. Technological parks and science museums, pilgrimage centers with wonderful art and architecture are an added advantage for tourists. Yoga, Ayurveda and Natural remedial Health resorts attract tourists from all over the world.

## Religious Tourism

India being a multi-religious country, religious tourism is the most popular type of tourism. Various package tours are organized for the people to attend the religious rituals and to visit places of religious importance. Most famous religious spots of India are as follows:

| | |
|---|---|
| Rameswaram | - Tamil Nadu |
| Kanchipuram | - Tamil Nadu |
| Varanasi(Kasi) | - Uttarpradesh |
| Saranath | - Uttarpradesh |
| Vaishnavadevi temple | - Jammu & Kashmir |
| St. Francis Xavier Cathedral | - Goa |
| Amritsar | - Punjab |
| Monasteries of Ladakh | - Jammu & Kashmir |

Scenic attraction is a very important factor in tourism. Scenery consisting of Mountains, Lakes, Waterfall, Glacier, Forests, and Deserts are the major features attracting people to visit them. India is blessed with nature and gifted with immense beauty from rolling hills to deep valley and snow covered mountains to lush green carpet.

## Hill Stations in India

The Indian sub continent has seven principal mountains ranges and the largest of all is the Himalayas that lie in the northern part of India. Most of the Himalayan hill stations in India are located in states of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, West Bengal, Arunachal Pradesh, Nagaland and Meghalaya. Maharashtra, Karnataka, Tamil Nadu and Kerala have hill stations in the Western Ghats. Andhra Pradesh, Odisha have hill stations in the Eastern Ghats.



Kodaikanal Hill Station

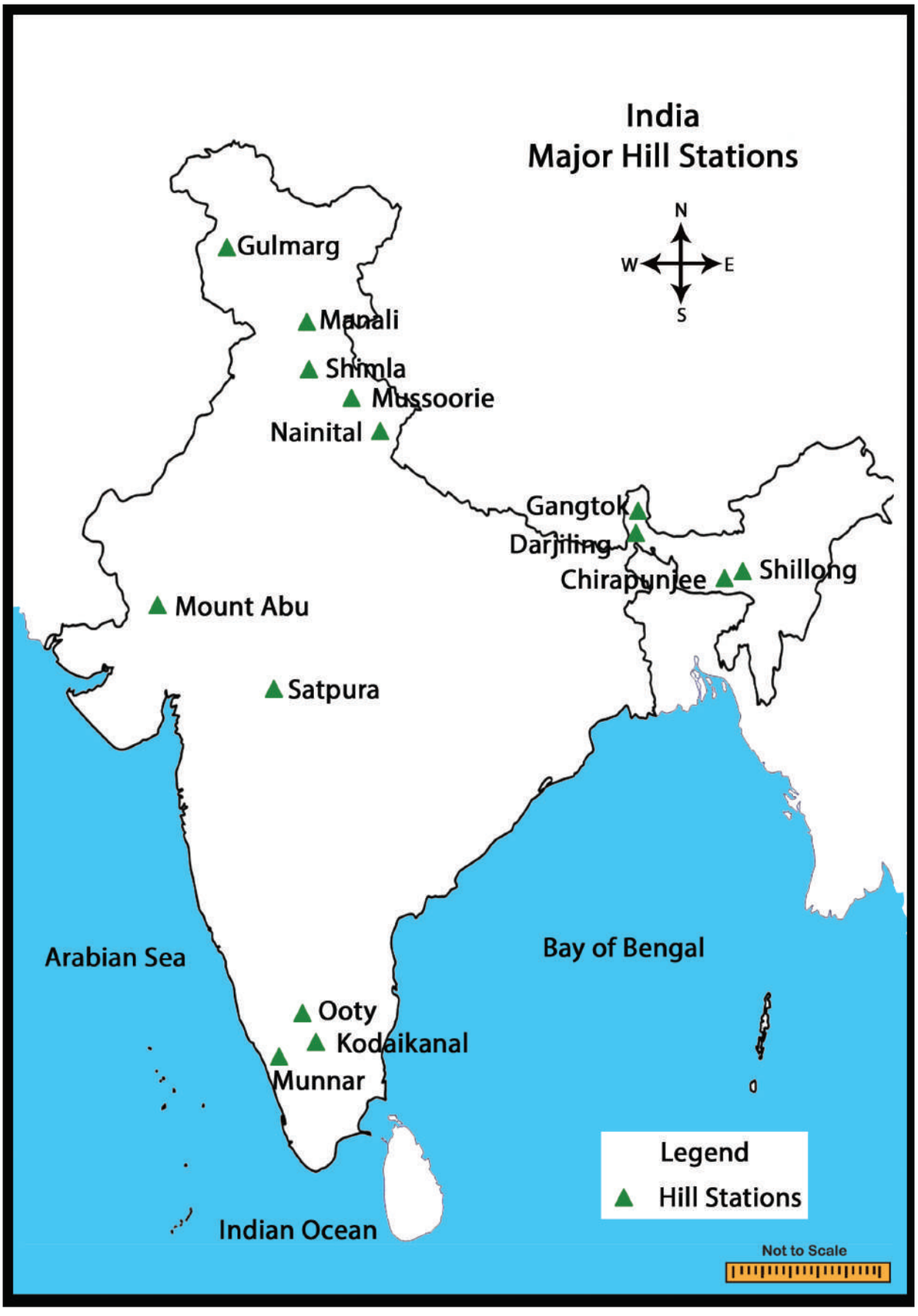
## The beautiful hill stations in India

| | | |
|---|---|---|
| Kodaikanal, Ooty | - | Tamil Nadu |
| Nainital, Mussoorie | - | Uttarakhand |
| Darjeeling | - | West Bengal |
| Gulmarg | - | Jammu & Kashmir |
| Shillong | - | Meghalaya |
| Shimla, Manali | - | Himachal pradesh |
| Munnar | - | Kerala |
| Gangtok | - | Sikkim |



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7th Social Science_Term_II_Geography_ Unit_2.indd 150 20-07-2019 1.53.29 PM

DO YOU KNOW?

| | | |
|---|---|---|
| ITC | – | Inclusive Tour Charter |
| IATA | – | International Air Transport Association |
| IATO | – | Indian Association of Tour Operators |
| TAAI | - | Travel Agents Association of India |
| TTTHA | - | Tamil Nadu Tour Travel and Hospitality Association |
| TTDC | – | Tamil Nadu Tourism Development Corporation |

## Water falls in India

In India there are many spectacular and wonderful waterfalls covered by dense forest, huge walls of rock and lush green trees. Among these waterfalls, some are seasonal, while some are perennial. Few of the amazing waterfalls are in swing during the monsoon season. This season brings lot of tourists to these bubbling waterfall sites. Notable waterfalls of India are given below:



Jog Falls

| S.No. | Water falls | Geographical location |
|---|---|---|
| 1. | Thalaiyar waterfalls | Horse tail type located in Dindugul district of Tamil Nadu |
| 2. | Jog water falls | Segmented waterfall (Raja, Rani and thunder) located in Shimogo district of Karnataka. |
| 3. | Nohkalikai waterfalls | Tallest plunge type of waterfall situated in the East khasi hill district of Meghalaya. |
| 4. | Talakona waterfalls | It is the highest waterfall in Andhra Pradesh. A lot of medicinal herbs are seen around the region. |
| 5. | Aathirappally waterfalls | The Niagara of India, is located in Thrissur district of Kerala. |

## Wild life and Bird Sanctuaries

India possesses a wide range of forests and grasslands. Diversity of these lands makes it one of the hotspot for flora and fauna. The dense and dark forest of Indian States provides suitable habitat for a wide and an unique variety of animals and birds. Royal Bengal Tigers, Indian Lions, Elephants, Rhinoceros, Indian leopard and Reptiles are the major tourist attractions. Bird sanctuaries attract



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7th Social Science_Term_II_Geography_ Unit_2.indd 151 20-07-2019 1.53.30 PM

attention for their exclusive variety of birds. Diverse range of climate of India invite birds from remote places to feed, breed and to nurture their young ones in the Indian bird sanctuaries.



Kaziranga National Park




Push factors in Tourism are Prestige

Pull factors in Tourism are Amenities.

X8R5C5

## Wildlife Sanctuaries in India

| S.No. | Wildlife sanctuary | State | Animals |
|---|---|---|---|
| 1. | Mudumalai wildlife sanctuary | Tamil Nadu | Tiger, Elephant , Bison, Deer |
| 2. | Kaziranga National Park | Assam | Tiger, Deer, Buffalo |
| 3. | Ranthambor National Park | Rajasthan | Tiger |
| 4. | Kanha National Park | Madhya Pradesh | Swamp Deer |
| 5. | Sundarbans National Park | West Bengal | Bengal Tiger |
| 6. | Gir National Park | Gujarat | Lions |
| 7. | Bhadra Wildlife Sanctuary | Karnataka | Bison, Leopard, Gaur |
| 8. | Periyar National Park | Kerala | Elephant, Deer |
| 9. | Corbett National Park | Uttarakhand | Tiger |

## Bird Sanctuaries in India

| S.No. | Bird Sanctuary | State |
|---|---|---|
| 1. | Koonthankulam bird sanctuary | Tamil Nadu |
| 2. | Kumarakom bird sanctuary | Kerala |
| 3. | Bharatpur bird sanctuary | Rajasthan |
| 4. | Mayani bird sanctuary | Maharashtra |
| 5. | Uppalapadu bird sanctuary | Andhra pradesh |
| 6. | Nal Sarovar bird sanctuary | Gujarat |
| 7. | Nawabganj bird sanctuary | Uttar Pradesh |



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## Beaches

India is a country with 7517 km long coastline comprising the most beautiful beaches bounded by Arabian sea and Bay of Bengal. Indian beaches are enriched with diverse coastal land forms filled with aquatic flora and fauna . Lush backwater in the lagoons of Kerala and picturesque beaches of Goa such as calangute, Aguda are the notable tourist destinations for water sports activities. The most charming and enchanting beaches of India are listed below.



Beach in Goa

| S.No. | Beaches | State | Geographical features |
|---|---|---|---|
| 1. | Dhanushkodi | Tamil Nadu | Turquoise blue sea water |
| 2. | Varkala Beach | Kerala | Sea Cliffs for wonderful sunset views |
| 3. | Tarkarli Beach | Maharashtia | Coral reefs and marine adventure |
| 4. | OM Beach | Karnataka | Two semi circular caves that join together forming the inverted symbol of OM |
| 5. | Aguda Beach | Goa | A huge hill dominates the southern side of the beach. |
| 6. | Marari Beach | Kerala | Saddle like rock(Hammock) Beach |

## Tourist Attraction in Tamil Nadu

Tamil Nadu has various tourist attractions like religious centres, spiritual retreat centres, beaches, hill stations, waterfalls, wildlife, art, culture, architecture, crafts, heritage monuments etc. The Government of Tamil Nadu has recognized the importance of tourism long ago and facilitated its development in desired directions. Exploring new avenues like medical tourism and adventure tourism in the past decades have helped Tamil Nadu tourism to achieve more than twenty percent annual growth. Tamil Nadu earns the largest share of income from tourism in India.

## Religious Tourism

Tamil Nadu is a state popularly known as land of Temples and has been the greatest source for spiritual rejunuvation for travellers all over the world. The state is home to around 33,000 ancient temples that mainly belongs to Dravidian style of architecture. Some of the world renowned religious destinations are as follows:



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7th Social Science_Term_II_Geography_ Unit_2.indd 153 20-07-2019 1.53.31 PM

- ❖ Thanjavur Big temple
- ❖ Madurai Meenakshi temple
- ❖ Rameswaram Ramanathaswami temple
- ❖ Temples of Kancheepuram
- ❖ Velankanni Madha church
- ❖ Nagore Dargah



Madurai Meenakshi Temple

## Hill Stations in Tamil Nadu

Tamil Nadu being situated in the Southern end of the Western and Eastern Ghats, is the home for several hill stations. Popular among them are Udagamandalam (Ooty), Kodaikanal, Yercaud, Coonoor, Valparai, Yelagiri, Sirumalai, Kalrayan Hills and Palani Hills, Shevroy hills and Cardamom Hills. They are also abodes of thick forest and wild life.

| | | |
|---|---|---|
| Ooty | - | Queen of Hills |
| Yercaud | - | Lake forest (Poor Man's Ooty) |
| Yelagiri | - | 14 hairpin bends |
| Kodaikanal | - | Princess of Hill Stations |
| Kotagiri | - | Green Hills |
| Velliangiri Hills | - | Kailash of the South |
| Kolli Hills | - | motor able terrain with 70 hairpin bends |
| Anaimalai Hills | - | Top slip |
| Meghamalai | - | High wavy mountains |
| Javadi | - | Nature's Heaven |

M3Y9G6

## Waterfalls in Tamil Nadu

Mountains and rivers of Tamil Nadu combined together created many endearing waterfalls. Waterfalls in Tamil Nadu with its inspiring natural wonders attracts many tourists. A trek amidst thick green trees, steep hills and a bath in the gushing water is most rejuvenating. Here is the list of famous water falls of Tamil Nadu.

| S.No. | Waterfalls | Geographical location |
|---|---|---|
| 1. | Hogenakal falls | It is a beautiful waterfall located in Dharmapuri district. |
| 2. | Kumbakkarai falls | River Pambar cascades to form this fall at the foot hills of Kodaikanal in Theni district. |
| 3. | Monkey falls | This waterfall lies on Anaimalai hills range in Coimbatore surrounded by Evergreen forests. |
| 4. | Killiyur falls | Situated in the shervarayon hill ranges of the Eastern Ghats. |



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7th Social Science_Term_II_Geography_ Unit_2.indd 154 20-07-2019 1.53.33 PM

| | | |
|---|---|---|
| 5. | Courtallam | Courtallam is located in Tirunelveli district. It is known for medical spa. |
| 6. | Agaya Gangai | It is a waterfall in Puliacholai on Kolli Hills in Eatern Ghats of Namakkal district. |
| 7. | Suruli Falls | This falls is also called as Cloud Land falls (or) Meghamalai falls. It is located in Theni district. |

## Wildlife and Bird Sanctuaries in Tamil Nadu



Mudumalai Wildlife Sanctuary

Wildlife sanctuary in Tamil Nadu includes Bird sanctuaries and National Parks. Tamil Nadu is also well known for the diverse natural heritage that it possesses. Hence tourists are highly excited about the wildlife tour across the state. The total area of Tamil Nadu is approximately 130,058 sq.km. 17.6% of the land area comprises of thick forests. Visitors will get to watch a smooth blend of wet evergreen forest, dry and wet deciduous forests, grasslands, sholas, mangroves and thorny scrubs. Besides varied natural vegetation, another prized possession of Tamil Nadu is wildlife Sanctuaries including Tiger, Elephant, Deer, Monkey, Bison etc., for protecting the entire flora and fauna. Wildlife Sanctuaries of the state are enlisted below:

## Wildlife Sanctuaries

| S.No. | Name of Wildlife Sanctuary | District |
|---|---|---|
| 1. | Mudumalai Wildlife Sanctuary | Nilgiris |
| 2. | Mundanthurai Wildlife Sanctuary | Tirunelveli |
| 3. | Point Calimere Wildlife Sanctuary | Nagapattinam |
| 4. | Indira Gandhi Wildlife Sanctuary | Coimbatore |
| 5. | Kalakad Wildlife Sanctuary | Tirunelveli |

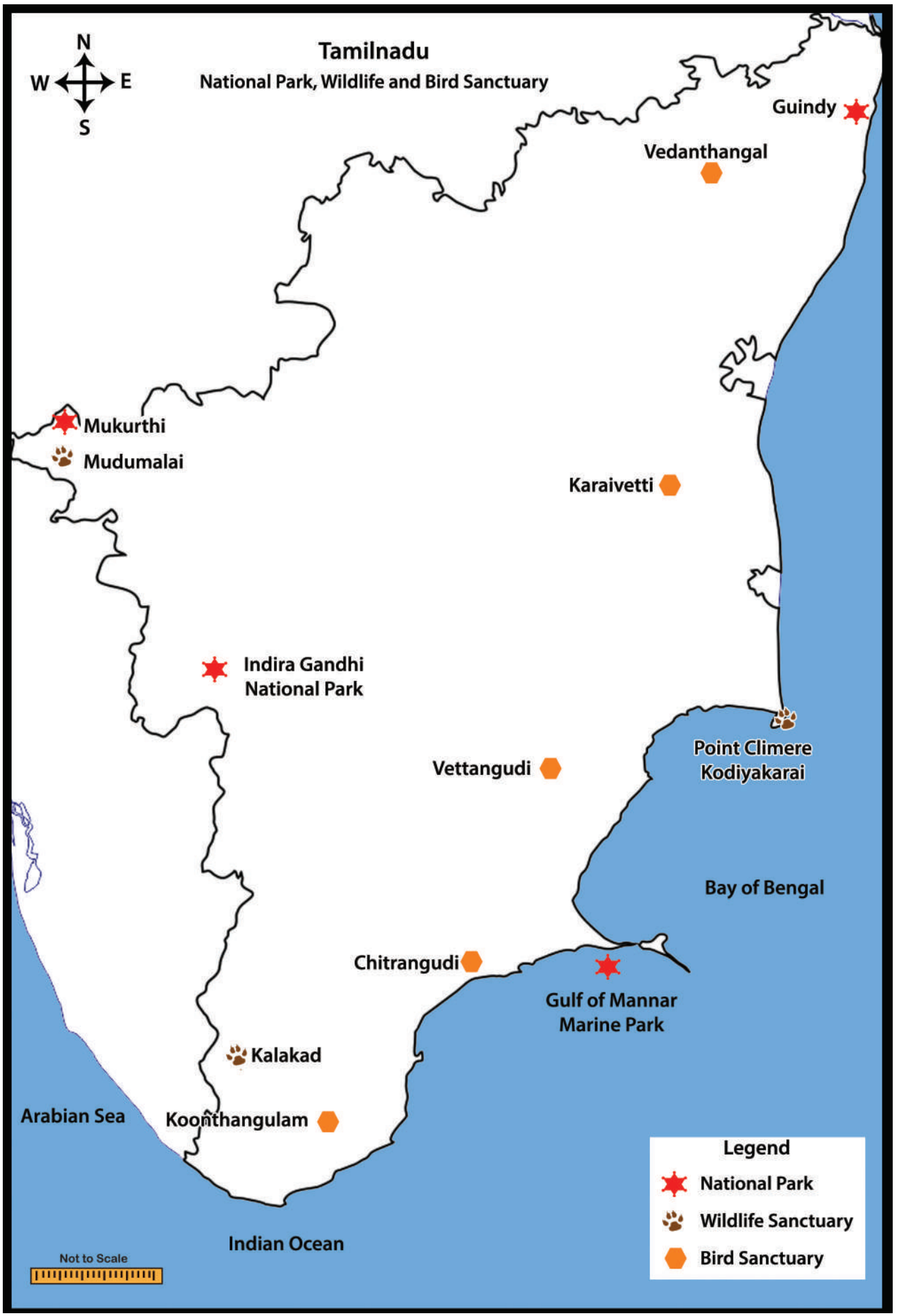
## Bird Sanctuaries in Tamil Nadu

| S.No. | Name of Birds Sanctuary | District |
|---|---|---|
| 1. | Vettangudi birds Sanctuary | Sivagangai |
| 2. | Karaivetti birds Sanctuary | Ariyalur |
| 3. | Vellode birds Sanctuary | Erode |
| 4. | Vedanthangal birds Sanctuary | Kancheepuram |


Vedanthangal birds Sanctuary



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7th Social Science_Term_II_Geography_ Unit_2.indd 156 20-07-2019 1.53.33 PM

## National Parks in Tamil Nadu

| S.No. | Name of National Parks | District |
|---|---|---|
| 1. | Guindy National Park | Chennai |
| 2. | Gulf of Mannar Marine Park | Ramanathapuram |
| 3. | Indira Gandhi National Park | Coimbatore |
| 4. | Mukurthi National Park | Nilgiris |
| 5. | Mudumalai National Park | Nilgiris |

## Beaches in Tamil Nadu

Tamil Nadu being a Coastal state in India which consists of several beaches. Some of them are world famous tourist spots. Beach is a lovely place to hang around with friends, families and kids. All these are ideal destinations for sun bath relaxation and water sports activities.

| S.No. | Beaches | Geographical features |
|---|---|---|
| 1. | Kovalam Beach Kanchipuram | Small fishing village |
| 2. | Marina Beach Chennai | Second longest urban beach |
| 3. | Kanyakumari Beach | Multi-coloured sand |
| 4. | Rameshwaram Beach | Waveless beach |
| 5. | Elliot Beach Chennai | Beautiful beach active in day & night |
| 6. | Mahabalipuram Beach Kanchipuram | Architectural and Archeological beach |
| 7. | Silver Beach Cuddalore | Water sports is the entertainment |
| 8. | Muttukadu Beach Kanchipuram | Calm and Shallow |



Marina Beach in Chennai

## Environmental Impact of Tourism

The quality of the environment is essential for tourism. The tourism industry created several positive and negative impacts on the environment.

**Positive Impacts**

- Direct financial Contributions
- Contributions to government revenues
- Improved environmental management and planning
- Increasing environmental awareness
- Protection and reservation of environment

**Negative Impacts**

**1. Depletion of Natural Resources**

- Water resources
- Local resources
- Land degradation

**2. Pollution**

- Air and Noise Pollution
- Solid Waste and Litering
- Sewage

**3. Destruction and Alteration of Eco system**

- Air
- Water
- Soil



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## Wrap up

- The word tourist was derived from an old English word “tourian.”
- The basic components of tourism are Attraction, Accessibility and Ameneities.
- Tourism can be divided on the basis of nature, utility, time and distance.
- Geographical component of Tourism are location, climate, settlement and culture.
- Industrialization and urbanization had created great pressure on modern living.
- India is a country known for its gentle (or) hospitality to all visitors.
- The Indian sub-continent has seven principal mountains ranges.
- Scenery consisting of Mountains, Lakes, Waterfalls, Glaciers, Forests, and Deserts.
- The dense and dark forest of Indian states provide home to wild life.
- Tamil Nadu is also well known for the diverse natural heritage that it possesses.

## Glossary

| | | | |
|---|---|---|---|
| 1. | Geyser | a natural hot spring | வெந்நீர் ஊற்று |
| 2. | Accessibility | the quality of being easily to obtain or use | அணுகுமுறை |
| 3. | Amenities | attractiveness of a place | வசதிகள் |
| 4. | Recreation | the feeling of being relaxed | பொழுதுபோக்கு |
| 5. | Amusement park | a large outdoor area with fairground rides, shows and other entertainments | பொழுதுபோக்கு பூங்கா |
| 6. | Bird sanctuary | an area of land in which birds are protected and encouraged to breed | பறவைகள் சரணாலயம் |
| 7. | Wildlife sanctuary | an area which provides protection and favourable living conditions to the wildlife | விலங்குகள் சரணாலயம் |
| 8. | Land degradation | Loss of natural fertility of soil because of loss of nutrients | நில வளம் குறைதல் |



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## Evaluation

### I. Choose the correct answer

1. The oldest type of tourism is _____
   a) Religious
   b) Historical
   c) Adventure
   d) Recreational

U2A6T2

2. In which state is the Kaziranga national park located.
   a) Rajasthan b) West Bengal
   c) Assam d) Gujarat
3. Which one of the following is not a beach of India?
   a) Goa b) cochin
   c) Kovalam d) Miami
4. Which of the following is not a bird sanctuary in India?
   a) Nal sarovor in Gujarat
   b) Koonthakulam in Tamil Nadu
   c) Bharatpur in Rajasthan
   d) Kanha in Madhya pradesh
5. In which district courtallam waterfalls is located?
   a) Dharmapuri b) Tirunelveli
   c) Namakkal d) Theni

### II. Fill in the blanks

1. The three main components of tourism together known as _____.
2. Gastronomy refers to an aspect of _____ tourism.
3. Suruli falls is also called as _____.
4. The second largest urban beach is _____ .
5. Expansion of TAAI _____ .

### III. Circle the Odd one

1. Transport, Attraction, Accommodation, Amenities
2. Nainital, Shillong, Munnar, Digha
3. Corbett, Sunbarbans, periyar,Mayani
4. Hogenakal, Kumbakkari, Suruli, Kalakad
5. Rishikesh, ladakh, Gulmarg, Kotagiri

### IV. Match the following

| | | |
|---|---|---|
| 1. | Anamalai hills | West Bengal |
| 2. | Monkey falls | Goa |
| 3. | Darjeeling | Coimbatore |
| 4. | Nature's Haven | Top slip |
| 5. | Aguda Beach | Javadi |

### V. Consider the following statement and tick (✓) the appropriate answer

1. **Asseration (A) :** Tourism is an essential activity for the life of the society.

**Reason (R) :** Its direct impact on social cultural, education and economic sector of the nation.

a. A and R are correct and A explains R
b. A and R are correct but A does not explain R
c. A is in correct but R is correct
d. Both A and R are in Correct

2. **Assertion (A) :** One of the most popular beaches in Goa Calangute is a treat for the adventure sports activities.

**Reason (R) :** Foreigners throng the beaches

a. A and R are correct and A explain R
b. A and R are correct but A does not explain R



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c. A is incorrect but R is correct d) Both A and d. R are incorrect

## VI. Answer the following briefly

1. Define Tourism?
2. Write short note on ECO Tourism?
3. What are the basic elements of Tourism?
4. Name any five hill stations in India?
5. Name any five beaches in Tamil Nadu?

## VII. Distinguish between

1. International Tourism and Historical Tourism
2. Religious Tourism and Adventure Tourism
3. Attraction and Accessibility

## VIII. Answer the following questions in detail

1. Explain the Geographical components of Tourism?
2. Write briefly about the waterfalls in Tamil Nadu?
3. Describe the Environment Impact of Tourism?

## IX. Hots

1. Why do we like sightseeing so much?
2. What are the ways to protect the sanctuaries?
3. List any five reasons for travelling?

## X. Activity

- This activity should be done by students under the supervision of the subject teacher.
- The students are grouped with six members in a group.
- Each student will discuss in the group about their last tour. Each group will collect photographs and information.
- The information will be shared in the class as well as displayed on the notice board of the class room.

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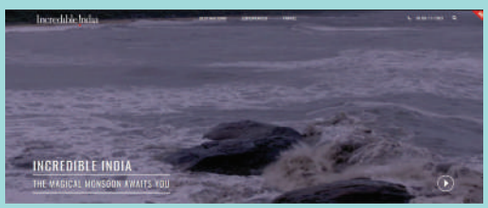

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## ICT CORNER

# Tourism

**Let's go for a tour**




**PROCEDURE :**

**Step 1:** Type the following URL https://www.incredibleindia.org/content/incredibleindia/en.html in the address bar or scan the QR code given in the right side.

**Step 2:** In this site you can experience the Heritage ,spiritual , Adventure,Yoga and wellness, Art ans culture, Food and cuisine, Nature and wildlife and Luxury..

**Step 3:** You can get the list of Popular destinations, Spiritual destinations, Heritage destinations, World Heritage , Buddhism in India and Museums here..

Scan the QR code Given below to download the mobile app of this site…



**Step 1**



**Step 2**



**Step 3**



**Step 4**

**Tourism - Attraction URL:**

URL https://www.incredibleindia.org/content/incredibleindia/en.

*Pictures are indicative only

*If browser requires, allow Flash Player or Java Script to load the page.

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Unit - 1

# Rocks and Soils



## Learning Objectives

- To understand the nature of rocks, their types and uses.
- To learn to identify the different types of rocks.
- To study about the nature of soil and its composition
- To understand the importance of soil conservation

QYIJGQ

## Introduction

Have you ever noticed any mountains or rocks nearby your location or during your travel? Have you ever been to any hill station during your vacation? Do you know how they originated on the earth surface? Do you know what kinds of material are used in the construction of temples, buildings, roads, flyovers etc. In this lesson, we will learn about rocks and soils.

In lower classes, we have studied about four realms of the earth, namely lithosphere, hydrosphere, atmosphere and biosphere. Lithosphere is the upper most and significant layer of the earth. It is composed of solid rocks and unconsolidated materials. The literal meaning of lithosphere is "**The sphere of rock**".

DO YOU KNOW?

Petrology is a branch of geology which deals with the study of rocks. '**Petrology**' is derived from the Greek word "**Petrus**" refers to rock and "**Logos**" refers to study

**Find out**

What is the base of the house made up of ?

## Rocks

The rocks are the solid mineral materials forming a part of the surface of the earth and other similar planets. The earth's crust (Lithosphere) is composed of rocks. A rock is an aggregate of one or more minerals. Rock is an important natural resource and is found in solid state. It may be hard or soft in nature. An estimation reveals that there are 2,000 different types of minerals found on the earth surface out of which only 12 are the basic minerals commonly found all over the earth. Minerals are chemical substances which exist in nature. They may occur either in the form of elements or compounds.

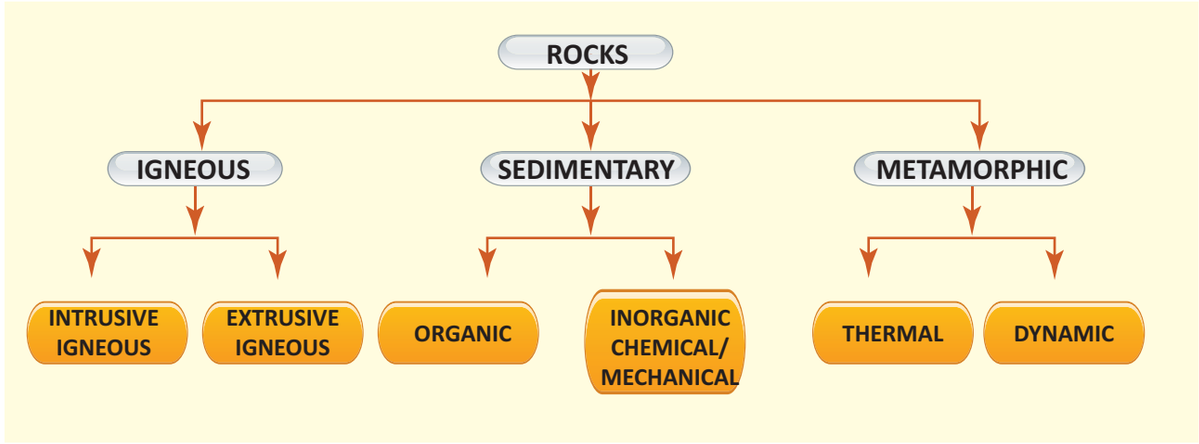
### Classification of Rocks

According to the mode of formation the rocks are classified into three types as follows.

1. **Igneous Rocks**
2. **Sedimentary Rocks and**
3. **Metamorphic Rocks**



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## Igneous Rocks

The igneous rocks are formed by the solidification of molten magma. These rocks are also called as the '**Primary Rocks**' or '**Parent Rocks**' as all other rocks are formed from these rocks.



**Igneous rock**




The word **Igneous** is derived from the Latin word '**Ignis**' means '**fire**'

## Characteristics of Igneous Rocks

1. These rocks are hard in nature
2. These are impermeable
3. They do not contain fossils
4. They are associated with the volcanic activities
5. These rocks are useful for construction works

## Types of Igneous Rocks

Igneous Rocks are of two types. They are:

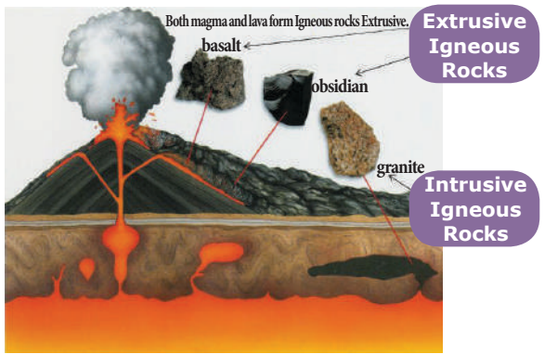
1. Extrusive Igneous Rocks
2. Intrusive Igneous Rocks

### 1. Extrusive Igneous Rocks

Can you visualize the lava comes out from a volcano? Lava is actually a fiery red molten magma comes out from the interior of the earth on its surface. After reaching the earth surface the molten materials get solidified and form rocks. Rocks formed in such a way on the crust are called Extrusive igneous rocks. These rocks are fine grained and glassy in nature due to rapid solidification. Basalt found in the north western part of peninsular India is the example for this type of rock.

### 2. Intrusive Igneous rocks

The molten magma sometimes cools down deep inside the earth's crust and becomes solid. The rocks formed this way is called '**Intrusive Igneous Rocks**'. Since they cool down slowly, they form large grains. Intrusive Igneous rocks are of two types. The deep seated rocks are called '**Plutonic rocks**' and the ones formed at shallow depths are called '**Hypabysal rocks**'. Granite, Diorite and Gabbro are the examples of plutonic rocks and Dolerite is an example of hypabysal rocks. Since the intrusive Igneous rocks consist of large crystals, they are also called as '**Crystalline rocks**'.




**Extrusive & Intrusive Igneous rocks**



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Some major **Active Volcanoes**: Mount Vesuvius, Mt. Stromboli and Mt. Etna in Italy and Mauna Loa and Mauna Kea in Hawaii Islands.

## Sedimentary Rocks



**Sedimentary Rocks**

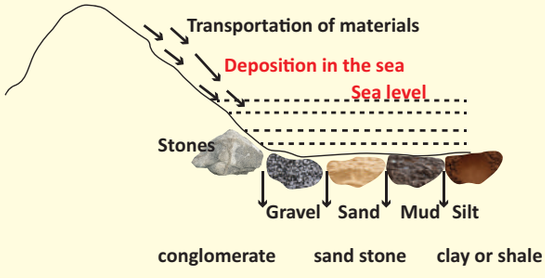
The word **'Sedimentary'** has been derived from Latin word **'Sedimentum'** means settling down. The sedimentary rocks are formed by the sediments derived and deposited by various agents. Due to high temperature and pressure, the undisturbed sediments of long period cemented to form sedimentary rocks. Sedimentary rocks consist of many layers which were formed by the sediments deposited at different periods. As it consists of many strata, it is also known as **'Stratified rocks'.**




Sedimentary rocks are the important source of natural resources like coal, oil and natural gas.

## Characteristics of Sedimentary rocks

1. They have many layers.
2. They are non-crystalline rocks.
3. They contain fossils.
4. They are soft and get eroded easily




**Formation of Sedimentary Rocks**




Oldest sedimentary rocks of the world has been identified in Greenland and estimated as 3.9 billion years old.

## Types of Sedimentary Rocks

### 1. Organic Sedimentary Rocks

These rocks are formed as a result of the decomposition of dead plants and animals. It contains fossils. Chalk, Talc, Dolomite and Limestone rocks are of this category.

### 2. Mechanical Sedimentary Rocks

These rocks are formed from the disintegration of igneous and metamorphic rocks. The natural agents erode and transport these rocks and deposit them at some places. After a long period of time, they cemented to form rocks. Sandstone, Shale and Clay are the examples of rocks of this type.

### 3. Chemical Sedimentary rocks

These are formed by precipitating of minerals from water. It is formed usually through evaporation of chemical rich solutions. These rocks are also called as evaporates. Rock Salt is an example of this kind.

## Metamorphic Rocks

The word Metamorphic is derived from two Greek words "Meta" and "Morpha", Meta means change and Morpha means shape. When Igneous and sedimentary rocks subject to high temperature and pressure, the original rocks get altered to form a new kind of rock called metamorphic rocks. Metamorphism is of two types. They are 1.Thermal Metamorphism: If the change in the rocks is mainly caused by high temperature, the process is called as thermal metamorphism. 2. Dynamic Metamorphism: If the change in the rock is mainly caused by high pressure, the process is called as Dynamic Metamorphism.



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One of the world wonders Taj Mahal in India was built by White Marble in a metamorphic rock.



**Metamorphic Rock**

### Formation of Metamorphic Rocks from Igneous rocks

1. Granite into gneiss caused by dynamic metamorphism.
2. Basalt into slate caused by thermal metamorphism.

### Formation of Metamorphic Rocks from Sedimentary rocks

1. Sandstone into quartz caused by thermal metamorphism.
2. Shale into slate caused by thermal metamorphism.

### Characteristics of Metamorphic Rocks

1. Metamorphic rocks are mostly crystalline in nature.
2. They consist of alternate bands of light and dark minerals.

## Rock cycle

Igneous rocks are the primary rocks formed first on the earth. These rocks are weathered, eroded, transported and deposited at some places to form sedimentary rocks. The Igneous and Sedimentary rocks are changed into metamorphic rocks under the influence of temperature and pressure. The metamorphic rocks are also get disintegrated and deposited to form sedimentary rocks. Formation of igneous rocks take place when there is an outflow of molten materials. Like this, the rocks of the earth crust keeps on changing from one form to another form under various natural forces and agents. The endless process is referred as **Rock Cycle**.

Quartzite and Marble are the rocks commonly used for construction and sculpture works. Marbles are widely used for making beautiful statues and decorative items such as vase, tiny gift articles and grinded marble is used to produce plastics, paper etc.,

### Uses of rocks

Rocks have been used by mankind throughout the history. Rocks are highly valuable and important to almost all aspects of our economy. The minerals and metals in rocks have been found essential to human civilization. Rocks are used for many purposes in our life and some of them are given below

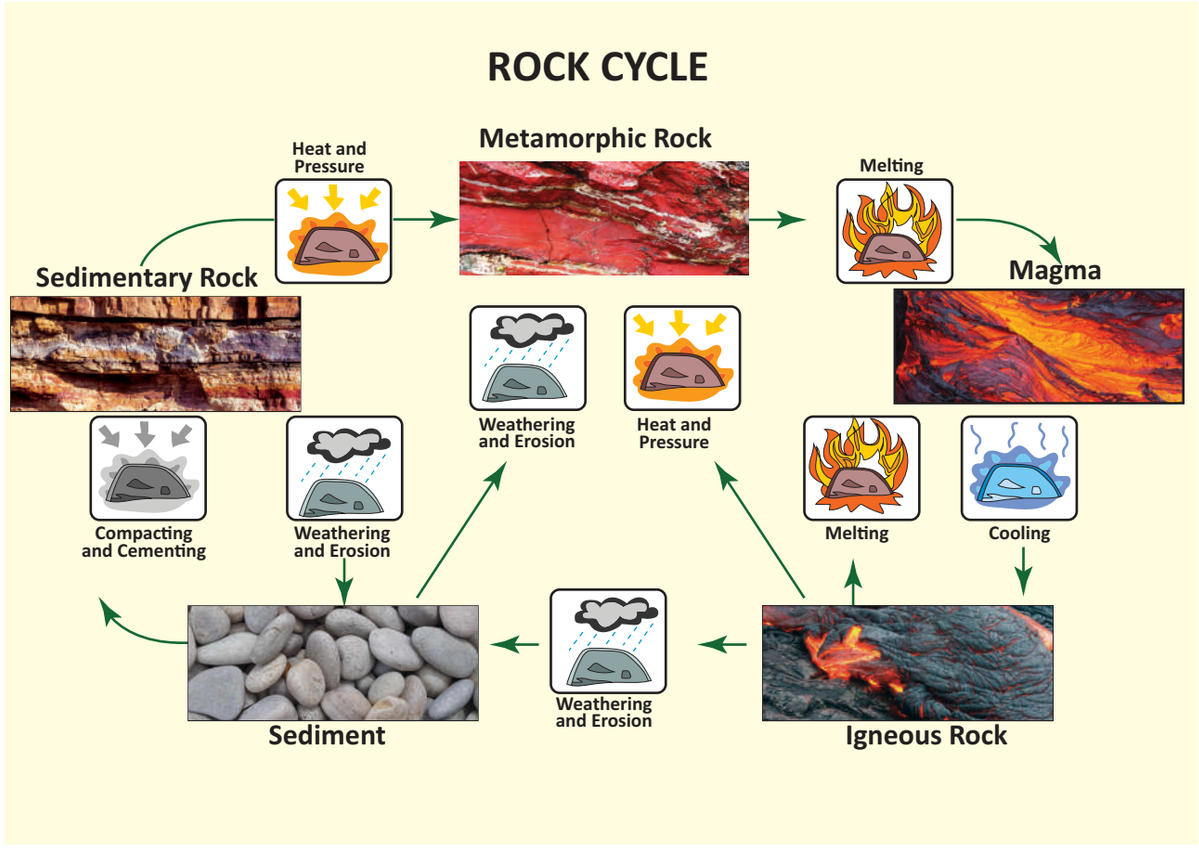
### Rocks are useful for making

1. cement
2. Writing chalk
3. Fire
4. Building materials
5. Bath scrub
6. Kerb stone
7. Ornament
8. Roofing materials
9. Decorative materials
10. These are valuable source of minerals such as gold, diamond, sapphire etc.



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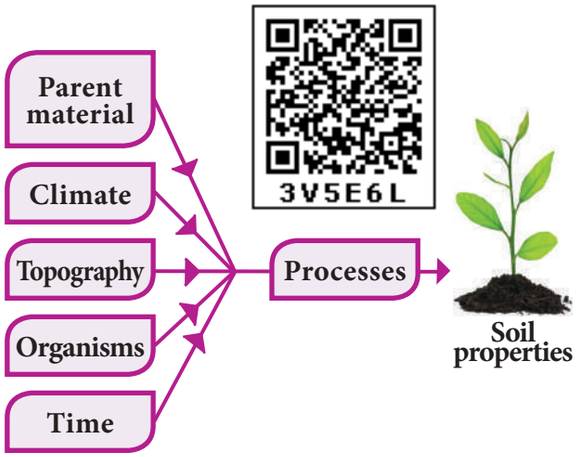



Rock Cycle

**ACTIVITY**

Collect different types of rocks and display them in the class room

## Soil and its Formation




Soil is a mixture of organic matter, minerals, gases, liquids and organisms that together support life. **Soil** minerals form the basis of soil. It forms on the surface of the earth. It is known as the '**skin of the earth**'. Soils are produced from rocks (parent material) through the **processes** of weathering and natural erosion. Water, wind, temperature change, gravity, chemical interaction, living organisms and pressure differences all help break down parent material. It leads to the formation of loose material. In course of time, they further break down into fine particles. This process release the minerals locked in the rock fragments. Later on, the vegetative cover which develop in that region forms humus content in the soil. This way the soil gets matured gradually.



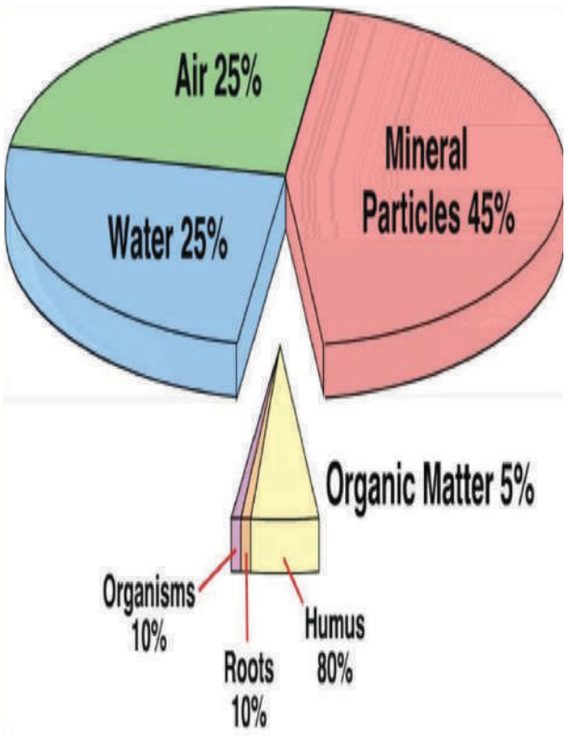

World Soil Day is observed on 5th December, every year



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## Soil Composition

The basic components of soil are mineral, organic matter, water and air. It consists of about 45% mineral, 5% organic matter, 25% of water and 25% air. It is only a generalized fact. The composition of soil varies from place to place and time to time.




**Soil Composition**

## Soil profile

The soil profile is defined as the vertical section of the soil from the ground surface and extends downwards.

### ACTIVITY

Collect samples of soil from your place and exhibit in the class room.

## Classification of soils

Soils are classified on the basis of their formation, colour, physical and chemical properties. Based on these, soil is classified into six major types. They are: Alluvial soil, Black soil, Red soil, Laterite soil, Mountain soil, Desert soil

### Alluvial soil

These soils are found in the regions of river valleys, flood plains and coastal regions. These are formed by the the deposition of silt by the running water. It is the most productive of all soils. It is suitable for the culitivation of sugarcane, jute, rice, wheat and other food crops.

### Black soils

These soils are formed by whethering of igneous rocks. Black soil is clayey in nature. It is retensive of moisture. It is ideal for growing cotton.

### Red Soils

These soils are formed by wheathering of metamorphic rocks and crystalline rocks. The presence of iron oxide makes this soil brown to red in colour. It is usually found in semi-arid regions. It is not a fertile soil. It is suitable for millet cultivation.

### Laterites soils

These are the typical soils of trophical regions. These soils are found in the regions which experienced alternate wet and dry condition. As these soils are formed by the process of leaching, it is in fertile. It is suitable for plantation crops of tea and coffee.

### Mountain soils

These soils are found over the slopes of mountain. Soils in these regions are thin and acidic. However characteristic of soil differs from region to region based on the altitude.

### Desert soils

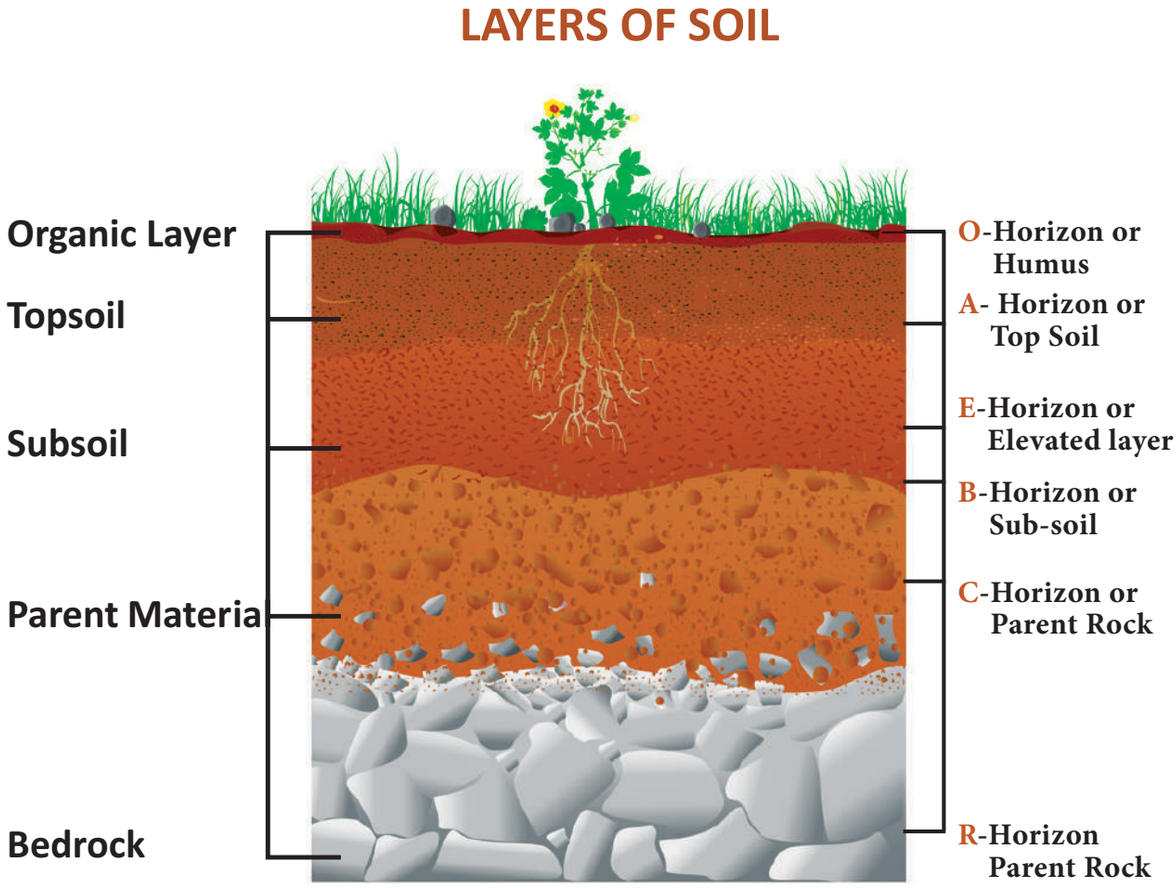
These are sandy soil found in the hot desert regions. These soils are porous and saline. Since it is infertile agriculture in these soils are not so successful.

## Soil Erosion

Soil erosion is the removal or destruction of the top layer of soil by natural forces and human activities. Soil erosion reduces the



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Layers of Soil

| Layers of soil | |
|---|---|
| O-Horizon or Humus | This layer is dominated by organic material (leaves, needles, twigs, moss and lichens). |
| A- Horizon or Top Soil | It is a part of top soil, composed of organic matter mixed with mineral matter. |
| E- Horizon or Elevated layer | E-Stands for elevated layer. This layer is significantly leached of clay, iron, and aluminum oxides, which leaves a concentration of ore |
| B- Horizon or Sub-soil | This layer reflects the chemical or physical alteration of parent material. Thus iron, clay, aluminum and organic compounds are found accumulated in this horizon. |
| C- Horizon or Parent Rock | Partially weathered parent material accumulates in this layer. |
| R- Horizon Parent Rock | This layer consists of unweathered part of bed rock. |

fertility of soil which in turn reduces the agricultural productivity. Running water and wind are the major agents of soil erosion. Sheet erosion, Rill erosion and Gully erosion are the major types of soil erosion.

## Soil conservation

Soil conservation is the process of protecting the soil from erosion to maintain its fertility. The methods that are widely practiced for conserving soil are afforestation, controlled grazing, construction of dams,



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**How long does it take to form soil?**

The time needed to form a soil depends on the Climate. The environments which is characterized by mild climate, takes 200-400 years to form one cm of soil and in wet tropical area, soil formation is faster and takes upto 200 years. To become a well matured soil, it takes about 3000 years.

Crop rotation, Strip farming, contour ploughing, terrace farming, checking shifting cultivation, wind break etc.,

## Uses of soils

Soil is one of the important natural resource. It is a basic requirement for plant growth and supports various life forms on the earth.

- The minerals present in the soil enhance and nourishes the crops and plants.
- It is used in making of ceramics or pottery.
- It is a source of material for construction and handicraft works.
- It acts as natural filter of water and purifies it.
- Soil supports ecosystem and play an important role in land management.

Rocks and soils are the important renewable natural resources. Both of them play an important role in everyday life of human beings as well as economic development. Nowadays rock-based companies are in increase which provide employment to a sizeable population. Soils attract human settlement and other economic activities. As India is an agricultural country, the proper management of soil resource will lead to sustainable food production besides its use for various other purposes. So, the soil resources must be conserved.

## Recap

- A rock is an aggregate of one or more minerals.
- The word **'Sedimentary'** has been derived from Latin word **'Sedimentum'** means settling down.
- Igneous rocks are the primary rocks formed first on the earth.
- Soil is a mixture of organic matter, minerals, gases, liquids and organisms that together support life.

| GLOSSARY | | |
|---|---|---|
| Crust | Outermost layer of the earth | புவியின்மேலோடு |
| Lava | Hot molten rock erupted from a volcano. | மேலோடு |
| Magma | Hot fluid or semi-fluid material found beneath the earth crust. | எரிமலைக் குழம்பு |
| Metamorphic rock | A rock formed by the alteration of igneous and sedimentary rocks caused by the metamorphic rocks. | உருமாறியப் பாறை |
| Rock cycle | The continuous process of transformations of rocks from one form to another. | பாறை சுழற்சி |
| Sedimentary rock | Rock is formed by the deposition of sediment. | படிவுப் பாறை |



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## Evaluation

### I. Choose the correct answer.

WHB4SC

1. Which of the following is known as sphere of rocks
   a) Atmosphere
   b) Biosphere
   c) Lithosphere
   d) Hydrosphere
2. World soil day is observed on
   a) 15th August b) 12th January
   c) 15th October d) 5th December
3. Fossils are found in
   a) Sedimentary rocks
   b) Igneous rocks
   c) Metamorphic rocks
   d) Plutonic rocks
4. The first layer of soil is called as
   a) Regur
   b) Regolith
   c) Unweathered rock
   d) partially weathered rock
5. Ideal soil for growing cotton is
   a) Red soil
   b) Black soil
   c) Alluvial soil
   d) Mountain soil
6. The major component of soil is
   a) Rocks b) Gas
   c) Water d) Minerals
7. Which one of the following is the most widespread most and productive category of soil
   a) Alluvial soil
   b)Black soil
   c) Red soil
   d) Mountain soil

### II. Fill in the blanks.

1. Scientific study of rocks is called _____.
2. _____ soil is highly suitable for cotton cultivation.
3. The "skin of earth" is _____.
4. _____ is the kind of metamorphic rock using which Taj Mahal was built.
5. _____ is known as the primary rocks.

### III. State whether the following statements are true or false.

1. Igneous rocks are called primary rocks.
2. Slate is formed from shale.
3. Red soil is formed by the process of leaching.
4. M-sand is used as alternative for natural sand in construction.
5. Volcanic mountains are covered with sedimentary rocks.

### IV. Match the following.

1)

| | | | |
|---|---|---|---|
| a. | Granite | 1. | Bed rock |
| b. | Soil layer | 2. | Plutonic rock |
| c. | Barren island | 3. | Strip farming |
| d. | Soil conservation | 4. | Active Volcano |

| | a | b | c | d |
|---|---|---|---|---|
| A | 2 | 1 | 4 | 3 |
| B | 2 | 1 | 3 | 4 |
| C | 4 | 3 | 2 | 1 |
| D | 3 | 4 | 2 | 1 |

2)

| | | | |
|---|---|---|---|
| a. | Basalt | 1. | Anthracite |
| b. | Limestone | 2. | Extrusive igneous |
| c. | Coal | 3. | Metamorphic rock |
| d. | Gneiss | 4. | Sedimentary rock |



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| | a | b | c | d |
|---|---|---|---|---|
| A | 2 | 4 | 1 | 3 |
| B | 2 | 4 | 1 | 3 |
| C | 3 | 1 | 2 | 4 |
| D | 3 | 1 | 4 | 2 |

## V. Choose the incorrect statement from the following.

1. a) Igneous rocks are called the primary rocks.
   b) Soil is the product of weathering of rocks.
   c) Sedimentary rocks are the hardest ones.
   d) Deccan plateau is the region of Igneous rocks.
2. a) Soil erosion decreases its fertility.
   b) Dynamic metamorphism is caused by high temperature.
   c) Soil is a renewable source.
   d) Humus is a part of the top layer of soil.

## VI. Consider the following statements and choose the right option from the given ones.

I) **Statement (1):** Sedimentary rocks consist of many layers.

**Statement (2):** Sedimentary rocks are formed by the sediments deposited at different points of time.

a) 1 and 2 are correct and 2 explains 1

b) 1 and 2 are correct but, 2 does not explain 1

c) 1 is correct but, 2 is incorrect

d) 2 is correct but, 1 is incorrect.

## VII. Give reasons for the following.

1. Chemical sedimentary rocks are found in the beds of reservoirs.
2. Igneous rocks are found in the regions of volcanoes.

## VIII. Distinguish the following.

1. Metamorphic rock and sedimentary rock.
2. Soil conservation and Soil erosion.

## IX. Give short answers.

1. How are igneous rocks formed?
2. Describe about the composition of soil.
3. Define 'rock'.
4. State the types of soils.
5. What is soil conservation?

## X. Give detailed answer for the following.

1. Explain the process of soil formation.
2. Classify and explain the rocks.
3. Give an account on different layers of soil.
4. Classify and explain the soil?

## XI. Activity Corner.

1. Complete the following table with the help of internet source

| Rocks | Mode of formation | Characteristics | Examples | Uses |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

2. **Map Work:** Mark the areas of black soil on the outline map of India.
3. **Exhibition:** Collect the soil samples of different types and display them with their names in the classroom .
4. **Group Discussion:** Natural sand is replaced by M-sand in construction.
   1. Status -
   2. Advantages -
   3. Disadvantages -



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4. Geography for UPSC Civil Service Preliminary Examination - By Surender Singh.
5. School Atlas Book - Tamilnadu Text Book Corporation.

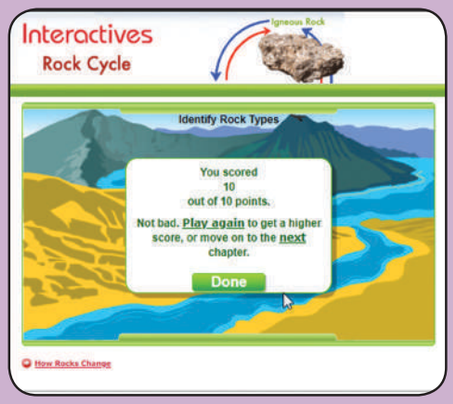

## INTERNET RESOURCES

- *www.Fert.nic.in*
- *www.greathimalayannationalpark.org*
- *www.csmrs.gov.in*

## ICT CORNER

### ROCK AND SOIL

**Through this activity you will know about types of rocks, how rocks change and the rock cycle.**




### Steps

- Open the Browser and type the URL given below (or) Scan the QR Code.
- Click the '**Begin**' button, start your rock collection
- Click '**Add to rock collection**' one by one
- Go to '**identify rock types**' and play the game

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**Website URL:**

http://www.learner.org/interactives/rockcycle/index.html



Aatchiyar Kalvi

Unit - 2

# Weather And Climate



## Learning Objectives

- To understand the importance of weather and climate
- To learn about the nature of the elements of weather and climate.
- To know the instruments used for measuring weather elements
- To be able to recognize the kind of weather and climate of a place

USGKNP

## Introduction

Climate is one of the basic elements in the natural environment. It affects landforms, soil types, fauna and flora. It influences man to a large extent.

In a small village in Dharmapuri district, Tamil nadu, in the month of May, Yuktha enjoys her vacation with her brother and family. She always wears cotton cloths. Her mother makes food like porridge, buttermilk, lemonade, watermelon etc which suits to summer. At the same time (In May month) Tiya who lives in Auckland, New Zealand with her father and mother wear fleece jacket, jeans, gloves and socks. Her mother makes hot food like sandwich, salmon, oatmeal, soups etc. Yuktha celebrates Christmas with friends in winter, where as Tiya celebrates Christmas during summer. Can you think of why?

Yuktha and Tiya stay in two different hemispheres and have different way of life. This is because of the difference in weather condition of those places.

Weather and climate influence man's activities like what we eat, wear, the house in which we live and work, farming, sailing, fishing, modern transport and even our play time etc. Hence one should have knowledge about the weather and climate. So, in this chapter we are going to learn about weather and climate, its elements and how they influence our lifestyle.

## Weather

**Weather** is the day today conditions(state) of the atmosphere at any place as regards sunshine, temperature, cloud cover, Wind fog condition, air pressure, humidity, precipitation and such other elements. It refers to short periods like a day, a week, a month or a little longer and as such the weather changes from time to time in a day and one period to the other in an year. In the

DO YOU KNOW?

Earth's atmosphere is a layer of gases surrounding the planet earth and retained by the earth's gravity. It contains about 78% nitrogen, 21% oxygen, 0.97% argon, 0.03% carbon dioxide and 0.04% trace amounts of other gases and water vapour.



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**Find out**

Do all the planets in the solar system have atmosphere?

morning the weather might be sunny with a clear sky in a place and evening there might be clouds and rain. Similarly the weather is cool in winter and hot in summer.

We often hear people saying "Today the climate is good or bad". It is incorrect to say like that. Instead it has to be said that the weather is good or bad. We could observe the television news readers saying weather report and not the climate report for e.g. cricket match have been postponed due to bad weather etc.

## Climate

**Climate** is generally defined as the average conditions (state) of the weather of a place or a region. The average atmospheric conditions are determined by measuring the weather elements for a long period of time which is usually for 35 years. The elements of weather and climate are the same. The climate does not change often like weather.

DO YOU KNOW?

The word Climate is derived from the ancient Greek word "**Klimo**" which means "**Inclination**".

### Controlling factors of weather and climate

Angle of the sun's rays, the length of daytime, altitude, distribution of land and water bodies, location and direction of mountain ranges, air pressure, winds and ocean currents are the major factors which affect the weather and climate of a region.

The earth is spherical in shape. So, the sun's rays fall unevenly on the earth's surface. The Polar regions receive slanting sun's rays. Hence there is little or no sunlight, thus there is an extreme cold winters. Vertical sun's ray's fall directly on regions around the equator,

DO YOU KNOW?

Scientific study of weather is called **Meteorology** and the scientific study of climate is called **climatology**.

hence the climate is very hot and almost no winters. The difference in temperature makes the air and water move in currents. Warm air rises and creates more space for air beneath, while cool air settles down.

**ACTIVITY**

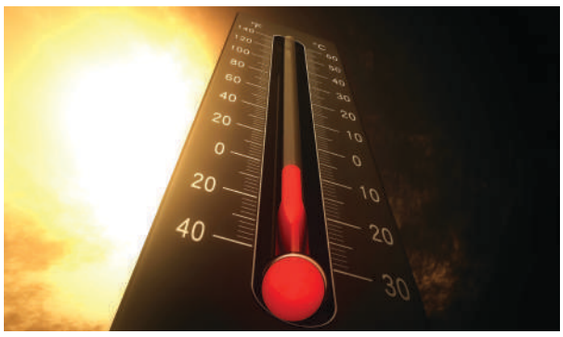
Discuss in the class room how altitude, distribution of land and water bodies, direction of mountain ranges, air pressure, winds and ocean currents affect weather/climate.

## Elements of weather and climate

Temperature, rainfall, pressure, humidity and wind are the major elements of weather and climate.

7P3FDK

### a) Temperature




**Thermo Meter**

Temperature is one of the key elements of weather and climate. The earth and its atmosphere get heated from the sun through insolation. The degree of heat present in the air is termed as temperature. Apart from sun's rays, the heat in air also depends the atmospheric mass to a small extent.



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Distribution of weather elements are shown by means of Isolines on maps. Isolines are those which join the places of equal values. Isolines are given different names based on the weather element they represent.

| | |
|---|---|
| **Isotherm** | Equal temperature |
| **Isocryme** | Equal lowest mean temperature for a specified period |
| **Isohel** | Equal sunshine |
| **Isollobar** | Equal pressure tendency showing similar changes over a given time |
| **Isobar** | Equal atmospheric pressure |
| **Isohyet** | Equal amount of rainfall |

Temperature varies with time due to changes in the level of radiation which reach the earth surface. This is due to motions of the earth (The rotation and revolution) and inclination of the earth's axis.

The temperature influences the level of humidity, the process of evaporation, condensation and precipitation.

Heat energy from solar radiation is received by the earth through three mechanisms. They are radiation, conduction and convection. The Earth's atmosphere is heated more by terriestrial radiation than insolation.

Temperature varies both horizontally and vertically. Temperature decreases with increasing height is known as Lapse rate which is 6.5 degree celsius per 1000 meters in troposphere .

## b) Factors affecting the distribution of temperature

Latitude, altitude, nature of land, ocean currents, prevaling winds, slope, shelter and distance from the sea, natural vegetation and soil are the major factors which affect the distribution of temperature.

## c) Measuring Temperature

The temperature of a unit volume of air at a given time is measured in scales like Celsius, Fahrenheit, and Kelvin. Meteorologist measures the temperature by the Thermometer, Stevenson screen and minimum and maximum Thermometer. The energy received by the earth through insolation is lost by outgoing radiation. Atmosphere is mainly heated by outgoing radiation from 2 to 4pm .So the maximum temperature is recorded between 2 and 4 pm regularly and minimum temperature is recorded around 4 am before sunrise.

### Mean Temperature

The average of maximum and minimum temperatures within 24 hours is called **mean daily temperature** [(87°F+73°F)/2=80°F]. **Diurnal range of temperature** is the difference between the maximum and minimum temperatures of a day. **Annual range of temperature** is the difference between the highest and lowest mean monthly temperatures of a year. The distribution of temperature is shown by means of Isotherms. **Isotherms** are imaginary lines which connect the same temperatures of different places.

## d) Heat zones of the earth

The fact that the earth is spherical in shape results in different parts of the earth



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getting heated differently.Based on the heat received from the sun, Earth is divided into three heat zones. They are

### Torrid Zone

It is a region between the tropic of cancer and the tropic of Capricorn. This region receives the direct rays of the sun and gets the maximum heat from the sun.This zone known as the torrid or the tropical zone

### Temperate zone

This zone lies between the Tropic of cancer and the Arctic circle in the Northern Hemisphere and between the Tropic of Capricorn and the Antartic circle in the southern Hemisphere.This zone gets the slanting rays of the sun and the angle of the sun's rays goes on decreasing towards ds the poles.Thus this zone experiences moderate temperature.

### Frigid Zone

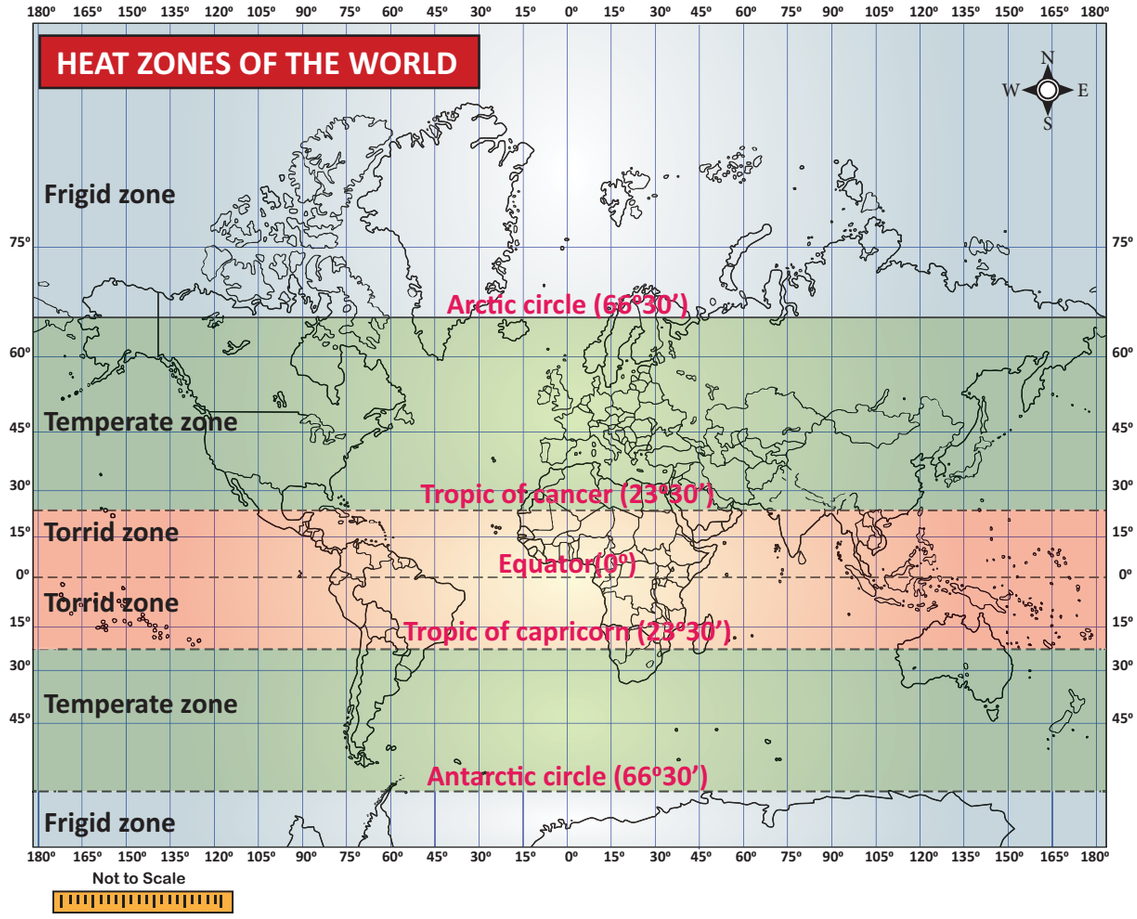
The frigid zone lies between the Arctic circle and the North Pole and between the Antartic circle and the South Pole.This region also known as Polar region.Since it receives the extremely low temperature throughout the year,these regions are covered with snow.

### Highest Temperature ever recorded

The highest temperature ever recorded on the earth is **56.7°C (134°F)**. It was recorded on 10th July 1913 at **Greenland Ranch of Death Valley**, California, USA.

### Lowest Temperature ever recorded

The lowest temperature ever recorded on the earth is **–89.2 °C (–128.6 °F; 184.0 K).** It was recorded on 21st July, 1983 at **Soviet Vostok** Station in Antarctica.






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## Rainfall

Rain is a liquid water in the form of droplets that have condensed from atmospheric water vapour and then become heavy enough to fall under gravity. Rain is a major component of the water cycle and is responsible for depositing most of the fresh water on the Earth. It is the source of water for all purposes. There is a close relationship between the temperature and rainfall distribution. Generally rainfall is high in the equatorial region and decreases gradually towards poles. Rainfall is measured by **Raingauge**.




**Raingauge**

## Air Pressure




**Aneroid Barometer**

The weight of air above a given area on the earth's surface is called atmospheric pressure or air pressure. The air pressure is measured by Barometer. **The standard air pressure at sea level is 1013.25mb.** At the earth's surface the pressure is 1.03kg.per sq cm. The variation in standard atmospheric pressure is found both horizontally and vertically. Based on the level of pressure, it is categorised into low pressure and high pressure. Low pressure area is an area in the atmosphere where the pressure is lower than its surrounding areas. In this situation, the wind from the surroundings blow towards the centre of low pressure. High pressure is an area of atmosphere where the barometric pressure is higher than its surrounding areas. In this case, the wind from the centre of high pressure blows towards the surrounding low pressure areas. Low pressure system is marked as "**L**" on weather map, where as the high pressure system is marked as "**H**". Low pressure systems are also called as a **depression and cyclones**. High pressure system is called **anti cyclones. Low pressure leads** to cloudiness, wind, and precipitation. High pressure leads to fair and calm weather. **Isobar** is used to show the distribution of air pressure.

DO YOU KNOW?

### Highest pressure ever recorded.

The highest ever air pressure at sea level was recorded at Agata, Russia on 31st December, 1968. The pressure was1083.8mb

### Lowest pressure ever recorded

The lowest pressure of 870mb was recorded at Typhoon Tip, near Guam, Mariana Island in Pacific Ocean on 12th October, 1979.

Humans are not sensitive to small variation in air pressure. But the small variations in pressure that do exist largely determine the wind and storm patterns of the earth. The distribution of atmospheric pressure is controlled by altitude, atmospheric temperature, air circulation, earth rotation, water vapour, atmospheric storms etc.



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TN_GOVT_VIII_Std_Geography_Unit II_updated.indd 186 25-03-2019 10:30:41

## Measuring air pressure

Meteorologist uses barometer/aneroid barometer to measure the air pressure. Barograms are used for recording continuous variation in atmospheric pressure.

**Why Do Your Ears Pop in Airplanes?**

As you go up in an airplane, the atmospheric pressure becomes lower than the pressure of the air inside your ears. Your ears pop because they are trying to equalize or match the pressure. The same thing happens when the plane is on the way down and your ears have to adjust to a higher atmospheric pressure.

# Humidity

Humidity refers to the degree of water vapour present in the atmosphere in gaseous form in particular time and place. It ranges from 0-5 percent by volume in atmosphere. Climatically it is an important constituent of the atmosphere and its quantity depends on the level of temperature. So, the level of humidity decreases towards poles from equator. Humidity is expressed in different ways.




**Hygrometer**

**Specific humidity** is a ratio of the water vapor content of the mixture to the total air content on a mass basis. It is expressed in grams of vapour per kilogram of air

**Absolute Humidity** is the mass or weight of water vapour present per unit volume of air. It is expressed usually in grams per cubic meter of air.

**Relative humidity** is a ratio between the actual amount of water vapour present in the air and the maximum amount of water vapour it can hold at a given temperature. It is expressed as a percentage.

Generally, warm air holds more water vapour than the cold air. When relative humidity reaches 100%, the air gets saturated. In this condition the temperature is said to be at dew-point. Further cooling will condense the water vapour into the clouds and rain. Relative humidity affects human health and comfortness. Very high and very low humidity are injurious to health. It also affects the stability of different objects, buildings and electrical applications.

## Measurement of Humidity

**Hygrometer** is used to measure the humidity. (which comprises wet and dry bulb-plate side by side in the Stevenson screen)

**Find out**

The effect of low and high humidity over Human beings in particular.




With decreasing air pressure,the availability of oxygen to breath also decreases. At very high altitudes, atmospheric pressure and available oxygen get so low that people can become sick and even die. Mountain climbers use bottled oxygen when they ascend very high peaks. They also take time to get used to the altitude as the quick move from high pressure to low pressure can cause decompression sickness. Aircraft create artificial pressure in the cabin which makes the passengers remain comfortable while flying.



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## Wind

The horizontal movement of air is called wind. Vertical movement of air is said as air current. The winds move from high pressure to low pressure. Unlike other elements a wind is made up of a series of gusts and eddies which can only be felt and not seen. Winds get their name from the direction from which they blow i.e, wind blows from south west is called southwest wind.

The wind systems are broadly categorized into three as follows.

- Planetary winds
- Seasonal winds
- Local winds

**Planetary Winds** are the ones which blow almost in the same direction throughout the year. So, they are called as Permanent or planetary winds. Trade winds, Westerlies and polar easterlies are the types of prevailing winds. **Seasonal winds are those** which change their direction according to season in a year. They are called as monsoon winds. These winds blow from sea to land during summer and land to sea during winter. **Local winds** are the winds blow over a small area only during a particular time of a day or a short period of a year. Land and sea breezes are example of these winds.

The Beaufort scale is a scale for measuring wind speed. It is based on observation rather than accurate measurement. It is the most widely used system to measure wind speed today. The scale was developed in 1805 by Francis Beaufort, an officer of the Royal Navy and first officially used by HMS Beagle.




Al-Balakhi, an Arab Geographer collected climatic data from the Arab travellers and prepared the First climatic Atlas of the world

### Measuring wind direction and speed

Meteorologist measures wind direction using **wind vane or weather cock**. Wind speed is measured by **anemometer**. Wind rose is a diagram used to depict the direction and periods (No. of days) of prevailing winds on map. **Meteorograph or triple register is an instrument** which records wind speed and direction, sunshine and precipitation. It also provides graphic representation.



**Anemometer**




Brazil has a large area where the average wind speed is low. Gabon, Congo and DR Congo in Africa, Sumatra, Indonesia and Malaysia are the least windy places on earth.

## Recap

- **Weather** is the day today condition of the atmosphere at any place. **Climate** is the average weather condition (state) of a place for a long period and is usually for 35 years.
- Temperature, precipitation, pressure, humidity and wind are the major elements of weather and climate.
- Temperature is the degree of heat present in the air.
- The weight of air above a given area on the earth's surface is called atmospheric pressure or air pressure.
- Horizontal movement of air is called wind.



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| GLOSSARY | | |
|---|---|---|
| Conduction | Transfer of heat energy from one place to another through the substances that are in direct contact with each other | வெப்பக்கடத்தல் |
| Condensation | The process in which the water vapour changes into liquid form. | ஆவிசுருங்குதல் |
| Eddies | They are the wind circulation that develops when the wind blows over or adjacent to rough terrain, buildings, mountains or other obstructions. | சுழற்காற்று |
| Humidity | The amount of water vapour in the air | ஈரப்பதம் |
| Insolation | Incoming solar radiation | சூரியக்கதிர்வீசல் |
| Radiation | The transmission of heat energy from one body to the other body without any medium is called radiation | கதிர்வீச்சு |



## Evaluation

### I. Choose the correct answer.

JKPA3G

1. Earth's atmosphere contains about ---- percentage of nitrogen and oxygen.
   a) 78% and 21% b) 22% and 1%
   c) 21% and 0.97% d) 10% and 20%
2. ---------- is generally defined as the average conditions of the weather of a place or a region.
   a) earth b) atmosphere
   c) climate d)s un
3. The earth receives energy from ----------.
   a) current
   b) electro magnetic radiation
   c) waves
   d) heat
4. Which one the following represents places with equal amount of rainfall
   a)isotherm b) isohel
   c)isobar d) isohytes
5. ---------- is used to measure the humidity.
   a) anemometer b) barometer
   c) hygrometer d) thermometer

### II. Fill in the blanks.

1. _____ refers to the condition of atmosphere for a short period of time.
2. The scientific study of weather is called _____.
3. The highest temperature ever recorded on the earth is _____.
4. _____ is a ratio between the actual amount of water vapour and the maximum amount of water vapour the air can hold.
5. _____ and_____ are measured by anemometer and wind vane respectively.
6. _____ are imaginary lines which connect the same temperatures of different places.

### III. Match the following.

| | | |
|---|---|---|
| 1. | Climate | Locating and Tracking Storms |
| 2. | Isonif | Cyclone |
| 3. | Hygrometer | Equal Snowfall |
| 4. | Radar | Long Term Changes |
| 5. | Low Pressure | Humidity |



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## IV. State whether the following statements are True or False.

1. The atmosphere is a layer of gases surrounding the planet.
2. The Scientific study of weather is called Climatology.
3. Isohel refers equal sunshine.
4. Humidity is calculated by Aneroid Barometer.

## V. Answer in brief.

1. Define 'weather'.
2. What is insolation?
3. What is meant by atmospheric pressure?
4. Write a short note on "Planetary winds"
5. What are "Isolines"?

## VI. Distinguish the following.

1. Weather and climate.
2. Absolute and relative humidity.
3. Permanent and seasonal winds.

## VII. Give reasons.

1. The Weather and climate in different regions vary.
2. Temperature decreases with increase in altitude.
3. Mountain climbers carry oxygen cylinders while ascending peaks.

## VIII. Answer in a paragraph.

1. How is temperature measured?
2. Write about the wind and its types.
3. List out the weather elements and associated measuring instruments.

## IX. Give any three suggestions to reduce global warming.

1. _____.
2. _____.
3. _____.

## X. Activities.

1. Make weather instruments like wind vane and rain gauge using web resources.
2. Make mini-meteorological station model in your school.
3. Observe and record the weather condition of your place in the following table.

| | | | |
|---|---|---|---|
| Date | | | |
| Place and Time | | | |
| Temperature | | | |
| Barometric pressure | | | |
| Precipitation type and amount | | | |
| Wind direction | | | |
| Wind speed | | | |
| Source of information- | | | |



## REFERENCE BOOKS


1. *Climatology an atmospheric science* John E. Oliver, John J. HIdore, 2003, person education (singapore)pte,Ltd. India branch, Delhi.
2. Goh Cheng Lelong, *Certificate Physical and Human Geography,* Goh Cheng Lelong, oxford publication (india).
3. *Climatology,* Savindra Singh, 2005, Prayag pustak bhawan, Allahabad, India.





## INTERNET LINKS

1. https://www.nationalgeographic.com/
2. https://climatekids.nasa.gov/menu/atmosphere/

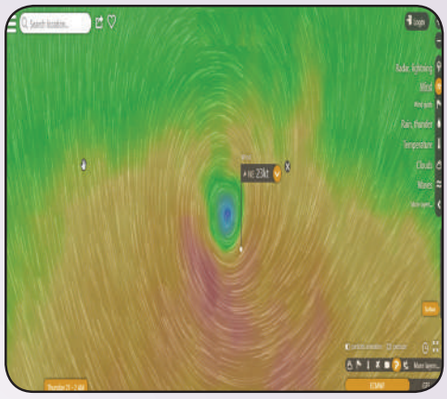


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## ICT CORNER

# WEATHER AND CLIMATE

**Through this activity you will know about wind direction, temperature, humidity andweather forecast visualizationof the world**



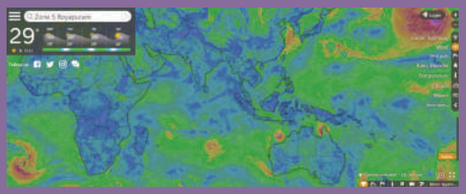
### Procedure

**Step – 1** Open the Browser and type the URL given below (or) Scan the QR Code.

**Step – 2** Enter your location in search box (Ex.Tiruchirappalli)

**Step – 3** Use the Drag flag and zoom in your area.

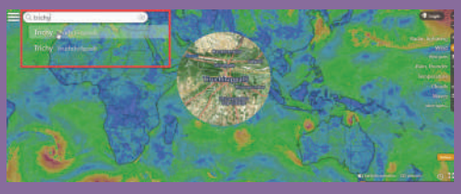
**Step – 4** Go to menu in right side and select from the list to know the weather of your area (Ex.Temperature)



**Step1**



**Step3**



**Step2**



**Step4**

### URL:

https://www.windy.com

Mobile: https://play.google.com/store/apps/details?id=com.windyty.android

*Pictures are indicatives only.

*If browser requires, allow Flash Player or Java Script to load the page

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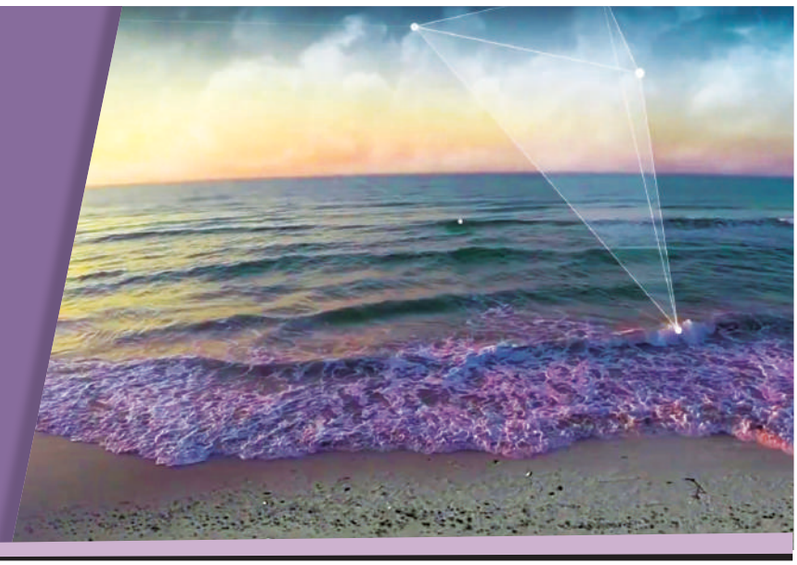


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Unit - 3

# Hydrologic Cycle



## Learning Objectives

- To understand the status of water on the earth.
- To learn the basic concepts of Hydrologic cycle.
- To study the different components of hydrologic cycle.

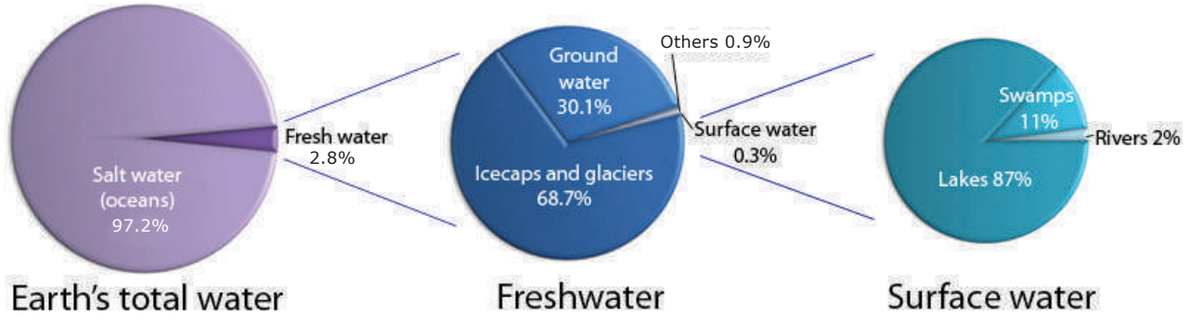
9DWYH8

## Introduction

Water is one of the most important elements on earth. All plants and animals need water for survival. Apart from drinking, water is required for domestic, agriculture, industrial purposes etc. Water is very essential for carrying out almost all economic activities. So, water is an indispensible element without which life form on the earth is not possible.

## Water on the Earth

About 71% of the earth's surface is covered by water. The quantity of water present on the earth is about 326 million cubic miles. It is hard to visualise this massive quantity of water. Most of the water on the earth is saline and is found in seas and oceans. The salt water constitutes about 97.2% and the fresh water is only about 2.8%. Out of this 2.8%, about 2.2% is available as surface water and the remaining 0.6% as groundwater. From this 2.2% of surface water, 2.15% is available in the form of glaciers and icecaps, 0.01% in lakes and streams and the remaining 0.04% is in other forms. Only about 0.25% of the total ground water of 0.6% can be




**Water on the Earth**



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economically extracted with the present drilling technology.

Water resources are useful or potentially useful to humans. Water in India is available in three sources. They are **precipitation, surface water** and **groundwater**.

**Table 1: Estimated Volume of Water on the Earth's Surface**

| Water Source | Volume of water (Cubic Miles) | Percentage to Total Water |
|---|---|---|
| Oceans, Seas, & Bays | 321,000,000 | 96.54 |
| Ice caps, Glaciers, & Permanent Snow | 5,773,000 | 1.74 |
| Groundwater | 5,614,000 | 1.69 |
| Soil Moisture | 3,959 | 0.001 |
| Ground Ice & Permafrost | 71,970 | 0.022 |
| Lakes | 42,320 | 0.013 |
| Atmosphere | 3,095 | 0.001 |
| Swamp Water | 2,752 | 0.0008 |
| Rivers | 509 | 0.0002 |
| Biological Water | 269 | 0.0001 |

(*Source: Shiklomanov, 1993*)

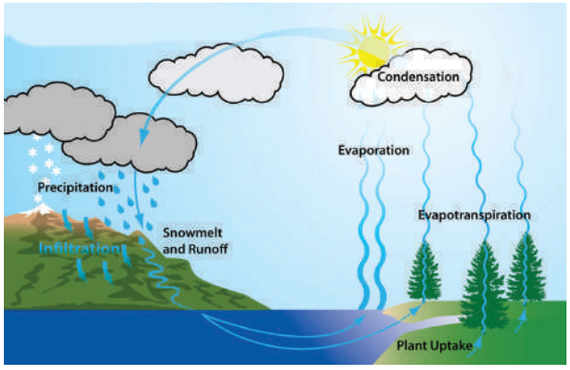
## Hydrologic Cycle or Water Cycle

Hydrology is the science which deals with the various aspects of water such as its occurrence, distribution, movement and properties on the planet earth. Availability of water on the earth is not uniform. Some places are very rich in water resources while some other places are poor in water resources.

Hydrologic cycle is a global sun-driven process where water is transported from oceans to atmosphere, from atmosphere to land and from land back to oceans. The water cycle can be considered as a closed system for the earth, as the quantity of water involved in the cycle is invariable, though its distribution varies over space and time.

Evaporation takes place from the surface water and transpiration from the plants. Water vapour gets condensed at higher altitudes by condensation nuclei and form clouds (resulting in droplet growth). The clouds melt and sometimes burst resulting in precipitation of different forms. A part of water from precipitation flows over the land is called runoff and the other part infiltrates into the soil which builds up the groundwater.

Hydrologic cycle is a circulation of water. It is a continuous process and takes place naturally. The three important phases of the hydrologic cycle are: **1) Evapotranspiration, 2) Precipitation** and **3) Runoff**.




**Hydrologic Cycle**

## Components of Hydrologic Cycle

There are six main components in hydrologic cycle. They are: 1) Evapotranspiration, 2) Condensation, 3) Precipitation, 4) Infiltration, 5) Percolation, and 6) Runoff.

### Evapotranspiration

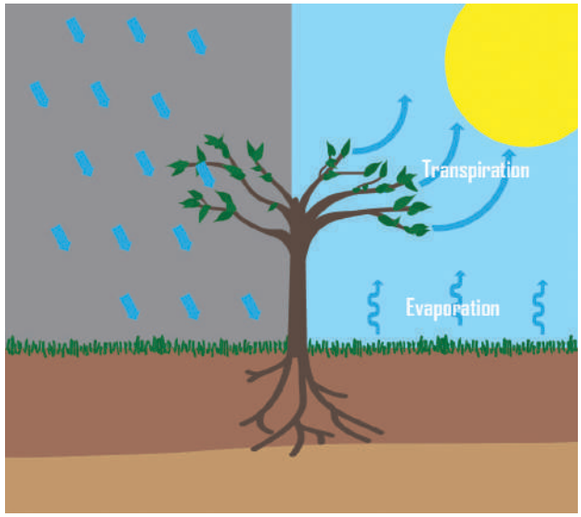
It is defined as the total loss of water from the earth through evaporation from the surface water bodies and the transpiration from vegetation. In cropped area, it is difficult to determine the evaporation and transpiration separately. Therefore it is collectively called as evapotranspiration.

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**Evapotranspiration**

## Evaporation

Evaporation refers to the process in which the liquid form of water changes into gaseous form. Water boils at 100°C (212°F) temperature but, it actually begins to evaporate at 0°C (32°F); and the process takes place very slowly. Temperature is the prime element which affects the rate of evaporation. There is a positive relationship between these two variables. Areal extent of surface water, wind and the atmospheric humidity are the other variables which affect the rate of evaporation.

Many studies reveal that the oceans, seas, lakes and rivers provide nearly 90 % of the moisture in the atmosphere through evaporation and the remaining 10 % is contributed by plants through transpiration.

On a global scale, the amount of water gets evaporated is about the same as the amount of water delivered to earth as precipitation. This process varies geographically, as the evaporation is more prevalent over the oceans than precipitation, while over the land, precipitation routinely exceeds evaporation. The rate of evaporation is low during the periods of calm winds than during windy times. When the air is calm, evaporated water tends to stay close to the water body. During windy, the water vapour is driven away and is replaced by dry air which facilitates additional evaporation.

**DO YOU KNOW?**

**The rate of evaporation increases with**

- Increase in wind speed
- Increase in temperature
- Decrease in humidity and
- Increase in areal extent of surface water bodies.

## Transpiration

Transpiration refers to the process by which the water content in the plants are released into the atmosphere in the form of water vapour. Much of the water taken up by plants is released through transpiration. The rate of transpiration is also affected by the temperature, wind and humidity. The soil water content and the ability of the soil to conduct water to the roots, the nature of the plant parts including barks and leaves also determine the transpiration rate. In case of agriculture, the crop characteristics, its environment and cultivation practices also affect the transpiration process.

## Condensation

It refers to the process in which the gaseous form of water changes into liquid form. Condensation generally occurs in the atmosphere when warm air rises, cools and loses its capacity to hold water vapour. As a result, excess water vapour condenses to form cloud droplets. Condensation is responsible for the formation of clouds. These clouds produce precipitation which is the primary route for water to return to the earth's surface in the water cycle. Condensation is the opposite of evaporation.

## Forms of Condensation

Dew, Fog and Clouds are the three major forms of condensation

a) **Dew:** It is a water droplet formed by the condensation of water vapour on a relatively cold surface of an object. It forms when the temperature of an object drops below the dew point temperature.



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**Frost:** The ice crystals formed by deposition of water vapour on a relatively cold surface of an object is known as frost. It forms when the temperature of an object drops below the freezing point of temperature.

b) **Fog:** Fog is the suspended tiny water droplets or ice crystals in an air layer next to the earth's surface that reduces the visibility to 1,000 m or lower. For aviation purposes, the criterion for fog is 10 km or less.

**Mist:** Mist is the tiny droplets of water hanging in the air. These droplets form when the water vapour in the air is rapidly cooled, causing it to change from invisible gas to tiny visible water droplets. Mist is less dense than fog.

c) **Clouds:** Clouds consist of tiny water droplets/ice particles which are so small and light in weight. Clouds are formed by microscopic drops of water or by small ice crystals. The size of the droplets generally range from a couple of microns to 100 microns. This is the limit beyond which cloud drops become rain drops.




- Condensation occurs when the air get saturated.
- Warm air can hold more water vapour than the cool air.
- Saturation occurs when the temperature drops down.

## Precipitation

Precipitation refers to all forms of water that fall from clouds and reaches the earth's surface. For the occurrence of precipitation, cloud droplets or ice crystals must grow heavy enough to fall through the air. When the droplets grow large in size, they tend to fall. While moving down, by collecting some small droplets, they become heavy enough to fall out of the cloud as raindrops.

## Forms of Precipitation

The form of precipitation in a region depends on the kind of weather or the climate of the region. The precipitation in the warmer parts of the world is always in the form of rain or drizzle. In colder regions, precipitation may fall as snow or ice. Common types of precipitation include rain, sleet, freezing rain, hail and snow.

**Rain:** The most common kind of precipitation is rain. The precipitation in the form of water droplets is called rain. The precipitation in which the size of rain drops are <0.5 mm in diameter is known as drizzle and the rain drops with >0.5 mm in diameter is known as rain. Generally drizzle takes place from stratus clouds.

**Sleet:** The precipitation which takes place in the form of mixture of water droplets and tiny particles of ice(5mm in diameter) is known as sleet. Sometimes raindrops fall through a layer of air below 0°C, the freezing point of water. As they fall, the raindrops freeze into solid particles of ice. So, the mixture of water droplets and ice particles would fall on the earth surface.

**Freezing Rain:** At other times raindrops falling through cold air near the ground do not freeze in the air. Instead, the raindrops freeze when they touch a cold surface. This is called freezing rain and the drops of water are usually greater than 0.5 mm in diameter.

**Hail:** The precipitation which consists of round pellets of ice which are larger than 5 mm in diameter is called hail or hailstones. Hail forms only in cumulonimbus clouds during thunderstorms. A hailstone starts as an ice pellet inside a cold region of a cloud. Strong updrafts in the cloud carry the hailstone up and down through the cold region many times.

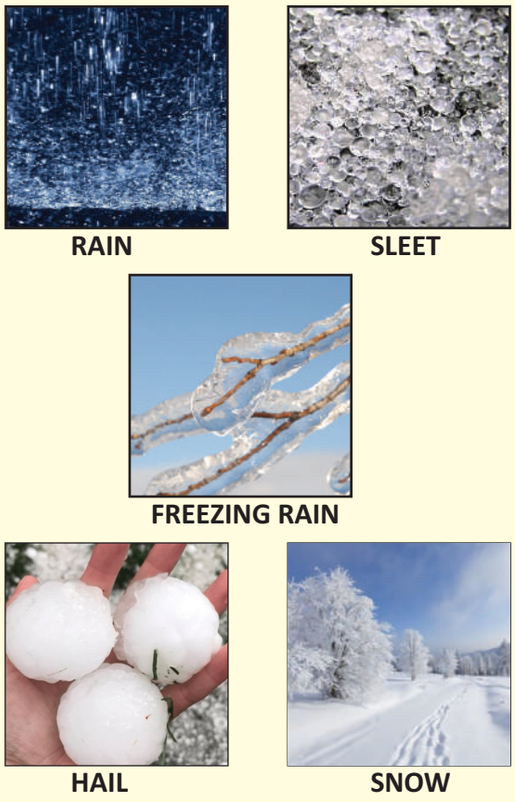
**Snow:** Often water vapour in a cloud is converted directly into snow pieces due to lowering of temperature. It appears like a



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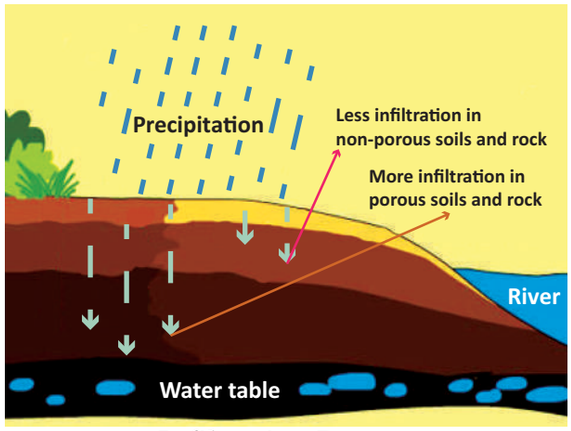
powdery mass of ice. The precipitation in the form of powdery mass of ice is known as snowfall. It is common in the polar and high mountainous regions.




**Different forms of Precipitation**

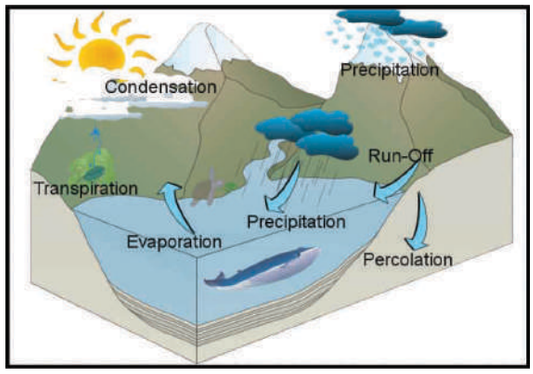
## Infiltration

Water entering the soil at the surface of the ground is termed as infiltration. Infiltration allows the soil temporarily to store water, making it available for plants use and organisms in the soil. Infiltration is an important process where rain water soaks into the ground, through the soil and underlying rock layers. Some of this water ultimately returns to the surface through springs or low spots down hills. Some of the water remains underground and is called groundwater. The rate of infiltration is influenced by the physical characteristics of the soil, vegetative cover, moisture content of the soil, soil temperature and rainfall intensity. The terms infiltration and percolation are often used interchangeably.




**Infiltration Process**

## Percolation




**Percolation Process**

Percolation is the downward movement of infiltrated water through soil and rock layers. Infiltration occurs near the surface of the soil and delivers water from the surface into the soil and plant root zones. Percolation moves the infiltrated water through the soil profile and rock layers which leads to the formation of ground water or become a part of sub-surface run-off process. Thus, the percolation process represents the flow of water from unsaturated zone to the saturated zone.

## Runoff

Runoff is the water that is pulled by gravity across land's surface. It replenishes groundwater and surface water as it percolates into an aquifer (it is an underground layer of water-bearing rock) or moves into a river, stream or watershed. It comes from unabsorbed water from rain, snowmelt,

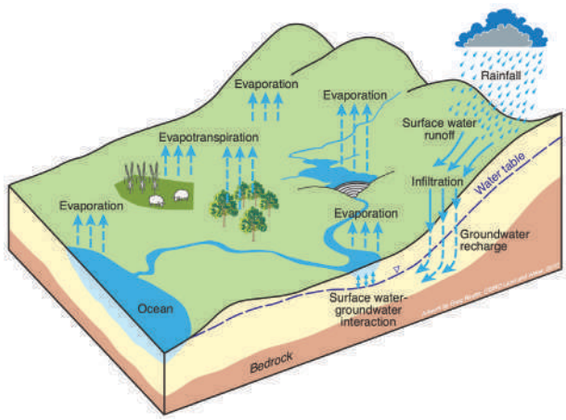


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irrigation or other sources, comprising a significant element in the water cycle as well as the water supply when it drains into a watershed.

Runoff is also a major contributor to the erosion which carves out canyons, gorges and related landforms. The amount of runoff that can happen depends on the amount of rainfall, porosity of soil, vegetation and slope. Only about 35% of precipitation ends up in the sea or ocean and the other 65% is absorbed into the soil.




**Runoff Process**

## Types of Runoff

Based on the time interval between the instance of rainfall and generation of runoff, the runoff may be classified into following three types

i) **Surface Runoff:** It is the portion of rainfall, which enters the stream immediately after the rainfall. It occurs, when the rainfall is longer, heavier and exceeds the rate of infiltration. In this condition the excess water makes a head over the ground surface, which tends to move from one place to another following land gradient and is known as overland flow. When the overland flow joins the streams, channels or oceans, it is termed as surface runoff or surface flow.

ii) **Sub-Surface Runoff:** The water that has entered the subsoil and moves laterally without joining the water-table to the streams, rivers or oceans is known as sub-surface runoff. The sub-surface runoff is usually referred as interflow.

iii) **Base Flow:** It is a flow of underground water from a saturated ground water zone to a water channel. It usually appears at a downstream location where the channel elevation is lower than the groundwater table. Groundwater provides the stream flow during dry periods of small or no precipitation.




**Units of the Measurement pertaining to Hydrology**

- Evaporation /interception - inches (or) cm
- Infiltration - inches (or) cm / hour
- Precipitation - inches (or) mm ( or) cm
- Run off - inches (or) mm (or) cm
- Run off rate - cubic feet per second
- Run off volume - acre feet (or) cubic feet
- Storage - cubic feet (or) acre feet

## Recap

- Water is one of the most important elements on earth. All plants and animals need water for survival.
- About 71% of the earth's surface is covered by water. Out of this, only about 2.8% is fresh water and the remaining 97.2% is saltwater found in seas and oceans.
- Hydrological cycle is a global sun-driven process where water is transported from oceans to atmosphere, from atmosphere to land and from land back to oceans.
- There are six main components in hydrologic cycle. They are evapotranspiration, condensation, precipitation, infiltration, percolation, and runoff.
- The precipitation in the warmer parts of the world is in the form of rain or drizzle. The common types of precipitation include rain, sleet, freezing rain, hail, and snow.
- Infiltration occurs near the surface of the soil and delivers water from the surface into the soil and plant rooting zone. Percolation moves it through the soil profile and rock layers to form groundwater.



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| GLOSSARY | | |
|---|---|---|
| Aquifer | It is an underground layer of water - bearing permeable rocks, rock fractures or unconsolidated materials (gravel, sand or silt) | நீர்கொள்பாறை |
| Evapotranspiration | It refers to the water lost through evaporation from the water bodies and transpiration from vegetation | நீராவியாதல் |
| Infiltration | the seepage of water into soil or rock | நீர் ஊடுருவல் |
| Percolation | the slow movement of water through the pores in soil | நீர்க்கசிவு |
| Precipitation | falling products of condensation in the atmosphere, as rain, snow, or hail | மழை |
| Runoff | overflow | ஓடும்நீர் |



## Evaluation

### I. Choose the Correct Answer.

1. The process in which the water moves between the oceans, atmosphere and land is called
   a) River Cycle b) Hydrologic Cycle
   c) Rock Cycle d) Life Cycle
2. The percentage of fresh water on the earth is
   a) 71 b) 97
   c) 2.8 d) 0.6
3. The process of changing of water from gaseous to liquid form is known as
   a) Condensation b) Evaporation
   c) Sublimation d) Rainfall
4. Water that flows in the sub-soil or through the ground into the streams, rivers, lakes and oceans is termed as
   a) Condensation b) Evaporation
   c) Transpiration d) Runoff
5. The evaporation of water from the leaves of plants is called
   a) Transpiration b) Condensation
   c) Water vapour d) Precipitation
6. Water that is good enough to drink is called
   a) Groundwater b) Surface water
   c) Potable water d) Artesian water

### II. Fill in the blanks.

1. The degree of water vapour present in the atmosphere is known as_____.
2. There are _____ phases in the water cycle.
3. The falling of water towards the earth surface from atmosphere in any form is known as _____.
4. The precipitation with the rain drop size of<0.5mm in diameter is known as _____.
5. Mist is denser than _____.

### III. Match the following.

| | | |
|---|---|---|
| 1. | Vegetation | Clouds |
| 2. | Condensation | Sleet |
| 3. | Snow and rain drops | At the surface |
| 4. | Infiltration | Transpiration |

### IV. Choose the correct statement

1. Evaporation refers to
   I. The process in which the gaseous form of water changes in to liquid form.



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II. It refers to the process in which the liquid form of water changes into gaseous form.

III. Water boils at 100°C temperature but, it actually begins to evaporate at 0°C.

IV. It is responsible for the formation of clouds.

a) I, IV and V are correct

b) II only correct

c) II and III are correct

d) All are correct

## V. State whether the following statements are True or False.

1. Water boils at 212°F temperature but, it begins to evaporate at 32°F.
2. Mist is not the tiny droplets of water hanging in the air.
3. The sub-surface runoff is usually referred as interflow.

## VI. Answer in brief.

1. Write a short note on aquifer.
2. Define " hydrological cycle".
3. How is the dew formation takes place?
4. Write a short note on surface run-off.

## VII. Give reasons.

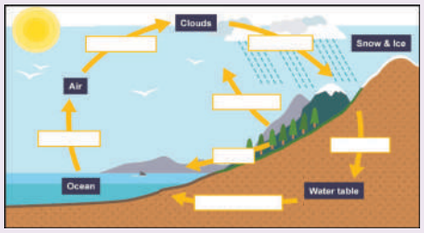
1. Infiltration of water is low in the region of non-porous soil.
2. Fresh water is less on the earth.
3. Snowfall is common in the polar region and mountainous regions.

## VIII. Answer in a paragraph.

1. Explain the different stages involved in the hydrological cycle.
2. Distinguish between evaporation and transpiration.
3. Give a detailed explanation on different forms of precipitation.
4. Explain the run-off and its types.

## ACTIVITY

Find out the missing components of hydrologic cycle in the given diagram and fill it up appropriately.




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1. Davie, T. (2008). *Fundamentals of Hydrology* (Second Edition – Routledge Fundamentals of Physical Geography Series). Routledge - Taylor & Francis Group, New York.
2. Musy, A. and Higy, C. (2011). *Hydrology: A Science of Nature Science* Publishers, Enfield.
3. Raghunath, H.M. (2006). *Hydrology – Principles, Analysis and Design* (Revised Second Edition). New Age International (P) Limited, Publishers, New Delhi.
4. Rakhecha, P.R. and Singh, V.P. (2009). *Applied Hydrometeorology,* Springer Publishing Company, Dordrecht and Capital Publishing Company, New Delhi.
5. Viessman, W. (Jr), Lewis, G.L. (2003). *Introduction to Hydrology* (Fifth Edition). Prentice-Hall of India Private Limited, New Delhi.


## INTERNET RESOURCES

1. http://www.fao.org/docrep/X0490E/x0490e04.htm.
2. https://www.sciencelearn.org.nz (University of Waikato).
3. https://cals.arizona.edu/azmet/etowhat1.pdf.
4. https://pmm.nasa.gov/education/sites/default/files/lesson_plan_files/evaporation_investigation_lesson_plan.pdf.
5. https://www.watereducation.org/aquapedia-background/runoff.



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# Unit - 1

# Migration and Urbanisation



## Learning Objectives

- To study the meaning, causes and consequences of migration
- To know the types of migration
- To describe the concept of Urbanisation
- To learn the origin and growth of Urbanisation
- To understand the problems of Urbanisation

Q6B6K8

## Introduction

Rajesh and Suresh were new students joined in a school. They were allotted to Section – 'A' in VIII standard. The class teacher and other students of the class welcomed them. Teacher said, "You are going to have two new friends today. So, you all introduce yourselves to others; say your name and place from where you are coming, okay". They started from the first bench. Rajesh and Suresh were sitting in the second bench. Rajesh had a turn to introduce himself. He said, "I am Rajesh, as my mother has been transferred to this school, we migrated from Chennai to Krishnagiri". Now Suresh had a turn to introduce himself. He said, "I am Suresh, coming from the Village called Pudupatti, it is five kilometres away from the school; Madam, Please tell me the meaning of 'migration' the word used by Rajesh". The teacher said, "yes, from this lesson you are going to learn in detail about it".

## MIGRATION

Migration has been defined differently by different experts. In general, migration is defined as the permanent or semi permanent change of residence of an individual or group of people over a significant distance. So, the term migration refers to the movement of people from one place to another.



**Migration**

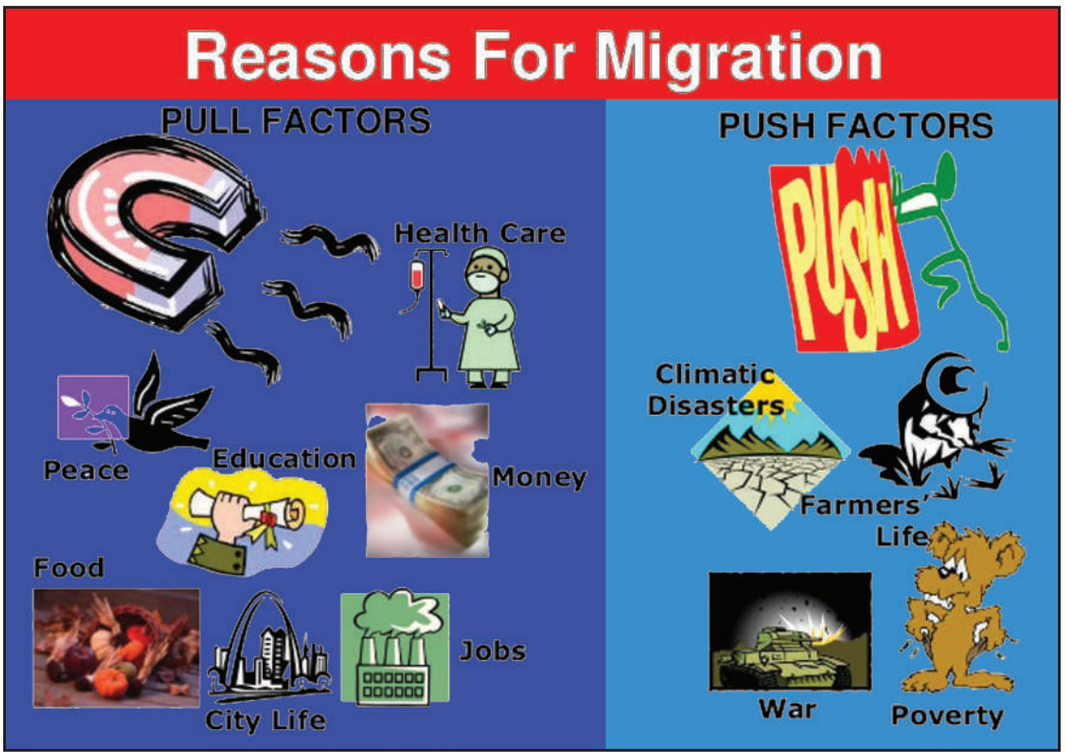
United Nations Organization Definition: Migration is a form of geographical mobility of population between a geographical unit to another, generally involving a permanent change of residence.

One of the most important aspects of social science is **"Human Migration".** It has maintained a close relation with mankind from its earliest stage. Migration is one of the most



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8th_Social_Science_Term_II_Geography_Unit_1.indd 108 27-07-2019 12:40:23




important dynamic human activities from the very beginning of human life. During the early days, people moved from one place to another in search of food. When most of the people ceased to live in forest and adopted civilized life, they developed relationship with domesticated animals and fertile land. As a result, mobility of mankind changed considerably. They almost left the nomadic life and started to live in permanent settlements. At this stage, people continued to move from one region to another in search of fertile land for cultivation. Afterwards, the nature of mobility frequently changed over a period of time.

## Factors of Migration

There are a number of factors which are responsible for the migration of human population. These factors can be grouped under the heads of favourable and unfavourable factors. The favourable factors which attract people towards a location are called pull factors. The unfavourable factors which make the people to move out from a location are called push factors.

The various causes which are responsible for human migration is categorized under five groups as follows.

**a) Ecological or Natural Causes of Migration**

The causes operate under this category are natural ones. They include volcanic eruption, earthquake, flood, drought etc. These events force the people to leave their native places and settle in the new areas. The conditions like the availability of water resources, areas free from hazards, pollution etc., attract the migrants.

**b) Economic causes of Migration**

Economy is one of the most important causes of human migration from one area to another. Various economic causes determine the level and direction of migration. The availability of fertile agricultural land, employment opportunities, development of technology etc., are some of the economic causes that attract the migration. The mass poverty and unemployment force the people to move out from their native places to the places where the better employment opportunities are available.



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| Pull Factors | Push Factors |
|---|---|
| **Natural Causes** | |
| Least hazard prone zones | Hazard prone zones |
| Favourable climate | Climate change (including extreme weather events) |
| Abundance of natural resources and minerals (e.g.water,oil,uranium) | Crop failure and scarcity of food |
| **Economic Cause** | |
| Potential for employment | Unemployment |
| **Socio-cultural Cause** | |
| Unification | Family conflicts |
| **Demographic Cause** | |
| Under population | Over population |
| **Political Causes** | |
| Political security | War, civil, unrest |
| Independence and freedom | Safety and security concerns (ethnic, religious, racial or cultural persecution |
| Affordable and accessible urban services (including healthcare, education, utilities and transport) | Inadequate or limited urban services and infrastructure (including healthcare, education, utilities, transport and water) |

**Share of Regions in World Population and International Migrants by Origin - 2017**

| S.No | Name of the Region | Total Population | Percentage of Global Population | International Migrants by origin | Percentage of International Migrants |
|---|---|---|---|---|---|
| 1 | Africa | 1,256,268 | 16.6 | 36,266 | 14.1 |
| 2 | Asia | 4,504,428 | 59.7 | 105,684 | 41.0 |
| 3 | Europe | 742,074 | 9.8 | 61,191 | 23.7 |
| 4 | Latin America and the Caribbean | 645,593 | 8.6 | 37,720 | 14.6 |
| 5 | Northern America | 361,208 | 4.8 | 4,413 | 1.7 |
| 6 | Oceania | 40,691 | 0.5 | 1,880 | 0.7 |
| 7 | Unknown | n/a | n/a | 10,560 | 4.1 |
| **8** | **World** | **7,550,262** | **100.0** | **257,715** | **100.0** |

**Source: International Migration Report, 2017, United Nations.**



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**c) Socio-cultural causes of Migration**

Socio-cultural causes also play some roles in the process of migration. Migration of women after marriage and migration associated with pilgrimage are based on the socio-cultural customs.



**Socio-cultural causes of Migration**

**d) Demographic causes of Migration**

In demographic sense, the population composition like age and sex, over population and under population are the major causes of migration. It is well known fact that adults are more migratory than any other age-groups. Women mostly migrate after their marriage. Generally over population is considered as a push factor and under population to be pull factor in the context of migration.

DO YOU KNOW?

Female migrants outnumber male migrants in Europe, Northern America, Oceania and Latin America and the Caribbean, while in Africa and Asia, particularly Western Asia, migrants are predominantly men. (International Migration Report, 2017).

**e) Political causes of Migration**

Various political causes like colonization, wars, government policies etc. have always been playing important role in human migration from time to time. Wars have been one of the significant causes of migration since ancient time.

## Types of Migration

Migration can be classified in several ways. It is usually categorized as follows

DO YOU KNOW?

In 2017, India was the largest country of origin of international migrants (17 million), followed by Mexico (13 million) (International Migration Report, 2017).

### a) Based on the movement associated with administrative limits

**(i) Internal migration:** The movement of people within a country is known as internal migration.

Further, the internal migration is classified into four categories on the basis of the place of origin and destination of migrants. **Rural to Urban Migration** is the movement of population from rural areas to growing towns and cities mainly in search of employment, education and recreation facilities. **Urban to Urban Migration** is the migration between one urban centre to the other like in search of higher salaries. **Rural to Rural Migration** is driven by fertile land for cultivation and other sociological factors like Marriage etc. **Urban to Rural Migration** is the movement from urban centres to rural areas to get rid-off the urban problems and returning to native places after retirement from jobs. Rural to urban migration is the most common one.

**(ii) International migration** – Migration that occurs across the national boundaries are known as international migration.

### b) Based on the willingness of the migrants for migration

**(i) Voluntary migration:** If the migration takes place on person's free will, initiative and desire to live in a better place and to improve their financial status, the migration is said to be voluntary.

**(ii) Involuntary or forced migration:** If the migration takes place against the will of migrants, the migration is termed as involuntary migration. The push factors like war may force the people to emigrate from a place is of this type.



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### c) Based on the duration of stay of migrants in the place of destination

**(i) Short term migration:** In this kind of migration, the migrants stay outside only for a short duration before returning to the place of origin. The duration may be from a few days to few months.

**(ii) Long term migration:** It is a kind of migration in which the migrants stay outside at least for a few years.

**(iii) Seasonal migration:** In this type of migration usually a group of people migrates from their native places during a particular season and returns after end of that season. People migrating to hill stations during summer and the migration of agricultural workers during sowing seasons belong to this category. **Transhumance** is an another example of seasonal migration.




The number of international migrants worldwide has continued to grow rapidly in recent years, reaching 258 million in 2017, up from 220 million in 2010 and 173 million in 2000 (International Migration Report, 2017).

## Consequences of Migration

Migration affects both the areas of origin of migration and the areas of destination. The following are the major consequences of migration.

**a) Demographic consequences:** It changes age and sex composition of population. Migration of females after their marriage leads to decline in sex ratio in the source regions and increase the sex ratio in the regions of destinations. The migration of male workers in search of jobs decreases the independent population of the source regions which increases the dependency ratio.

**b) Social consequences:** The migration of people from different regions towards an urban area leads to the formation of plural society. It helps the people to come out of narrow mindedness and people become generous.

**c) Economic consequences:** The migration of more people from over populated to under populated regions results the imbalance of the resource-population ratio. In some cases, the regions of over and under population may become the regions of optimum population. Migration may influence the occupational structure of the population of an area. Through this it will certainly affect the economy of the regions also. **Brain drain** is a consequence of migration. Brain drain refers to the migration in which skilled people from economically backward countries move to developed countries in search of better opportunities. Eventually, this leads to backwardness in source regions. This is called as **"backwash effect".**

**d) Environmental consequences:** Large scale movement of people from rural to urban areas causes overcrowding in cities and puts heavy pressure on resources. It leads to rapid growth of cities. The over population in urban areas leads to the pollution of air, water and soil. Scarcity of drinking water, lack of space for housing, traffic congestions and poor drainage are the common environmental problems prevail in urban areas. The lack of space for housing and the rising of land cost lead to the formation of slums.

## URBANISATION

Urbanisation refers to the process in which there is an increase in the proportion of population living in towns and cities.



**Urbanisation**



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## Causes of Urbanisation

Urbanisation is driven by three factors: natural population growth, rural to urban migration and the reclassification of rural areas into urban areas. Present day urbanisation includes changes in demographics, land cover, economic processes and characteristics of geographic area.

X4M3X4

DO YOU KNOW?

In 2007, for the first time in history, the global urban population exceeded the global rural population and the world population has remained predominantly urban thereafter. (World Urbanisation Prospects, 2014 Revision, Highlights).

## Origin and Growth of World Urbanisation

The process of urbanisation in the world has a long history.

**Ancient Period:** The urban centres started developing during the pre-historic period (before 10000 years). During this period primitive man started domestication of plants and animals. It was the period of development of permanent settlements. The river valley regions of the Egypt, Greece and India gave rise to agrarian communities which eventually formed the urban communities and urban centres. The excess production of food grains was the major reason for urbanisation. **Ur and Babylon in Mesopotamia, Thebes and Alexandria in Egypt, Athens in Greece, Harappa and Mohenjodaro in India were noted prehistoric cities of the world.**

In ancient period the increase in the number and size of urban centres occurred during the two great colonizing periods of the Greeks and Romans. During the beginning of the 7th century itself many cities were found near the Aegean Sea. During the Greek colonizing period, the expansion of trade promoted the growth of towns and cities.

DO YOU KNOW?

India, China and Nigeria – together are expected to account for 35 % of the growth in the world's urban population between 2018 and 2050. India is projected to add 416 million urban dwellers, China 255 million and Nigeria 189 million (World Urbanisation Prospects, 2018, Key facts).



**A City in Harappa**

**Medieval Period:** It refers to the period after the 11th century. During this period, the European countries, increased their overseas trade which played an important role in the revival of European towns and cities after a period of low development. **At the end of the thirteenth century, Paris, London, Geneva, Milan and Venice were the important cities found in Europe.**



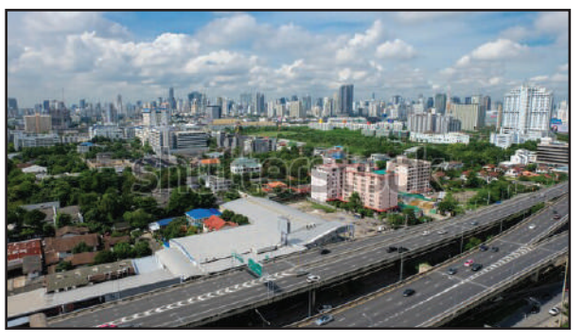

**Modern Period:** This period starts from 17th century. It marks the third phase of development in urbanisation. The industrial revolution in the19th century accelerated the growth of towns and cities. The Europeans with urban civilization gave birth to a large number of new towns in North America and Soviet Union. The modern



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8th_Social_Science_Term_II_Geography_Unit_1.indd 113 27-07-2019 12:40:24

means of transport and communication, the development of new trade routes during 19th century had strengthened the trade centres and urban areas. The latest development in urbanisation was noticed in the continent of Africa. Before 1930, Africa had towns only on its coasts but now it has 50 towns with population exceeding 1,00,000. Major cities in Africa are Cairo, Nairobi, Mombasa, Bulawayo, Duala, Abidian, Logos, Accra, Addis Abba, Leopoldville, Luanda, Cape Town, Natal, Pretoria etc. Thus, in modern age, the accelerating urbanisation is resulting in a redistribution of population throughout the world.



**Modern Urbanisation**




In 1950, 30% of the world's population was urban, and by 2050, 68 % of the world's population is projected to be urban (World Urbanisation Prospects, 2018, Key facts).

**World Urbanisation**

| S.No | Name of the Region | Urban Population in % |
|---|---|---|
| 1 | North America | 82 |
| 2 | Latin America and Caribbean | 81 |
| 3 | Europe | 74 |
| 4 | Oceania | 68 |
| 5 | Asia | 50 |
| 6 | Africa | 43 |
| **World Average** | | **55** |

Source: World Urbanisation Prospects, 2018, Revision, Key facts.

**World Top Five Cities**

| S.No | Name of the City | Population in million |
|---|---|---|
| 1 | Tokyo *(Japan)* | 37 |
| 2 | Delhi *(India)* | 29 |
| 3 | Shanghai *(China)* | 26 |
| 4 | Mexico city *(Mexico)* | 22 |
| 5 | Sao Paulo *(Brazil)* | 22 |

Source: World Urbanisation Prospects, 2018, Revision, Key facts

## Consequences of Urbanisation

**a) Housing and Slums:** There is a lack of space for housing and a marked reduction in the quality of housing in the urban areas due to increase in population. This problem may increase in the years to come. Rapid rate of urbanisation results the development of slums.



**Slums**

**b) Over Crowding:** Over-crowding leads to unhealthy environment in the urban areas. It also the cause of many diseases and riots.

**c) Water supply, Drainage and Sanitation:** No city has round the clock water supply in the world. Drainage situation is equally bad. The removal of garbage is a Himalayan task for urban local bodies.



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8th_Social_Science_Term_II_Geography_Unit_1.indd 114 27-07-2019 12:40:25

**d) Transportation and Traffic:** Absence of planned and adequate arrangements for traffic and transport is another problem in urban centres. The increasing number of two wheelers and cars make the traffic problem worse. They cause air pollution as well.

**e) Pollution:** Towns and cities are the major polluters of environment. Several cities discharge their entire sewage and industrial effluents untreated into the nearby rivers. Industries in and around the urban centres pollute the atmosphere with smoke and toxic gases.

## Recap

- Common pattern of migration is from rural to urban.
- Migration takes place due to natural, economic, socio-cultural, demographic and political causes.
- Urbanisation is the result of rural to urban migration, natural growth of population and reclassification of rural areas into urban areas.
- Problems of urbanisation are mainly owing to over population, inadequate infrastructure, industrial development and increase in number of vehicles.

| GLOSSARY | | |
|---|---|---|
| Migrant | The person who migrates from one place to another. | இடம் பெயர்பவர் |
| Emigration | A migration in which an individual or a group move out from home country. | குடி பெயர்ச்சி |
| Emigrant | An international migrant departing to another country by crossing the international boundary | குடி பெயர்பவர் |
| Immigration | A migration in which a person or group of people move into a new country | குடியேற்றம் |
| Immigrant | An international migrant who enters into an area from a place outside the country | குடியேறுபவர் |
| Push factors | The factors which force the people to move out from their native places. | உந்து காரணிகள் |
| Pull factors | The factors which attract people from outside into a place. | இழு காரணிகள் |
| Transhumance | It is also called Seasonal Migration, where pastoral farmers move with their herds seasonally or periodically between plains and mountains. | கால்நடையுடன் இடம்பெயர்வு |



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8th_Social_Science_Term_II_Geography_Unit_1.indd 115 27-07-2019 12:40:26

## Evaluation

### I. Choose the correct answer

B4T6M3

1. People move from _____ to _____ mainly in search of better jobs
   a) Rural to Urban
   b) Urban to Rural
   c) Hills to plains
   d) Plains to hills
2. A person moves from his own country to another country is known as _____
   a) Immigrant b) Refugee
   c) Emigrant d) Asylum seeker
3. The migration in search of fertile agricultural land is _____ migration
   a) Rural to Rural b) Rural to Urban
   c) Urban to Rural d) Urban to Urban
4. War is one of the _____ causes of human migration
   a) Demographic b) Socio-Cultural
   c) Political d) Economic
5. The main reason for the development of urbanisation in pre-historic period was _____
   a) Production of food grains
   b) Domestication of cattle
   c) Fishing
   d) hunting

### II. Fill in the blanks

1. Urbanisation is determined by _____ number of factors
2. _____ is the major push factor operating in rural areas
3. _____ Metropolitan city in India has the second highest urban population in the world
4. The movement of a person based on his free will and desire to live in a better place is called _____ migration
5. In modern time urban growth was accelerated by the development of _____

### III. Match the following

| | | |
|---|---|---|
| 1. Emigration | - | In migration |
| 2. Immigration | - | Out migration |
| 3. Pull factor | - | employment |
| 4. Push factor | - | Socio- Cultural migration |
| 5. Marriage | - | Employment opportunity |

### IV. State whether the following statements are true or false

1. Slums are generally found in cities
2. Mass migration is absent in the modern period
3. The process of Urbanisation has a short history
4. Cities and towns are the major polluters of environment
5. Transhumance is also referred as seasonal migration

### V. Consider the given statements and choose the correct option from the given ones

**Statement (A):** Urbanisation is mainly due to the movement of people from rural to cities.

**Reason (R) :** Rural to Urban migration is not a predominant one.

a) A is correct but R is incorrect
b) Both A and R are incorrect
c) Both A and R are correct
d) A is incorrect and R is correct

### VI. Answer the following questions in brief

1. Define "Migration".
2. What are the causes of rural to urban migration?
3. State the causes of the ecological or natural migration.



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8th_Social_Science_Term_II_Geography_Unit_1.indd 116 27-07-2019 12:40:26

4. Name any two pull factors of migration.
5. What is Urbanisation?
6. List out any four most populous cities in the world.

## VII. Answer the following questions in detail

1. What are the different types of migration? Explain.
2. Explain in detail about the various causes of migration?
3. Discuss the problems of urbanisation.

## VIII. Map Study

**On the outline map of the world mark the following places**

1. Tokyo
2. New Delhi
3. Mexico city
4. Shanghai
5. Sao Paulo
6. Oceania
7. Latin America
8. Paris
9. London
10. Cairo

## IX. Activities

1. List out and analyze the reason for migration of people in your locality.
2. Collect the pictures and information regarding the effects of urbanisation and make an album.

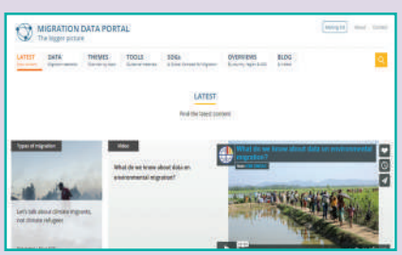
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## ICT CORNER

### Migration and Urbanisation

**Through this activity you will know about total number of international migrations**




**Step – 1** Open the Browser and type the URL given below (or) Scan the QR Code.

**Step – 2** Go to left side menu and Select any Country (Ex. India)

**Step – 3** Drag the Time line in left side menu to know about migration status of India

**Web URL: https://migrationdataportal.org/latest**

*Pictures are indicatives only.

*If browser requires, allow Flash Player or Java Script to load the pag

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8th_Social_Science_Term_II_Geography_Unit_1.indd 117 27-07-2019 12:40:26

# Unit - 2

# Hazards



## Learning Objectives

- To learn the meanings of hazard, disaster and catastrophe.
- To describe the major types of hazards, their causes and effects.
- To develop awareness regarding hazards and related prevention measures.

K5X6U2

## Introduction

Teacher : Good morning students.

Students : Good morning teacher.

Teacher : Are all present today?

Krithika : No teacher, Shruthi is absent today.

Teacher : Why is she absent today?

Pavithra : Teacher, don't you know what happened to her?

Teacher : No my dear child, what happened to her?

Theshmitha : Teacher, Yesterday, while returning home, she was struck by a big branch of a tree due to heavy rain and got injured.

Teacher : Oh my God….what a pity? Students, you all must be very careful while moving around to avoid the problems from hazards.

Kamalesh : Teacher, what do you mean by hazards? You mean the Belgian football player **'Hazard'**?

Teacher : No…no, it is an event which can affect the living and non-living things of earth. I think today is the right day to get into the interesting chapter 'hazards'.

## Hazards

In the beginning of twenty-first century, the earth supported a human population that was more numerous and found healthier and wealthier than ever before. At the same time, there were a lack of awareness on the risks that faced by the people. By keeping this in mind, the present lesson of hazards is intended to familiarise the different types of hazards to promote awareness among students regarding hazards.

Hazards are defined as a thing, person, event or factor that poses a threat to people, structures or economic assets and which may cause a disaster. They could be either human-made or naturally occurring in the environment. The word 'hazard' owes its origin to the word 'hasart' in old French meaning a game of dice (in Arabic – az-zahr; in Spanish – azar).

Though the society experiences several types of hazards, it is important for a region to be aware of those threats that are most likely to affect the community most severely.



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8th_Social_Science_Term_II_Geography_Unit_2.indd 118 27-07-2019 12:41:42

DO YOU KNOW?

A natural hazard is a natural process and event that is a potential threat to human life and property. The process and events themselves are not a hazard but become so because of human use of the land.

A disaster is a hazardous event that occurs over a limited time span in a defined area and causes great damage to property/ loss of life, also needs assistance from others.

A catastrophe is a massive disaster that requires significant expenditure of money and a long time (often years) for recovery.

## Types of Hazards

Some hazards occur frequently and threat the people. Hazards are classified in different ways.

I. Based on their causes of occurrence.

II. Based on their origin.

### I. Based on their causes of occurrence

Hazards can be broadly classified into three types: natural, human-made and socio-natural hazards.

1. **Natural hazards:** These are the results of natural processes and man has no role to play in such hazards. The main examples of natural hazards are earthquakes, floods, cyclonic storms, droughts, landslides, tsunamis and volcanic eruptions.



**Natural hazard**

2. **Human-made hazards:** these are caused by undesirable activities of human. It can be the result of an accident, such as an industrial chemical leak or oil spill, or an intentional act. Such hazards can disturb the safety, health, welfare of people and cause damage or destruction to property. The following are the examples of human-made hazards. They are explosions, hazardous wastes, pollution of air, water and land, dam failures, wars or civil conflicts and terrorism.



**Human-made hazards**

3. **Socio-natural hazards (Quasi-natural hazards):** these are caused by the combined effect of natural forces and misdeeds of human. Some of the examples are:

- The frequency and intensity of floods and droughts may increase due to indiscriminate felling of trees, particularly in the catchment areas of the rivers.
- Landslides are caused by natural forces and their frequency, and impact may be aggravated as a result of construction of roads, houses etc., in mountainous areas, excavating tunnels and by mining and quarrying.
- Storm surge hazards may be worsened by the destruction of mangroves.
- Smog is a serious problem in most big urban areas. The emissions from vehicles and industries, combustion of wood and coal together combined with fog leads to smog.

### II. Based on their origin

Hazards can be grouped into eight caregories

1. **Atmospheric hazard** – Tropical storms, Thunderstorms, Lightning, Tornadoes, Avalanches, Heat waves, Fog and Forest fire.
2. **Geologic/Seismic hazard** – Earthquakes, Tsunamis, Landslides and Land subsidence.
3. **Hydrologic hazard** – Floods, Droughts, Coastal erosion and Storm surges.



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8th_Social_Science_Term_II_Geography_Unit_2.indd 119 27-07-2019 12:41:44

4. **Volcanic hazard** – Eruptions and Lava flows.
5. **Environmental hazard** – Pollution of soil/ air/water, Desertification, Global warming and Deforestation.
6. **Biological hazard** – Chickenpox, Smallpox, AIDS [HIV] and Killer bees.
7. **Technological hazard** – Hazardous material incidents, Fires, Infrastructure failures [Bridges, Tunnels, Dams] and Nuclear/ Radiological accidents.
8. **Human-induced hazard** – Terrorism, Mass shootings, War, Transportation accidents and Civil disorder.

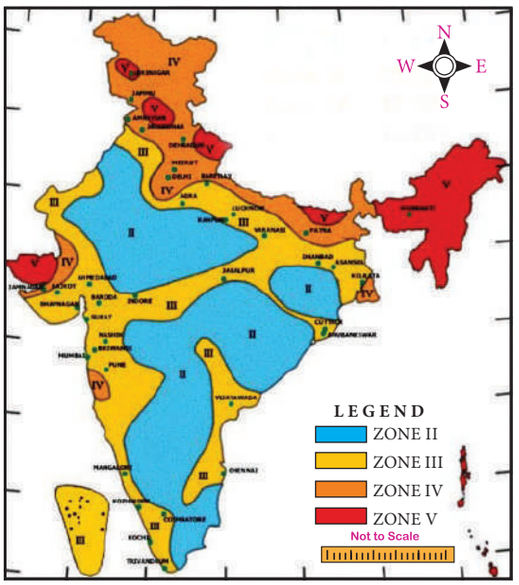
## Major Hazards in India:

### 1) Earthquakes

Earthquake is a violent tremor in the earth's crust, sending out a series of shock waves in all directions from its place of origin.

Earthquake prone regions of the country have been identified on the basis of scientific inputs relating to seismicity, earthquakes occurred in the past and tectonic setup of the region. Based on these inputs, Bureau of Indian Standards has grouped the country into four seismic zones: Zone II, Zone III, Zone IV and Zone V (No area of India is classified as Zone I).

**Seismic Zones of India**




(Source: National Institute of Disaster Management, New Delhi)



**Earthquakes**

**Earthquake-prone Zones of India**

| Seismic Zones | Level of Risk | Regions |
|---|---|---|
| Zone V | Very High | Comprises entire northeastern India, parts of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Rann of Kutch in Gujarat, part of North Bihar and Andaman & Nicobar Islands. |
| Zone IV | High | Covers remaining parts of Jammu and Kashmir and Himachal Pradesh, National Capital Territory (NCT) of Delhi, Sikkim, northern parts of Uttar Pradesh, Bihar and West Bengal, parts of Gujarat and small portions of Maharashtra near the west coast and Rajasthan. |
| Zone III | Moderate | Comprises Kerala, Goa, Lakshadweep Islands, remaining parts of Uttar Pradesh, Gujarat and West Bengal, parts of Punjab, Rajasthan, Madhya Pradesh, Bihar, Jharkhand, Chhattisgarh, Maharashtra, Odisha, Andhra Pradesh, Tamil Nadu and Karnataka. |
| Zone II | Low | Covers remaining parts of country. |



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8th_Social_Science_Term_II_Geography_Unit_2.indd 120 27-07-2019 12:41:45

### 2) Floods

Flood is an event in which a part of the earth's surface gets inundated. Heavy rainfall and large waves in seas are the common causes of flood.



**Flood**

**The major causes of floods are:**

**A. Meteorological factors**

i) Heavy rainfall

ii) Tropical cyclones

iii) Cloud burst

**B. Physical factors**

i) Large catchment area

ii) Inadequate drainage arrangement

**C. Human factors**

i) Deforestation

ii) Siltation

iii) Faulty agricultural practices

iv) Faulty irrigation practices

v) Collapse of dams

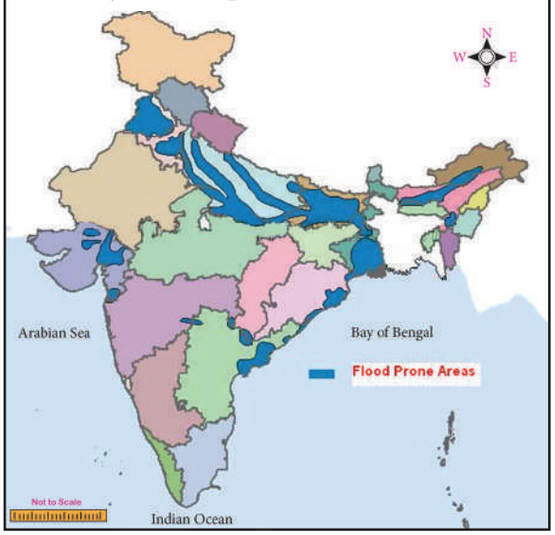
vi) Accelerated urbanisation

**ACTIVITY**

Discuss in the classroom about the actions to be taken before, during and after flood.

The following map shows the major flood prone areas in India. Gangetic plains covering the states of Punjab, Haryana, Uttar Pradesh, North Bihar, West Bengal and Brahmaputra valley are the major flood prone areas in north and northeast India. Coastal Andhra Pradesh, Odisha and southern Gujarat are the other regions which are also prone to flood often.

**Major flood prone areas of India**




(Source: National Institute of Hydrology, New Delhi)

### 3) Cyclonic Storms

A cyclonic storm is a strong wind circulating around a low pressure area in the atmosphere. It rotates in anti-clockwise direction in Northern Hemisphere and clockwise in the Southern Hemisphere.

Tropical cyclones are characterised by destructive winds, storm surges and exceptional levels of rainfall, which may cause flooding. Wind speed may reach upto 200 km/h and rainfall may record upto 50 cm/day for several consecutive days.

A sudden rise of seawater due to tropical cyclone is called storm surge. It is more common in the regions of shallow coastal water.

**East coastal areas vulnerable to storm surges**

i) North Odisha and West Bengal coasts.

ii) Andhra Pradesh coast between Ongole and Machilipatnam.

iii) Tamil Nadu coast (among 13 coastal districts, Nagapattinam and Cuddalore districts are frequently affected).

**West coastal areas vulnerable to storm surges**

The west coast of India is less vulnerable to storm surges than the east coast.

i) Maharashtra coast, north of Harnai and adjoining south Gujarat coast and the coastal

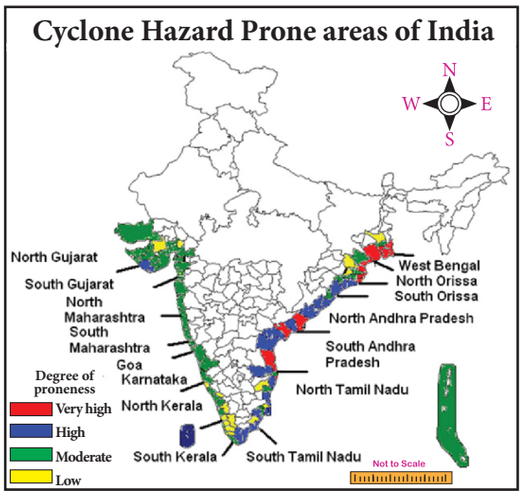


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8th_Social_Science_Term_II_Geography_Unit_2.indd 121 27-07-2019 12:41:45

belt around the Gulf of Cambay.

ii) The coastal belt around the Gulf of Kutch.




(Source: Mohapatra et al., 2015)

### 4) Droughts

Any lack of water to satisfy the normal needs of agriculture, livestock, industry or human population may be termed as a drought. Further, the drought could be classified into three major types as,

i) **Meteorological drought:** it is a situation where there is a reduction in rainfall for a specific period below a specific level.

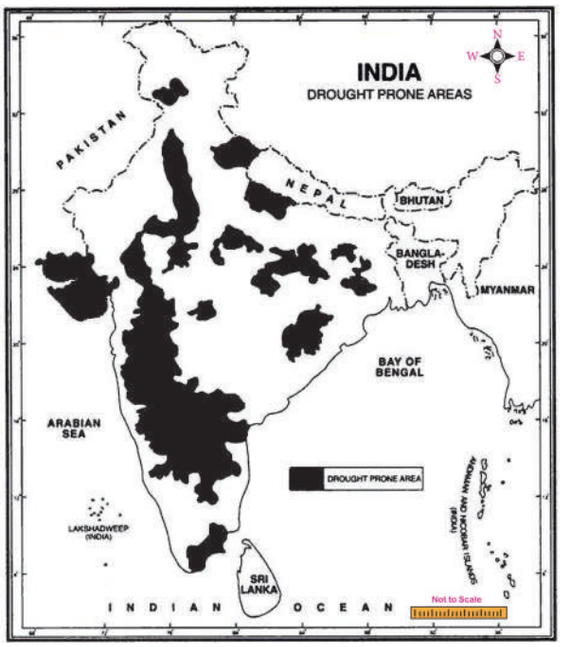
ii) **Hydrological drought:** it is associated with reduction of water in streams, rivers and reservoirs. It is of two types, a) Surface water drought, and b) Groundwater drought.

iii) **Agricultural drought:** it refers to the condition in which the agricultural crops get affected due to lack of rainfall.



**Drought**

Droughts in India occur in the event of a failure of monsoon. Generally monsoon rainfall is uneven in India. Some areas receive heavy rainfall while other regions get moderate to low rainfall. The areas which experience low to very low rainfall are affected by drought.




(Source: Khullar, 2014)

**Fact**

About one third area of the country is affected by drought. It severely affects 16% of the land area and 12% of the total population of India. The areas that receive an annual rainfall of less than 60 cm are the drought prone regions of India.

The major areas highly prone to drought are:

1) The arid and semi-arid region from Ahmedabad to Kanpur on one side and from Kanpur to Jalandhar on the other.

2) The dry region lying in the leeward side of the Western Ghats.

### 5) Landslides

Landslide is a rapid downward movement of rock, soil and vegetation down the slope under the influence of gravity. Landslides are generally sudden and infrequent. Presence of steep slope and heavy rainfall are the major causes of landslides. Weak ground structure, deforestation, earthquakes, volcanic eruptions, mining, construction of roads and railways over the mountains are the other causes of landslides.



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8th_Social_Science_Term_II_Geography_Unit_2.indd 122 27-07-2019 12:41:47

About 15% of India's landmass is prone to landslide hazard. Landslides are very common along the steep slopes of the Himalayas, the Western Ghats and along the river valleys. In Tamil Nadu, Kodaikanal (Dindigul district) and Ooty (The Nilgiris district) are frequently affected by landslides.

### 6) Tsunamis

Tsunami refers to huge ocean waves caused by an earthquake, landslide or volcanic eruption. It is generally noticed in the coastal regions and travel between 640 and 960 km/h. Tsunamis pose serious danger to the inhabitants of the coastal areas.

DO YOU KNOW?

The word 'Tsunami' is derived from Japanese word 'tsu' meaning harbour and 'nami' meaning wave (Harbour wave).

**Indian Ocean Tsunami of 2004**

- On December 26, 2004, at 7:59 a.m. local time, an undersea earthquake with a magnitude of 9.1 struck off the coast of the Indonesian island of Sumatra.
- The tsunami killed at least 2,25,000 people across a dozen countries, with Indonesia, Sri Lanka, India, Thailand, Somalia and Maldives, sustaining massive damage.

### 7) Hazardous Wastes

The wastes that may or tend to cause adverse health effects on the ecosystem and human beings are called hazardous wastes.

The following are the major hazardous wastes

i) **Radioactive substance:** tools and unused fuel rods of nuclear power plants.

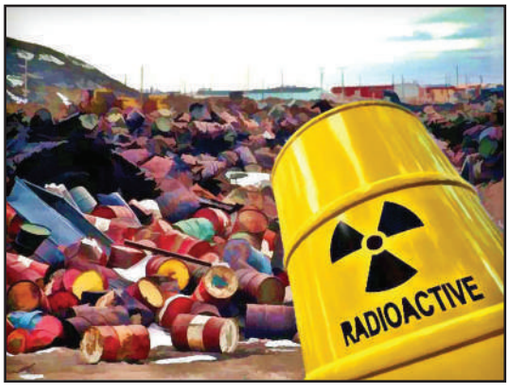
ii) **Chemicals:** synthetic organics, inorganic metals, salts, acids and bases, and flammables and explosives.

iii) **Biomedical wastes:** hypodermic needles, bandages and outdated drugs.

iv) **Flammable wastes:** organic solvents, oils, plasticisers and organic sludges.

v) **Explosives:** the wastes resulting from ordnance manufacturing and some industrial gases.

vi) **Household hazardous wastes:** pesticides, waste oil, automobile battery and household battery.




**hazardous wastes**

DO YOU KNOW?

**Chernobyl nuclear disaster site (near Pripyat) to become an official tourist spot**

**Before:**

- Chernobyl (then Soviet Union) nuclear accident was happened on 26th April, 1986.
- The radiation emitted was more than 400 times than that released by the atomic bomb dropped on Hiroshima (Japan) in 1945. This accident remains the largest nuclear accident in history.
- More than 3,50,000 people were evacuated from the area and severe restrictions on permanent human settlement are still in that place.

**Now:**

- 33 years after the accident, the Exclusion Zone, which covers an area now in Ukraine and Belarus is inhabited by numerous animals and more than 200 bird species.
- In 2016, the Ukraine part of this zone was declared as a radiological and environmental biosphere reserve by the government.

### 8) Pollution of Air

Air is a mixture of several gases. The main gases are nitrogen (78.09%) for forming products



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8th_Social_Science_Term_II_Geography_Unit_2.indd 123 27-07-2019 12:41:47
201

such as, fertilisers for plants and for making the air inert, oxygen (20.95%) for breathing and carbon dioxide (0.03%) for photosynthesis. Some other gases like argon, neon, helium, krypton, hydrogen, ozone, zenon and methane are also present. Besides, water vapour and dust particles make their presence felt in one way or the other.

Air pollution is the contamination of the indoor or outdoor air by a range of gases and solids that modify its natural characteristics and percentage. Air pollutants can be categorised into primary and secondary pollutants.

A **primary pollutant** is an air pollutant emitted directly from a source. A **secondary pollutant** is not directly emitted as such, but forms when other pollutants (primary pollutants) react in the atmosphere.

**Primary Pollutants**

i) Oxides of Sulphur

ii) Oxides of Nitrogen

iii) Oxides of Carbon

iv) Particulate Matter

v) Other Primary Pollutants

**Secondary Pollutants**

i) Ground Level Ozone

ii) Smog

**9) Pollution of Water**

Water pollution may be defined as alteration in the physical, chemical and biological characteristics of water, which may cause harmful effects in human and aquatic life.



**Water pollution**

In India, water pollution has been taking place on a large scale and since a long period. Both surface and groundwater bodies are polluted to a great extent. The major causes of water pollution in India are:

i) Urbanisation

ii) Industrial effluents

iii) Sewages

iv) Agricultural runoff and improper agricultural practices

v) Seawater intrusion

vi)Solid wastes

## Need for Prevention Measures

Prevention is defined as the activities taken to prevent a natural calamity or potential hazard from having harmful effects on either people or economic assets.

- Prevention planning consists of i) hazard identification, and ii) vulnerability assessment.
- Delayed actions may increase the economic losses.
- For developing countries like India, prevention is perhaps the most critical components in managing disasters.

**Nature is emerging as a new weapon of mass destruction, do you agree?**

Around 22,000 people have died in India in 10 years until 2017 due to major environmental disasters – Indian Meteorology Department.

In the past two decades (1998-2017) over 5,00,000 people have died due to extreme weather events around the world – stated by Global Climate Risk Index Report Published by Germanwatch (German-based non-profit organisation).



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8th_Social_Science_Term_II_Geography_Unit_2.indd 124 27-07-2019 12:41:47

## Recap

- Hazards are defined as the phenomena that pose a threat to people, structures or economic assets and which may cause disaster.
- There are three types of hazards namely natural hazards, human-made hazards and Socio-natural hazards
- Natural hazards are earthquakes, floods, cyclonic storms, droughts, landslides, tsunamis, volcanic eruptions etc.
- Human-made hazards are explosions, hazardous wastes, pollution of air, land and water, dam collapses, wars or civil conflicts, terrorism etc.
- Socio- natural hazards are caused by the combined effect of natural forces and misdeeds of human.

| GLOSSARY | | |
|---|---|---|
| Earthquake | It is a violent tremor in the earth's crust. | நிலஅதிர்வு |
| Flood | It is a state of high water level along a river channel or on coast that leads to inundation of land. | வெள்ளம் |
| Drought | Any lack of water to satisfy the normal needs of agriculture, livestock, industry or human population may be termed as a drought. | வறட்சி |
| Tsunami | It is a series of waves caused by the earth movements under the sea. | ஆழிப் பேரலை |

## Evaluation

### I. Choose the correct answer

1. _____ percentage of nitrogen is present in the air.
   a) 78.09%
   b) 74.08%
   c) 80.07%
   d) 76.63%

Y1N8Q1

2. Tsunami in Indian Ocean took place in the year _____.
   a) 1990 b) 2004
   c) 2005 d) 2008
3. The word tsunami is derived from _____ language.
   a) Hindi
   b) French
   c) Japanese
   d) German
4. The example of surface water is
   a) Artesian well b) Groundwater
   c) Subsurface water d) Lake
5. Event that occurs due to the failure of monsoons.
   a) Condensation b) Drought
   c) Evaporation d) Precipitation

### II. Fill in the blanks

1. Hazards may lead to_____.
2. Landslide is an example of _____ hazard.
3. On the basis of origin, hazard can be grouped into _____ categories.
4. Terrorism is an example of _____ hazard.
5. Oxides of Nitrogen are _____pollutants which affects the human beings.
6. Chernobyl nuclear accident took place in _____.



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8th_Social_Science_Term_II_Geography_Unit_2.indd 125 27-07-2019 12:41:47

## III. Match the following

| List I | | List II |
|---|---|---|
| 1) Primary pollutant | - | Terrorism |
| 2) Hazardous waste | - | Tsunami |
| 3) Earthquake | - | Outdated drugs |
| 4) Meteorological drought | - | Oxides of Sulphur |
| 5) Human induced hazard | - | Reduction in rainfall |

## IV. Answer in brief

1. Define 'hazard'.
2. What are the major types of hazards?
3. Write a brief note on hazardous wastes.
4. List out the major flood prone areas of our country.
5. Mention the types of drought.
6. Why should not we construct houses at foothill areas?

## V. Distinguish the following

1. Hazards and disasters.
2. Natural hazard and human-made hazard.
3. Flood and drought.
4. Earthquake and tsunami.

## VI. Answer in a paragraph

1. Write an essay on air pollution.
2. Define earthquake and list out its effects.
3. Give a detailed explanation on the causes of landslides.
4. Elaborately discuss the effects water pollution.

## VII. Activities

1. Name the hazards which you have identified.
2. List out the hazards that occur frequently and occasionally in your place.

| Frequent Hazards | | Occasional Hazards | |
|---|---|---|---|
| 1 | | 1 | |
| 2 | | 2 | |
| 3 | | 3 | |
| 4 | | 4 | |
| 5 | | 5 | |

3. On the map of Tamil Nadu shade the 13 coastal districts in different colours.



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2. Keller, E.A. and DeVecchio, D.E. (2012). *Natural Hazards: Earth's Processes as Hazards, Disasters and Catastrophes* (3rd Edition), Pearson Prentice Hall, New Jersey.
3. Khullar, D.R. (2014). *India: A Comprehensive Geography*, Kalyani Publishers, New Delhi.
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| Item | | In and around your school | In your residential environs | On the way to school from home |
|---|---|---|---|---|
| 1. | Hazardous factory / Industry | | | |
| 2. | Roads of heavy traffic | | | |
| 3. | Tall buildings | | | |
| 4. | Things which burn easily | | | |
| 5. | Open drainage / Septic tank | | | |
| 6. | Others | | | |



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8th_Social_Science_Term_II_Geography_Unit_2.indd 126 27-07-2019 12:41:47

UNIT 1

# Lithosphere – I Endogenetic Processes

## Learning Objectives

- To know about the spheres of the Earth
- To illustrate the internal structure of the Earth
- To study the rock types and its cycle
- To explain the internal processes of the Earth
- To understand the processes of Earthquakes and volcanoes

FDCAVV

## Introduction

The Earth is a unique planet of the Solar family. The Earth is composed of four spheres namely, the lithosphere, the atmosphere, the hydrosphere and the biosphere. This lesson focuses on the internal processes of the Earth. The sequence of lessons generally follows the spheres of the Earth system in a comprehensive manner.

Have you ever wondered what our Earth is made up of? Or what lies underneath the Earth's surface?

"The Earth can physically be described as a ball of rock (the lithosphere), partly covered by water (the hydrosphere) and wrapped in an envelope of air (the atmosphere). To these three physical zones it is convenient to add a biological zone which includes all the living organisms (the biosphere)."

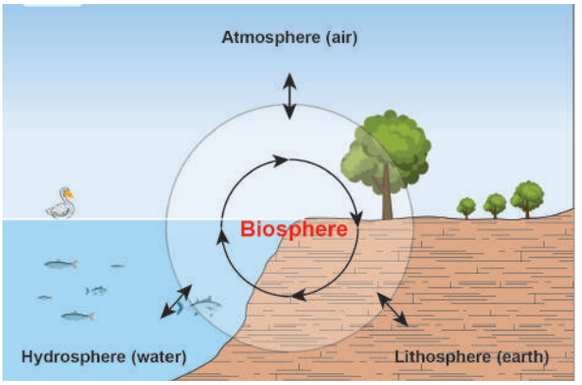
**Arthur Holmes**

## 1.1 Spheres of the Earth

Earth's surface is a vast area of 510 million sq.km, where four spheres of the Earth interact. The abiotic spheres are the lithosphere, atmosphere and hydrosphere. The biotic sphere is the biosphere. Together, these spheres constitute the planet, Earth.

## 1.2 Structure of the Earth

The outer surface and inner core of the Earth are totally different in their nature and structure. The structure of the Earth's interior is divided into three layers namely **the crust, the mantle and the core**.




Spheres of the Earth



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TN_GOVT_IX_Std_Geography_Ch01.indd 157 02-04-2019 13:05:49

The **lithosphere** is the solid outer part of the Earth.

The **atmosphere** is a thin layer of gases that surrounds the Earth.

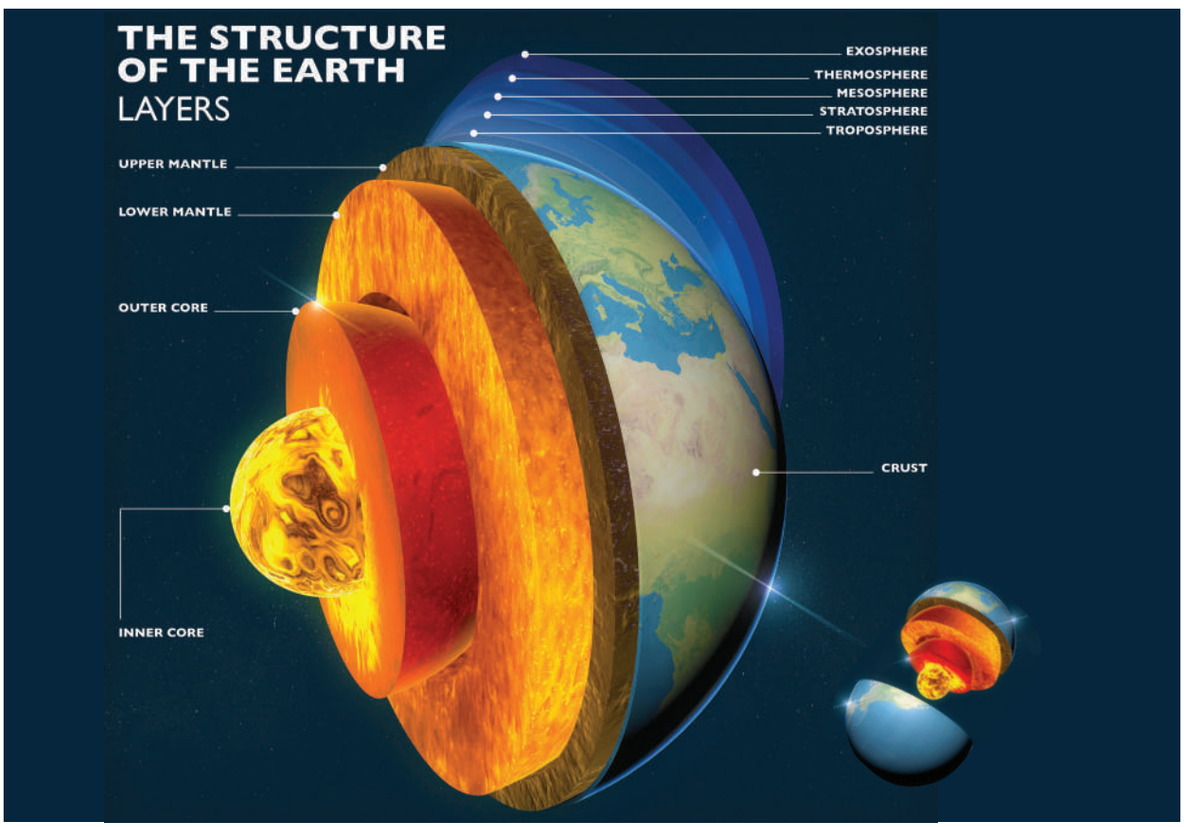
The **hydrosphere** is the watery part of the Earth's surface including oceans, rivers, lakes and water vapour

The **biosphere** is the layer of Earth where life exists.



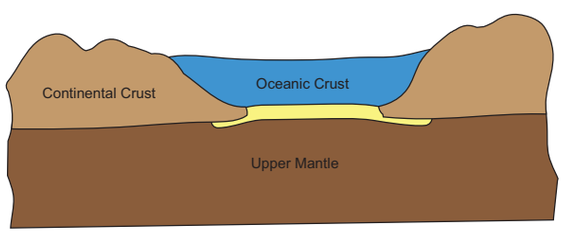

The terms **'lithosphere'** and **'crust'** are not the same. The lithosphere includes the crust and the uppermost part of the mantle.

All terrestrial planets have lithosphere. The lithospheres of Mercury, Venus, and Mars are much thicker and more rigid than that of the Earth.




## Crust

Crust is the outer layer of the Earth, where we live. It is the skin of our Earth, which ranges between **5 to 30 km**. It is the solid and rigid layer of the Earth. The thickness of the crust is greater below the continents than the ocean floor. The crust is classified as **continental crust** and **oceanic crust.** The major elements of crust SIAL are Silica (**Si**) and Aluminium (**Al**) and SIMA (**Si** - Silica and **MA** - Magnesium)




Continental Crust is made up of SIAL and Oceanic Crust is made up of SIMA



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TN_GOVT_IX_Std_Geography_Ch01.indd 158 02-04-2019 13:05:51

## Mantle

The interior part beneath the crust is called mantle, which is about 2,900 km thick. The major elements of the mantle are Silica (Si) and Magnesium (Mg) and hence it is also termed as SIMA. In the upper part of the mantle, the rock remains solid, whereas in the lower part of the mantle, rocks are in molten form. This molten rock inside the Earth is called 'magma'.

## Core

The core is the innermost and hottest layer of the Earth which lies below the mantle. It is composed mainly of Nickel (Ni) and Iron (Fe). Hence it is called NIFE. The core is divided into Solid inner core and Liquid outer core. The presence of large quantities of iron in the core is responsible for the Earth's gravitational force. As the Earth rotates on its axis, the liquid outer core spins over the solid inner core and generates the Earth's magnetic field. This is responsible for the functioning of the magnetic compass. Due to high pressure, the materials in the inner core are unable to move and hence remain solid.

# 1.3 Rocks

The crust is a storehouse of rocks. An aggregate of minerals on the Earth's crust is called 'rock'. It may be hard and compact like 'granite' or soft as 'clay' or loose as 'sand'.




The Deepest Place ever reached by human technology vary from time to time. Till 2011 Kola Super Hole (12,262m) in Murmansk, Russia was the deepest place. But in 2012, Z-44 Chavyo Well (12,376m) broke the record, and is supposed to be 15 times the height of Burj Khalifa in Dubai.The exploration of Earth's interior continues.

## Types of Rock

Based on formation, rocks are classified as:

- Igneous,
- Sedimentary and
- Metamorphic.

**Fact**

The ancient city of Petra in Jordan is an example of an entire city carved out of rocks. There are many specimens of magnificent rock-cut architecture in India, like the Ajanta and Ellora caves in Maharashtra, the Aihole and Badami temples in Karnataka, the Konark temple in Odisha and Mamallapuram in Tamil Nadu.

### *Igneous Rocks*

The word 'igneous' is derived from the Latin word Ignis meaning 'Fire'. The interior of the Earth contains very hot molten material called 'Magma'. When the magma reaches the Earth's surface, it is referred to as 'Lava'. The lava on the surface cools down and gets solidified as rocks called igneous rocks. Granite and basalt are examples of such rocks. Igneous rocks are also called Primary or Mother rocks because all other rocks are directly or indirectly formed from them.

### *Sedimentary Rocks*

These sedimentary rocks are named after the latin word 'sediment' meaning ' settle. Rivers, glaciers and winds carry bits of rock and soil and deposit them in layers. After a few million years, these deposits harden into compact rocks and are called Sedimentary rocks.

The bodies of plants and animals that fall on the deposits get embedded in the layers and form Fossils. Sandstone, limestone, chalk, gypsum, coal and conglomerate are examples of sedimentary rocks.



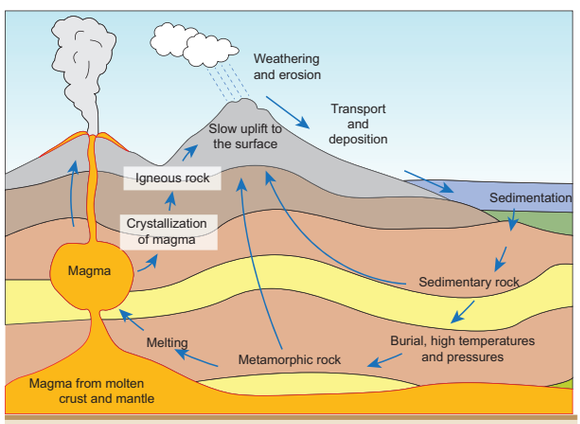
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TN_GOVT_IX_Std_Geography_Ch01.indd 159 02-04-2019 13:05:51

### *Metamorphic Rocks*

The term 'metamorphic' is derived from the word 'metamorphosis', which means, 'change of form'. When igneous or sedimentary rocks are subjected to extreme heat and pressure, they undergo a complete change in their form and character .i.e., in course of time, granite may get transformed to gneiss, basalt to schist, limestone to marble and sandstone to quartzite.

## Rock Cycle

The Rock cycle is a continuous process through which igneous, sedimentary and metamorphic rocks are transformed from one form to another.




### Activity

Narrate the processes involved in the given rock cycle diagram in your own words.

# 1.4 Geomorphic Processes

The forces that act from the Earth's interior towards the Earth's surface are called **Internal processess** or **Endogenetic processes**. These forces build the landscape and create topographic relief.

The forces that act on the surface of the Earth due to natural agents like running water, glacier, wind, waves etc. are called **External processes** or **Exogenetic processes**. These external processes tear the landscape down into relatively low elevated plains and shapes the landform created by Endogenetic process.

## Internal Processes

The internal processes generate heat and eject materials from deep below the Earth's crust. **Internal radioactivity** is the principal source of power for this process.

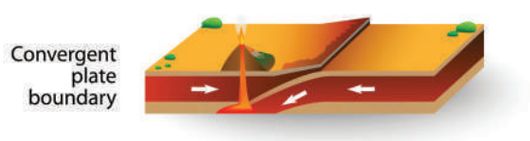
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### *Plate Tectonics*

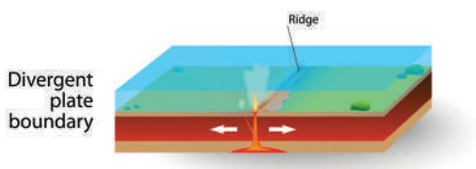
The lithosphere is divided into a number of huge slabs of rocks called '**Tectonic plates**.' These tectonic plates are divided into major and minor plates. These plates float independently over the mantle. Collisions of these plates produce mountain ranges and other irregular surface features, both on land and the ocean floor. This phenomenon is called '**plate tectonics**'. The movement of tectonic plates is due to thermal energy from the mantle. Now we have a better understanding about the plate movements and its relation to Earthquake and volcanic activities.

### *Types of Plate Boundaries*

**Convergent Boundary** - Here the plate moves toward each other and sometimes, a plate sinks under another. The location where the sinking of a plate occurs is called a subduction zone (eg) Fold Mountain-Himalayas.



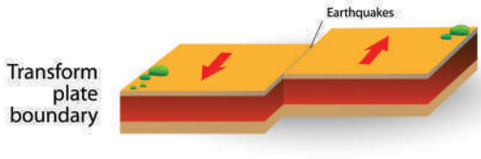

**Divergent Boundary** – Here the plates pull away from each other as magma pushes up from the mantle (eg) Mid Atlantic Ridge






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TN_GOVT_IX_Std_Geography_Ch01.indd 160 02-04-2019 13:05:52

**Conservative/Transform Boundary** – Here the plates slide horizontally past each other. (eg) San Andres Fault.




## Movements of Continental Plates

Due to lateral compressional forces, the plates are forced to move upwards and downwards. This is called '**Folding**'. Mountains formed by folding are called fold mountains. The process of folding creates lofty mountain ranges such as the Himalayas and the Alps

According to plate tectonics, the plates are in constant motion with an average rate of few centimetres per year. The movement might seem slow, but over millions of years, the plates and the continents riding on them move a long way. For example, about 250 million years ago, the Indian Plate was a part of the **Gondwana land**, which comprised of modern Africa, Australia, Antarctica, and South America.

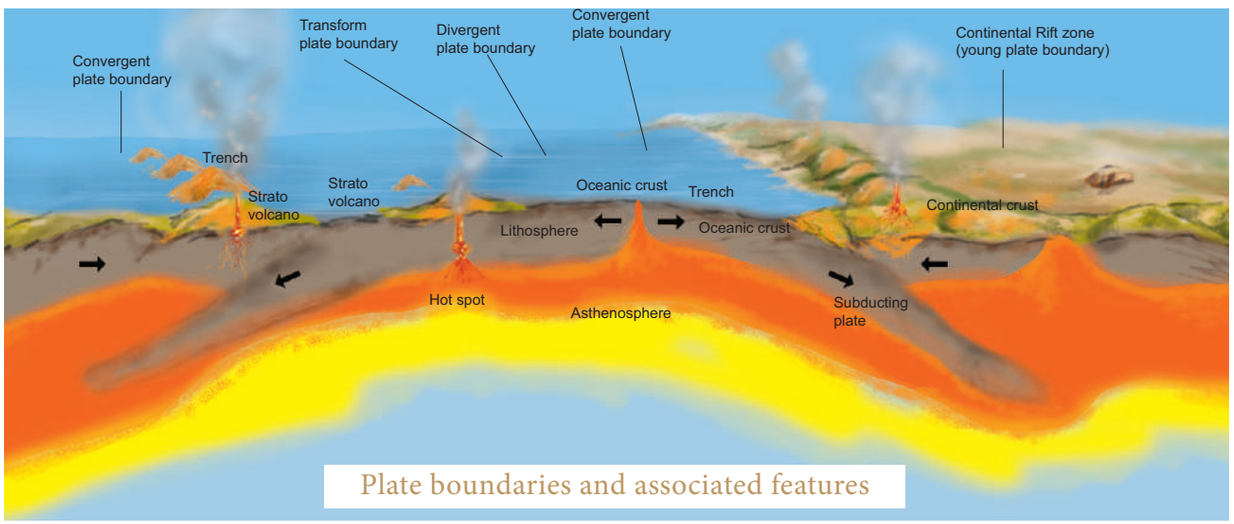
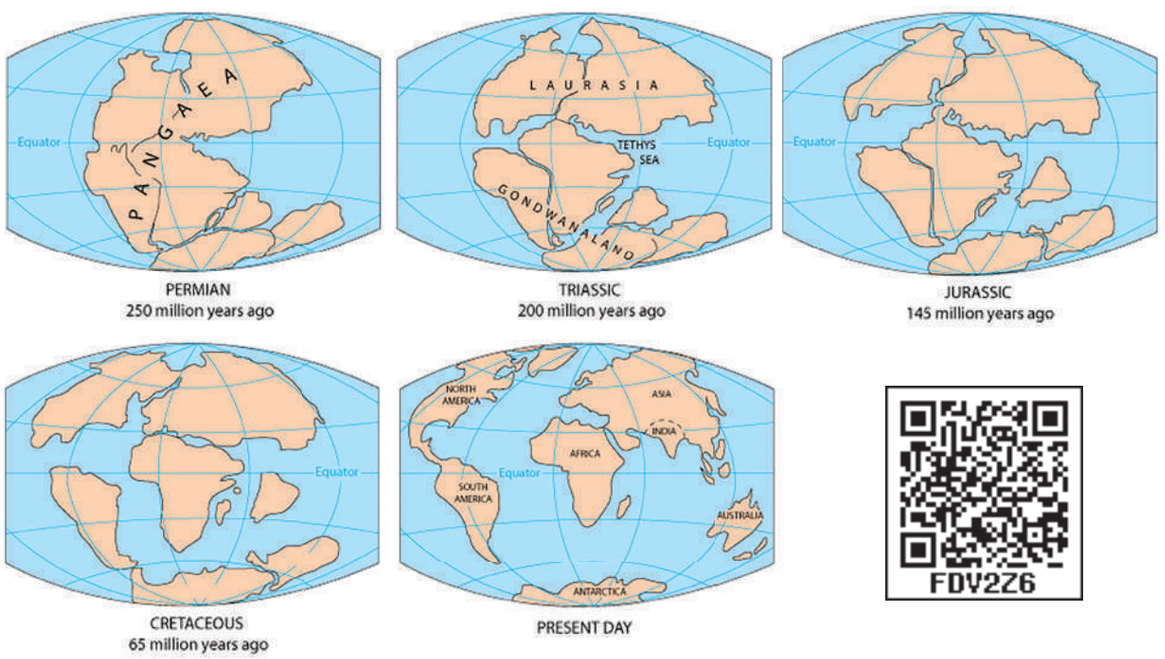



Plate boundaries and associated features




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TN_GOVT_IX_Std_Geography_Ch01.indd 161 02-04-2019 13:05:54

Approximately 140 million years ago, the Indian plate broke away from the ancient super continent 'Gondwana' and began moving north and collided with Asia. The collision with the Eurasian Plate along the boundary between India and Nepal formed the **Orogenic** belt that created the Tibetan Plateau and the mighty Himalayan Mountains.

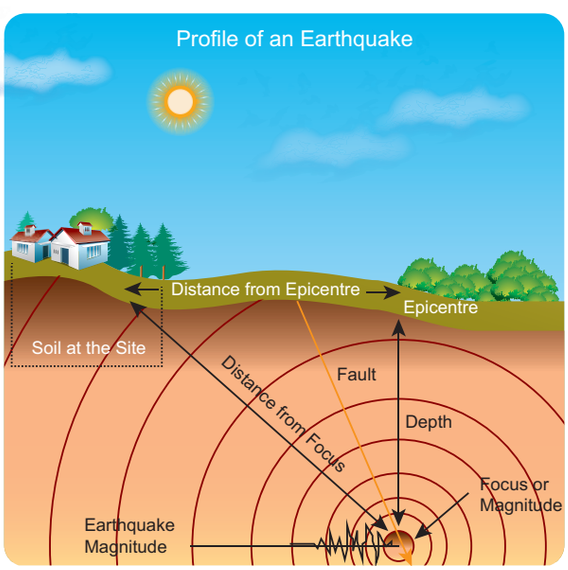
### Activity

Here is a list of a few mountains.

- Ural Mountains, Andes Mountains, Vindhya Range, Alps mountains,
- Satpura range, Rocky Mountains, Sierra Nevada.
- Identify and Locate with help of atlas

## *Earthquake*

**Earthquakes are generally caused by the sudden vibrations in the Earth's crust, which spreads outward in all directions as waves from the source of disturbance.** The point of origin of an Earthquake is called **'Focus' (Hypocenter)** which generates a series of elastic waves. **'Epicentre'** is a point on the Earth's surface that lies directly above the focus. The impact of the Earthquake is felt the most at the epicentre.




## Seismic Waves

Earthquakes generate **seismic waves**. The nature, force and speed of these seismic waves depend on the nature of the medium through which it passes. Accordingly, there are three major types of waves.

**Primary or P-waves** are the fastest of all the Earthquake waves and the first to reach the epicentre. These waves pass through solids, liquids and gases, either through push or pull with an average velocity of 5.3km per second to 10.6 km per second.

### Fact

C.F. Richter devised a scale to measure the magnitude of Earthquakes. This scale relates to the energy released at the epicentre and provides an estimation of the severity of an Earthquake. It is an open ended scale. The highest magnitude ever recorded is 9.5 on Richter scale (Bio-Bio, Chile in 1960).

**Secondary or S-waves** travel only through solids. These transverse waves shake the ground perpendicular to the direction in which they propagate. The average velocity of these waves is 1Km per second to 8 km per second.

**Surface Waves (or) L-waves** are similar to P-waves but they travel primarily along the ground surface. These waves travel comparatively slower and are the most destructive waves. The average velocity of these waves are 1 km per second to 5 km per second.

**DO YOU KNOW?**

The instrument which records the Earthquake waves is called 'seismograph' or 'seismometer'. The science that deals with Earthquakes is called 'seismology'.

## Tsunami

The word 'Tsunami' is a Japanese term, meaning harbour waves. It is adopted to describe



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch01.indd 162 02-04-2019 13:05:54

large seismically generated sea waves caused by Earthquakes, submarine explosions and landslides. These waves travel at a great speed (more than 500 km per hour) and the length of the waves exceeds 600 km. These waves reach to a height of more than 15 m near the sea shore and are capable of causing destruction along the coastal area.

The 2004 Indian Ocean Earthquake that caused tsunami is the sixth-deadliest natural disaster which travelled at a speed of 600 km per hour with an estimated death toll of 2,80,000. The Earthquake which occurred near Indonesia at 00.58 hours took nearly 7 hours to reach Chennai.

DO YOU KNOW?

On 26 December 2004 a tsunami occurred in the Indian Ocean. It was the **result** of the Indio-Australian Plate **subducting** below the Eurasian Plate. It was caused by an Earthquake **measuring** a magnitude of above 9 in the Richter scale. The Earthquake caused the **seafloor** to **uplift**, displacing the seawater above.

## Volcanoes

A volcano is a vent or an opening on the surface of the Earth crust, through which hot solid, liquid and gaseous materials (**Magma**) erupt out to the surface from the Earth's interior. Magma rises up and ejects on the surface as **Lava**. Volcanoes are also formed when plates move apart.

Volcanoes generally have the following major components. They are:

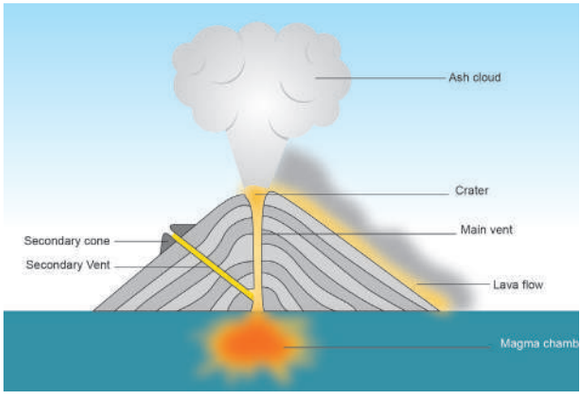
i. Magma chamber - a large pool of liquid rock found beneath the surface of the Earth
ii. Vents - an opening serving as an outlet for air, smoke, fumes, magma etc
iii. Volcanic cone - a landform built by the magma ejected from the vent in the shape of a cone.
iv. Crater - a bowl shaped depression found at the top of the volcano through which the magma flows out.

Based on the periodicity **of eruptions**, volcanoes are classified into

(i) Active volcano, (ii) Dormant volcano, (iii) Extinct volcano.

DO YOU KNOW?

The term 'volcano' is derived from the Latin term VULCAN, which is the name of Roman "God of Fire".

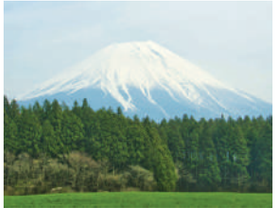



### a. Active Volcano



Active volcanoes are those which constantly eject volcanic lava, gases and fragmented materials. (eg.) Mount St. Helens in the United States.

### b. Dormant Volcano (or) Sleeping Volcano



Volcanoes that do not show any sign of volcanic activity for a long period of time are known as dormant volcanoes. Sometimes there may be a sudden explosion which may cause unimaginable loss to life and property (e.g.) Mt. Fuji , Japan

### c. Extinct or Dead Volcano

When a volcano permanently stops its volcanic activity, then it is



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch01.indd 163 02-04-2019 13:05:55

called as extinct or dead volcano (e.g.) Mt. Kilimanjaro, Tanzania Tiruvannamalai - Tamilnadu

**Activity**

Take a bottle filled with soda. Give it a few shakes. Now twist the cap open. What do you observe?s

Volcanoes can also be classified based on their **structure and composition as** composite volcano, shield volcano and dome volcano

### *d. Composite Volcano*

**Composite volcano**, also known as strata volcano, is a conical volcano built by many layers of hardened lava, pumice and volcanic ash. These are commonly found in the Pacific Ocean Eg. Mt. Fuji, Japan

### *e. Volcanic Dome*

A lava dome or volcanic dome is roughly a circular mound formed due to the slow ejection of viscous lava from a volcano. As the lava is rich in silica with intense viscosity, it is prevented from flowing far from its vent. e.g. Parícutin, Mexico

**Hots**

Pacific Ring of Fire — Most seismically and volcanically active. Why?

### *f. Shield Volcano*



Shield volcanoes are formed by intense viscous lava.

These are shallow depositions with gently sloping sides.

Hence the lava flows out in all directions to create a shield.

E.g., Mauna Loa, Hawaii

## Distribution of Earthquakes and Volcanoes

Most Earthquakes and volcanic eruptions do not strike randomly, but occur along the plate boundaries. One such area is the ***Circum-Pacific Ring of Fire,*** where the Pacific Plate meets many surrounding plates. The Ring of Fire is the most seismically and volcanically active zone in the world. The other distinctive major belts are Mid-Oceanic Ridges ,Mid-Continental Belts and Alpine - Himalayan belt.

## Effect Of Volcanoes

### Constructive Effects

Volcanic materials enrich the soil fertility that promotes agricultural activities. The hot volcanic region helps in generating geothermal energy. Many dormant and active volcanoes are the most attractive tourist spots of the world. Most of the volcanic materials are used as building materials.

### Destructive Effects

Volcanic eruption causes Earthquakes, flash floods, mud slide and rock fall. Lava can travel very far and burn, bury, or damage anything in its path. The large amount of dust and ash makes breathing hard and irritable. Volcanic eruptions can alter the weather conditions and disrupt transport (Iceland volcanic eruption) in and around the volcanic region.

**Recap**

- The spheres of the Earth are the lithosphere, atmosphere, hydrosphere and biosphere.
- Earth's interior is divided into three layers - Crust, Mantle and Core.
- Based on composition, the crust, mantle and core are referred to as SIAL, SIMA and NIFE respectively.
- The formation and deformation of landforms on the surface of the Earth are due to continuous internal and external processes.
- The lithosphere is composed of major and minor tectonic plates.
- Earthquake is the shaking or trembling of the Earth's crust.
- Earthquake and volcanoes are useful to understand the Earth's interior.



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch01.indd 164 02-04-2019 13:05:56

## EXERCISE

FE4Y1T

### I Choose the correct answer

1. _____ is the rigid outer layer of the Earth.
   a. core b. mantle
   c. Crust d. inner core
2. _____ layer is made up of liquid iron
   a. Inner core b. Outer core
   c. Mantle d. Crust
3. Magma is found in the _____
   a. crust b. mantle
   c. core d. None of the above
4. Diastrophism is connected to
   a. volcanism b. earthquakes
   c. tectonics d. fold/fault
5. The movement of tectonic plates is induced by _____ energy.
   a. hydel b. thermal
   c. wave d. tidal
6. In the ancient period, Gondwanaland moved towards _____ direction.
   a. north b. south
   c. east d. west
7. Many million years ago , India was a part of the super continent _____
   a. Gondwana b. Laurasia
   c. Panthalasa d. Pangea.
8. The movement of plates that creates stress and tension in the rocks causing them to stretch and cracks result in _____.
   a. fold b. fault
   c. mountain d. earthquake
9. _____ refers to a bowl-shaped depression found at the top of the volcano.
   a. crater b. vent
   c. chamber d. volcanic cone
10. The point of origin of an Earthquake is called the _____
    a. epicentre b. focus
    c. seismic wave d. magnitude

### II. Match the following

1. Endogenetic process — Seismograph
2. Mantle — Subduction Zone
3. Convergent boundaries — Volcanic
4. Earthquake — Pacific Ocean
5. Composite volcano — SIMA

### III. Consider the given statements:

1. i. Mt. Fuji is a dormant volcano
   ii. Mt. Kilimanjaro is a dormant volcano
   iii Mt. Tanzania is a dormant volcano
   Which of the statement(s) is are true
   a. i is true b. ii is true
   c. iii is true d. I, ii, iii are true
2. **Statement:** Magma gushes out when it finds vents.
   **Reason:** Interior of the Earth contains compressed hot magma
   Which of the statement(s) is are true
   a. Statements & reason are true
   b. Statements is true, reason is false
   c. Statement is false reason is true
   d. Statement & reason are false
3. **Statement I:** Mountain ranges are formed by the collision of tectonic plates
   **Statement II:** The movement of tectonic plates is due to the thermal energy from the mantle
   a. Statement I is false II is true
   b. Statement I and II are false



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c. Statement I is true II is false

d. Statement I and II are true

## IV. Answer in brief:

1. Write a brief note on the various spheres of the Earth.
2. Mention the layers of the interior of the Earth.
3. Define Plate tectonics.
4. What is Tsunami?
5. What is a Volcano? Mention its major components.
6. What is an Earthquake and how it occurs?
7. What are seismic waves and mention its types?
8. Write about the Pacific Ring of fire.

## V. Give Reasons for the following:

1. SIAL floats over SIMA.
2. Igneous rocks are also called Primary Rocks or Mother rocks.

## VI. Distinguish between

1. Core and crust.
2. Epicentre and Hypocentre
3. Divergent and convergent boundaries.
4. Primary waves and Secondary waves.
5. Shield volcano and volcanic Dome.

## VII. Write answers in a Paragraph

1. Describe the structure of the Earth.
2. Write a note on the internal and external processes of Earth.
3. How are volcanoes classified based on the periodicity of their eruptions?
4. Explain the effects of Volcanoes.

## VIII. Map Skill

On the given outline map of the world, mark the following:

a. Pacific Ring of fire

b. Earthquake prone zones (any two)

c. Locate any two active volcanoes of the world.

d. Himalayas and Alps ranges

e. Rift valley of East Africa.

## IX. HOTS

Consider the various sources of information related to the Earth's Interior. Classify the above as DIRECT & INDIRECT sources of information. Give reasons

- Seismic activity
- Earth 's magnetism
- Volcanoes
- Mined rocks
- Gravitational force
- Meteors

## X. Life Skills

Imagine that you feel tremors or shocks in your locality. What will be your role in saving lives from destruction? List out the Do's and Don'ts.



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TN_GOVT_IX_Std_Geography_Ch01.indd 166 02-04-2019 13:05:56

UNIT 2

# Lithosphere – II Exogenetic Processes

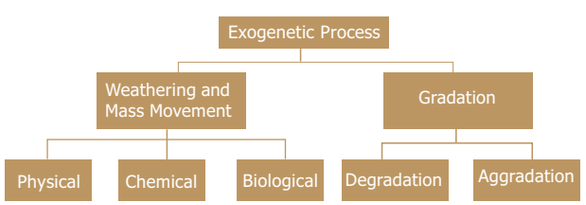
## Learning Objectives

- To comprehend the various external processes of the Earth
- To study the different types of weathering and the resultant features
- To learn how the weathered materials are transported by movement
- To study about the erosional and depositional landform features associated with rivers, underground water, glaciers, winds and waves

FEDU3G

## Introduction

The Earth is a dynamic system that undergoes various changes due to internal and external processes. The continuous interaction of these two processes controls the structure of the earth's surface. The external processes are the consequence of solar energy and gravitational forces, whereas the internal processes are an outcome of the earth's internal heat.




## 2.1 Weathering

**Weathering** is the breaking, disintegration and decomposition of materials of the earth's crust by their exposure to atmosphere.

There are three types of weathering

- Physical weathering,
- Chemical weathering and
- Biological weathering

### Physical weathering

It is the breakdown of rocks without changing their chemical composition, through the action of physical forces. The constant freezing and thawing of rocks during the night and day leads to the expansion and contraction of rocks. Cracks are formed and disintegration occurs eventually. **Exfoliation, block disintegration, granular disintegration** etc., are the different types of weathering.

#### *Exfoliation*

The alternate heating and cooling on rounded rock surfaces leads to the peeling of rocks, layer by layer like an onion. This is called **exfoliation**. **sheeting** and **shattering** are the other forms of exfoliation.





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TN_GOVT_IX_Std_Geography_Ch02.indd 167 02-04-2019 13:06:30

### *Granular Disintegration:*

Granular disintegration takes place in crystalline rocks where the grains of the rocks become loose and fall out. This is due to the action **of temperature** and **frost**.



### *Block Disintegration:*

Repeated expansion and contraction of rocks during day and night respectively causes stress on the joints of the rocks which results in block disintegration



**Hots**

Is weathering a pre-requisite in the formation of soil?

**Facts**

The disintegrated rock materials, in due course of time, are weathered further, to form soil. Soil is a mixture of disintegrated rock material and decayed organic matter called humus.

## Chemical Weathering

Disintegration and decomposition of rocks due to chemical reactions is called Chemical Weathering. This is predominantly high in the hot and humid regions such as the equatorial, tropical and sub tropical zones. Chemical weathering takes place through the processes of **oxidation, carbonation, solution,** and **hydration.** The agents of Chemical weathering are Oxygen, Carbon-dioxide, Hydrogen and water.



### *Oxidation*

Oxygen in the atmosphere reacts with the iron found in rocks, thus leads to the formation of iron oxide.This process similar to the rusting of iron, pressure of air and water is known as oxidation, which results in the weakening of rocks.

### *Carbonation*

Carbonation is the mixing of water with the atmospheric carbon-dioxide, forming carbonic acid. Carbonation is important in the formation of caves, in limestone region. When the carbonic acid reacts with the carbonate rocks, the rocks get disintegrated.

### *Solution*

The process of dissolution of rock substances in water result in the loosening of the rock particles. This inturn breaks down the rocks.

### *Hydration*

Absorption of water into the mineral structure, certain chemicals in the rock enlarge in size in humid conditions. These minerals found in the rock swell and this results in the development of cracks and the



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TN_GOVT_IX_Std_Geography_Ch02.indd 168 02-04-2019 13:06:34

rock wears down. This type of weathering is called hydration.

### Biological Weathering

Biological weathering occurs due to the penetration and expansion of plant roots, earthworms, burrowing animals (rabbits, rats) and some human activities.



## 2.2 Gradation

Gradation is the process of levelling of the land by means of natural agents like rivers, ground water, winds, glaciers, and sea waves. These agents produce various gradational relief features in due course of time. Gradation takes place in two ways: **degradation** and **aggradation**

**Gradation or Denudation** is the levelling wearing down of the land surface by various natural agents.

**Aggradation** is building up of landforms due to natural agents.

**Degradation** is eroding of land surface

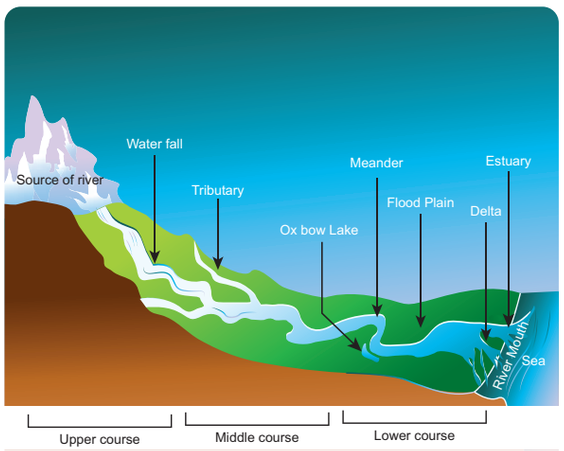
**Gradation = Erosion + Transportation + Deposition**

### Agents of Gradation

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#### *Running water (River) -(Fluvial Land forms)*

The work of running water (rivers) is the most extensive among all the other agents of gradation. Rivers originate on higher landforms like, mountains, hills and plateaus that receive water from various sources like the rain, glaciers, springs, lakes, etc.The place where the river originates is called its source and where it joins the sea is known as its mouth.




### Courses of River:

Rivers generally originate from mountains and end in a sea or lake. The whole path that a river flows through is called its course. The course of a river is divided into:

i. The upper course
ii. The middle course and
iii. The lower course

#### *i. The Upper Course*

**Erosion** is the most dominant action of river in the upper course. In this course, a river usually tumbles down the steep mountain slopes. The steep gradient increases the velocity and the river channel performs erosion with great force to widen and deepen its valley. The land features carved by a river in its upper course are **V-shaped valleys, gorges, canyons, rapids, pot holes, spurs, and waterfalls.**

#### *ii. The Middle Course-*

The river enters the plain in its middle course. The volume of water increases with the confluence of many tributaries and thus increases the load of the river. Thus, the predominant action of a river is **transportation**. Deposition also occurs due to the sudden decrease in velocity. The river in the middle course develops some typical landforms like **alluvial fans, flood plains, meanders, ox-bow lakes** etc.,



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TN_GOVT_IX_Std_Geography_Ch02.indd 169 02-04-2019 13:06:35

### *iii. The Lower course*

The river, moving downstream across a broad, level plain is loaded with debris, brought down from its upper and middle courses. Large deposits of sediments are found at the level bed and the river, splits into a number of channels called distributaries. The main work of the river here is **deposition** and it develops typical landforms like **delta and estuary.**

- **Tributary** – Small streams that join the main river. Eg. River Bhavani
- **Distributary** – River channels that get separated from the main river. E.g., River Kollidam.

## Erosional Landforms of River

### Gorges and Canyons:

When the river flows through a mountainous region made up of hard rocks, it forms a valley with almost vertical sides called gorge. In India, deep gorges have been formed by Brahmaputra and Indus in the Himalayas.

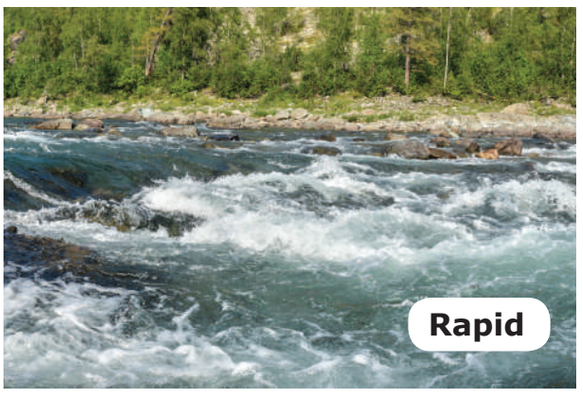
A deep gorge with steep sides that runs for hundreds of kilometres is referred to as canyon e.g. Grand Canyon of the river Colorado in the U.S.A.




### Waterfall

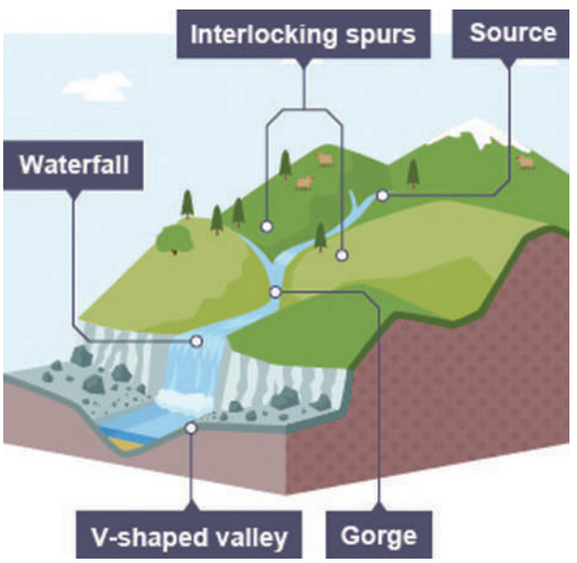
When a river flows in a region where hard rocks lie over soft rocks horizontally, the soft rocks get eroded quickly and the hard rocks projects outwards. Thus, the river falls vertically from a steep slope to form a **waterfall**. When the water falls with great force, it erodes the rock material beneath and creates a depression called a **plunge pool**. Shallow fast flowing water in a stream is called a **rapid** or **river jumps**

The highest waterfalls in the world is Angel falls (979 m) in Venezuela.




### V-shaped valley

A 'V'- shaped valley is formed by the vertical erosion of the river where the valley is deepened and widened.




### Pot hole

Due to the river action, cylindrical holes are drilled vertically in the river bed, with varying depth and diametre. These are called **pot holes**.



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch02.indd 170 02-04-2019 13:06:37




## Meander

As the river loaded with debris flows slowly, it forms sweeping loops and bends. It is referred to as meanders.



## Ox bow lake

Meanders in due course of time become almost a complete circle with narrow necks. This in turn gets abandoned and forms a lake. This is called an Ox-bow lake.

The world's largest oxbow lake is Lake Chicot is Arkansas of USA. Lake Kanwar in Bihar (India) is Asia's largest fresh water ox bow lake.

## Depositional Landforms of River

### Alluvial Fan

A fan shaped deposition made by the river at the foothills is called an alluvial plain

### Flood Plain

Fine sediments are deposited on river banks when a river floods. These sediments make the region rich and fertile. This is called a flood plain. As the height of the river banks gets increases due to continuous deposition of a flooded river, levees are formed.

**Estuary:** Estuary is formed where the rives meets the sea. Deposition of silt by the river is not possible here in the estuaries like delta as if the waves keep on eroding the deposits. Ex. River Narmada and Tapti.

### Delta

A triangular shaped low lying area formed by the river at its mouth is called delta.
Deltas have fine deposits of sediments enriched with minerals. Eg. Cauvery Delta, Tamil Nadu.



**Facts**

**The Greek letter** (△)pronounced delta closely resembles the triangular delta of the river Nile. The Ganga-Brahmaputra Delta is the largest delta in the world.

The world's best known geyser is the Old Faithful geyser in the Yellowstone National Park in Wyoming, U.S.A

**As an agent of gradation, underground water creates distinct landforms in lime-stone regions called Karst Topography.**

### Karst Topography

Ground water is an active agent in limestone regions. Karst topography is formed due to the dissolution of soluble rocks such as limestone, dolomite and gypsum.

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TN_GOVT_IX_Std_Geography_Ch02.indd 171 02-04-2019 13:06:40

Limestone topography of Western Slovenia extends for a distance of 480 km in length and 80 km in width which is termed as Karst in the Slavic language. The world's largest karst area is the Nullarbar located on the Great Australian Coast.

Karst regions are also found in Southern France, Spain, Mexico, Jamaica, Western Cuba, Central New Guinea, Sri Lanka and Myanmar.

**Facts**

**Karst Areas in India**

Guptadham caves - Western Bihar, Robert cave and Tapkeshwar temple - Uttarakhand. Pandav caves Pachmari - Madhya Pradesh, Kutumsar - Bastar district in Chattisgarh, Borra caves of Visakhapatnam - Andhra Pradesh

## Erosional Landforms of Underground Water

Most of erosion takes place due to the process of solution. When rain water mixes with carbon-di- oxide and enters into a limestone region, it dissolves and destroys much of the limestone. As a result, landforms such as **Terra rossa, Lappies, sinkholes, swallow holes, dolines, uvalas, poljes, caves and caverns are formed**.

### Terra Rossa (Italian term for Red soil)

Deposition of red clay soil on the surface of the Earth is due to the dissolution of limestone content in rocks. The redness of the soil is due to the presence of iron oxide.



### *Lappies*

When the joints of limestone rocks are corrugated by groundwater, long furrows are formed and these are called LAPPIES.




### *Sinkhole*

A funnel shaped depressions formed due to dissolution of limestone rock is called sinkholes. Their average depth ranges between three and nine meters






The World's deepest sinkhole is China's xianozhai Tienkang at 2172 feet. There are as many as 15000 Sinkholes in Illinois

**Activity**

Take a trough filled with sand. empty a portion of sand in the middle and fill it with sugar. Now level the sand over the sugar. Pour water into the trough and observe what happens. The sugar dissolves and forms a depression. This is similar to the formation of sinkhole.



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch02.indd 172 02-04-2019 13:06:41

## *Caves and Caverns*

Caves and caverns are subterranean features of karst topography. Caves are hollows that are formed by the dissolution of limestone rocks when carbon di oxide in air turns into carbonic acid after its reaction with water. They vary in size and shape. Caverns are the caves with irregular floors. Eg. Guptadham caves in Western Bihar.

All types of deposits in the caves and caverns are collectively called **speleothems** which **includes travertines, tufa, dripstones**.

Swallow Holes, Uvalas, Dolines, Poljis are other erossional Features of karst regions predominant in other parts of the world.




**Facts**

Cave insects lose their senses of sight and develop extraordinary long antenna to compensate the loss of sight

## Depositional Landforms of Underground Water

It is interesting to know that a variety of depositional features are formed on the floor, ceiling and walls of the caves and caverns of the Karst Topography.

### Stalactite, Stalagmite and Column

When the water containing dissolved calcite gradually drips from the ceiling of the caves, water evaporates and the remaining calcite hangs from the ceiling. Thus **Stalactites** are formed. When the calcite deposits rises upward like a pillar **Stalagmites** are formed. Sometimes, Stalactites and Stalagmites meet together to form **Columns or Pillars**.




## *Glaciers:*

A Glacier is a large mass of ice that moves slowly over the land, from its place of accumulation. It is also known as 'River of ice'. The place of accumulation is called snowfield. **The height above which there is a permanent snow cover in the higher altitude or latitude is called snowline.** Higher the latitude, lower the snowline from sea level.

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**Hots**

Snowline of Alps is 2700 metre where as the snowline of Greenland is just 600 metre. Find out the reason.

**Activity**

**Fake Snow**

*Materials needed:*-Cup of Baking Soda, Shaving Cream

*Method:*-Pour one cup of baking soda,

Spray the shaving cream

The snow will start forming almost immediately..

The gradual transformation of snow into granular ice is called 'firn' or ' neve' and finally it becomes solid glacial ice.

## Erosional Landforms of Glacier

Glaciers are powerful erosive agents. Some of the important erosional landforms are



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TN_GOVT_IX_Std_Geography_Ch02.indd 173 02-04-2019 13:06:43

**Cirque, Aretes, Matterhorn, U-shaped valley, Hanging valley, Fiords** etc., Most of these glacial features are predominantly seen in countries like Switzerland, Norway etc.,

## Cirque

The glacier erodes the steep side walls of the mountain and forms a **bowl-shaped armchair like depression**, it is termed as Cirque

## Arete

Aretes are narrow ridges formed when two cirque walls joined together back to back, and forms narrow knife like ridges.

## Pyramidal Peak

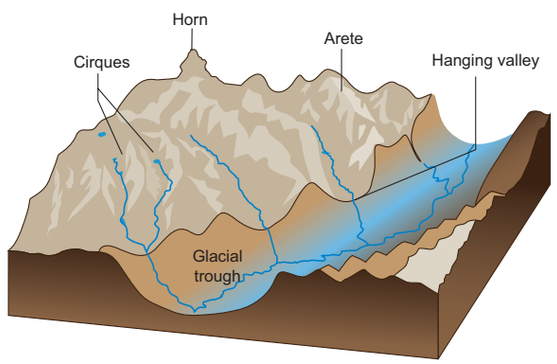
The pyramidal peaks formed when three or more cirques meet together (eg) **Matterhorns.**

## U-Shaped Valley

When the glacier moves down along a river valley, the valley further gets eroded deep and wide to form a 'U' shaped valley.

## Hanging Valley

These are valleys eroded by tributary glacier and that hangs over the main valley.



Glaciated topography

## Fjord



Fjords are glacial valleys that are partly submerged in the sea.

## Depositional Landforms of glacier

After getting eroded, fragments of rocks and boulders along with dirt form **glacial debris**. Glacial debris gets deposited in the low lying areas and form depositional features like **moraines, drumlins, eskers, kames and outwash plains**.

## Moraine

Landforms formed by the glacial deposits of valley or continental glaciers are termed as moraines. They are of various shapes and sizes, like ground, terminal and lateral moraines etc



## Drumlin(Basket of Egg Topography)

**Drumlins** are deposits of glacial moraines that resemble giant inverted teaspoons or half cut eggs.

## Esker

Long narrow ridges composed of boulders gravel and sand deposited by streams of melting water which run parallel to a glacier are called eskers.

## Outwash Plain

An outwash plain consists of glacial sediments deposited by the melting ice at the terminus of a glacier. It appears as an extensive accumulation of sand, gravel and silt.





Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch02.indd 174 02-04-2019 13:06:45

**Activity**

Discuss in a small groups about the effects of global warming.

### *Wind*

When air blows horizontally at or near the earth's surface is called wind. The erosional, transportational and depositional action of wind is predominant in arid regions. This is called as Aeolian Process.

## Erosional Landforms of wind

Some of the erosional landforms of wind are mushroom rocks, Inselbergs and yardangs.

### *Mushroom Rock*



Rocks are made up of hard and soft layers. When a rock's bottom is soft, the sand-laden winds blow against it and wear it down. By the constant wearing down action of the wind, the bottom gets eroded away to form a mushroom like structure. This is called a **mushroom or pedestal rock**. Such rocks are found near Jodhpur in Rajasthan.

### *Inselberg*



Inselberg is a German term which means an **island mountain**. Certain hard rocks like igneous rocks are more resistant to wind action. Such **isolated residual hills** rising abruptly from their surroundings are termed as inselbergs. Eg. Uluru or Ayers Rock, Australia.

### *Yardang*

In arid regions, certain rocks have hard and soft layers arranged vertically. When winds blow over these rocks, the soft layers get eroded leaving irregular crests. These are called yardangs.



## Depositional Landforms of wind

Some of the depositional landforms are sand dunes, barchans and loess.

### *Sand Dune*

In deserts, during sandstorms, wind carries loads of sand. When the speed of wind decreases, huge amount of sand gets deposited. These **mounds or hills of sand** are called sand dunes. There are different types of sand dunes.

### *Barchan*

Barch are isolated, **crescent shaped sand dunes**. They have gentle slopes on the windward side and steep slopes on the leeward side.



### *Transverse Dunes*

Transverse dunes are asymmetrical in shape. They are formed by alternate slow and fast winds that blow from the same direction.



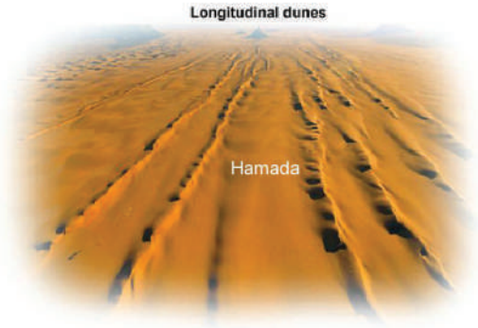

### *Longitudinal Dunes(Seif dunes)*

Longitudinal dunes are long narrow ridges of sand, which extend in a direction



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch02.indd 175 02-04-2019 13:06:47

parallel to the prevailing winds. These dunes are called Seifs in Sahara




### *Loess*

The term loess refers to the deposits of fine silt and porous sand over a vast region. Extensive loess deposits are found in Northern and Western China, the Pampas of Argentina, in Ukraine and in the Mississippi Valley of the United States.



DO YOU KNOW?

The thickest known deposit of loess is, 335 metre found in the loess plateau in China.

### *Wave*

A steady up (crest) and down (trough) movement of surface water are called waves. Sea waves are the most powerful agents of gradation and their erosional, transportational and depositional processes are confined to a very narrow belt along coastal areas.

## Erosional Land Forms of Waves

Some of the erosional landforms of sea waves are **sea cliff, sea cave, arch, stack, beach, bar and spit and wave cut platform**.

### 1. Sea Cliffs

Sea cliffs are steep rock faces formed when sea waves dash against them. The rocks get eroded to form steep vertical walls.

### 2. Sea Cave

Prolonged wave attack on the base of a cliff erodes rock materials, which result in the formation of **caves**.

### 3. Sea Arch

When two caves approach one another from either side of a headland and unite, they form an **arch**. (Eg.) Neil Island, Andaman and Nicobar.



### 4. Sea Stack

Further erosion by waves ultimately leads to the total collapse of the arch. The seaward portion of the headland will remain as a pillar of rock known as **stack**. Eg the Old man of Hoy in Scotland.

### 5. Wave Cut Platforms

Flat surface found at the foot of sea cliffs are called as wave cut platforms. Wave cut platform is also referred as wave cut benches terrace.

## Depositional Landforms of Waves

### Beach

Sand and gravel are moved and deposited by waves along the shore to form **beaches**. This is the most dominant and constructive work of the sea. (Eg.) Juhu beach along Mumbai coast, Puri beach in Odisha and Marina beach in Chennai.

### Bar

A bar is an elongated deposit of sand, shingle or mud found in the sea, almost parallel to the shoreline.





Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch02.indd 176 02-04-2019 13:06:48

## Spit



A spit is a ridge or embankment of sediment, attached to the land on one end and terminating in open water on the other end. Spits are common at the mouth of estuaries. Eg. Kakinada spit

### Recap

- Levelling of uneven landform is called gradation.
- Weathering is the breaking down of the rocks.
- Physical, chemical and biological are the three types of weathering.
- Running water, glacier, underground water, wind and waves are agents of weathering.
- Soil is the weathered materials covering the earth's surface insitu.

## EXERCISE

FFFDA2

### I. Choose the best answer:

1. The disintegration or decomposition of rocks is generally called as
   a. weathering b. erosion
   c. transportation d. deposition
2. The process of the levelling up of land by means of natural agents.
   a. aggradation b. degradation
   c. gradation d. none
3. _____ is seen in the lower course of the river.
   a. Rapids b. Alluvial fan
   c. Delta d. Gorges
4. Karst topography is formed due to the action of
   a. Glacier b. Wind
   c. Sea waves d. Ground water.
5. Which one of the following is not a depositional feature of a glacier?
   a. cirque b. Moraines
   c. Drumlins d. Eskers
6. Deposits of fine silt blown by wind is called as
   a. Loess b. Barchans
   c. Hamada d. Ripples
7. Stacks are formed by _____
   a. Wave erosion
   b. River erosion
   c. Glacial erosion
   d. Wind deposion
8. _____ erosion is responsible for the formation of cirque
   a. wind b. glacial
   c. river d. underground water.
9. Which one of the following is a second order land form?
   a. Asia b. Deccan Plateau
   c. Kulu valley d.Marina Beach.

### II. Match the following:

1. Distributaries – glacial action
2. Mushroom rock – action of sea wave
3. Eskers – Lower course of river
4. Stalactites – Aeolian process
5. Cliff – karst topography

### III. Consider the given statements and choose the right option given below

1. (i). 'I' Shaped valley is an erosional feature of the river
   (ii) 'U' Shaped valley is an erosional feature of the glacier



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch02.indd 177 02-04-2019 13:06:48

(iii) 'V' Shaped valley is an erosional feature of the glacier

a. i, ii & iii are right

b. i & ii are right

c. i & iii are right

d. only I is right

2. **Statement I:** Running water is an important agent of gradation

**Statement II:** The work of the river depends on the slop of land on which if flows

a. Statement I is false II is true

b. Statement I and II are false

c. Statement I is true II is false

d. Statement I and II are true

3. **Statement:** Limestone regions have less underground water.

**Reason:** Water does not percolate through limestone

a. The statement is right reason is wrong.

b. The statement is wrong Reason is right.

c. The statement and reason are wrong.

d. The statement and reason are right.

## IV. Answer in brief:

1. Define weathering.
2. What do you mean by biological weathering?
3. Mention the three courses of a river with any two land forms associated to each course.
4. What are ox-bow lakes?
5. How does a sea cave differ from a sea arch?
6. List out any four karst topographical areas found in India.
7. What do you mean by a hanging valley?
8. Define: a) Moraine b) Drumlin c) Esker.
9. Mention the various features formed by wind erosion.
10. What is a wave cut platform?

## V. Give Reasons:

1. Chemical weathering is predominant in hot and humid zones.
2. Silt deposits are less at estuaries than deltas.
3. The snow line is at the sea level in Polar regions.
4. Wind can possibly erode the rocks from all sides.
5. In limestone regions, surface drainage is rarely found.

## VI. Distinguish between:

1. Physical and chemical weathering.
2. Delta and Estuary
3. Stalactite and stalagmite.
4. Longitudinal and Transverse sand dunes.
5. Inselbergs and yardangs
6. Spit and bar.

## VII. Answer in Paragraph:

1. Write a note on weathering classify and explain.
2. Explain the erosional landforms formed by underground water.
3. What is a glacier? Explain its types.
4. Describe the depositional work of winds.

## VIII. Map Skill:

On the given outline map of the world, mark the following.

1. Any two deltas
2. A Karst region
3. Any two hot and cold deserts

## IX HOTS

1. Is wind the only gradational agent in the desert?



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TN_GOVT_IX_Std_Geography_Ch02.indd 178 02-04-2019 13:06:49

2. Underground water is more common in limestone areas than surface run off. Why?

3. The river channels in the lower course are wider than the upper course.

## X. Give geographical terms for the following:

a. Chemical alternation of carbonate rocks on lime stone region.
b. Flat surfaces near cliffs.
c. Erosion + Transportation = Deposition
d. The bottom line of a snow field.

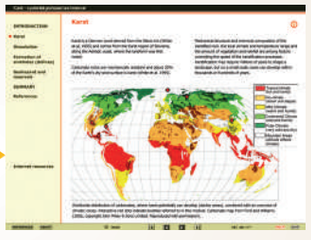
## INTERNET RESOURCES

1. www.usgs.gov.in
2. www.nasa.gov.in
3. https://www.isro.gov.in
4. https://www.india.gov.in

## ICT CORNER

### Karst Topography

Through this activity you will explore **Karst formation.**



**Steps**

- Use the URL to reach '**Karst Topography**' page. Allow flash player to play, if it asks.
- Click '**Next**' button in the bottom of the page to proceed to the next page and explore the animation.
- Select '**Dissolution**' option from the left and explore.
- Use the arrow keys to move forward and backward to the animation.

**Website URL:**

http://folk.uio.no/hanakrem/svalex/E-learning/Karst/

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TN_GOVT_IX_Std_Geography_Ch02.indd 179 02-04-2019 13:06:49

UNIT 3

# Atmosphere

## Learning Objectives

- To understand the composition and structure of atmosphere
- To differentiate weather and climate
- To correlate the factors influencing weather and climate
- To recognize the classification of Clouds, wind and rainfall

FFP9BP

## Introduction

Earth is a unique planet where life is found. Can you imagine life on the earth without air? No. The air is essential for the survival of all forms of life. The blanket of air that surrounds the Earth is called the atmosphere. It is held close to the earth by gravitational attraction.

## 3.1 Composition of the Atmosphere

Atmosphere is a mixture of gases, water vapour and dust particles in different proportions. **Nitrogen (78%) and Oxygen (21%)** are permanent gases of the atmosphere. They constitute 99% of the total composition and their percentages always remain the same without any change. The remaining one percentage is occupied by Argon (0.93%), Carbon-di-oxide, (0.03%), Neon (0.0018%), Helium (0.0005%), Ozone (0.00006%) and Hydrogen (0.00005%). Krypton, Xenon and Methane are also present in trace. Water vapour (0 - 0.4%) is also found in the atmosphere, which plays an important role in predicting weather phenomenon. The other solid particles present in the atmosphere includes dust particles, salt particles, pollen grains, smoke, soot, volcanic ashes etc.,.

### Fact

In 1772 CE Daniel Rutherford discovered Nitrogen in atmosphere. In 1774 Joseph priestly discovered oxygen in atmosphere

Oxygen is most important for living organisms. $CO_2$ absorbs heat and keeps the atmosphere warm by insulation and radiation. Nitrogen acts as a diluent and is chemically inactive. Ozone helps in protecting the earth from harmful ultra violet radiation. The solid particles in the atmosphere acts as nuclei on which water vapour condense to form precipitation.

## 3.2 Structure of the Atmosphere

The atmosphere is thick near the earth surface and thins out until it eventually merges with space. The five atmospheric layers are: Troposphere, stratosphere, Mesosphere, Thermosphere and Exosphere.

### Troposphere

The lowest layer of the atmosphere is the troposphere. The Greek word 'tropos' means 'turn' or change. The layer extends up to 8 kms



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TN_GOVT_IX_Std_Geography_Ch03.indd 180 02-04-2019 13:07:22

at the poles and up to 18 kms at the Equator. The temperature decreases with increasing height. Almost all weather phenomenon take place in this layer. Hence it is called **weather making layer.** The upper limit of the troposphere is called as tropopause.

### Stratosphere

Stratosphere lies above the troposphere. It extends to a height of about 50km above earth surface. Since this layer is a concentration of ozone molecules, it is also referred as **ozonosphere**. The temperature increases with increase in height in this layer. Large jet planes normally fly here. The upper limit of the stratosphere is called as stratopause.

### Mesosphere

Mesosphere extends between 50km and 80km. The temperature decreases with increasing height. Radio waves transmitted from earth are reflected back to earth from this layer. Most of the meteors nearing the earth, get burned here. The upper most limit of the mesosphere is the mesopause.

### Thermosphere

Thermosphere exists above the mesosphere. It extends to about 600 km. The composition of gases in the lower thermosphere is more or less uniform, hence it is called "Homosphere". The upper portion of the thermosphere has uneven composition of gases and hence it is referred as "Heterosphere". Here the temperature increases with increasing height. Ionosphere is a layer of the thermosphere that contains Ions and free electrons.

**Fact**

Magnetosphere lies beyond the exosphere. It is the earth's magnetic belt, where proton and electrons, coming out from the sun are trapped by the earth. The magnetic field extends to around 64,000 km above the Earth.

### Exosphere

The uppermost layer of the atmosphere is called exosphere. This layer is extremely rarefied with gases and gradually merges with the outer space. This zone is characterized by **aurora Australis** and **aurora borealis.**




Auroras are cosmic glowing lights produced by a stream of electrons discharged from the Sun's surface due to magnetic storms that are seen as unique multicoloured fireworks hanging in the polar sky during midnight

## 3.3 Weather and Climate

Weather and climate are the terms that are related to the atmospheric conditions. Weather denotes the way the atmosphere behaves every day and climate reveals the average of weather conditions over relatively long periods of time. The difference between the two may be clearly understood with the following table.

**Hots**

Why is Troposphere called as weather making layer?

### There are many factors that influence weather and climate.

- Distance from the equator
- Altitude
- Nearness to the sea
- Nature of the prevailing winds
- Mountain barrier
- Cloud cover
- Ocean currents
- Natural vegetation

### Distance from the Equator

The sun's rays fall vertically on the equator. The rays are inclined on the regions



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TN_GOVT_IX_Std_Geography_Ch03.indd 181 02-04-2019 13:07:22

away from the equator and near the poles due to the spherical shape of the earth. The vertical rays heat up the earth more than the inclined rays. Thus, the places near the equator are warmer than the places which are far away from the equator.

## Activity

Connect the following places with their latitudes and the temperature observed

| Weather | | Climate | |
|---|---|---|---|
| Partly sunny  | 1. Weather is the study of atmospheric conditions for short duration over small areas. | 1. Climate is the study of the average weather condition observed over a long period of time for a larger area. | Warm Climate  |
| Windy  | 2. The weather changes very often ; hour to hour and day to day | 2. Climate is more or less permanent and remains the same always. | Monsoon  |
| Rainy  | 3. A place can experience different types of weather conditions in a day. Eg. A day with hot morning can have a rainy noon. | 3. A place can experience almost the same type of climate | Wet climate  |
| Chilly  | 4. Weather data is collected every day in the observatories | 4. Climate is average of the weather data. | Extreme Climate  |
| Stormy  | 5. Study of weather is called Meteorology | 5. Study of climate is called Climatology | cyclone  |

| City | Latitude | Temperature [In August] |
|---|---|---|
| Kanyakumari – Tamil Nadu | | |
| Delhi-India | | |
| Moscow – Russia | | |

**Altitude:** Altitude refers to the height above mean sea level. The temperature decreases at the rate of **6.5°C per km of height.** This is called **Normal lapse rate**. So, places at the higher altitude have a lower temperature.

## Activity

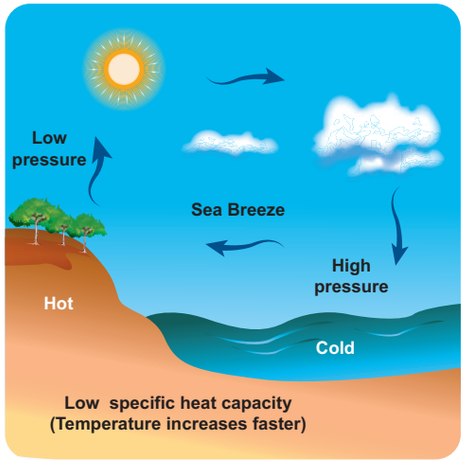
Connect the following places with Altitude and the temperature

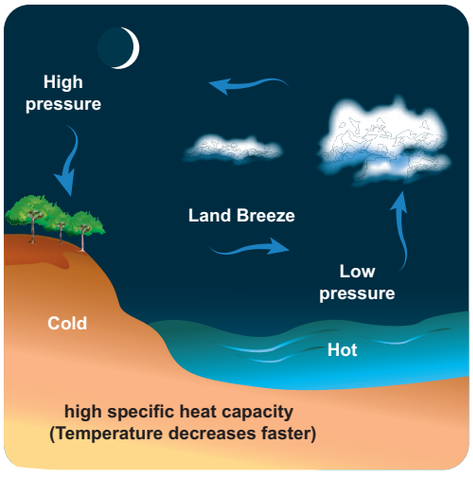


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| City | Altitude (height) | Tempera-ture [In May] |
|---|---|---|
| Madurai-Tamilnadu | | |
| Uthagamandalam – Tamilnadu | | |
| Simla -Himachal Pradesh | | |

## Nearness to the sea:




The climate of a place, varies according to its nearness to the sea. Places near the coast experience equable climate due to the influence of the winds from the sea. Places located inland, far from the sea, does not experience the moderating influence of the sea, such places experience a continental type of climate.

### Fact

During the day, the land masses get heated more rapidly than the oceans. Heated air ascends and this causes low pressure on the adjoining ocean. Therefore, the wind blows from ocean to land in the afternoon. This is called sea breeze. **Sea breeze** helps in reducing the temperature of the coastal region especially during the summer season.

During the night, the land cools more rapidly than the ocean. Cold air sinks and forms high pressure. The wind blows from land to sea during the night, this is called **land breeze**.

## Nature of the Prevailing Winds

The wind changes the climate of a place based on, from where they blow. When wind blows from a warm region, it makes the place warm and cold, when blows from a colder region. The on-shore winds cause rainfall making the place cool whereas the off-shore winds bring dry weather.

## Mountains barriers

The location of the mountains influence the climate of a place. The mountain chains act as natural barrier for the wind. Sometimes they prevent the entry of cold winds into the country or the escape of monsoon winds, thus having a great influence over the climate.

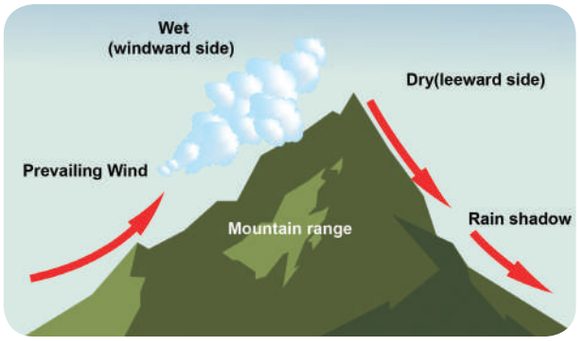



The windward is the side of a mountain which faces the prevailing wind. It receives heavy rainfall.

The **leeward side** of the mountain is the side sheltered from the wind. It receives very less rainfall.



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### Cloud Cover

Clouds reflect a large amount of radiation from the sun. This prevents the entry of heat to the earth's surface. So, in areas generally of cloudless sky like the deserts, temperature is very high. On the other hand under cloudy sky, the temperature is low.

### Ocean currents

The warm ocean currents raise the temperature of the nearby coastal areas, while the cold current lower the temperature of a place.

### Natural vegetation

The trees release water vapour into the air and makes it cool. Thus forest areas have lower range of temperature throughout the year in contrast to non-forested areas.

## 3.4 Winds

The horizontal movement of air along the surface of the earth is called the "**Wind**" while the vertical movement of air is a called an "**Air Current**". The winds always blow from a high pressure area to a low pressure area. Wind is mostly named after the direction from which it blows. For example, the wind blowing from the east is known as the easterly wind or easterlies.

An "**anemometer**" records **wind speed** while a "**wind vane**" measures the **direction of the wind**. The unit of measurement is **kilometre per hour or knots**



Anemometer




Wind vane

## Types of Winds

Winds are generally classified into the following four major types:

- Planetary winds
- Periodic winds
- Variable wind
- Local wind

### Planetary winds:

The winds which constantly blow in the same direction throughout the year are called the Planetary winds. They are also called as permanent winds or the prevailing winds. These winds include **Trade winds, Westerlies** and **Polar Easterlies**

### *Trade Winds*

Trade winds blow from the subtropical high pressure belt to the Equatorial low pressure belt in both the hemispheres. They blow with great regularity, force and in a constant direction throughout the year. These winds were very helpful to traders who depended on the winds while sailing in the seas. And so, they are named as Trade winds.

**Activity**

Find the correlation between the Trade Winds and the location of prominent deserts like Sahara, Atacama etc.

### *Westerlies*

Westerlies are the permanent winds that blow from the tropical high pressure belt to the sub polar low pressure belt in both the hemispheres. They blow from South West to North East in the northern hemisphere and North West to South East in the southern



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TN_GOVT_IX_Std_Geography_Ch03.indd 184 02-04-2019 13:07:25

hemisphere. The velocity of westerlies become so vigorous and fast to be called **Roaring Forties** at $40^0$, **Furious Fifties** at $50^0$ and **Screaming Sixties** at $60^0$ latitudes.

### *Polar Easterlies:*

Polar easterlies are cold and dry polar winds that blow from the polar high pressure belt to the sub polar low pressure belt. These are weak winds blowing from North East direction in the Northern Hemisphere and South East direction in the Southern Hemisphere.

**Fact**



G.G.Coriolis

The rotation of the Earth causes deflection of winds from their original path, called the "Coriolis effect". Winds are deflected to the right in the northen hemisphere and to the left in the southern hemisphere which is known as "Ferrel's law". This was profounded by William Ferrel. He used "Coriolis force" named after G.G Coriolis (1792-1843) for proving Ferrel's Law

## Periodic winds

The periodic winds are the seasonal winds that change their direction periodically. These winds are caused by the differential heating of land and ocean.

Winds which reverse their direction with the change of seasons are called monsoons. Tropical Monsoon winds of Indian subcontinent is a best example.

### *Variable wind*

### *Cyclones*

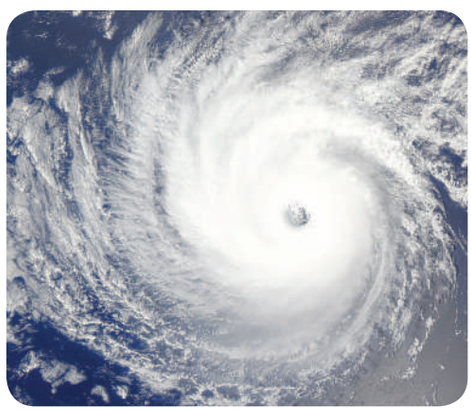
The term cyclone is a Greek word meaning "**coil of a snake**". Cyclones are centres of low pressure where, winds from the surrounding high pressure area converge towards the centre in a spiral form. Due to the rotation of the earth, the cyclonic winds in the northern hemisphere move in anti clock wise direction, where as they move in clockwise direction in the southern hemisphere.

Cyclones can be classified into

Tropical cyclones
Temperate cyclones
Extra tropical cyclones

### *Tropical cyclones:*

Tropical cyclones are known as '**cyclones**' in Indian ocean, '**typhoons**' in the western pacific ocean, '**hurricanes**' in the Atlantic and eastern Pacific ocean, '**baguios**' in Phillipines and '**willy willy**' in Australia, **Taifu** in japan. Tropical cyclones often cause heavy loss of life and property on the coasts and become weak after reaching the landmasses.



**Fact**

**Super Cyclone**

A violent cyclone that hit Odisha, on Friday, **29 October 1999**, was one of the most devastating and strongest storm to hit the Indian coast. Winds of up to 260 kph raged for over 36 hours. The winds caused a seven-metre tidal wave that swept more than 20 km inland and brought massive destruction and death to a number of coastal districts in the state of Odisha. It is estimated that more than 10 million people in 12 coastal belt districts were affected by the cyclone. More than 10,000 people lost their lives.



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Deliberations for naming cyclones in the Indian ocean region began in 2000 and a formula was agreed upon in 2004. Eight countries in the region Bangladesh, India, Maldives, Myanmar, Oman, Pakistan, Srilanka, and Thailand contributed a set of names which our assigned sequentially whenever a cyclonic storm develops.

### *Temperate cyclones:*

Temperate cyclones are formed along a front where hot and cold air masses meet in mid-latitudes between 35° and 65°N and S. Temperate cyclones do not become weak like the tropical cyclones on reaching the land. Temperate cyclone commonly occurs over the North Atlantic Ocean, North West Europe, Mediterranean basin. Mediterranean basin's temperate cyclones extend up to Russia and India in winter. In India it is as called western disturbances.

A front is the boundary separating warm and cold air masses. One type of airmass is usually denser than the other, with different temperatures and humidity. This meeting of airmass causes rain, snowfall, hail storm, thunder storm, lightining cold days, hot days, and windy days.

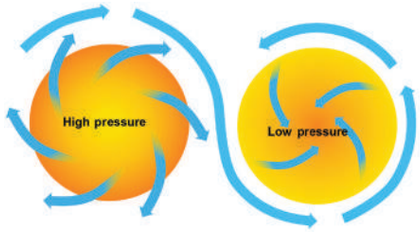
### *Extra tropical cyclones:*

Extra tropical cyclones occur in the latitudes between 30° and 60° in both the hemispheres. They are also called as **mid-latitude cyclones**. They collect energy from temperature differences which are found in higher latitudes. Extra tropical cyclones produce mild showers to heavy gales, thunderstorms, blizzards, and tornadoes.

**Hots**

Cuddalore and Nagapattinam are always affected by cyclones. Why?

**Anticyclone and Cyclone**




### Anticyclones:

Anticyclones are the opposite of cyclones. Here an area of high pressure region is found in the centre surrounded by low pressure on all sides. The wind from the high pressure region move outwards to the low pressure regions in a spiral form. Anticyclones are often accompanied by cold and heat waves.

### Local Winds:

Local winds are the winds that blow only in a particular locality for a short period of time, The effect of these local winds are experienced only in that particular area.

Such as land and sea breeze, mountain and valley breeze. They are mostly seasonal and have local names like....

- Foehn (Alps-Europe)
- Sirocco (North coast of Africa)
- Chinook (Rockies-North America)
- Loo (Thar Desert- India)
- Mistral (Mediterranean sea in France)
- Bora (Mediterranean sea in Italy)

## 3.5 Clouds

According to their height, clouds are classified into the following types

- High clouds (6-20km Height)
- Middle clouds (2.5km-6km Height)
- Low clouds (ground surface to 25km height)

These major types of clouds are further divided into different types on the basis of shape and structure.



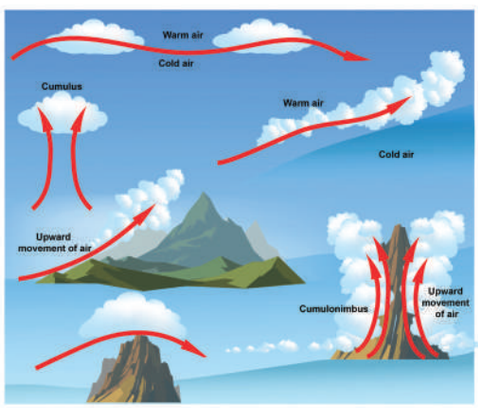
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TN_GOVT_IX_Std_Geography_Ch03.indd 186 02-04-2019 13:07:27

## High clouds

**Cirrus:** Detached clouds in the form of white delicate fibrous silky filaments formed at the high sky (8000 meters to 12000 meters) are called Cirrus clouds. These clouds have Ice crystals and are dry and do not give rainfall.

**Cirro-cumulus:** White patched, sheet or layer like clouds composed of ice crystals.

**Cirro-stratus:** Smooth milky transparent whitish clouds composed of tiny ice crystals.




DO YOU KNOW?

During sunset cirrus clouds look colourful hence they are called as "Mare's Tails".

## Middle clouds

**Alto-stratus:** Thin sheets of grey or blue coloured clouds in uniform appearance. consisting of frozen water droplets

**Alto-cumulus:** clouds fitted closely together in parallel bands, called as 'Sheep clouds' or wool pack clouds.

**Nimbo stratus:** These are clouds of dark colour very close to the ground surface associated with rain, snow or sleet.

DO YOU KNOW?

The only sphere which contains all clouds in the atmosphere is troposphere

## Low clouds

**Strato-cumulus:-** Grey or whitish layer of non-fibrous low clouds found in rounded patches at an height of 2500 to 3000 metres, associated with fair or clear weather

**Stratus:-** Dense, low lying fog-like clouds associated with rain or snow

**Cumulus:-** Dome-shaped with a flat base often resembling a cauliflower, associated with fair weather

**Cumulo-nimbus:-** Fluffy thick towering thunderstorm cloud capable of producing heavy rain, snow, hailstorm or tornadoes

## Precipitation

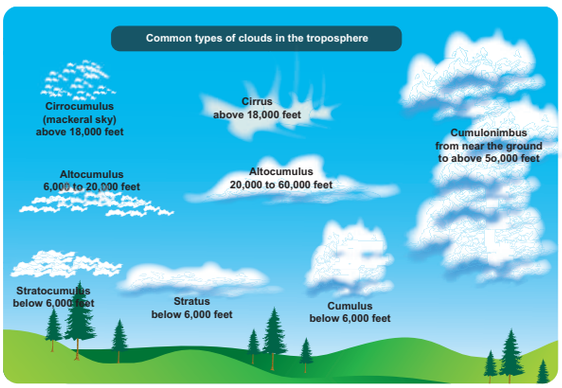
Falling down of condensed water vapour in different forms is called Precipitation. When the dew point is reached in the cloud water droplets become saturated and start to fall. Hence, they fall on the earth as Precipitation.

The climatic conditions/ factors influencing the forms of precipitation mainly are:

- Temperature.
- Altitude
- Cloud type.
- Atmospheric conditions.
- Precipitation process.

The main forms of precipitation include **drizzle, rain, sleet, snow, hail etc.**

### *Drizzle*






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TN_GOVT_IX_Std_Geography_Ch03.indd 187 02-04-2019 13:07:30

Falling of numerous uniform minute droplets of water with diameter of less than 0.5 mm is called drizzle from low clouds. Sometimes drizzles are combined with fog and hence reduce visibility.

### *Rain*

Rain is the most widespread and important form of precipitation in places having temperature above the freezing point. It occurs only when there is abundant moisture in the air. The diameter of a rain drop is more than 5mm.

### *Sleet*

Sleet refers to a precipitation, in the form of pellets made up of transparent and translucent ice. This precipitation is a mixture of snow and rain

### *Snow*

Snow is formed when condensation occurs below freezing point. It is the precipitation of opaque and semi opaque ice crystals. When these ice crystals collide and stick together, it becomes snowflakes.

### *Hails*

**Hails are** chunks of ice (greater than 2cm in diameter) falling from the sky, during a rainstorm or thunderstorm. **Hailstones** are a form of solid precipitation where small pieces of ice fall downwards. These are destructive and dreaded forms of solid precipitation because they destroy agricultural crops and human lives.

**Fact**

Any thunderstorm which is associated with fall of hail stones is known as hailstorm. Hailstorm is one of the most feared weather phenomenon because it has the potential to destroy plant, trees, crops, animals and human life.

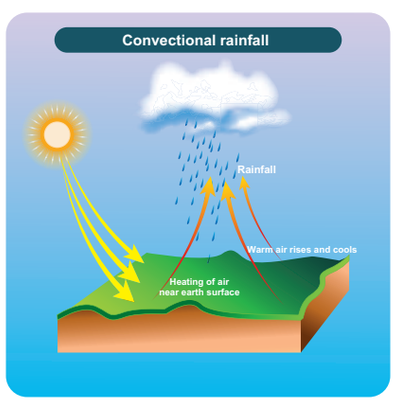
## 3.6 Rainfall

Rainfall is the most predominant type of Precipitation. Moisture laden air masses raise upwards, forms clouds and bring rainfall. Based on the mechanisms of raising the air, there are three types of rainfall.

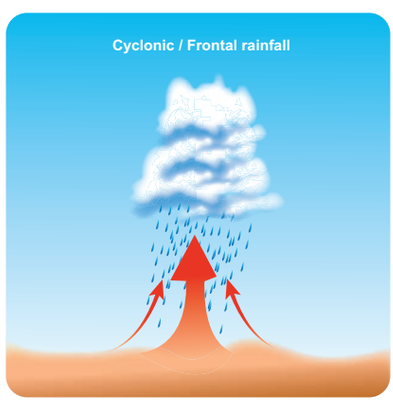
1. Convectional rainfall
2. Frontal or cyclonic rainfall
3. Orographic rainfall.

### 1. Convectional rainfall (or) 4'o' Clock rainfall

Earth surface is intensely heated through solar radiation during the day time. When the air near the earth surface is heated, it rises and expands. This heating results is the formation of **convectional air currents**. Thus the ascending moist air cools, condenses and results in convectional rainfall. **Convectional rainfall** occurs regularly in the equatorial region in the evenings. It is also experienced in tropical, sub-tropical and temperate regions in the summer months and on warmer days.




### 2. Cyclonic rainfall (or) Frontal

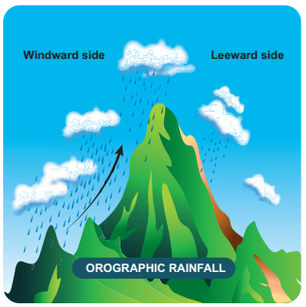





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Cyclonic precipitation occurs during cyclones when air masses are made to converge and move upward so that adiabatic cooling occurs. Cyclonic rainfall occurs in tropical as well as temperate regions. When warm and cold air masses converge, condensation and precipitation takes place on the boundary between warm and cold air masses called as Frontal rainfall.

### 3.Orographic rainfall (or) Relief rainfall




Orographic rainfall, also called relief rainfall, is caused when air is forced to rise against a high mountain. The mountain barriers lying across the direction of air flow, forces the moisture laden air to rise along the mountain slope. This results in the cooling of the air, which leads to the formation of clouds and rain.

This rainfall is called Orographic rainfall. The side of the mountain facing the wind is called the **windward side** and receives heavy rainfall. It is called the rainfed region. The other side of the mountain that does not face the wind is called the **leeward side** and receives less rainfall becomes rain shadow region.

DO YOU KNOW?

Mawsynram is the wettest place of India as it is located in the windward side of the Purvachal hills, whereas Shillong lies on the leeward side and thus receives less rainfall. This is the same, in the case of Mumbai and Pune.

## 3.7 Humidity

Humidity is an important aspect of the atmosphere because it affects both weather and climate. The amount of water vapour present in the atmosphere is referred to as humidity. Humidity of the atmosphere is high when it has large quantities of water vapour. The amount of water vapour in the atmosphere is called absolute humidity.

DO YOU KNOW?

When the relative humidity of the air is 100%, the air is said to be saturated. Saturated air will not absorb any more water vapour.

The temperature at which air gets saturated is called **dew point**.

Humidity of the atmosphere is measured by the wet and dry bulb thermometer also called the **Hygrometer**

Absolute humidity is expressed in terms of grams of water vapour present per cubic metre of air. Relative humidity is expressed in percentage.

## Recap

- Atmosphere is a thin layer of gases that surrounds the earth.
- The major gases in the atmosphere are Nitrogen (78%) and oxygen (21%)
- Five Layers of the atmosphere are Troposphere, stratosphere, mesosphere, thermosphere and exosphere
- Atmosphere gets heated through conduction.
- Wind is the horizontal movement of air
- Wind blows from high pressure belt to low pressure belt.
- The 4 types of winds are permanent (planetary), periodic, local and variable winds.
- Cyclone is an area of low pressure surrounded by high pressure
- Anticyclone is an area of high pressure area surrounded by low pressure.
- Clouds: A visible mass of Condensed water vapour floating in the air
- All precipitation occurs from clouds
- According to height clouds are classified into High clouds, Middle clouds and low-clouds
- The main forms of precipitation are drizzle, rain, snow, sleet, hail etc.



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## EXERCISE

J1WER6

### I. Choose The Best Answers:

1. _____is the most important gas for the survival of living organisms.
   a. Helium b. carbon-di-oxide
   c. oxygen d. methane
2. The lowest layer of the atmosphere is _____
   a. Troposphere b. Stratosphere
   c. Exosphere d. Mesosphere
3. _____ reflects radio waves.
   a. Exosphere b. Ionosphere
   c. Mesosphere d. Stratosphere
4. The average global surface temperature is _____
   a. 12°c b. 13°c
   c. 14°c d. 15°c
5. The process of change of state of water from gaseous to liquid state is called ___
   a. Precipitation b. evaporation
   c. transpiration d. condensation.
6. The _____ is the chief energy source of the Earth.
   a. Sun b. Moon
   c. Stars d. Clouds.
7. All types of clouds are found in the _____
   a. Troposphere b. Ionosphere
   c. Mesosphere d. Exosphere
8. _____ clouds are called 'Sheep clouds'
   a. Alto-cumulus b. Alto-Stratus
   c. Nimbo - stratus d. Cirro-stratus.
9. The Monsoons are _____
   a. Prevailing winds
   b. Periodic winds
   c. local winds
   d. none of the above.
10. Dew in the form of ice crystals is called _____
    a. frost b. fog
    c. mist d. sleet.
11. _____ is called the eye of the storm/ cyclone.
    a. Pressure b. wind
    c. cyclones d. snow.
12. The vertical movement of air is called
    a. Wind b. storm
    c. Air current d. drift.

### II. Match the following:

1. Meteorology — wind speed
2. Climatology — direction of wind
3. Anemometer — cirrus
4. Wind Vane — study of climate
5. Mare's Tail — study of weather
6. Leeward side — Australia
7. Willy willy — rain shadow region

### III. Answer the following Briefly:

1. Define atmosphere
2. Name the different atmospheric layers
3. Mention the factors that affect the climate?
4. Write short note on Lapse rate.
5. What are the processes responsible for heating the atmosphere?
6. Mention the Planetary wind system of the earth.
7. Write short note on:
   a. Trade winds.
   b. Roaring Forties
8. How are clouds formed?
9. What are the different types of rainfall?
10. What is Precipitation? What are the different forms of precipitation?
11. Write short notes on:
    a. drizzle b. rain
    c. sleet d. snow
    e. heat
12. How are Cyclones classified?



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## IV. Give reason:

1. Cyclones cause huge loss of life and property.
2. Cloudy days are warmer than cloudless days.
3. Fog is dangerous for traffic.
4. Convectional rainfall is also called 4'0 clock rain.
5. Polar Easterlies are cold and dry. Why it is so?

## V. Distinguish between the following:

1. Weather and climate
2. Land breeze and sea breeze
3. Windward side and Leeward side.
4. Tropical cyclone and Temperate cyclones.

## VI. Paragraph Questions:

1. Write a paragraph about the structure of the atmosphere.
2. Explain the different types of Permanent winds.
3. How are clouds classified? Explain them.
4. How are cyclones formed? How are they classified?
5. Explain the different forms of precipitation

## VII. Activity:

1. **Preparing chart of** clouds at various atmospheric layers.
2. **Collecting Proverbs** clouds and rain related Proverbs
3. **Poem on** 'clouds', 'rain'
4. **Report writing** observe the clouds for a week. Write your report about the shape and colours ofclouds.
5. **Working models** a) Rain Gauge b)Wind vane
6. **Preparing bar diagram**

   Collect the **data of temperature** of Kanyakumari, Delhi, Allahabad, and Itanagar for a day.Also collect the data of **rainfall received** by Jaisalmer (Rajasthan), Mawsynram (Meghalaya), Nagapattinam, Coimbatore for a day.
7. **Become a budding Meterologist:**

   Record the local weather condition of your place for a week.



## ICT CORNER Melting point

**Through this activity you will observe the land forms formed by glaciers.**



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### Steps

1. Use the URL to download the '**Glaciers**' flash file.
2. Select the '**Glacier type**' from bottom and change them using arrows to see the different land forms affected by it.
3. Select '**Anatomy of Glaciers**' from top of the page and animate the activity to observe the glacier formation.
4. Select '**Glacier Erosion**' and press '**Move Glacier**' button to observe erosion made by glaciers.

### Website URL:

https://ees.as.uky.edu/sites/default/files/elearning/module13swf.swf



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UNIT 4

# Hydrosphere

## Learning Objectives

- To understand the importance of water
- To know about fresh water
- To know about the relief features of the ocean floor
- To recognize the movements of ocean water
- To understand marine resources and the need for conservation

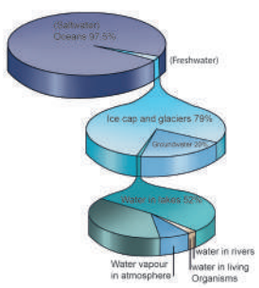
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## Introduction

We know that, our planet Earth consists of **four spheres**. They are the **Lithosphere**, **Atmosphere, Hydrosphere** and **Biosphere**. In the earlier chapters, we have studied about the Lithosphere and Atmosphere. We shall now learn the other two spheres namely the Hydrosphere and the Biosphere.

## 4.1 Hydrosphere

One of the most indispensable natural resources on earth is water. The Earth is also called the **Blue planet**, as it holds water in abundance and thus stands unique among all other planets. Hydrosphere consists of water in various forms found on the earth. Over 97% of the water on the Earth's surface is confined to oceans. Less than 3% of water is held on land as glaciers, ice caps, groundwater, rivers, lakes, and also as the water vapour in air.



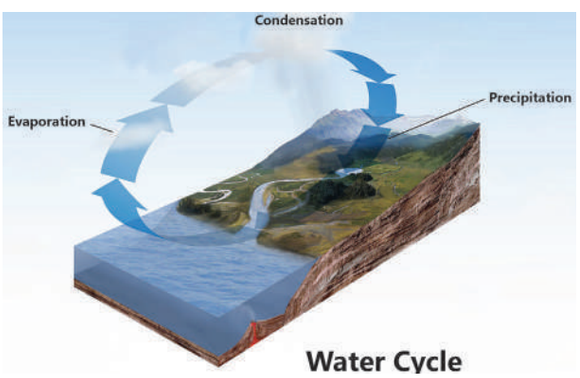

**Global Distribution of Water Resource**

## 4.2 Hydrological Cycle

BXSD4Z

The Earth's water is not static. It is always in motion. This continuous movement of water on, above and below the earth's surface is called the Hydrological Cycle. The **three major processes** involved in the water cycle are **evaporation, condensation and precipitation**. Water changes its form constantly i.e. Ice, water and water vapour. This process happens in the blink of an eye or even over millions of years.

Water resources of the Earth can be broadly divided into **fresh water** and **salt water.**




**Water Cycle**



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## 4.3 Fresh Water

Rain water is considered to be the purest form of water, as it contains very less proportion of salts when compared to the oceans and seas. Hence it is called fresh water. A major part of fresh water is found in the frozen state in the form of ice caps and glaciers. Around 1% of it is found in the liquid state as rivers, streams, lakes, ponds etc. Surface water may also penetrate through porous rocks and gets collected beneath the Earth's surface. This is called groundwater.

**Fact**

Finland is known as the land of thousand lakes. There are 1,87,888 lakes in Finland.

DO YOU KNOW?

**Water table is a level below the ground, where water is found collected beneath the Earth's surface.**

**Aquifers are porous rock strata filled with water, found below the earth's surface.**

## 4.4 Oceans

The continents and oceans are however, not evenly distributed in the northern and the southern hemispheres. The northern hemisphere holds 61% of land whereas the southern hemisphere holds 81% of water. It is because of this pattern of land and water distribution, the **northern hemisphere** is called as the **land hemisphere** and the **southern hemisphere** is called as the **water hemisphere.**




**Hots**

- **71% of the earth is covered by water, but very little can be used by humans. Why?**
- **The oceans are salty. Why?**

Oceans and seas are considered as resource bowl of the earth because of the immense availability of food, minerals etc., Present distribution of the world's oceans and major seas are illustrated in the map.

DO YOU KNOW?

**Sylvia Earle is a famous American oceanographer . She was named as the first, 'Hero for the Planet' by Time magazine for her efforts towards marine life protections.**

**Jacques-Yves Cousteau (1910-1997) was a famous French Ocean explorer, who conducted extensive under-sea investigations .**

**He belonged to the information service of the French Navy, and was sent on missions to Shanghai and Japan (1935–1938) and in the USSR (1939).**

**Honours**

- **Cross of War 1939–1945 (1945)**
- **U.S. Presidential Medal of Freedom (1985)**

### 4.4.1 Relief Of The Ocean Floor

The ocean basins are **characterised by the following major relief features:**

BY296M

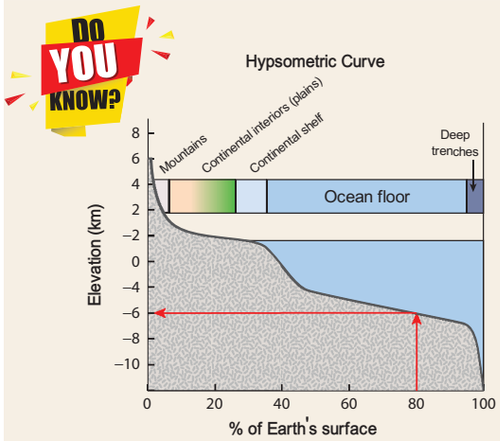
(A) Continental shelf
(B) Continental slope
(C) Continental rise
(D) Deep sea plain or Abyssal plain
(E) Oceanic deep
(F) Oceanic ridge

**(A) Continental Shelf**

A shallow and gently sloping platform extending out from the adjoining continental land mass into the sea is called Continental Shelf. It is almost a uniform zone of sea bed with a gentle gradient.



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**A Hypsometric Curve is a graphic representation which shows the height of a certain place found on land and the height of ocean features at sea.**

**'Hypso' means height in Greek.**

The continental shelf is of great significance for the following reasons:

- They are shallower, thus enables sunlight to penetrate through the water. This encourages abundant growth of grass, sea weeds and plankton. Hence these zones become the **richest fishing grounds** in the world. Eg. The **Grand Banks of Newfoundland**.
- The continental shelves have extensive deposits of minerals and mineral fuels. Hence, this zone becomes accessible for oil drilling and mining activities. E.g. Mumbai High in Arabian Sea.

**Geo Connect**



**ONGC:** Oil and Natural Gas Corporation is India's largest oil and gas exploration and production company. Its latest estimate is that about 20 million tons of oil reserves are found west of Mumbai High off shore.

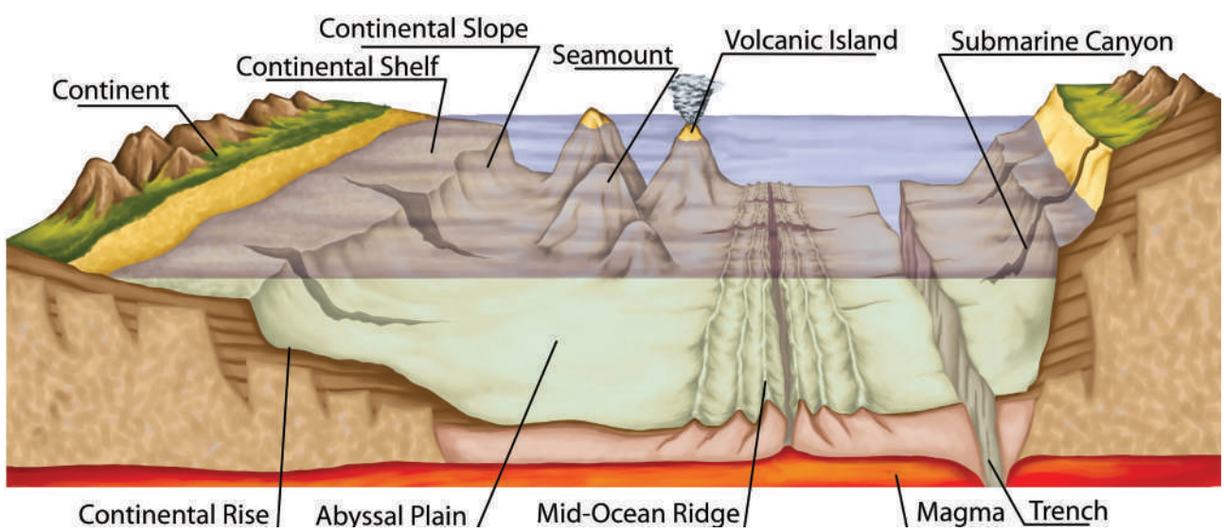
### (B) Continental Slope

A steep slope which descends from the edge of the continental shelf to the deep ocean-bed is called continental slope. It forms a boundary between the Continental Crust and the oceanic crust. This zone is free from deposits as they are steep. The most important characteristic of continental slope is the **presence of deep canyons and trenches.** Due to the low penetration of sunlight, the slope has nearly freezing temperature. Hence aquatic life has very slow rate of metabolism.

### (C) Continental Rise

At the base of the continental slope is a gently sloping layer of sediments which merge into the deep-sea floor. This underwater feature found between continental slope and abyssal plains is called the continental rise. It **consists of submarine fans** which are similar to the alluvial fans found on land.

## Major Relief Features of the Ocean






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### (D) Deep Sea Plains or Abyssal Plains

The deep sea plains or abyssal plains are underwater plains found on the deep ocean floor. These plains extend from continental rise to the mid oceanic ridges. The gradient of the slope is very gentle and it appears as a uniform flat and featureless plain. These plains are usually covered by the thick layer of sediments composed of clay, silt and sand, brought by the rivers. These are often characterized by features like abyssal hills, sea mounts, guyots, coral, atoll etc.

BYB58A

**DO YOU KNOW?**

**Abyssal plains in the Atlantic and Indian Oceans tend to be extensive than the Pacific Ocean because, majority of the world's largest rivers empty their sediments into either Atlantic or Indian Ocean. E.g. Amazon, Ganga and Brahmaputra rivers.**

### (E) Oceanic Deeps

Trenches are the deepest part of the oceans and occupy about 7% of the total relief of the ocean floor. The ocean temperature in the trench is slightly cooler than the freezing temperature. As they are sediment free, most **trenches** are V-shaped with steep sides. **Epicentre of the great earthquakes** are all found in the trenches.

**DO YOU KNOW?**

**Dragon Hole is the deepest known underwater sink hole in the world. The local fishermen call it the 'eye' of the South China Sea.**



### (F) Oceanic Ridge

Oceanic ridge is a continuous submarine mountain chain. They are made of young basaltic rock formed when two tectonic plates moves apart. The mid-ocean ridge is probably the most extensive single feature of the earth's topography. Two of the most well known mid-ocean ridges are the Mid-Atlantic Ridge and the East Pacific Ridge. The Mid-Atlantic Ridge is the largest unbroken oceanic ridge.

**DO YOU KNOW?**

**Fathoms ⇨ A nautical measurement of the depth of water in the ocean.**

**Isobath ⇨ An imaginary line on a map joining the points of equal depths.**

**Isohaline ⇨ An imaginary line on a map joining the points of equal salinity in oceans.**




**Mid Atlantic Ridge**

## 4.4.2 Movement of the Ocean Water

The ocean water is dynamic. Temperature, salinity, density, external forces of the sun, moon and the winds keep the ocean waters in movement, both horizontally and vertically. Waves and currents are in **horizontal motion** while tides have **vertical motion.**

### (A) Waves

Of all the movements of the oceans, sea waves are considered to be the strongest. Sea waves are ripples on water caused when winds blow over



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the sea. The height of these waves depends on the speed of wind, its duration and the direction from which they blow. Sometimes waves are also caused by tremors felt on the ocean floor. Such waves are quite destructive and called **Tsunami**.

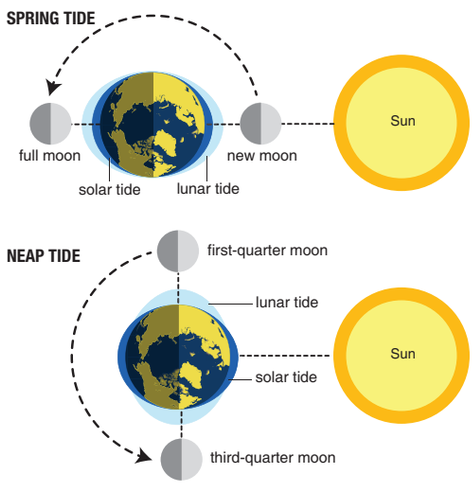
**The energy of the falling wave water is used to turn hydro turbines to generate power. Wave energy power plants have been installed at Vizhinjam in Kerala coast and Andaman and Nicobar islands of India.**

### (B) Tides

The periodic rise and fall of sea water due to the gravitational pull of the sun and moon on earth are called tides. They are classified broadly into **Spring tides** and **Neap tides.**

When **the Sun, Moon and Earth are aligned in the same line**, the collective gravitation pull of the sun and moon on earth's water strengthens to form a high tide known as **spring tide**. Such tides always occur on **full moon** and **new moon days**.

#### TYPES OF TIDES




When **the sun and the moon are at right angles**, their gravitational forces work against each other, causing a low tide called **neap tide**. A neap tide occurs between two spring tides i.e., twice a month, when **the first and last quarter moon appears**.



**Potential tidal energy zones of India are the Gulf of Khambhat, Gulf of Kutch and Sundarbans.**

#### MARITIME BORDERS

Maritime boundary of most the Countries is fixed to be 12 nautical miles from the baseline. This was fixed by the U.N. Convention on the Law of the sea 2013 where as Jordan and Palau have 3 nautical miles as their maritime boundary and Benin, Republic of Congo, EI Salvador, Peru and Somalia have 200 nautical miles.

### (C) Ocean Currents

The movement of oceanic water on the surface and at the depths in a definite direction is called ocean current. Ocean currents are in **clockwise motion in the northern hemisphere** and in the **anti-clockwise motion in the southern hemisphere.**

The factors that generate ocean currents are:

- Earth's rotation
- Prevailing winds and
- Differences in temperature and salinity of ocean water.

On the basis of temperature, ocean currents are classified as **warm currents** and **cold currents**. The movement of ocean currents from the low latitudes (tropical zones) towards high latitudes (temperate and polar zones) is called warm current. Eg. Gulf Stream in Atlantic Ocean, North Equatorial Current in Pacific Ocean.

***NIO* (National Institute of Oceanography) was established in 1st January 1966. The headquarters of NIO is located at Dona Paula, Goa. It Conducts research and observations to understand oceanic features, Ocean engineering, marine Archaeology etc.**



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## 4.5 Marine Resources

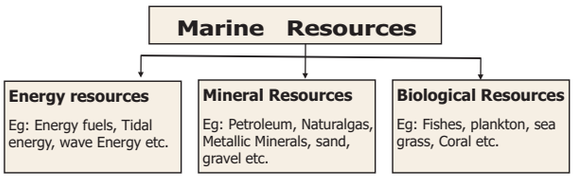
The biotic and abiotic resources found in the oceanic water and at the bottoms are called marine resources. The ocean's resources play a vital role in sustaining the needs of society. A diverse array of marine organisms is used for food, medicine, cosmetics, and a wealth of industrial applications. The world's demand for energy, minerals and water have become increasingly dependent on non-living marine resources.

BYK19X



**Hots**

- What will happen if the seas and oceans contain only fresh water?




### 4.5.1 Conservation Of Marine Resources

Oceans are the life blood of planet earth and mankind. The humankind depends on the marine resources for its survival. They are also essential for the economic prosperity, social well-being and quality of life. Oceans have extensive deposits of oil reserves. Besides a major fishing ground, it helps in generating non-conventional energy, development of many ports and harbours for trade activities. Coastal tourism also attracts people around the world, thereby contributing to the economy of many countries.

**DISTRIBUTION OF MAJOR OCEAN CURRENTS AND EFFECTS**

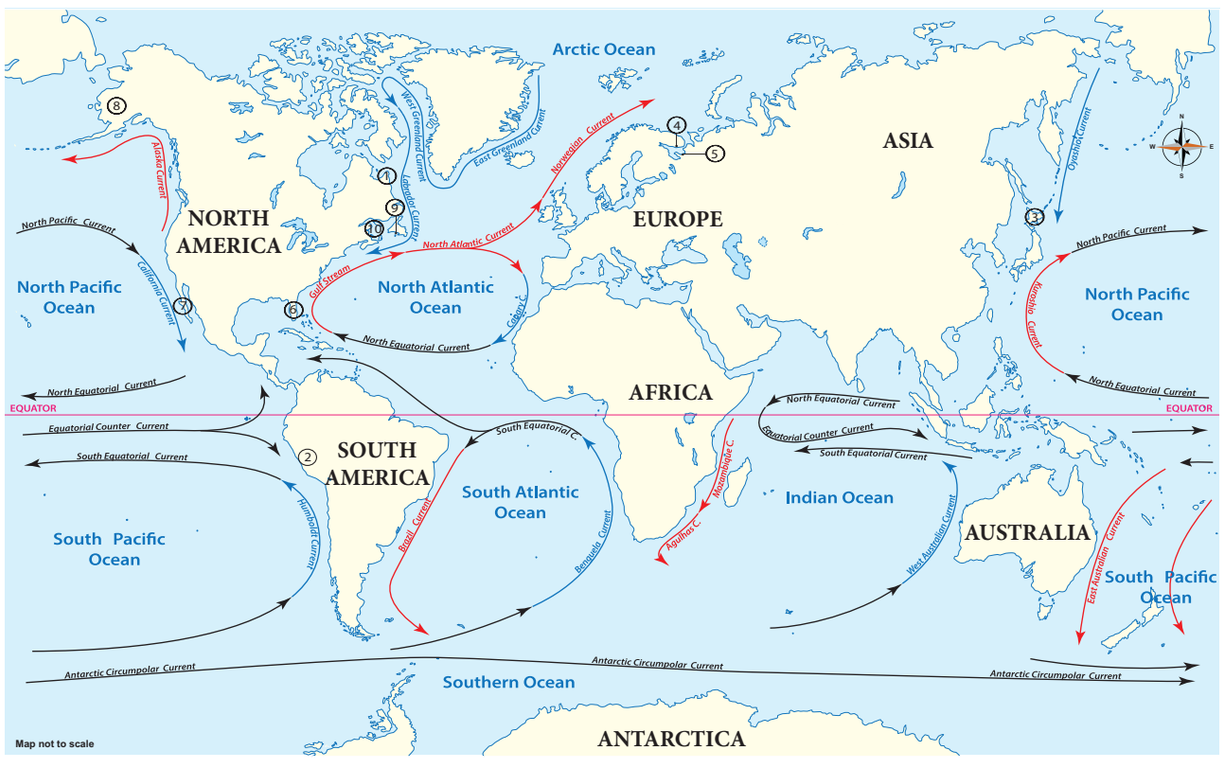
| Ocean | Name of the Current | Effects |
|---|---|---|
| South Atlantic Ocean | Benguela Current [Cold] | Leads to foggy conditions along the coast of Namibia. Helped in the development of Namibian & Kalahari deserts |
| North Atlantic Ocean | Canaries [Cold] | Influences the extension of Sahara Desert |
| | Gulf Stream [Warm] | Its confluence with the Labrador current produces heavy fog along the coast of Newfoundland, obstacles the navigation. Hence, Newfoundland is one of the major fishing grounds of the world. |
| | North Atlantic Drift [Warm] | It keeps the ports at higher latitudes ice-free throughout the year. Eg. Port of Rorvik (Norway), Murmansk and Severodvinsk (Russia) |
| | Labrador [Cold] | Its confluence with Gulf Stream creates fog and hinders navigation. |
| South Pacific Ocean | Peruvian / Humboldt Current [Cold] | Helped in the desertification of the Atacama desert. El-Nino effects the weather in western & S. America. It also affects timely arrival of Indian monsoon |



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| | | |
|---|---|---|
| North Pacific Ocean | Kuroshio Current [Warm] | It plays a vital role in carrying large amount of heat to the adjacent land areas and forms cloud cover that cause rainfall. |
| | Oyashio / Kurile Current [Cold] | Its confluence with the Kuroshio current produces heavy fogs around Hokkaido, which become potential hazards for navigation. Hence, Hokkaido acts as the major fishing ground of the world. |
| | Alaska Current [Warm] | Keeps the seaports of Alaska open throughout the year. |
| | California Current [Cold] | Leads to foggy conditions along the coast of California. It helped in the development of Arizona & Sonata deserts. |
| Indian Ocean | West Australian Current [Cold] | Leads to foggy conditions along the western coast of Australia. It helped in the genesis of west Australian desert. |

# Major Ocean Currents of the World




1. Labrador
2. Peru
3. Hokkaido
4. Port Murmansk
5. Port Severodvinsk
6. Florida
7. California
8. Alaska
9. Newfoundland
10. Grandbank

Warm current
Cold current



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TN_GOVT_IX_Std_Geography_Ch04_Rev.indd 198 04-04-2019 10:34:49

## The Great Barrier Reef



The Great Barrier reef is the world's largest coral reef system composed of 2,900 individual reefs and 900 islands stretching for about 2,000 kilometres. It covers an area of about 3,50,000 km. The reef is located in the Coral sea, off the coast of Queensland,Australia. The Great Barrier Reef can be seen from the outer space. This sprawling coral reef system is one of the most biologically diverse places on the planet.Coral reefs are built by billions of tiny organisms, known as Coral polyps.CNN labelled it as one of the seven natural wonders of the world.

## Recap

- Hydrosphere, the third sphere of Earth, is a collection of all forms of water on the earth.
- Hydrological cycle is the continuous movement of water on Earth.
- Water is available on Earth as fresh and salt water. Over 97% of the water on the Earth's surface is confined to oceans.
- The five major oceans of the world are the Pacific, the Atlantic, the Indian, the Southern and the Arctic ocean.
- The major relief of the ocean floor are continental shelf, continental slope, continental rise, abyssal plains, ocean deeps and ocean ridges.
- Marine resources are nothing but the biotic and abiotic resources found in the oceans.
- Oceans are the lifelines of Earth and mankind. Hence, they need to be conserved.

The Gangetic Dolphin was declared the National Aquatic Animal in 2010. This has become an endangered species. Are the Dolphins really at risk? If so, list out the reasons.



## EXERCISE

BYTWBK

### I Choose the correct answer

1. The Sunda Trench lies in the _____ ocean.
   a) Atlantic  b) Pacific
   c) Indian  d) Antarctic
2. The temperature of the ocean waters generally_____ at greater depth.
   a) increases
   b) decreases
   c) remains constant
   d) none of the above
3. Ocean currents are produced due to _____
   a) due to rotation of earth
   b) due to variation in temperature
   c) due to earth's movement
   d) all the above
4. Consider the following statements.
   1. Most of the fishing grounds occur in areas where the continental shelf is wide.
   2. Fishing is well developed in warm tropical waters.
   3. Mixing of warm and cold currents facilitates plant nutrients for fish.



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5. Inland fishing became significant in India.

a) 1 and 2 are correct.
b) 1 and 3 are correct.
c) 2,3 and 4 are correct.
d) 1,2 and 3 are correct

6. The oceanic ridge comes into existence due to

a) convergence of tectonic plates
b) divergence of tectonic plates
c) lateral movements of plates
d) stearing of plates.

7. Which of the following indicates the correct sequence of the topography beneath the surface of the sea?

a) Continental shelf-Continental slope-Sea plain-Sea trench.
b) Continental slope-Continental shelf-Sea plain-Sea trench.
c) Sea plain-Continental slope-Continental shelf-Sea trench.
d) Continental slope-Sea plain-Continental shelf-Sea trench.

8. Which of the following is not correctly matched?

a) Gulf Stream - Pacific Ocean
b) Labrador current - North Atlantic Ocean
c) Canary current - Mediterranean sea
d) Mozambique current - Indian Ocean.

9. The amount of planktons to be found in the ocean is determined by

1. Depth of the water.
2. Ocean currents.
3. Temperature and Salinity.
4. Length of day and night.

a) 1 and 2 are correct
b) 1,2 and 3 are correct
c) 1,3 and 4 are correct
d) All are correct.

## II. Questions are of Assertion(A), Reason (R) type.

a) Both A and R are correct and R explains A.
b) Both A and R are correct but R does not explain A.
c) A is correct but R is false.
d) A is false but R is correct

1. **Assertion (A):** Oceans are always shown in blue in maps.

**Reason(R):** It indicates the natural colour of the oceans.

2. **Assertion(A):** Flat topped seamounts are known as Guyots.

**Reason(R):** All guyot features are of volcanic origin.

3. **Assertion(A):** Submarine canyons are deep gorges on the ocean floor.

**Reason(R):** They are mainly restricted to continental shelf, slope and rise

4. **Assertion (A):** Atolls are more common in the Atlantic ocean.

**Reason(R):** The marine population at the depth is less.

## III. Match the following:

| | | | |
|---|---|---|---|
| 1. | Mariana trench | - | Decreases salinity in the oceans |
| 2. | Great Barrier Reef | - | Along the coast of Japan |
| 3. | Sargasso sea | - | Deepest point in the Pacific |
| 4. | Spring tides | - | Australia |
| 5. | Heavy rains | - | Second order landform |
| 6. | Kuroshio current | - | North Atlantic Ocean |
| 7. | Continental slope | - | On full and new moon days |



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## IV. Answer the following in brief:

1. What do you mean by the term Hydrosphere?
2. What is hydrological cycle?
3. Mention the various relief features of ocean floor
4. What are the factors that generate the ocean currents?
5. Write a brief note on sea waves.

## V. Give reasons for the following:

1. The northern hemisphere and the southern hemisphere are called land and water hemispheres respectively.
2. Continental shelf provides good fishing ground.

## VI. Distinguish the following:

1. Spring tide and Neap tide.
2. Abyssal plains and Ocean deeps.

## VII. Answer in a paragraph:

1. Write a paragraph on the origin of oceans.
2. Write a note on continental shelf and continental slope.
3. What do you mean by ocean currents? Explain its types.
4. Explain the influences of the marine resources on mankind.



# ICT CORNER

### Geography - Hydrosphere

Let us know the names of the earth's spheres by using memory cards



**Steps**

Step 1: Open the Browser type the URL Link given below (or) Scan the QR Code.

Step 2: You see the Earth's Spheres cards.

Step 3: Click the cards and choose correct Spheres and Examples

**Website URL :**

https://matchthememory.com/Earthspheres

https://www.purposegames.com/game/the-hydrosphere-game

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UNIT 5

# Biosphere

## Learning Objectives

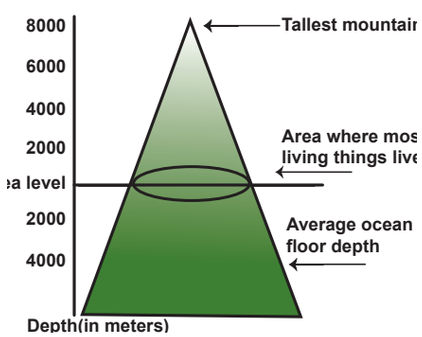
- To understand the scope and meaning of biosphere
- To understand the meaning of ecosystem, its components, functions and biodiversity
- To understand the major biomes of the world
- To know the need for conservation of biomes

BZ3SD8

## Introduction

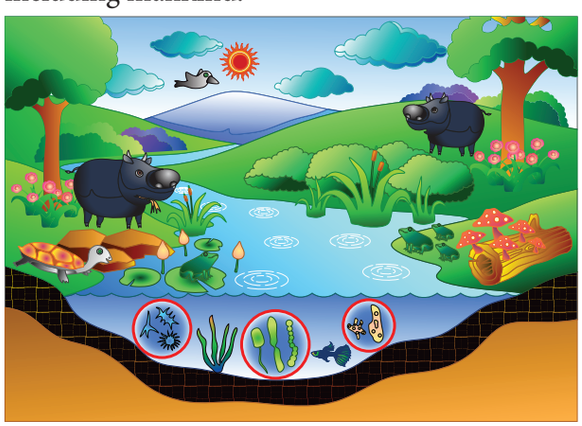
Biosphere, the fourth sphere of the Earth, is a life supporting layer that exists on the earth's surface. This layer on earth encompasses the Lithosphere, Hydrosphere and Atmosphere. It includes flora and fauna that thrive on or near the earth's surface. The vertical range of the biosphere is approximately 20 km, which is measured from the ocean floor to the troposphere. However, most plants and animals live in a very narrow section for about 1 km above and below the Mean Sea Level (MSL). Biosphere is made up of different ecosystems and biomes. All living things, large or small, are grouped into ***species***.The area in which an animal, plant or micro organism lives is called its **habitat**. A wide variety of plants and animals live in a particular habitat known as ***biodiversity.***

VERTICAL RANGE OF BIOSPHERE ON EARTH




## 5.1 Ecosystem

An ecosystem is a community, where all living organisms live and interact with one another and also with their non-living environment such as land, soil, air, water etc. Ecosystems range in size from the smallest units (Eg: bark of a tree) that can sustain life to the global ecosystem or ecosphere. (Eg: Cropland, Pond ecosystem, Forest ecosystem, Desert ecosystem etc.). Biosphere harbours all ecosystems on the earth and sustains life forms including mankind.



### Activity

Narrate the forest ecosystem in your own words.



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch05.indd 202 02-04-2019 13:09:09




- The branch of science that deals about ecosystem is called ***Ecology.***
- A person who studies ecology is referred to as an ***Ecologist.***

## 5.1.1 Components of Ecosystem




An ecosystem consists of three basic components, namely

A) Abiotic components
B) Biotic components and
C) Energy component

### A) Abiotic Components

Abiotic components include the non-living, inorganic, physical and chemical factors in the environment. Eg. Land, Air ,Water, Calcium, Iron etc.

### B) Biotic Components

Biotic components include plants, animals and micro organisms. Biotic components can be classified into three categories :

- **Producers** are self nourishing components of the ecosystem. Hence they are called **Autotrophs**. They are found both on land and water. Eg. Plants, Algae, Bacteria etc.
- **Consumers** are those that depend on producers, directly or indirectly. Hence they are called **Heterotrophs**.

**The common category of consumers are:**

- **Primary consumers** depend on producers for their food. They are exclusively herbivores. Eg. zebra, goat etc.
- **Secondary consumers** are small carnivores i.e., they consume herbivores. Eg. lion, snake etc.
- **Tertiary consumers** are top carnivores that prey on both herbivores and carnivores. Eg. owl, crocodile etc.
- **Decomposers** are some organisms that are incapable of preparing its own food. They live on dead and decaying plants and animals. Hence they are called **Saprotrophs**. Eg. fungus, mushrooms etc.

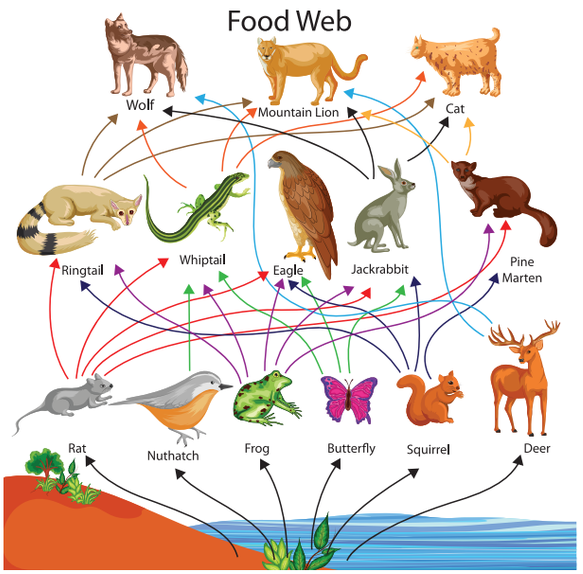
**Activity**

*Find the etymology of Herbivores, carnivores, omnivores and scavengers using dictionary.*

### C) Energy Components

All organisms in the biosphere use energy to work and convert one form of energy into another. The Sun is the ultimate source of energy for the biosphere as a whole. The solar energy gets transformed into other forms of energy through the various components in the ecosystem. The producers, consumers and the decomposers contribute a lot to the energy flow in an ecosystem.

## 5.1.2 Functions of an ecosystem




The living organisms form an interacting set of flora and fauna which are organized into trophic levels, food chains and food webs. The functioning of an ecosystem depends on the pattern of the energy flow, as it helps in the distribution and circulation of the organic and inorganic matter within an ecosystem. Energy flow generally takes place in a hierarchical order in an ecosystem through various levels. These levels are called **trophic levels**.



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch05.indd 203 02-04-2019 13:09:09

The chain of transformation of energy from one group of organisms to another, through various trophic levels is called **a food chain**. A system of interlocking and interdependent food chains is called a **food web**.

## 5.2 Biodiversity

Biodiversity or biological diversity refers to a wide variety of living organisms (plants, animals and other micro organisms) which live in a habitat. It is highly influenced by topography, climate as well as human activities. It represents the strength of the biological resources of a place on earth. In biodiversity, each species, no matter how big or small, has an important role to play in the ecosystem. It maintains the ecological balance and facilitates social benefits such as tourism, education, research etc. over an area.

### 5.2.1 Loss of biodiversity

The extinction of species (flora and fauna) due to human and natural influences is called **loss of biodiversity**.

A healthy eco system provides clean water, pure water, enriched soil, food, raw materials, medicines etc. Hence stable biosphere has to be conserved.

## 5.3 Biomes

A biome is a geographically extensive ecosystem where all flora and fauna are found collectively. It is the total assemblage of plant and animal life interacting within the biosphere. Biomes are defined by abiotic factors like, relief, climate, soils and vegetation. They are classified into two broad categories, **terrestrial biomes** and **aquatic biomes**.



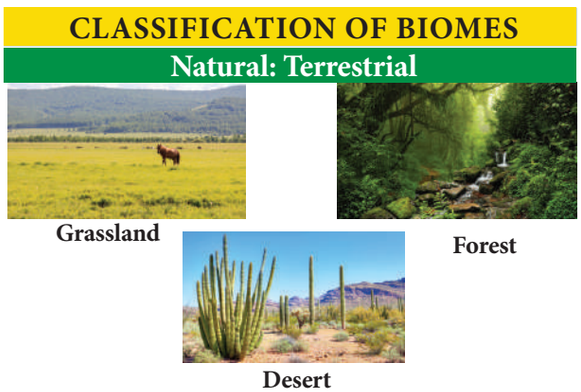

- An ecological region that has lost more than 70% of its original habitat is considered a ***hotspot.***
- Hotspots in India are the Himalayas, Western Ghats, Indo Burma Region and Sundaland.
- There are 34 areas around the world which are qualified as biodiversity ***hotspots***

### 5.3.1 Terrestrial Biomes

Terrestrial biomes is a group of living organisms that live and interact with one another on land. They are mainly determined by temperature and rainfall. Some of the major terrestrial biomes of the world are

A. Tropical Forest Biomes
B. Tropical Savanna Biomes
C. Desert Biomes
D. Temperate Grassland Biomes
E. Tundra Biomes

BZLJGI




### A. Tropical Forest Biomes

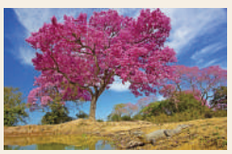
The tropical forest biome is comprised of several sub-biomes, including evergreen rainforest, seasonal deciduous forest etc.

Tropical forests have the highest biodiversity and primary productivity of any of the terrestrial biomes. The **Amazon basin, Congo basin** and **Indonesian islands** are the major regions of this biome. These regions have very dense forests and so have great economic importance. Human



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch05.indd 204 02-04-2019 13:09:17

settlements are found scattered here. They sustain their livelihood through food gathering, fishing, lumbering and shifting cultivation. Due to the humid nature of this biome, the people get afflicted to tropical diseases like malaria, yellow fever etc. The chief trees found here are **rubber, bamboo, ebony,** etc. Bats, pheasants, jaguars, elephants, monkeys etc. are the important birds and animals found here.



DO YOU KNOW?

The U.S. National Cancer Institute has identified about 70% of the plants used for treating cancer. Which are found only in rain forests. Eg. Lapacho.

## B. Tropical Savanna (Grasslands) Biomes

Tropical grasslands are generally found between tropical forests and deserts. Tropical Savanna biomes are found between 10° to 20° N and S latitudes. These grasslands are generally flat and are found in the Sahel, south of Sahara in East Africa and in Australia. This biome is generally hot and dry and experiences moderate to low rainfall. So, the grass which grow here are tall and sharp. Hence the chief occupation of the people found here is herding. The primitive people living here are **nomadic**.

The common animals found here are the lion, leopard, tiger, deer, zebra, giraffe etc. Flora such as **Rhodes grass, red oats grass, lemon grass** etc. are found in this biome.

DO YOU KNOW?

Of late, parts of the Savanna grasslands are being converted into farmlands, which pose a great threat to the wide range of fauna. For Eg. The population of the big cats like cheetah, lion etc. are dwindling drastically.

## C. Desert Biomes

Deserts are usually found on the western margins of the continents between 20° and 30° N and S latitudes. The annual rainfall is less than 25 cm in these regions. Due to the lack of rainfall and arid conditions, these regions do not possess any vegetation but have special vegetation type called **Xerophytes**. As the soil is sandy and saline, deserts remain agriculturally unproductive. Drought resistant thorny scrubs and bushes, palms are found here.



Tribal people who live here practice food gathering and hunting. They move their temporary settlements frequently in search of pastures. Transportation becomes very difficult here and is carried on by camels. Reptiles like snakes, lizards, scorpions etc., are most commonly found here.

DO YOU KNOW?



**An oasis is a fertile fresh water source found in deserts and semi-arid regions. Oases are fed by springs. Crops like date palms, figs, citrus fruits, maize etc. are cultivated near these oases.**

## D. Temperate Grassland Biomes

Temperate Grasslands are usually found in the interior of the continents and are characterized by large seasonal temperature variations, with warm summer and cold winter. The type of grassland in these regions strongly depends upon precipitation. **Higher precipitation** leads to **tall** and soft grass and **lower precipitation** leads to **short** and soft grass. These regions favour wheat cultivation. Extensive mechanised agriculture is practised due to lack of farm labour. Pastoral industry



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TN_GOVT_IX_Std_Geography_Ch05.indd 205 02-04-2019 13:09:21

becomes the main occupation, thereby facilitating slaughtering of animals, packing of raw and processed meat, dairy products etc. The common birds and animals are grass hopper, wolf, bison, prairie dog etc.




Temperate grasslands are called differently in different parts of the world.
Prairies -- North America
Steppes -- Eurasia
Pampas -- Argentina and Uruguay
Veld -- South Africa
Downs -- Australia
Canterburg -- Newzealand
Manchurian -- China

### E. Tundra Biomes

These vast lowlands are found where the ground remains frozen. Greenland, Arctic and Antarctic regions and Northern parts of Asia, Canada and Europe fall in this biome. These regions are also called **Barren lands**. This biome experiences long severe winter and short cool summer. Due to the prevailing of low temperature and short growing seasons, the net primary productivity is very low in tundra. People are nomadic. Hunting and fishing are their major occupations. The population here is extremely sparse and the harsh environment makes them change their settlement frequently. They live in igloos in winter and in tents during summer. Arctic moss, Arctic willow, lichens etc. grow here. Fauna like the polar bear, wolverine, reindeer, snowy owl are found here.



## 5.3.2 Aquatic Biomes

Aquatic biome is a group of living organisms that live and interact with one another and its aquatic environment for nutrients and shelter. Like terrestrial biomes, aquatic biomes are influenced by a series of abiotic factors.It is broadly classified as **fresh water biomes and marine biomes.**

### A. Fresh water Biomes:

It comprises lakes, ponds, rivers, streams, wetlands etc. It is influenced by various abiotic components such as the volume of water, water flow, composition of oxygen, temperature, etc. Humans rely on freshwater biomes for drinking water, crop irrigation, sanitation and industry. Water lily, lotus, duck weeds etc. are the common plants found here. Trout, salmon, turtles, crocodiles etc. are the animals found here.



### B. Marine Biomes:

They are the largest aquatic biomes on earth. They are continuous bodies of salt water and provide a wide range of habitats for marine plants and animals. Coral reefs are a second kind of marine biomes within the ocean. Estuaries, coastal areas where salt water and fresh water mix, form a third unique marine biome. As water provides maximum mobility to marine organisms, nutrients are circulated more quickly and efficiently here than the terrestrial biomes. Apart from animals, plants such as kelp, algae, phytoplankton etc. also grow in water. Aquatic biomes are not only important for plants and animals, but also for humans. Humans use aquatic biomes for water, food and leisure activities.



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TN_GOVT_IX_Std_Geography_Ch05.indd 206 02-04-2019 13:09:23

Some of the threats and issues to aquatic biomes are overfishing, pollution and rise in sea level.



### 5.3.3 Conservation

The biosphere extends from the deep ocean trenches to lush rain forests. People play an important role in maintaining the flow of energy in the biosphere. At the same time, the primary cause of today's loss of biodiversity is habitat alteration caused by human activities. The ever increasing population results in over exploitation of biological resources. This has an adverse impact on flora and fauna on earth. There are places on earth that are both biologically rich and deeply threatened. Hence it is man's duty to conserve and care for the earth and make it a better place to live in.




- A Biosphere Reserve is a special ecosystem or specialized environment with flora and fauna that require protection and nurturing. **There are 18 Biosphere Reserves in India**.

## Recap

- The biosphere is a thin layer on, above and beneath the earth where life exists.
- The place on earth where living organisms live and interact with one another and with their physical environment is called an ecosystem.
- The three major components of ecosystem are biotic components, abiotic components and energy flow.
- Biotic components are classified into producers, consumers and decomposers.
- The functioning of the ecosystem depends on the energy flow through various levels called trophic levels.
- The wide variety of living organisms that are found on the planet is called biodiversity.
- The extinction of such biological diversity due to human influences or nature is called loss of bio diversity.
- The geographically extensive ecosystem where living organisms are collectively found is termed as biome.
- Biomes are broadly classified as terrestrial and aquatic biomes.
- Biosphere has to be conserved, as it is considered to be an asset to planet earth.



## EXERCISE

BZVFI6

### I. Choose the correct answer

1. The coldest biome on Earth is
   a) Tundra b) Taiga
   c) Desert d) Oceans
2. This is the smallest unit of biosphere.
   a) Ecosystems b) Biome
   c) Environment
   d) None of the above
3. Nutrients are recycled in the atmosphere with the help of certain micro organisms, referred to as
   a) Producers
   b) Decomposers
   c) Consumers
   d) None of the above
4. To which climatic conditions are Xerophytic plants specifically adapted to?
   a) Saline and sandy
   b) Limited moisture availability
   c) Cold temperature
   d) Humid



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch05.indd 207 02-04-2019 13:09:25

5. Why is the usage of rainforest biomes for large scale agriculture unsustainable?

a) because it is too wet.

b) because the temperature is too warm.

c) because the soil is too thin.

d) because the soil is poor.

## Questions 6 – 8 are assertion type questions. Directions:

a) Both assertion (A) and reason(R) are true; R explains A

b) Both assertion(A) and reason(R) are true; R does not explain A

c) A is true; R is false

d) Both A and R are false

6. **A:** Heterotrophs do not produce their own food.

**R:** They depend on autotrophs for their nourishment.

7. **A:** Hotspots are the regions characterised by numerous endemic plants and animal species living in a vulnerable environment.

**R:** To manage and focus on conservation work more effectively, researchers identified hotspots.

8. **A:** The number of gorillas in Africa has plummeted by 60% in the past twenty years.

**R:** Non intervention of human beings in the forest areas.

## II. Fill In The Blanks

1. An area where animals, plants and micro organisms live and interact with one another is known as _____
2. _____ are also called Heterotrophs.
3. _____ is a system of interlocking and independent food chains.
4. _____ is an extensive large ecosystem.
5. The vegetative type commonly found in desert biomes is called _____
6. _____ is an aquatic biome that is found where fresh water and salt water mix.

## III. Answer the following in brief:

1. What is Biosphere?
2. What is an ecosystem?
3. What does the term 'biodiversity' mean?
4. What is meant by loss of biodiversity?
5. Mention the various terrestrial biomes.

## IV. Give reasons for the following:

1. Producers are also called autotrophs.
2. Biosphere provides a stable ecosystem.

## V. Distinguish between the following:

1. Producers and Decomposers.
2. Terrestrial biomes and Aquatic biomes.
3. Tropical vegetation and Desert vegetation
4. Savannas and Tundra

## VI. Answer the following in a paragraph:

1. Explain the various components of ecosystem.
2. Write a paragraph on the functions of an ecosystem.
3. Explain about the aquatic biomes on Earth.

## VII. Find out the dates for the following:

1. World Wild Life Day . . .. . . . . . .
2. International Day of Forest . . . . . .
3. World Water Day. . . . . .
4. Earth Day . . . . . .
5. World Environment Day June 5th
6. World Oceans Day . . . . . .

## VIII. Map Study

Locate the following on the world outline map.

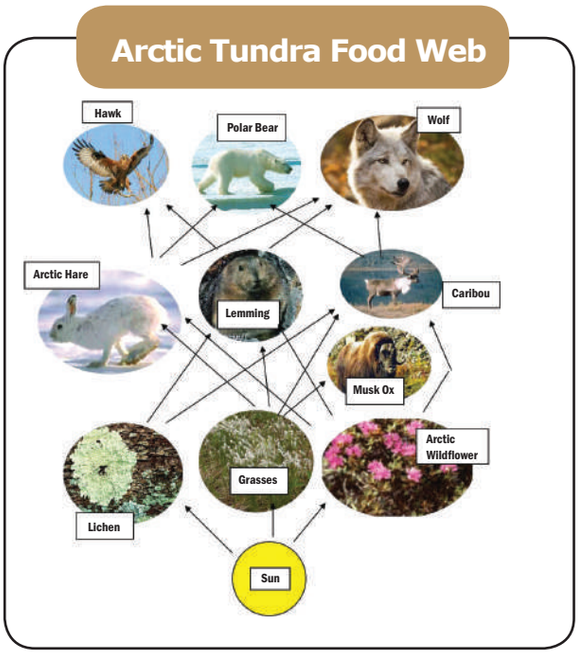
1. Priairies
2. Downs
3. Tundra Biomes
4. Equatorial Biomes



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TN_GOVT_IX_Std_Geography_Ch05.indd 208 02-04-2019 13:09:25

## IX. Picture Study

Narrate the given food web of Arctic Tundra in your own words.




## REFERENCE BOOKS


1. *Environmental Geography* by Savindra Singh Edition: 1995, Prayag Pustak Bhawan, Allahabad, India
2. *Physical Geography* by Dr. Savindra Singh Edition: 2015, Pravalika Publications, Allahabad, India.
3. *Essential Environmental Studies* S.P. Misra and S.N.Pandey Second Edition, Ane books Pvt. Ltd., New Delhi, India.
4. *Environmental Geography* by Dr. Savindra Singh Edition: 2015, Pravalika Publications, Allahabad, India.

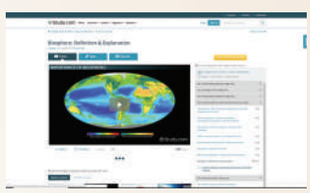

## INTERNET RESOURCES

1. www.usgs.gov
2. http://environment.nationalgeographic.com
3. www.nasa.gov
4. www.britannica.com
5. http://earth.usc.ed

## ICT CORNER

### Geography -Biosphere

**Let as know 'Biosphere' with the help of videos**



**Steps**

Step 1: Open the Browser type the URL Link given below (or) Scan the QR Code.

Step 2: Register as a student or teacher with your email id.

Step 3: Select the option Video and see the Biosphere video.

Step 4: Select the option Quiz and choose the correct answer.

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**Website URL :**

https://matchthememory.com/Earthspheres



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UNIT 6

# Man and Environment

## Learning objectives

- To know the components of environment
- To understand the various features of human-environment interaction
- To know various settlement patterns
- To know the different economic activities of man
- To understand the environmental effects of human behaviour

GJF5YS

## Introduction

Environment is a set of relationships between man and nature. Man has survived through the ages, dwelling within his surrounding called the environment. The word 'environment' is derived from the French word 'environ' meaning encircled or surrounded. Environment includes both living (biotic) and non living (abiotic) components.

## 6.1 Man and Environment

Early man depended entirely on nature for food, clothing and shelter. Man has enjoyed a dominant position over the other living organisms around him because of his erect posture, hands and intelligence. From the paleolithic period to the neolithic period, man has invented and developed the wheel, fire, tools and patterns of agriculture and housing to his comfort, which led him to improve the standard of living making himself technologically advanced. Thus, modern man modified the environment where he multiplied in numbers to increase population and has always extended his territories, leading to the exploitation of natural resources.

DO YOU KNOW?

The **Stockholm Conference**, 1972, declared man as both a creator and moulder of his environment. 'The Earth Summit', formally known as the United Nations Conference on Environment and Development (UNCED) was held in Rio de Janeiro in 1992.

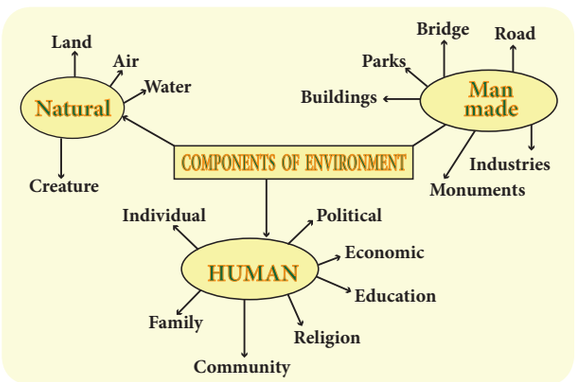
**Classification of Environment:**

Environment is generally classified as

(a) Natural environment

(b) Human environment and

(c) Man made environment






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TN_GOVT_IX_Std_Geography_Ch06_V2.indd 210 02-04-2019 16:30:30

### (a) Natural environment

Earlier, we have learnt about the natural components of environment such as lithosphere, atmosphere, hydrosphere and biosphere. In this chapter, we will study about the human and man-made components in a detailed manner.

### (b) Human Environment

Human environment is defined as the interaction between man as an individual, with his family, occupation and society. It is also related to various cultural aspects such as education, religion, economics and politics.

### (c) Man-made environment

Man-made environment has been created by man himself for the purpose of fulfilling his needs and to make his life more convenient and easy. For example, building, transport, park, industrie, monument, etc. To bring an equilibrium between man and the environment, man has to study the distribution of population, availability of resources, development in technology, alternate means of fulfilling the increasing demand created by the growing population and other man-made features.

## 6.2 Population

Can you imagine a world without human beings? Humanbeings are important to develop the economy and society. The Latin word 'populus' means 'people'. Population is the total number of people living together in a particular place at the given point of time.

GJP21F

### What is Demography?

In ancient Greek, 'demos' means people and 'graphis' means study of measurement. So, 'Demography' is the statistical study of human population.

### 6.2.1 Population Growth

**'It is easy to add but difficult to maintain'**
Population is a dynamic phenomenon where the number, distribution and composition are constantly changing. Human population increases as babies are born and decreases as people die. For most of human history, births have only slightly exceeded deaths every year. As a result, human population grow slowly. About the time of Industrial Revolution, it began to increase rapidly.

**Natural increase** of population is the difference between the birth rate and death rate. In fact population is always increasing but only in very rare cases it may decrease through natural or man-made disasters such as famine, landslides, earthquakes, tsunami, epidemics, extreme weather conditions and war.

**Population change** refers to an increase or decrease in the population of an area influenced by the number of **births, deaths and migration**. The population of the world doubled from 500 million in 1650 to 1000 million in1850.The **projected population for 2025 and 2050 is about 8 billion and 9 billion respectively**.

**Population growth** refers to an **increase** in the number of people who reside in a particular area during a particular period.

### Census

Census is an official enumeration of population carried out periodically. It records information about the characteristics of population such as age, sex, literacy and occupation. Different countries of the world conduct census every 5 to 10 years as recommended by the United Nations. The first known census was undertaken nearly six thousand years ago by the Babylonians in 3800 BC (BCE). Denmark was the first country in the modern world to conduct a census. In **India, the first census was carried out in the year 1872.** Censuses have been conducted regularly every tenth year **since 1881**. The Indian Census is the most comprehensive source of demographic, social and economic data. Have you ever seen a census report? Check in your library.



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Population increases when there are more births and immigration. It decreases when there are more deaths and emigration. Population growth, can be calculated as




The **black death** is estimated to have killed 30 - 60 percent of Europe's total population during the 14th century. The dominant explanation for black death is attributed to the outbreak of plague.

## 6.2.2 Distribution of Population

Population distribution refers to the way in which people are spread out across the earth's surface.

The world population is not uniformly distributed, owing to the following factors.

**a). Physical Factors**

Physical factors include temperature, rainfall, soil, relief, water, natural vegetation, distribution of minerals and availability of energy resources.

**b). Historical Factors**

Regions with historical importance (river valley civilizations), war and constant invasions fall under historical factors responsible for population distribution.

**c). Economic Factors**

Educational institutions, employment opportunities, manufacturing industries, luxurious amenities, trade and commerce and other facilities encourage dense population in an area.




The World Population Day is observed on 11th July every year. It seeks to raise awareness of global population issues. The United Nations Development Programme started celebrating this event from the year 1989.

## 6.2.3 Density of Population

Density of population refers to the number of people living per square kilometre. An area is said to be sparsely populated when it has a large area with less number of people. Similarly, smaller the area with a large number of people, it is said to be densely populated.

$$\text{Population Density} = \frac{\text{Total Population}}{\text{Total land area}}$$

**The world's population density is divided into three main groups.**

- Areas of high density (above 50 people per sq.km) - East Asia, South Asia, North West Europe & Eastern North America.
- Areas of moderate density (10 to 50 people per sq.km) - The sub tropical regions like Angola, Congo, Nigeria and Zambia in Africa.
- Areas of low density (less than 10 people per sq.km) - Central Africa, Western Australia, Northern Russia, Canada, etc…

### Activity

**The population data of the five most densely populated districts of Tamil Nadu is given below. (Findout the population density and their rank)**

| District | Area (square km) | Population (2011 census) | Population Density | Rank |
|---|---|---|---|---|
| Chennai | 178.2 | 46,46,732 | | |
| Kanchipuram | 7857 | 39,98,252 | | |
| Vellore | 6077 | 39,36,331 | | |
| Thiruvallur | 3424 | 37,28,104 | | |
| Salem | 5205 | 34,82,056 | | |



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TN_GOVT_IX_Std_Geography_Ch06_V2.indd 212 02-04-2019 16:30:30

## Over population and Under Population

Over population is a condition when a country has more people than its resources to sustain. Under Population is a condition where there are too few people to develop the economic potential of a nation fully.

DO YOU KNOW?

'India has an official population policy implemented in 1952. India was the first country to announce such a policy. The main objective of this policy was to slow down the rate of population growth, through promotion of various birth control measures.

## 6.3 Human Settlements

A settlement can be described as any temporary or permanent unit area where people live, work and lead an organized life. It may be a city, town, village or other agglomeration of buildings. During the early days, man preferred tree branches, caves, pits or even rock cuts as his shelter. As days passed by, man slowly learnt the art of domesticating animals and cultivating food crops. The evolution of farming took place along four major river basins i.e. the Nile, Indus, Hwang Ho, Euphrates - Tigris. Man built huts and mud houses. Slowly settlements came into existence. A settlement generally consisted of a cluster of houses, places of worship and a place of burial. Later, small settlements developed into villages. Several villages together formed a town. Bigger towns developed into cities. Settlements were formed in different shapes, sizes and locations.

### 6.3.1 Classification of Settlements

On the basis of occupation, settlements may be classified as **rural** and **urban settlements.**

### 6.3.1 (A) Rural Settlements

Any settlement where most of the people are engaged in primary activities like agriculture, forestry, mining and fishery is known as a rural settlement. Most of the world's settlements are rural, that are mostly stable and permanent. The most important and unique feature of rural settlements is the vast, open spaces with green, pollution-free environment.

### Patterns of Rural Settlements:

**Rectangular pattern:**



Rectangular pattern of settlements are found in plain areas or valleys. The roads are rectangular and cut each other at right angles.

**Linear pattern:**



In a linear pattern, the houses are located along a road, railway line and along the edge of the river valley or along a levee.

**Circular or semicircular pattern:**



The pattern of settlement that is found around the lakes, ponds and sea coasts are called circular or semi circular pattern.

**Star like pattern:**



Where several metalled or unmetalled roads converge, star shaped settlements develop. In the star shaped settlements, houses are spread out along the sides of roads in all directions.



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**Triangular pattern:**



Triangular patterns of rural settlement generally develop at the confluence of rivers.

**T-Shaped, Y-Shaped, Cross-Shaped or Cruciform settlements:**

T-shaped settlements develop at tri-junctions of the roads **(T),** while **Y**-shaped settlements emerge as the places where two roads converge with the third one. Cruciform settlements develop on the cross-roads which extend in all four directions.



**Nebular pattern:**



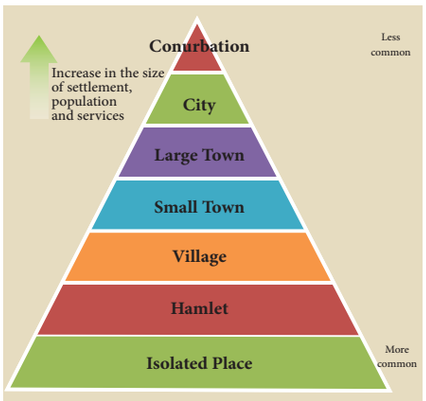
The arrangement of roads is almost circular which ends at the central location or nucleus of the settlement around the house of the main landlord of the village or around a mosque, temple or church.

## 6.3.1 (B) Urban Settlements

Urban is the term related to cities and towns where people are primarily engaged in non-agricultural activities, such as secondary, tertiary and quaternary activities. The common characteristic feature of an urban unit is that they are compact, congested and liable to a large number of population. They comprise of mostly man-made structures that fulfill the requirements of a society's administrative, cultural, residential and religious functions. The factors responsible for urbanization are better employment opportunities, suitable conditions for business, education, transport, etc.

**Classification of Urban Settlements**

Urban centres are classified as towns, cites, metropolitan cities, mega cities, conurbation, etc., depending on the size and services available and functions rendered to it.




**Town: A** town is generally larger than a village, but smaller than a city. It has a population of less than 1 lakh. E.g.: Arakkonam near Chennai

**City:** Cities are much larger than towns and have a greater number of economic functions. The population in cities are estimated to be more than 1 lakh. E.g.: Coimbatore

**Metropolitan cities:** Cities accommodating population between 10 lakhs and 50 lakhs are metropolitan cities. E.g.: Madurai

**Megacities:** Cities with more than 50 lakh population are called Megacities. E.g.: Greater Chennai

**Conurbation:** A conurbation is a region comprising of a number of cities, large towns and other urban areas. E.g.: Delhi conurbation

DO YOU KNOW?

- Damascus is widely believed to be the oldest, continuously inhabited city in the world, dating back to at least 11, 000 years.
- Tokyo is the world's largest city with the greater Tokyo area, housing about 38 million inhabitants.
- According to the Quality of Living Rankings by Consultancy Mercer, in 2016, the city offering the best quality of life was Vienna, with Zurich falling second. (Sources: United Nations, UNESCO, Mercer).



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TN_GOVT_IX_Std_Geography_Ch06_V2.indd 214 02-04-2019 16:30:30

## 6.4 Economic Activities

Economic activities are those efforts or actions that involve production, distribution and consumption of commodities and services at all levels within a region.

### Types of Economic Activities

**Primary Activities**:

Primary Activities pertain to the extraction of raw materials from the earth's surface. For example: food gathering, hunting, lumbering, fishing, cattle rearing, mining and agriculture.

**Secondary Activities**:

Secondary Activities transform raw materials into finished goods. For example: Iron and Steel industries, automobile manufacturing etc.

**Tertiary Activities**:

Activities which by themselves do not produce goods, but support the process of production are called tertiary activities. For example: Transport, communication, banking, storage and trade.

**Quaternary Activities**:

The activities related to Research and Development, as well as knowledge are called Quaternary activities. For e.g. Services like consultation, education and banking

**Quinary Activities:**

The activities that focus on the creation, rearrangement and interpretation of new and existing ideas are called quinary activities. It includes the highest levels of decision making in a society or economy. E.g.: Senior business executives, scientists and policy makers in the Government.

## 6.5 Environmental Issues

Environment is the basic life support system that provides air, water, food and land to all living organisms. But human beings degrade the environment through rapid industrialization.

Some of the environmental issues that we are going to learn are:

- Deforestation
- Pollution such as air, water ,noise, etc
- Urbanisation
- Fracking
- Waste disposal

GJXX33

### Deforestation

Deforestation is the cutting down of trees permanently by the people to clear forests in order to make the land available for other uses.

**Effects of Deforestation:**

Deforestation results in many effects like floods and droughts, loss of soil fertility, air pollution, extinction of species, global warming, spread of deserts, depletion of water resource, melting of ice caps and glaciers, rise in sea level and depletion of ozone layer.

The United Nations Conference on Environment and Development (UNCED) by name Earth Summit Conference held at Rio de Janeiro, Brazil, on June 1992 concluded that all member countries should reduce their emission of carbon dioxide, methane and other green house gases thought to be responsible for global warming.

### Conservation of forests

(i) Conservation of forests can be done through the **regulation of cutting of trees**.

**(ii) Control over forest fire:** Through regular monitoring and controlling the movement of the people forest fire can be prevented.

**(iii) Proper use of forest products:** We depend on forests for our survival from the air we breathe, to the wood we use. Besides providing habitats for animals and livelihoods for humans, forest products are one of the most essential things in our day to day life. Therefore we must use forest products properly



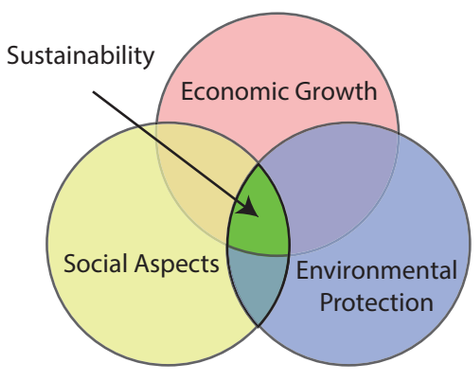
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## 6.6 Sustainable Development

**In 1987,** the **Brundtland Commission** cited the definition of sustainability.

**"Sustainable development is development that meets the needs of the present without compromising the ability of future generation to meet their own needs".**

For sustainable development to be achieved, it is crucial to harmonize three core elements: **economic growth, social aspects and environmental protection**. These elements are interconnected and are crucial for the well-being of individuals and societies. To achieve true sustainability, we need to balance the economic ,social and environmental factors of sustainability in equal harmony.




### Social Sustainability

The ability of a social system such as a country, family or organization to function at a defined level of social well being and harmony is called social sustainability. Problems like war, endemic poverty, widespread injustice and low education rates are symptoms of a system in socially unsustainable. The balancing capacity of a government in maintaining peaceful existence towards other countries and at the same time providing the requirements of its citizens without affecting the environment creates social sustainability.

### Economic Sustainability

The people on earth consume far more than what is their fair share.

- The economic sustainability is successfully implemented through strong Public Distrubution System.
- Economic sustainability ensures that our economic growth maintains a healthy balance with our ecosystem.

### Environmental Sustainability

Environmental sustainability is the ability of the environment to support a defined level of environmental quality and natural resource extraction rates forever to mankind. Unnecessary disturbances to the environment should be avoided whenever possible.

### Students' Activity

(Teacher should get a record of the students)

* **Play outside!**

  This simple activity goes a long way in teaching sustainability. Sharing in and appreciating a love of the outdoors will inspire children to care for earth.

* **Read books about the earth.**

  Books are great for young children to begin to learn about the earth.

* **Make your own paper.**

  Kids can use recycled paper scraps to make new paper!

### Why is sustainability important?

The excessive usage of natural and manmade resources deplete its availability for the future generation. We need to look after our planet, our resources and our people to ensure that we can hand over our planet to our children to live in true sustainability. Hence conservation and awareness are the two important terms that can bring sustainability to our living. When we use the word sustainability to mean maintain, it means to maintain it forever. This is because our actions have a lasting effect on the environment and we should protect it for our future generations.



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch06_V2.indd 216 02-04-2019 16:30:31

**How to help the value of sustainability grow among students?**

- **Lifestyle**

Your lifestyle is your choice and you can change it. For example, when you go to the grocery store, make sure you always carry a cloth bag. This way the shopkeeper does not have to give you many plastic bags.

- **Fixing**

If your watch or a toy or a camera is broken or not working, try getting it fixed before you buy yourself a new one.

- **Recycle**

Try and be conscious about the things around you. When you consume something, see if you can re-use it later.

- **Needs vs Wants**

Before you buy something, ask yourself the question- do I NEED this or do I WANT it? Remember sustainability begins with you. So act locally and think globally.

## Recap

- The place, things and nature that surround any living organism is called environment.
- The interaction between man as an individual with his family, occupation and society is called human environment.
- Population is a dynamic phenomenon where the number, distribution and composition are constantly changing.
- Population change refers to an increase or a decrease in the population of an area influenced by births, deaths and migration.
- The density of population is measured by dividing the total population by its total area.
- On the basis of occupation, settlements are classified as rural and urban.
- Primary, secondary, tertiary, quaternary and quinary are the different types of economic activities.
- Problems such as climatic changes, poverty, war and uneven distribution of resources leads to an unbalanced ecosystem. Therefore, to sustain mankind, it is a must to learn about sustainable development.

## EXERCISE

GK7T4Q

### I Choose the correct answer

1. All external influences and factors that affect the growth and development of living organisms is _____.
   a) Environment b) Ecosystem
   c) Biotic factors d) Abiotic factors
2. The 'World Population Day' is observed on _____ every year.
   a) August 11th b) September 11th
   c) July 11th d) January 11th
3. The statistical study of human population is _____.
   a) Demography b) Morphology
   c) Etymology d) Seismography
4. The extraction of valuable minerals and other geological minerals from the mines, is _____.
   a) Fishing b) Lumbering
   c) Mining d) Agriculture
5. The Secondary sector of the economy produces _____from raw materials.
   a) Semi finished goods
   b) Finished goods
   c) Economic goods
   d) raw materials



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch06_V2.indd 217 02-04-2019 16:30:31

6. Gradual increase of the earth's temperature by the Green house gases in the atmosphere is called _____.

a) Acid rain b) thermal pollution
c) Global warming d) Deforestation

## II. Match the following:

| | | | |
|---|---|---|---|
| 1. | Loudspeaker | - | Push factor |
| 2. | Rio de Janeiro, Brazil | - | Pull factor |
| 3. | Cruciform settlement | - | noice pollution |
| 4. | Natural disaster | - | T- shaped settlement |
| 5. | Better living conditions | - | Earth Summit, 1992 |

## III. Consider the given statements and choose the right option given below

1. **Assertion(A):** Ozone layer in the stratosphere is considered as a protective shield.

   **Reason(R):** It prevents the UV radiation from reaching the earth's surface.

   a) A and R are correct and A explains R
   b) A and R are correct, but A does not explain R
   c) A is incorrect but R is correct
   d) Both A and R are incorrect

2. **Assertion(A):** In tertiary activities, instead of producing goods by themselves, they are in the process of production.

   **Reason(R):** People in Tertiary activities are purely eco friendly.

   a) Both A and R are incorrect
   b) A and R are correct but A does not explain R
   c) A is correct and R is incorrect
   d) A and R are correct and A explains R

## IV. Answer the following in brief:

1. What do you mean by the term 'density of population'?
2. What is 'black death'?
3. Where do we have high and low densities of population?
4. Write any two ways of how the locals and the government restored Palk Bay.
5. Define.
   i) Population growth
   ii) Census
   iii) Sustainable Development.

## V. Give reasons for the following:

1. Deforestation is encouraged throughout the world.
2. Acid rain destroys the ecosystem..
3. The economy of the quaternary sector is called knowledge economy.
4. Population growth has to be brought under control.
5. Sustainable development growth has been set to protect the planet.

## VI. Distinguish the following:

1. Birth rate and Death Rate
2. Rural settlement and urban settlement
3. Primary activities and Secondary activities

## VII. Answer in a paragraph:

1. Explain the factors affecting the distribution of population.
2. Describe the patterns of rural settlement with neat diagrams.

## VIII. Map skill:

A. On the outline map of the world mark the following.

1. An area of high density of population in Europe.



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TN_GOVT_IX_Std_Geography_Ch06_V2.indd 218 02-04-2019 16:30:31

2. An area of low density of population in Australia.
3. Palk Bay.
4. A fracking banned country.
5. England - A country affected by 'black death'.
6. Denmark - First country where the modern census was conducted.
7. River Hwang Ho.

B. On the outline map of Tamil Nadu mark the following.

1. A metropolitan city
2. A district with 7857 people per sq. km.
3. Gulf of Mannar
4. Palk Strait

## IX. HOTS:

Study your area and write down about its settlement pattern.

## REFERENCE BOOKS


1. Savindra Singh, (1991), *Environmental Geography,* Prayag Pustak Bhawan, Allahabad – 211002
2. Majid Husain, (2015), *Environment and Ecology* Access Publishing India Pvt. Ltd, New Delhi.
3. Sharma. J.P. (2011), *Environmental Studies,* an Imprint o Laxmi Publications Pvt. Ltd, New Delhi.


## INTERNET RESOURCES

https://www.google.co.in/search?

https://www.curbed.com/2017/8/9/16059384/vertical-forest-italy-climate-change

https://www.un.org/development/desa/publications/world-population-prospects-the-2017-revision.html

## ICT CORNER

### MAN AND ENVIRONMENT



**Through this activity, you will know about the population growth from the ancient age to the present.**

### Procedure

Step 1: Use the URL or scan the QR code to open the activity page.

Step 2: Click the 'Change Projection' to explore the map and data from the globe

Step 3: Click the' Reset Map' button to reset the map to starting position.

Step 4: Click the ' Play' button in timeline to show the gradual growth of population.

**URL:**

https://worldpopulationhistory.org/ (or) scan the QR Code

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*Pictures are indicatives only.



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch06_V2.indd 219 02-04-2019 16:30:32

UNIT 7

# Mapping Skills

## Learning objectives

- To introduce maps
- To read maps using its components
- To learn the methods of surveying and other techniques of acquiring map data like aerial photography and satellite remote sensing
- To gain knowledge of the latest techniques of mapping, namely GIS and GNSS

GKGP6D

## Introduction

With maps on hand, one can see the world in one sweep. A map is worth a thousand words. Mapping skills are the basics to understand a map and to interpret the area depicted. Maps are introduced with its components such as scale, signs and symbols. Surveying is the process of recording the measurement of a land area. Its outcomes are the data sources of maps. This lesson deals with the latest techniques of mapping - remote sensing, GPS, GIS, global navigation system and web maps of the 21st century.

## 7.1 Map as a Tool

A map is the basic tool of a geographer. It illustrates the earth's surface clearly and effectively through a combination of drawings, words and symbols. Thus, maps form an integral part of teaching geography. A map is a location guide.

DO YOU KNOW?

A cartographer is one who measures, analyzes and interprets geographical information to create maps and charts for political, cultural and educational purposes.

### 7.1.1 Maps and Cartography

Maps are drawings of an area as seen from above. A map is defined as the miniature image of the 3 dimensional earth's surface on a paper/cloth or any flat surface. Maps can show a whole or part of the world. Maps are drawn to a scale and direction. Maps have legends to explain the meaning of symbols and colours used on it. The art of map - making is called **Cartography**.

### 7.1.2 Components of a map

A map should include the following components namely, the title, scale, direction, grid system, projection, legend, conventional signs and symbols.

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#### (A) Title

It indicates the purpose or theme of the map. Example: India – Physical, World – Political, Tamil Nadu – Transport.

#### (B) Scale

Scale makes it possible to reduce the size of the whole earth to show it on a piece of paper. A scale is a ratio between the actual



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TN_GOVT_IX_Std_Geography_Ch07.indd 220 02-04-2019 13:10:20

distance on the map to the actual distance on the ground. Scales can be represented in three methods. They are the **Statement, Representative Fraction (R.F) and Linear or Graphical scale methods.**

### Statement scale

The statement scale describes the relationship of map distance to ground distance in words, such as one centimetre to ten kilometres. It is expressed as 1cm = 10 km.

### The Representative Fraction (R.F)

It describes the proportion or ratio of the map distance to ground distance. It is usually abbreviated as R.F. It is stated as 1/100000 (or) 1:100000. This means that one unit on the map represents 100,000 of the same unit on the ground. This unit may be an inch or a centimetre or any other linear measurement unit. Thus,

$$\text{Representative Fraction (R.F.)} = \frac{\text{Distance on the map}}{\text{Distance on the ground}}$$

**For example:** To find the RF when the scale is 1 cm to 1km. Here, 1 cm =1 km

According to the formula, R.F= $\frac{1\,cm}{1\,km}$

Convert the km to cm. Therefore, 1km =100000 cm. So, RF. is 1:100000.

Find the R.F. when the scale is 1 centimetre to 2 kilometre.

### Linear (or) Graphical scale

In a map, a linear scale is represented by a straight line divided into equal parts (Primary and secondary) to show what these markings represent on the actual ground. This scale helps in the direct measurement of distance on the map.

### Linear scale model




(Graphic Scale)

1/50,000 (fractional scale)
1:50,000 (ratio)
1 unit on the map represents 50,000 units in the real world.

## (C) Direction

Maps are drawn normally with north orientation. North direction in a map is always towards the North Pole of the earth. If you position yourself looking at the North Pole, on your right will be the east; your left will be the west; at your back will be south. These four main directions are called the cardinal directions. Direction is usually indicated on a map by a North-South line, with the North direction represented by an arrow head.

### Activity

Imagine you are standing in India facing north, find in which direction are the following located using the map given below

Saudi Arabia _____

Myanmar_____

China _____

Indian ocean _____

Kazakhstan _____

Sumatra _____

Afghanistan _____




Mnemonic device or memory technique to recall cardinal directions is the sentence "Never Eat Soggy Wheaties." (North, East, South and West)

## (D) Grid System

The location of a place can be simply defined by its latitude and longitude. In normal practice, latitude is stated first and then comes the longitude. The latitude and longitude of a place can be expressed in units of **degree, minutes and seconds**.



Aatchiyar Kalvi
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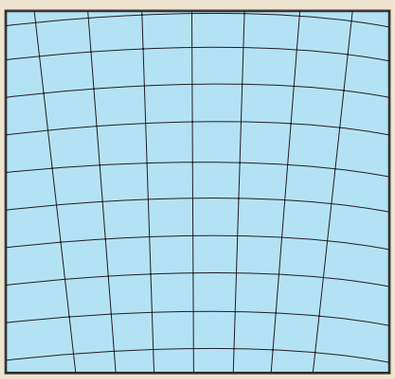
DO YOU KNOW?

The mainland of India extends from 8°4'N to 37°6'N latitude and from 68°7' E to 97°25' E longitude. Here, (°) is degree and (') is minutes.

## Activity

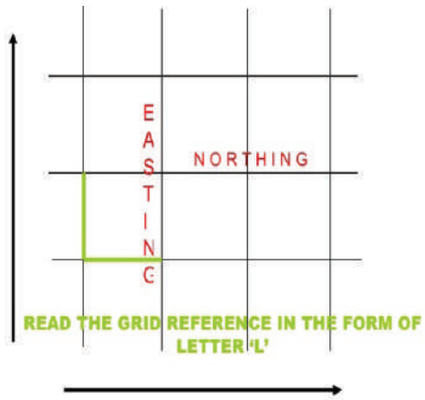
Use grids to enlarge Australia.





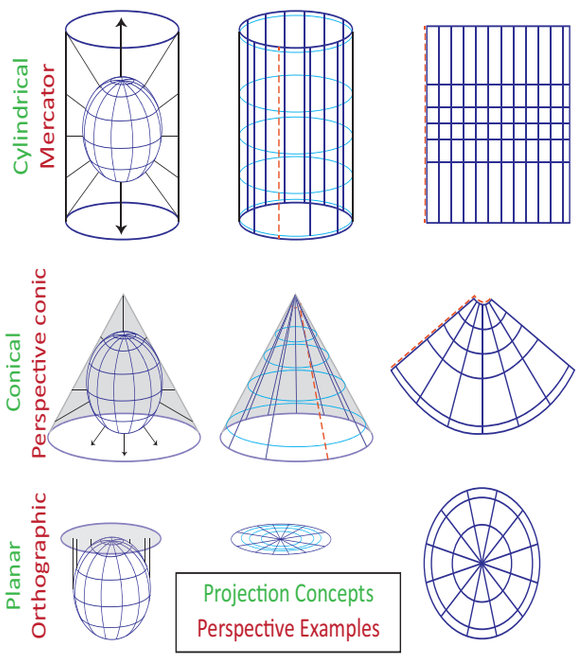
## (E) Projection

A map projection is a way of showing the spherical shaped earth on a flat piece of paper. Where does the word 'projection' come from? Imagine a clear globe with latitude and longitude lines and the outlines of the landmasses on it. Suppose there was a light bulb inside the globe. If you wrapped a piece of paper around the globe and turned on the light bulb, the outlines of the grid and landmasses would be projected onto the paper. Map projection is defined as the transformation of spherical network of latitudes and longitudes on a plane surface. Projections are drawn to maintain the **shape, area and directions**.




The three methods in widest use are as follows:

- Projection on the surface of a cylinder
- Projection on to the surface of a cone
- Projection directly onto a flat plane, called planar or zenithal or azimuthal projection




## (F) Legend

The legend of a map helps to understand the map details which are placed at the left or right corner at the bottom of the map.

## (G) Conventional signs and symbols

Conventional signs and symbols are standard symbols used on a map and explained in the legend to convey a definite meaning. The topographic map contains a variety of information about physical and cultural features.



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch07.indd 222 02-04-2019 13:10:21

These are shown by using signs and symbols in various colours so that the clarity of the map is maintained.

**There are three types of map symbols**

1. **Point Symbols** - buildings, dipping tanks, trigonometrical beacons
2. **Line Symbols** - railways, roads, power lines, telephone lines
3. **Area Symbols** - Cultivated lands, ponds, orchards and vineyards




The actual shape of the Earth is termed Geoid, which is an oblate spheroid.



The "azimuthal" polar projection is depicted on the United Nations flag.

North America was prominent on the initial 1945 UN flag (which had the longitude line 90 degrees west pointing upwards). The following year, the map on the flag was reoriented to be more neutral by having the International Date Line (180 degrees east, lying in the middle of the Pacific Ocean) pointing upwards. The map ends at 60 degrees South latitude, meaning Antarctica does not appear.

**The following colour codes are used with map symbols**

1. **Brown:** land or earth features - contour lines, eroded areas, prominent rock outcrops, sand areas and dunes, secondary or gravel roads
2. **Light Blue:** water features - canals, coastlines, dams, lakes, marshes, swamps and levees, ponds, rivers and water towers.
3. **Dark Blue:** national waterways
4. **Green:** vegetation features - cultivated fields, golf courses, nature and game reserve boundaries, orchards and vineyards, recreation grounds, woodland
5. **Black:** construction features - roads, tracks, railways, buildings, bridges, cemeteries, communication towers, dam walls, excavations and mine dumps, telelphone lines, power lines, windpumps, boundaries
6. **Red:** construction features - national, arterial and main roads, lighthouses and marine lights
7. **Pink:** international boundaries

**Conventional Signs and Symbols**

| | | | |
|---|---|---|---|
| | Fort | | Metalled Road |
| | Church | | Cart track |
| | Pagoda | | Pack-track |
| | Graveyard | | Foot-path with bridge |
| | Chhatri | | Aerodrome |
| | Mosque | | Light-house |
| | Temple | | Electric power Line |
| PO | Post Office | | Perennial Stream |
| PS | Police Station | | Dry Stream |
| RH | Rest House | | Canal |
| CH | Circuit House | | Dry River |
| IB | Inspection Bunglow | | Dam with masonry work |
| RS | Railway station | | Dam with earth work |
| | Broad Gauge Railway | | Permenant Hut |
| | Level Crossing | | Temporary Hut |
| | Metalled Road | | Tower Antiquities |

## 7.1.3. Survey

Surveying is done to measure the angle, direction, area, height and distance of an object or place on the surface of the earth using instruments. Surveying techniques are used to obtain the field data and to prepare maps. A knowledge of surveying helps one in map-making, particularly in the preparation of physical maps.

Geographers mainly use **Chain, Prismatic compass, Plane table, Dumpy level, Abney level, Clinometre, Theodolite, Total Station** and **GNSS** to measure the distance, angle, altitude and position of the area of survey.



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**Modern survey tools used by geographers for map making.**









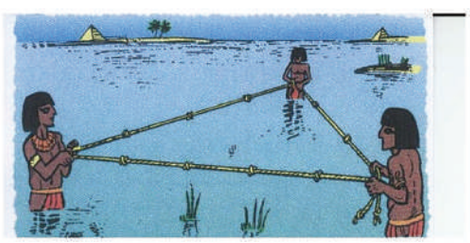







**Early History of Surveying**: In Egypt, surveyors were called 'rope stretchers' because they used ropes to measure distances.

**The Egyptian 'Rope Stretchers'**



## 7.2 Remote Sensing as a Source of Map Data

**Remote Sensing refers to the observation and measurement of earthly objects without touching them.**

'**Remote**' means far away and '**Sensing**' means observing or collecting information. Remote sensing means acquiring information of things/places from a distance, using a variety of tools and methods.




We operate three remote sensing organs in our body.



a) Eyes -sense of sight

b) Nose - sense of smell

c) Ear – Sense of hearing

Remote sensing has a long history, dating back from the use of cameras carried by balloons and pigeons in the 18th and 19th centuries. During the 20th century, airborne photographs and satellite remote sensing developed swiftly.

### 7.2.1. Aerial photography

Aerial photography refers to the technique of obtaining information about places or objects or phenomena with the help of photographs taken using cameras mounted on **low flying birds, balloons, helicopters, aeroplanes and drones.** The aerial photographs are captured continuously with a time gap of 10-30 seconds at a fixed height. Each photo will have a slight overlap of the area in the preceding photo. By making a mosaic of all the photos excluding the overlapping areas, a stereoscopic (3D) image of the study area can be produced.

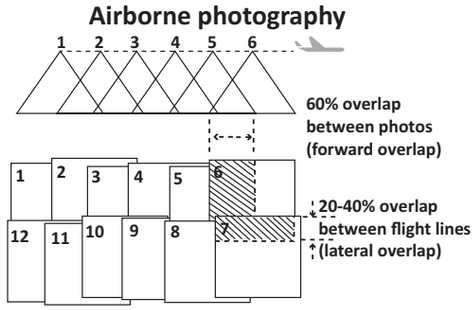



Felix Nadar was a French photographer, journalist, novelist and balloonist. In 1858, he became the first person to take aerial photographs. He took his first photograph in 1853 and pioneered the use of artificial lighting in photography, working in the catacombs of Paris. Around 1863, Nadar built a huge (6000 $m^3$) balloon named Le Géant ('The Giant').





Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch07.indd 224 02-04-2019 13:10:22




**Aerial photography using drone in the techno world**

## 7.2.2 Satellite Remote Sensing

Satellite remote sensing is the science of collecting data about an object or area from artificial satellites orbiting the Earth. The term 'satellite imagery' refers to digitally transmitted images of the satellites.

The preliminary data is retrieved from satellites like LANDSAT, CARTOSAT, OCEANSAT, etc. Fire and flood details can be extracted and delivered to relevant authorities within two hours of satellite image capture. E.g. major earthquakes in China and New Zealand, bushfire in Victoria and floods in Kerala. Dynamic phenomena such as flood, movement of wild animals, shoreline changes, finding lost ships and planes. Researchers use satellite imageries for these.

### Components of Remote Sensing

- Energy source
- Transmission path
- Target
- Sensor

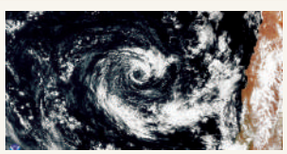



People cannot be tracked generally by satellite or aerial photographs but they can be tracked by their mobile phone signals.

## 7.2.3 Global Navigation Satellite System (GNSS)

Have you ever booked a cab using a smart phone app? Did you see the map showing the route of your travel and movement of your vehicle on mobile phones? How is it possible to calculate the time duration of your travel?

GKZG9N

| Satellite remote sensing | Aerial Photography |
|---|---|
|  |   |
| ■ High cost of satellite systems. Takes at least 10 years to plan, construct, test and launch.<br>■ Satellites collect large amount of data of the entire area in a short span.<br>■ It allows global coverage and does not require permission.<br>■ Satellites circle the Earth; they can repeat and revisit easily.<br>■ Weather does not affect the functioning of satellites.<br>■ All information is digital; it can be easily integrated with software for image improvement. | ■ Surveying can be planned and executed in a shorter time economically.<br>■ Takes more time to capture an area. Aircraft needs to fly back and forth.<br>■ It covers a small area and needs permission from authorities.<br>■ Revisits or repeatability involves extra cost.<br>■ Adversely affected by bad weather<br>■ It is an analogue record, so no further improvement is possible after obtaining photographs. |



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch07.indd 225 02-04-2019 13:10:23

In the 21st century, GNSS has become a part of our lives to promote the safety and convenience of transport. **Global Navigation Satellite System (GNSS)** is a satellite system connected with a small electronic receiver or tracker to locate, monitor and track a user's vehicle wherever in the world. It can also set up instant alerts when a driver of a vehicle speeds or deviates from a particular area. GNSS applications are used in tracking or mapping vehicles, ships and aircraft. A group of satellites (Space Segment) working with a network of ground stations (Control Segment) provide location data. The receiver (User Segment) converts satellite signals into location, speed and time data.

### Examples of GNSS

- Europe-Galileo
- USA-NAVSTAR Global Positioning System (GPS)
- Russia-Global'naya Navigatsionnaya Sputnikovaya Sistema (GLONASS)
- China- BeiDou Navigation Satellite System
- India's-IRNSS (NAVIC) system

### a. Global Positioning System (GPS)

Without the Global Positioning System (**GPS**) on our vehicles and mobile phones, we would feel lost. GPS is the U.S. implementation of the world's first and currently the most used Global Navigation Satellite System (GNSS) created by the U. S. Department Of Defense (**DOD**). It became fully operational in 1995. **NAVSTAR** (Navigation Satellite Timing and Ranging) is a network of 24 U.S. satellites in six different orbits in space flying 20,350 km above the surface of the Earth; each one circles the planet twice a day to provide continuous, worldwide coverage. GPS receivers now come in all shapes and sizes, Most are the size of a cellular phone. Some are handheld, others are installed in ships, planes, trucks and cars.

### Advantages of GPS

- GPS technology has tremendous applications in everything from mobile phones, watches, bulldozers, shipping containers and ATMs.
- The main purpose of GPS is to help in providing accurate transport data (distance, route and direction). It helps in military searches and rescue in wars. It can work as a reliable tourist guide.
- GPS helps during accident and rescue efforts, speeding the delivery of emergency services and disaster relief.
- Weather forecasting, earthquake monitoring and environmental protection can be done effectively by using GPS.

### b. Geographic Information System (GIS)

Geographic Information System is a computer-based tool for managing a large amount of data collected for a given geographic region through remote sensing, GPS and other sources. The Geographic Information System is a combination of computer hardware, software, geographic data and the personnel.

G - Geographic - A particular area
I - Information - facts in order
S - System - arrangement

GIS was first recognised in the late 1950s by Waldo Tobler and Roger Tomlinson (Canada). Prime examples of importing GIS for public welfare are Google Maps, Yahoo Maps and Google Earth.

The key ingredient is location. We must have a coordinate, an address or a distance from a known point that helps us to link the information to a location on a map. Each type of data of an area is stored as a separate 'layer' of the map. In GIS, layers may be used some times and removed according to need. Examples are hospitals, schools, water bodies, parks and ATMs. The computers can create maps showing any combination of data.

## 7.3 Bhuvan

Bhuvan (Sanskrit for Earth) is a **free internet based computer application** launched by the **Indian Space Research Organization** (ISRO)



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch07.indd 226 02-04-2019 13:10:23

on August 12th 2009. It enables visualization of Indian Remote Sensing (IRS) images taken over a year ago, by ISRO's seven satellites, including CartoSat-1 and CartoSat-2. Using Bhuvan connected to Internet, one can explore places of interest, scenes of events in the news or parts around the world they may never visit in person, by either entering the names of places or co-ordinates (latitudes and longitudes). Bhuvan has tremendous uses for scientists, academicians, policy makers and the general public.

## Recap

- Surveying is the process of recording the measurements of a land area.
- Anaximander was the first ancient Greek to draw a map of the known world.
- Maps can show the whole or a part of the world.
- The art and science of map making is called Cartography.
- A map should include certain components namely, the title, scale, direction, grid reference, projection, legend, conventional signs and symbols.
- Grids are sets of lines for defining a location on a map.
- Remote sensing means acquiring information of things / places from a distance.
- Global Navigation Satellite System (GNSS) helps to locate, monitor and track a user's vehicle anywhere in the world.
- GIS is a combination of computer hardware, software, geographic data and the personnel.

## EXERCISE

GL9CBB

### I. Choose the best answer

1. The new phase in topographical surveying in the 20th century is _____.
   a) toposheets b) aerial photography
   c) maps d) satellite imagery
2. _____ indicates the purpose or theme of the map.
   a) Title b) Scale
   c) Direction d) Legend
3. Standard symbols that are used in maps to convey a definite meaning are called _____.
   a) conventional signs and symbols
   b) coordinates
   c) grid references
   d) directions
4. Which one of the following maps show us a very large area with less details? _____.
   a) Large scale b) Thematic
   c) Physical d) Small scale
5. GPS consists of a constellation of _____ satellites.
   a) 7 b) 24
   c) 32 d) 64

### II. Match the following

| | | | |
|---|---|---|---|
| 1. | The art and science of mapping | – | a) USA |
| 2. | Thematic mapping | – | b) Geoid |
| 3. | Actual shape of the earth | – | c) Inmarsat |
| 4. | A satellite | – | d) Political map |
| 5. | NAVSTAR | – | e) Cartography |



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch07.indd 227 02-04-2019 13:10:23

## III. Consider the given statements and choose the right option given below

1. **Assertion (A):** The points at which the vertical and horizontal lines of the grid intersect are called coordinates.

   **Reason (R):** The lines that run horizontally and vertically are called Northings and Eastings respectively.

   (a) Both (A) and (R) are true ; (R) explains (A)

   (b) Both (A) and (R) are true ; (R) does not explain (A)

   (c) (A) is correct ; (R) is false

   (d) (A) is false ; (R) is true

2. **Assertion (A)** The legend of a map does not help us to understand the information in a map.

   **Reason (R)** It is usually placed at the left or right corner at the bottom of the map.

   (a) (A) is false ; (R) is true

   (b) Both (A) and (R) are true ; (R) does not explain (A)

   (c) (A) is correct ; (R) is false

   (d) Both (A) and (R) are true ; (R) explains (A)

## IV. Answer in brief

1. Name the different methods to represent the Earth.
2. What is a map?
3. What are the components of a map?
4. The distance between two cities A and B is 5 km. It is represented by a line of 5 cm on the map. Calculate the distance and give the answer in RF.
5. Mention a few surveying instruments.
6. Define remote sensing.
7. What are the components of remote sensing?

## V. Give Reasons

1. Satellite imageries stimulate map making.
2. Map is the basic tool of a geographer.
3. Grid references are essential to find the exact location of places on a map.

## VI. Distinguish Between The Following

1. Globe and Map
2. Large scale map and small scale map
3. Aerial photographs and satellite imageries
4. GIS and GPS

## VII. Answer in Paragraph

1. What do you mean by the term 'scale of the map'? Explain its classification.
2. Write a note on directions with relevant diagram.
3. Explain the major uses of GPS? Explain about any one.
4. Bhuvan has tremendous uses for scientists, policy makers and the general public. Justify.

## VIII. Map Excercise:

1. With the help of an atlas, mark the following on the outline map of Tamil Nadu.

   *a*) The latitude and longitude of Chennai.

   *b*) Mark the city located at $10^{0}$ N, $78^{0}$ E.

   *c*) Locate the city approximately on $11^{0}$N and $76^{0}$E.

   *d*) Find the latitude and longitude of Kanyakumari and mark it.

## IX. HOTS

1. Can you imagine a world without satellites?
2. Imagine you are a cartographer. Draw the map of your area.



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch07.indd 228 02-04-2019 13:10:23

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3. Anji Reddy, M, (2015) Fourth Edition, *Text Book of Remote Sensing and Geographical information systems,* BSP Books Pvt. Ltd., Hyderabad.
4. Panda, B.C, (2009), *'Remote sensing principles and Applications'*, Viva books, New Delhi.
5. Misra, R.P and Ramesh, A, (1969) 'Fundamentals of cartography' Prasaranga University of Mysore, Mysore.
6. LO, C.P and Albert, K.W, Young (2002) 'Concepts and Techniques of Geographic Information Systems' Prentice – Hall of India Pvt. Ltd., New Delhi.


## INTERNET RESOURCES

www.usgs.gov.in

www.nasa.gov.in

www.surveyofindia.gov.in

https://bhuvan.nrsc.gov.in

https://www.isro.gov.in

### ICT CORNER

## MAPPING SKILL

**Through this activity, you will know about the distance between any two landmarks in the maps.**



### Procedure

Step 1: Use the URL or scan the QR code to open the activity page.

Step 2: Click 'Polyline' button. Draw a poly line between any two favourable places.

Step 3: After finishing, the Poly line shows the measurement of distance as miles and kilometres.

Step 4: Click '+' and '-'button to zoom in and zoom out.

**URL:**

https://mapmaker.nationalgeographic.org/ (or) scan the QR Code

B568_9_SS_EM_T3

*Pictures are indicatives only.



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch07.indd 229 02-04-2019 13:10:24

UNIT 8

# Disaster Management: Responding to Disasters

## Learning objectives

- To know the phases of disaster management
- To understand how to respond to disaster such as Tsunami, earthquake, riot and fire
- To describe the measures to manage riots disaster

GLI8CY

### Case Study - Tsunami

Shortly before 8 am on 26 December 2004, the cicadas fell silent and the ground shook in dismay. The Moken, an isolated tribe on the Andaman Islands in the Indian Ocean, knew that the Laboon, the 'wave that eats people', had stirred from his ocean lair. The Moken also knew what was next: a towering wall of water washing over their island, cleansing it of all that was evil and impure. To heed the Laboon's warning signs, elders told their children, run to high ground. 'If the water recedes after an earthquake, run immediately to high ground'

The tiny Andaman and Nicobar Islands were directly in the path of the tsunami generated by the magnitude 9.1 of earthquake off the coast of Sumatra. Final total put the islands' death toll at 1,879 alone with another 5,600 people missing. The islanders who had heard the stories about the Laboon or similar mythological figures survived the tsunami essentially unscathed. Most of the casualties that occurred in the southern Nicobar Islands were outsiders, leaving them with no indigenous tsunami warning system to guide them to higher ground.

## Introduction

Humans have passed down stories through the ages that helped cultures to cope when disaster inevitably struck. These stories were fodder for anthropologists and social scientists, but in the past decade, geologists have begun to pay more attention to how indigenous people understood and prepared for disaster. These stories, which couched myth in metaphor, could ultimately help scientists prepare for cataclysms to come. In this lesson, you will learn about how to respond to certain disasters to become resilient.

A disaster is "a catastrophe that causes great damage or loss of life and property".

## 8.1 Disaster Response

Disaster response entails restoring physical facilities, rehabilitation of affected population, restoration of lost livelihoods and reconstruction efforts to restore the infrastructure lost or damaged. The Response Phase focuses primarily on emergency relief: saving lives, providing first aid, restoring damaged systems (communications and transportation), meeting the basic life requirements of those impacted by disaster (food, water and shelter) and providing mental health and spiritual support and care.



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## Who are the first responders?

No matter how large or small, local communities are expected to provide immediate disaster response. On a daily basis, **police officers, firefighters, and emergency medical technicians** are a community's first responders, whether during fire, flood or acts of terrorism. Mental health professionals and the community's hospitals may also be activated in those early minutes and hours after disaster.

Disaster management includes Prevention, Mitigation, Preparedness, Response and Recovery. Disaster management involves all levels of government. Non-governmental and community based organizations play a vital role in the process. Modern disaster management goes beyond post-disaster assistance. It now includes pre-disaster planning and preparedness activities, organizational planning, training, information management, public relations and many other fields. Crisis management is important, but is only a part of the responsibility of a disaster manager.




**Disaster Management Cycle**

The traditional approach to disaster management has a number of phased sequences of action or a continuum. These can be represented as a disaster management cycle. We mainly focus on the way how the community should respond to disasters.

### 8.1.1 Earthquake

An earthquake is a sudden vibration of the part of the earth caused by plate movements. It occurs along the plate boundaries. The place inside the earth where an earthquake originates is **focus**. The point on the earth's surface above the called a focus is called an **epicentre**. The damage caused by the earthquake is the highest near the **epicentre**. The earthquake is measured by an instrument called a **Seismograph**. It is recorded in **Richter scale**. Let us now see how the communities can better respond to earthquakes.




1. Japan is in a very active seismic area and it has the densest seismic network in the world.

2. Which country actually has the most number of earthquakes? Indonesia is in a very active seismic zone also, but because it is larger than Japan, it has more earthquakes.

3. Which country has the most earthquakes per unit area? This would probably be Tonga, Fiji or Indonesia, since they are all in extremely active seismic areas along subduction zones.

## What to do during an earthquake?

Be aware that some earthquakes are actually foreshocks and a larger earthquake might occur later. Minimize your movements to a few steps that reach a safe place nearby and stay indoors until the shaking has stopped and you are sure exiting is safe.

### If indoors

1. DROP to the ground; take COVER by getting under a sturdy table or other piece of furniture and HOLD ON until the shaking stops. If there is no table or desk near you, cover your face and head with your arms and crouch in an inside corner of the building.
2. Protect yourself by staying under the lintel of an inner door, in the corner of a room, under a table or even under a bed.
3. Stay away from glass windows, outside doors and walls and anything that could fall (such as lighting fixtures or furniture).
4. Stay inside until the shaking stops and go outside.



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch08.indd 231 04-04-2019 10:28:08

### If outdoors

1. Move away from buildings, trees, streetlights and utility wires.
2. If you are in open space, stay there until the shaking stops. The greatest danger exists directly outside buildings at exits and alongside exterior walls. Most earthquake-related casualties result due to collapsing walls, flying glass and falling objects.

### If in a moving vehicle

1. Stop as quickly as safety permits. Avoid stopping near or under buildings, trees, overpasses and utility wires.
2. Proceed cautiously once the earthquake has stopped. Avoid roads, bridges or ramps that might have been damaged by the earthquake.

**Activity**

**Mock drill: Earthquake.**

It is important that we know what to do if an earthquake occurs. In case we are inside the class when it occurs, instruct loudly "earth quake position – drop, cover, and hold on". Drop down on your knee. Cover your head, neck and face. Go under a table to protect your head and neck.

## 8.1.2 Tsunami




A tsunami can kill or injure people and damage or destroy buildings and infrastructure as waves come forth and recede. A tsunami is a series of enormous ocean waves caused by earthquakes, underwater landslides, volcanic eruptions or asteroids. Tsunamis can travel 700-800 km per hour, with waves 10-30 meter high. It causes flooding and disrupts transportation, power, communications, and water supply.

### How to respond to Tsunami?

1. You should find out if your home, school, workplace or other frequently visited locations are in tsunami hazard areas along the sea-shore.
2. Plan evacuation routes from your home, school, workplace, or any other place you could be, where tsunamis poses a risk.
3. Use a weather radio or stay tuned to a local radio or television station to keep informed of local watches and warnings.
4. Discuss tsunamis with your family. Everyone should be aware of what to do when tsunami strikes. Discussing tsunamis ahead of time will help reduce fear and save precious time in an emergency. Review flood safety and precautionary measures with your family.

### What to do after a Tsunami?

1. You should continue using a weather radio or staying tuned to a Coast Guard emergency frequency station or a local radio or television station for updated emergency information.
2. Check yourself for injuries and get first aid if necessary, before helping injured or trapped persons.
3. If someone needs to be rescued, call professionals with the right equipment to help.
4. Help people who require special assistance, like Infants, elderly people, those without transportation, large families who may need additional help in an emergency situation, people with disabilities, and the people who care for them.
5. Stay out of a building if water remains around it. Tsunami water, like floodwater, can undermine foundations, causing buildings to sink, floors to crack, or walls to collapse.
6. Check for gas leaks. If you smell gas or hear a blowing or hissing noise, open a window and get everyone outside quickly.

## 8.1.3 Riot

Though riot may seem dramatic, an angry mob can be just as dangerous and unpredictable as just about any natural disaster. Thousands of people are killed in riots all over the world each year, and



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch08.indd 232 04-04-2019 10:28:08

these riots erupt from a number of racial, religious, economic, political, or social causes that cannot be predetermined. As per Pew Research Center analysis of 198 countries on April 11, 2015. Syria tops in riot in the world followed by Nigeria, Iraq and India.

If you've found yourself in the middle of a riot, you may not be able to run away immediately, but you can take some measures to protect yourself from harm. If you want to know how to survive a riot, just follow these steps.

### Surviving a Riot

### At Travel Destination: What to Do

1. Keep abreast of the current news if you are in a volatile area.
2. If you come across a demonstration, don't become inquisitive, just leave the area and find another route to your intended destination.
3. Avoid any place where police or security forces action is in progress.

### If caught in a riot:

1. If you find yourself caught up in a demonstration, keep to the edge of the crowd where it is safer. At the first opportunity, break away and seek refuge in a nearby building or find a suitable doorway or alley and stay there until the crowd passes.
2. When leaving the fringe of the demonstration, just walk away – don't run as this will draw attention to you.
3. In the event that you are arrested by the police/military, do not resist. Go along peacefully and contact your law advisor to help you resolve your predicament.
4. If you are caught up in the crowd, stay clear of glass shop fronts, moreover, move with the flow.
5. If shooting breaks out, drop to the ground and cover your head and neck, and lie as flat as you can.

## 8.1.4 Fire

Wildfires occur when vegetated areas are set alight and are particularly common during hot and dry periods. They can occur in forests, grasslands, bush and deserts, and with blowing wind, can spread rapidly.

Fires can lead to the destruction of buildings, wooden bridges and poles, power, transmission and telecommunication lines, warehouses containing oil products and other fuel. It causes injury to people and animals.

The most common causes of fires are lightning strikes, sparks during arid conditions, eruption of volcanoes and man-made fires arising from deliberate arson or accidents.

A side-effect of wildfires which also threatens inhabited areas is smoke. Fires create large quantities of smoke, which can be spread far by wind and poses a respiratory hazard.

On an average, in India, every year, about **25,000 persons die** due to fires and related causes. Female accounts for about 66% of those killed in fire accidents. It is estimated that about **42 females and 21 males die every day in India due to fire.**

**Think why**

Smoke kills more than fire.






Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch08.indd 233 04-04-2019 10:28:08

### Fire Safety Do's and Don'ts

1. Know your building's evacuation plan.
2. Evacuate calmly and quickly, whenever a fire alarm or carbon monoxide alarm sounds.
3. Before opening a door, feel it with the back of your hand. If the door is hot, do not open it.
4. If you encounter smoke during your evacuation, stay low to the floor.
5. Know the outside rally point for your building.
6. Know the locations of fire extinguishers, fire alarm pull stations and exits.

**Activity**

**Mock Drill :**

To escape a **fire**, **stop**, **drop**, and **roll**. In case your clothes burn, stop running, drop on the floor and roll to stop the fire spreading.

### What you should do during a fire:

1. Stay calm.
2. Pull the nearest fire alarm or call 112.
3. Give your name and location of the fire. Do not hang up until the police dispatcher tells you to do so.
4. Leave the building immediately.
5. Inform others as you pass them to leave the building immediately.
6. Walk—don't run—to the nearest exit.
7. Never use elevators—an elevator may become a trap.

**HOTS**

Why should you cut off all the branches of trees below 3 metres of height standing near your house?

## Exercise

GM1ZG9

### I. Choose the best answer

1. One among the following is not the first responder in case of a disaster.
   a. police officers
   b. firefighters
   c. insurance agents
   d. emergency medical technicians
2. 'Drop, Cover, Hold' is a mock drill a vowal for
   a. Fire b. Earthquake
   c. Tsunami d. Riot
3. When you happen to see a fire break out, you will make a call to
   a. 114 b. 112
   c. 115 d. 118
4. Which of the following statements is untrue?
   a. 'Stop, Drop, Roll' is for fire.
   b. 'Drop, Cover, Hold' is for an earthquake.
   c. 'If sea water recedes back, run to higher places' is for flood.
   d. 'If gunshots are heard, drop to the ground and cover the head with hand' is for riot.
5. Which of the following statements belongs to responding to earthquake?
   a. Avoid, any place where police or security forces action is in progress.
   b. Know the height of your street above sea level and the distance of your street from the coast.
   c. Stay away from glass, windows, outside doors and walls and anything that could fall.
   d. Before opening a door, feel it with the back of your hand.



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch08.indd 234 04-04-2019 10:28:09

## II. Answer in brief

1. Who are the community's first responders to disaster?
2. What are the four phases of the Disaster Management Cycle?
3. Though Japan has the densest seismic network, Indonesia has the most number of earthquakes. Why?
4. How many males and females die per day due to fire in India?
5. What should you do after a Tsunami?

## III. Answer in Paragraph

1. Write a short note on Tsunami.
2. What do you do if you are indoors during an earthquake?
3. How do you respond to Tsunami?
4. Write three sentences about what to do during fire.

## Practice

1. Mock drill for fire
2. Mock drill for earthquake

## REFERENCE BOOKS


1. Disaster management Module, TNSCERT.
2. NDMA.
3. Wikipedia


## INTERNET RESOURCES

http://www.ndmindia.nic.in/

Helpline Numbers

011-23438252

011-23438253

011-1070

## A-Z GLOSSARY

| | |
|---|---|
| **Asthenosphere** | Upper layer of the earth's mantle below the lithosphere. |
| **Air current** | Movement of air when it rises upward or sinks down. |
| **Cataclysms** | Large scale violent events in the natural world |
| **Condensation** | Process of change of state of water from gaseous to liquid. |
| **Continental drift** | The gradual movement of the Earth's continents on the surface of the planet |
| **Coriolis Force** | Deflection of winds from their original path due to Earth's rotation. |
| **Doldrums** | The equatorial low pressure belt, extending between 5°N and 5°S. |
| **Eruption** | The ejection of molten rock, steam, etc. from a volcano or geyser. |
| **Geology** | The science that deals with the physical structure and substances of the earth, their history and the processes which act on them. |
| **Hazard** | Potential threat to life |
| **Hostility** | Unfriendliness |
| **Inquisitive** | Curious about learning things |
| **Internal Radioactivity** | Radiations emitted from radioactive metals inside the earth and act as a driving force for the earth's tectonics. |




Aatchiyar Kalvi

| | |
|---|---|
| **Lair** | A place where a wild animal lives in |
| **Mitigation** | Action of reducing severity |
| **Normal Lapse rate** | Decrease of temperature at the rate of 6.5°C/km increase in altitude. |
| **Orogeny** | Mountain building process due to lateral compression of the crust. |
| **Pacific ring of fire** | The Pacific Ring of fire is an arc around the Pacific Ocean where many volcanoes are found. |
| **Pangea** | A super continent that existed during the late Palaeozoic and early Mesozoic eras. |
| **Panthalasa** | Super ocean that surrounded Pangaea. |
| **Predicament** | Unpleasant situation |
| **Rehabilitation** | Act of restoring someone to health or normal life through training and therapy |
| **Riot** | An occasion where a large number of people behave in a noisy, violent and uncontrolled way |
| **Unscathed** | Without suffering any injury or damage |
| **Wind vane** | Also known as windcock. It is a device to find out the direction of wind. |



Aatchiyar Kalvi
TN_GOVT_IX_Std_Geography_Ch08.indd 236 04-04-2019 10:28:09

Unit - 1

# India – Location, Relief and Drainage



## Learning Objectives

- To understand the strategic importance of India's absolute and relative location in the world
- To know the distinct characteristics of major physiographic divisions of India
- To compare the regions of Great Indian plains
- To understand the drainage system of India
- To differentiate the Himalayan and peninsular rivers

ZVGEWC

## Introduction

India is the seventh largest country in the world and second largest country in Asia. It forms a part of south Asia and is separated by the Himalayas from the rest of the continent. India accounts for about 2.4 % of the total area of the world with an area of 32,87,263 sq.km. many of the India states are larger than several countries of the world.

### India's Land and Water Frontiers

India shares its 15,200 km long land frontier with Pakistan in the west, Afghanistan in the north-west, China, Nepal and Bhutan in the north and Bangladesh and Myanmar in the east. India's longest border is with Bangladesh (4156 km)while the shortest border is with Afghanistan.(106 km)

About 6,100 km long coastline of India is washed on three sides of the country by the Indian Ocean and its two arms namely the Arabian sea in the west and the Bay of Bengal in the east. The total length of the coast line of India including the islands is 7,516.6 km. India and Sri Lanka are separated by a narrow and shallow sea called Palk Strait.

### India and the World

The Indian land mass has a central location between, the East and the West Asia. India and the southward extension of the Asian continent. The trans Indian ocean routes which connect the countries of Europe in the west and the countries of East Asia provide a strategic central location to India. Thus it helping India to establish close contact with West Asia, Africa and Europe from the western coast and with South East, east Asia from the eastern coast.

### India: A Subcontinent

India along with the countries of Myanmar, Bangladesh, Pakistan, Nepal, Bhutan and Sri Lanka is called a subcontinent. This region is separated from the rest of Asia by a chain of mountains in the northwest, north and northeast and by seas in the south. This region also possesses a distinct continental characteristics in physiography, climate, natural vegetation, minerals, human resources etc. Hence India is known as '**subcontinent**'.



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch01.indd 82 10-04-2019 09:45:17




## 1.1 Location and Extent

India extends from **8°4'N** to **37°6'N** latitudes and **68°7'E** to **97°25'E** longitudes. Hence India is located of the north Eastern hemisphere

The southernmost point of the country is Pygmalion Point or Indira Point (6°45'N latitude) located in the Andaman and Nicobar Islands. The southernmost point of main land of India is **Cape Comorin** (Kanniyakumari). The north-south extent of India is **3,214** km and it extends from **Indira Col** in Jammu and Kashmir in the north to Kanniyakumari in the south. The east-west extension is **2933** km and it stretches from Rann of Kutch (Gujarat) in the west to Arunachal Pradesh in the east. The Tropic of Cancer (23°30' N) passes through the middle of the country dividing it into two halves as northern temperate and southern tropical lands. India has been politically divided into 29 states and 7 union territories for administrative convenience.

**FIND OUT**

- The number of Union Territories along western coast and eastern coast
- Area wise which is the smallest and largest state?
- The states which do not have an international border or lie on the largest state
- Classify into four groups each having common frontiers with i) Pakistan ii) China iii) Myanmar and iv) Bangladesh

**DO YOU KNOW?**

Amaravati is the new capital of Andhra Pradesh But according to Andhra Pradesh Reorganization Act, Hyderabad will be the capital for both the states of Andhra Pradesh and Telungana till 2024 (For 10 years from the act passed).

### 1.1.1 Indian Standard Time (IST)

The longitudinal difference between Gujarat in the west and Arunachal Pradesh in the east



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch01.indd 83 10-04-2019 09:45:18
286

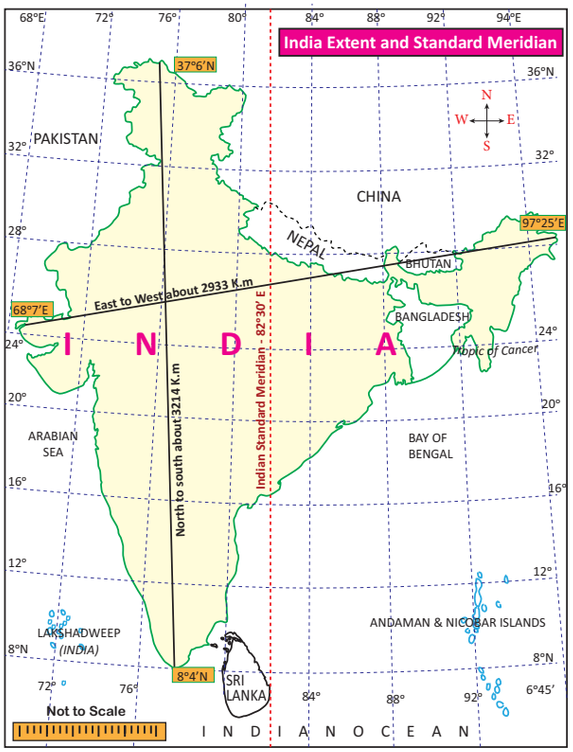



**India - States and Union Territories**

is about 30°. The Earth rotates through its axis around 360° in 24 hours. Thus, a difference of 1° longitude will make a difference of 4 minutes in time. The difference in longitude between Gujarat (68°7'E) and Arunachal Pradesh (97°25' E) is 29°18'. Hence the difference in local time between these two places is 29°18' X 4' (minutes) = 1 hour 57 minutes 12 seconds (approximately 2 hours). Since Arunachal Pradesh is towards east, it will have sunrise about two hours earlier than the sunrise at Gujarat which is in the west.



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch01.indd 84 10-04-2019 09:45:18




In order to avoid these differences, Indian standard time is calculated. The local time of the central meridian of India is the standard time of India. **India's central meridian is 82°30' E longitude.** It passes through Mirzapur and roughly bisects the country in terms of longitude. The IST is 5.30 hrs ahead of Greenwich Mean Time (GMT).

## 1.2 Major Physiographic Divisions of India

The majestic Himalayan peaks in the north, the beautiful beaches in the south, the great Indian desert in the west and the breathtaking natural heritage in the east make India a geographically vibrant, colourful and truly incredible country.

There is a varied nature of physiographic divisions in India. Though the country has many landforms based on the major differences, it is divided into the following five physiographic divisions:

1. **The Himalayan Mountains**
2. **The Great Northern Plains**
3. **The Peninsular plateau**
4. **The Indian Desert**
5. **The Coastal Plains**
6. **The Islands**

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### 1.2.1 Himalayan Mountains

The Himalayan Mountains (Northern Mountains) consist of the youngest and the loftiest mountain chains in the world because they have been formed only few millions years ago and also they were formed because of the folding of the earth crust due to tectonic activity. It stretches for a distance of 2,500 km from the Indus gorge in the west to Brahmaputra gorge in the east. The width of the Northern Mountains varies from 500 km in Kashmir to 200 km in Arunachal Pradesh. The Pamir Knot, popularly known as the **"Roof of the World"** is the connecting link between the Himalayas and the high ranges of Central Asia. From the Pamir, Himalayas extend eastward in the form of an arc shape. The term "Himalaya" is derived from Sanskrit. It means **"The Abode of Snow"**. The Northern Mountains that function as a great wall is grouped into three divisions. **1) The Trans-Himalayas, 2) Himalayas, 3) Eastern or Purvanchal hills**.

DO YOU KNOW?

Aravalli range is the oldest fold mountain range in India.



FIND OUT

Find the Hill stations which are located in Himalayan Mountains.



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch01.indd 85 10-04-2019 09:45:19
288




## 1. The Trans-Himalayas

It is also known as western Himalaya's. It lies to the north of the great Himalayan range. It lies in Jammu and Kashmir and Tibetian plateau. As its areal extent is more in Tibet, it is also known as Tibetean Himalayas. The Trans-Himalayas are about 40 km wide in its eastern and western extremities and about 225 km wide in its central part. They contain the Tethys sediments. The rocks of this region contain fossils bearing marine sediments which are underlain by 'Tertiary granite'. It has partly metamorphosed sediments and constitutes the core of the Himalayan axis. The prominent ranges of Trans Himalayas are Zaskar, Ladakh, Kailash, and Karakoram.



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch01.indd 86 10-04-2019 09:45:19

## 2. The Himalayas

It constitutes the core part of northern mountains. It is an young fold mountain. It was formed by the movement of Angara land mass in the north and Gondwana land mass in the south. The Tethys sea found between these two land masses was uplifted by the compression and the resultant landform was the Himalayas. It consists of many ranges. The main divisions of the Himalayas are the ***(i) Greater Himalayas, (ii) the Lesser Himalayas and (iii)the Siwaliks***

| Peak | Country | Height in metres |
|---|---|---|
| Mt. Everest | Nepal | 8848 |
| Mt.K2 or Godwin Austen | India | 8611 |
| Kanchenjunga | India | 8598 |
| Makalu | Nepal | 8481 |
| Dhaulagiri | Nepal | 8172 |
| Nanga Parbat | India | 8126 |
| Annapurna | Nepal | 8078 |
| Nanda Devi | India | 7817 |
| Kamet | India | 7756 |
| Namcha Barwa | India | 7756 |
| Gurla Mandhata | Nepal | 7728 |




Himalaya is the home of several high peaks. However, it holds the record of having the maximum number of highest peaks among any mountain range in world. Out of 14 heights peaks in this world, Himalayas holds 9.

### (i) The Greater Himalayas or the Himadri

The Greater Himalayas rise abruptly like a wall north of the Lesser Himalayas. The Greater Himalayas are about 25 km wide. Its average height is about 6,000 m. The Greater Himalayas receive lesser rainfall as compared to the Lesser Himalayas and the Siwaliks. Physical weathering is less effective over the Greater Himalayas as compared to the other ranges. Almost all the lofty peaks of Himalayas are located in this range. The notable ones are Mt. Everest (8,848 m) and Kanchenjunga (8,586 m). Mt.Everest is located in Nepal and Kanchenjunga is located between Nepal and Sikkim. This range is the most continuous of all ranges. It is region of permanent snow cover. So, it has many glaciers. **Gangothri, Yamunothri and Siachen** are some of them.

### (ii) The Lesser Himalayas or The Himachal

It is the middle range of Himalayas. Height of this range varies from 3, 700 to 4,500 m. Its width varies upto 80 km. The major rocks of this range are slate, limestone and quartzite. This region is subjected to extensive erosion due to heavy rainfall, deforestation and urbanization. Pir Panjal, Dhauladhar and Mahabharat are the mountain ranges found in this part. Major hill stations of the Himalayas are located in this range. **Shimla, Mussourie, Nainital, Almora, Ranikhet and Darjeeling** are the familiar ones.




The major passes in the Himalayan are Karakoram pass (Jammu and Kashmir), Zojila pass, Shipkila pass (Himachal Pradesh), Bomdila pass (Arunachal Pradesh), Nathala pass (Sikkim) and Jhelepla pass (Sikkim). The Khyber pass which connects Pakistan and Afanisthan, and Bolan pass in Pakistan are important passes of the Indian subcontinent

### (iii) The Siwaliks or Outer Himalayas

The Siwaliks extend from Jammu and Kashmir to Assam. It is partly made by the debris brought by the Himalayan rivers. The altitude varying between 900-1100 metres elevation of this range is 1300 m. The width of Siwaliks vary from 10 km in the east to 50 km in the west. It is the most discontinuous range.



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch01.indd 87 10-04-2019 09:45:20
290

The longitudinal valleys found between the Siwaliks and the Lesser Himalayas are called Duns in the west and Duars in the east. These are the ideal sites for the development of settlements in this region.

### 3. Purvanchal Hills

These are the eastern off-shoot of Himalayas. It extended in the north-eastern states of India. Most of these hills are located along the border of India and Myanmar while others are inside India. Dafla Hills, Abor Hills, Mishmi Hills, Patkai Bum Hills, Naga Hills, Manipur Hills, Mizo Hills, Tripura Hills, Mikir Hills, Garo Hills, Khasi Hills and Jaintia Hills are the hills which are collectively known as **purvanchal Hills**.

#### Importance of Himalayas

- Himalayas blocks southwest monsoon winds and causes heavy rainfall to north India.
- It forms a natural barrier to the sub-continent.
- It is the source for many perennial rivers like Indus, Ganges, Brahmaputra etc.
- The Northern Mountains are described as the paradise of tourists due to its natural beauty.
- Many hill stations and pilgrim centres like Amarnath, Kedarnath, Badrinath and Vaishnavidevi temples are situated here.
- It provides raw material for many forest based industries.
- It prevents the cold winds blowing from the central Asia and protects India from severe cold.
- Himalayas are renowned for the rich biodiversity.

#### Longitudinal Divisions of Himalayas

1. The Kashmir Punjab Himachal Himalayas- Located between the rivers of Indus and Sutlej.
2. The Kumaun Himalayas- Located between the rivers of Sutlej and Kali.
3. The Central-Nepal Himalayas- Located between the rivers of Kali and Tista.
4. The Assam Eastern Himalayas- Located between rivers of Tista and Dihang.

## 1.2.2 The Great Northern Plains

The fertile land extending across seven north Indian states forms the Great Northern Plains. This extensive plain lies to the south of the northern mountains. This plain is one of the most extensive stretches of the alluvium in the world and is deposited by the rivers Indus, Ganga, Brahmaputra and their tributaries. The length of the plain is about 2,400 km and the width varies from 240 to 320 km. Its width increases from east to west. It covers an area of over 7 lakh sq.km.

The Great Plains of India is remarkably a homogeneous surface with an imperceptible slope. They are formed mostly by the depositional process of the Himalayan and Vindhyan rivers. These rivers deposit enormous quantity of sediments deposited along the foothills and flood plains. The important characteristics featuress of sediment deposition in the plains areas as follows.

### a) The Bhabar Plain

This plain is made up of gravels and unassorted sediments deposited by the Himalayan rivers. The porosity of this plain is so high that most of the small streams flow over this region disappear. It lies to the south of the Siwalik from west to east (Jammu Division to Assam). Its width varies from 8 to 15 km. It is wider in the western plains (Jammu Division) than in the east (Assam). This plain is not suitable for cultivation, only big trees with large roots thrive in this region.

### b) The Tarai Tract

It is a zone of excessive dampness, thick forests and rich wild life. This tract lies to the south of Bhabar plains. The width of this belt is 15-30 km. The Tarai is wider in the eastern parts of the Great Plains, especially in Brahmaputra



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch01.indd 88 10-04-2019 09:45:20

Valley due to heavy rainfall. In many states, the Tarai forests have been cleared for cultivation.

### c) The Bhangar Plains

The Bhangar represent the upland alluvial tracts of the Great Plains of India, formed by the older alluviums. The Bhangar land lies above the flood limits of the rivers. This soil is dark in colour, rich in humus content, well drained and useful for agriculture.

### d) The Khadar Plains

The new alluvium tracts along the courses of the rivers are known as the 'Khadar' or 'Bet' lands. The Khadar tracts are enriched by fresh deposits of silt every year during rainy seasons. The Khadar land consists of sand, silt, clay and mud. It is highly fertile soil.

### e) Delta Plains

The deltaic plain is an extension of the Khadar land. It covers about 1.9 lakh sq.km in the lower reaches of the Ganga River. It is an area of deposition as the river flows in this tract sluggishly. The deltaic plain consists mainly of old mud, new mud and marsh. In the delta region, the uplands are called '**Chars**' while the marshy areas are called '**Bils**'.

## 1.2.3 The Peninsular Plateaus

The plateau region lies to the south of the Great Northern Plains. This is the largest physiographic division of our country. It covers an area of about 16 lakh sq.km (about half of the total area of the country). It is an old rocky plateau region. The topography consists of a series of plateaus and hill ranges interspersed with river valleys.

Aravalli hills mark the north-western boundary of the plateau region. Its northern and north-eastern boundaries are marked by the Bundelkhand upland, Kaimur and Rajmahal hills. The Western Ghats and the Eastern Ghats mark the western and eastern boundaries respectively. The altitude of a large portion of the plateau is more than 600 m from mean sea level. **The peak of Anaimudi is the highest point in the plateau**. Its height is 2,695 m and is located in Anaimalai. The general slope of this plateau is towards east. The Great Plateau

**On the basis of deposition of sediments by various rivers and topographical characteristics, the Northern Plains of India is divided into the following four major regions:**

**a) Rajasthan Plains:** It is located to the west of Aravalli range. It covers an area of about 1,75,000 sq.km. Rajasthan plain is formed by the deposition of the river Luni and the long vanished river Saraswathi. There are several salt lakes in Rajasthan. The Sambhar salt lake (Pushkar Lake) near Jaipur is the prominent one.

**b) Punjab - Haryana Plains:** It lies to the north-east of the Great Indian Desert. This plain is found over an area of about 1.75 lakh sq.km. The Punjab - Haryana plains are formed by the deposition of the rivers Sutlej, Beas and Ravi. This plain acts as water - divide (doab). The two major watershed it divides are Yamuna – Sutlej and Ganga – Yamuna.

**c) Ganga Plains:** It extends from the Yamuna River in the west to Bangladesh in the east. The total area covered by this plain is about 3.75 sq.km. River Ganga and its tributaries such as Ghaghra, Gandak, Kosi, Yamuna, Chambal, Betwa etc. constitute this plain by their sediments and make a great plain in India. It is the largest plain of India. The general slope of the entire plain (upper, middle and lower Ganga plains) is towards east and south-east.

**d) Brahmaputra Plains:** It is located mainly in the state of Assam. It is a low - level plain located in the eastern part of the Great Plains of India and is formed by the deposits of river Brahmaputra. It covers an area of about 56,275 sq.km. These plains create alluvial fans and marshy tracts.



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch01.indd 89 10-04-2019 09:45:20
292

is a part of the Gondwana (very ancient one) land mass. Due to the old age, the rivers in this region attained their base level and developed broad and shallow valleys.

The river Narmada divides the plateau region of India broadly into two parts. The region lying to the north of the Narmada is called the Central Highlands and the region lying to the south of Narmada is called the Deccan Plateau. All the major rivers (Mahanadi, Godavari, Krishna, Kaveri etc.) lying to the south of the Vindhyas flow eastwards and fall into the Bay of Bengal. Narmada and Tapti are the two rivers situated to the south of the Vindhyas flow westward. Their movement towards west is due to the presence of a rift valley in the region.

### a) Central Highlands

The Central Highlands extend between the river Narmada and the Northern Great Plains. The Aravallis form the west and northwestern edge of the Central Highlands. These hills extend from Gujarat, through Rajasthan to Delhi in the northwesterly direction for a distance of about 700 km. The height of these hills is about 1,500 m in southwest while near Delhi the height is hardly 400 m. **Gurushikhar with 1,722 m is the highest peak of this range**.

The Western part of the Central Highland is known as the Malwa Plateau. It lies to the southeast of Aravallis and to the north of Vindhyachal Range. The rivers Chambal, Betwa and Ken drain the Malwa Plateau before they join the river Yamuna. The part of the Central Highlands which extends to the east of Malwa Plateau is known as Bundelkhand and its further extension is known as Bagelkhand. The eastern part of the Central High lands which lies in the north-eastern part of the Indian Plateau is known as Chhota-Nagpur Plateau. It covers much of Jharkhand, adjacent parts of Odisha, West Bengal, Bihar and Chhattisgarh. This region is very rich in mineral resources particularly iron ore and coal.

### b) Deccan Plateau

This physiographic division is the largest part of the plateau region of India. The shape of this plateau is roughly triangular. One of the sides of this triangle is marked by the line joining Kanniyakumari with Rajmahal Hills and this line passes through the Eastern Ghats. The second arm is marked by the Satpura Range, Mahadeo Hills, Maikal Range and the Rajmahal Hills. The third arm is marked by the Western Ghats. The area of this Plateau is about 7 lakh square km and the height ranges from 500 to 1000 m above sea level.

The Western Ghats forms the western edge of the Peninsular Plateau. It runs parallel to the Arabian Sea coast. The northern part of this range is called as Sahyadris. The height of the Sahyadris increases from north to south. Anaimudi is a sort of tri-junction of the Anaimalai Range, the Cardamom Hills and the Palani Hills. Kodaikanal is a beautiful hill resort situated on the Palani Hills. Eastern Ghats run from southwest to northeast form the eastern edge of this Plateau. This range is also called as Poorvadri. The Eastern Ghats join the Western Ghats at the Nilgiri hills, bordering Karnataka and Tamil Nadu. The Eastern Ghats are not continuous like the Western Ghats. The rivers of Mahanadi, Godavari, Krishna, Pennar and Kaveri have dissected this range at many places.

## 1.2.4 The Indian Desert

The Thar desert, also known as the Great Indian desert is a large arid region in the north western part of the Indian subcontinent that covers an area of 2,00,000 $km^2$ and forms a natural boundary between India and pakisthan. It is the world $7^{th}$ largest desert, and world $9^{th}$ largest sub tropical desert located in Western part of the India.

The desert lies in the western part of the aravalli range and covers 2/3 of Rajasthan state. There are two major divisions in the Thar desert. They are known as the Actual



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch01.indd 90 10-04-2019 09:45:20

desert region (Marusthali) and the semi desert region (Bhangar). Many different types of sand dunes and salt lakes (Dhands) are seen here.



**Thar Desert**

### 1.2.5 The Coastal Plains

The Peninsula Plateau of India is flanked by narrow coastal plains of varied width from north to south, known as the Western Coastal Plains and the Eastern Coastal Plains. They were formed by the depositional action of the rivers and the erosional and depositional actions of the sea-waves. The Indian coastal plains are divided into the following two divisions: 1) The Western Coastal Plains and 2) The Eastern Coastal Plains.

#### 1. The Western Coastal Plain

It lies between the Western Ghats and the Arabian Sea. It extends from Rann of kutch in the north to Kanniyakumari in the south and its width varies from 10 to 80 km. It is mainly characterised by sandy beaches, coastal sand dunes, mud flats, lagoons, estuary, laterite platforms and residual hills. The northern part of the West Coastal Plain is known as Konkan Plain. The middle part of this plain is known as Kanara. The southern part of the plain is known as Malabar coast which is about 550 km long and 20-100 km wide. This part of the coast is characterized by sand dunes. Along the coast, there are numerous shallow lagoons and backwaters called **Kayals** and **Teris**. **Vembanad** is a famous back water lake found in this region.

#### 2. The Eastern Coastal Plain

It lies between the Eastern Ghats and the Bay of Bengal and, stretches along the states of West Bengal, Odisha, Andhra Pradesh and Tamil Nadu. These plains are formed by the alluvial fillings of the littoral zone by the east flowing rivers of India. The coastal plain consists mainly of the recent alluvial deposits. This coastal plain has a regular shoreline with well-defined beaches. The coastal plain between Mahanadi and Krishna river is known as the Northern Circars and the southern part lies between Krishna and Kaveri rivers is called Coromandal coast. The **Marina beach** on this coast in Chennai and it is the second longest beach in the world. Among the back water lakes of this coast, lake **Chilka** (Odisha) is the largest lake in India located to the southwest of the Mahanadi delta, the **Kolleru Lake** which lies between the deltas of Godavari and Krishna and the **Pulicat Lake** lies in the border of Andhra Pradesh and Tamil Nadu are the well known lakes in the east coastal plain.

### 1.2.6 The Islands

India has two major island groups namely Andaman and Nicobar and Lakshadweep. The former group consists of 572 islands and are located in Bay of Bengal, and the later one has 27 islands and are located in Arabian Sea. The islands of Andaman and Nicobar are largely tectonic and volcanic origin. India's only active volcano is found on Barren Island in Andaman and Nicobar group of Islands, while the islands of the Arabian Sea are mainly coral origin.

#### a) Andaman and Nicobar Islands



**Andaman Islands**

These islands are located in an elevated portion of the submarine mountains. Since these islands lie close to the equator, the climate remains hot and wet throughout the year and has dense forests. The area of the island group is about 8,249 sq.km. The entire group of islands



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch01.indd 91 10-04-2019 09:45:21
294

is divided into two. They are Andaman in the north and the Nicobar in the south. These island groups are of great strategic importance for the country. Port Blair is the administrative capital of the Andaman and Nicobar islands. The **Ten Degree Channel** separates Andaman from Nicobar group. The southernmost tip, the **Indira Point** is a part of Nicobar Island.

### b) Lakshadweep Islands

This is a small group of coral islands located off the west coast of India. It covers an area of 32 sq. km. Kavaratti is its administrative capital. Lakshadweep islands are separated from the Maldive Islands by the Eight Degree Channel. The uninhabited "**Pitt Island**" of this group has a bird sanctuary. Earlier, it had three divisions namely Laccadive, Minicoy and Amindivi. It was named as Lakshadweep in 1973.

### c) Offshore Islands

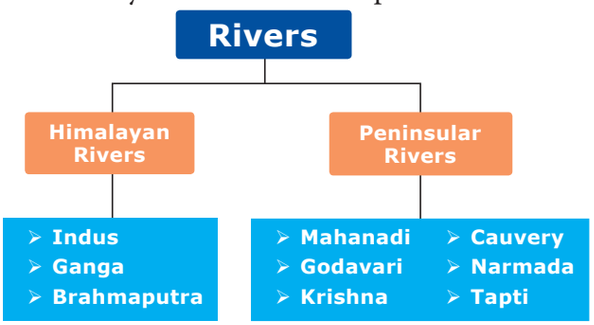
Besides the two group of islands, India has a number of islands along the Western Coast, Eastern Coast, in the delta region of Ganga and in the Gulf of Mannar. Many of these islands are uninhabited and are administered by the adjacent states.

## 1.3 Drainage System of India

A drainage system is an integrated system of tributaries and a trunk stream which collects and drains surface water into the sea, lake or some other body of water. The total area drained by a river and its tributaries is known as a drainage basin. The drainage pattern of an area is the result of the geological structure of the respective areas. The river system provides irrigation, drinking water, navigation, power as well as grant livelihoods for a large number of population. The drainage system of India is broadly divided into two major groups on the basis of their location. They are Himalayan rivers and the Peninsular rivers.

### 1.3.1 Himalayan Rivers

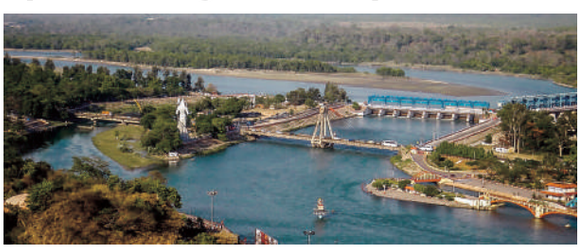
These rivers are found in north India and originate from Himalayas. So, they are also called as Himalayan rivers. These are perennial rivers.




### a) The Indus River System

The Indus River is one of the largest rivers of the world. It originates from the northern slope of the Kailash range in Tibet near Manasarovar Lake at an elevation of about 5,150 m. Its length is about 2,880 km (Only 709 km is in India). The river has a total drainage area extending 11,65,500 sq km in which 321,289 sq km areas are drained in India. The river flows through the Ladakh and Zaskar ranges and creates deep gorges. The river runs through Jammu and Kashmir, turns south near Chillar and enters Pakistan. Its major tributaries are Jhelum, Chenab (Largest tributary of Indus), Ravi, Beas and Sutlej. It enters into with the Arabian Sea.

### b) The Ganga River System



**Ganga River - Haridwar**

The Ganga River system is the largest drainage system of India it extend over and area of 8,61,404 sq km in India. The Ganga plain is the most densely populated place in India and many towns are developed on the banks of this river. The river Ganga originates as Bhagirathi from the Gangotri Glacier in Uttar Khasi District of Uttarkhand state, at an elevation of



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch01.indd 92 10-04-2019 09:45:21

7,010 m. The length of the river Ganga is about 2,525 km. Its major tributaries from the north are Gomti, Gandak, Kosi and Ghaghra and from south, Yamuna (largest tributary of Ganga), Son, Chambal etc. The river Ganga is known as the River Padma in Bangladesh. The combined river of Ganga and Brahmaputra creates the World's largest delta known as Sundarbans in Bangladesh before joining the Bay of Bengal.

### c) The Brahmaputra River System

The river Brahmaputra originates from the Chemayungdung Glacier of the Kailash range to the east of Lake Manasarovar in Tibet at an elevation of about 5,150 m. The total area is about 5,80,000 sq km but the drainage area lying in India is 1,94,413 sq km This river is known as Tsangpo (Purifier) in Tibet. The length of this river is about 2,900 km (900 km in India). It enters into India through a gorge in Arunachal Pradesh namely Dihang. It has many tributaries. Tista, Manas, Barak, Subansiri are some of them. This river is called as Jamuna in Bangladesh. After it joins with the river Ganga in Bangladesh, the river is called as Meghna.

### Characteristics of Himalayan Rivers

- Originate from Himalayas
- Long and wide
- Perennial in nature
- Unsuitable for hydro power generation
- Middle and lower courses are navigable

## 1.3.2 Peninsular Rivers

The rivers in south India are called the Peninsular rivers. Most of these rivers originate from the Western Ghats. These are seasonal rivers (non–perennial). They have a large seasonal fluctuation in volume of water as they are solely fed by rain. These rivers flow in valleys with steep gradients. Based on the direction of flow, the peninsular rivers are divided into the West flowing and East flowing rivers.

## 1.3.3 East Flowing Rivers

### a) Mahanadi

The river Mahanadi originates near Sihawa in Raipur district of Chattisgarh and flows through Odisha. Its length is 851 km. Seonath, Telen, Sandur and Ib are its major tributaries. The main stream of Mahanadi gets divided into several distributaries such as Paika, Birupa, Chitartala, Genguti and Nun. All these distributaries form the Delta of Mahanadi which is one of the largest deltas in India. The Mahanadi empties its water in Bay of Bengal.

### b) Godavari

**Godavari** is the longest river (1,465 km) with an area of 3.13 lakh km$^2$ among the Peninsular rivers. It is also called Vridha Ganga. It originates in Nasik district of Maharashtra, a portion of Western Ghats. It flows through the states of Telangana and Andhra Pradesh before joining Bay of Bengal. Purna, Penganga, Pranitha, Indravati, Tal and Salami are its major tributaries. The river near Rajahmundry gets divided into two Channels called Vasistha and Gautami and forms one of the largest deltas in India. Kolleru, a fresh water lake is located in the deltaic region of the Godavari.

### c) Krishna

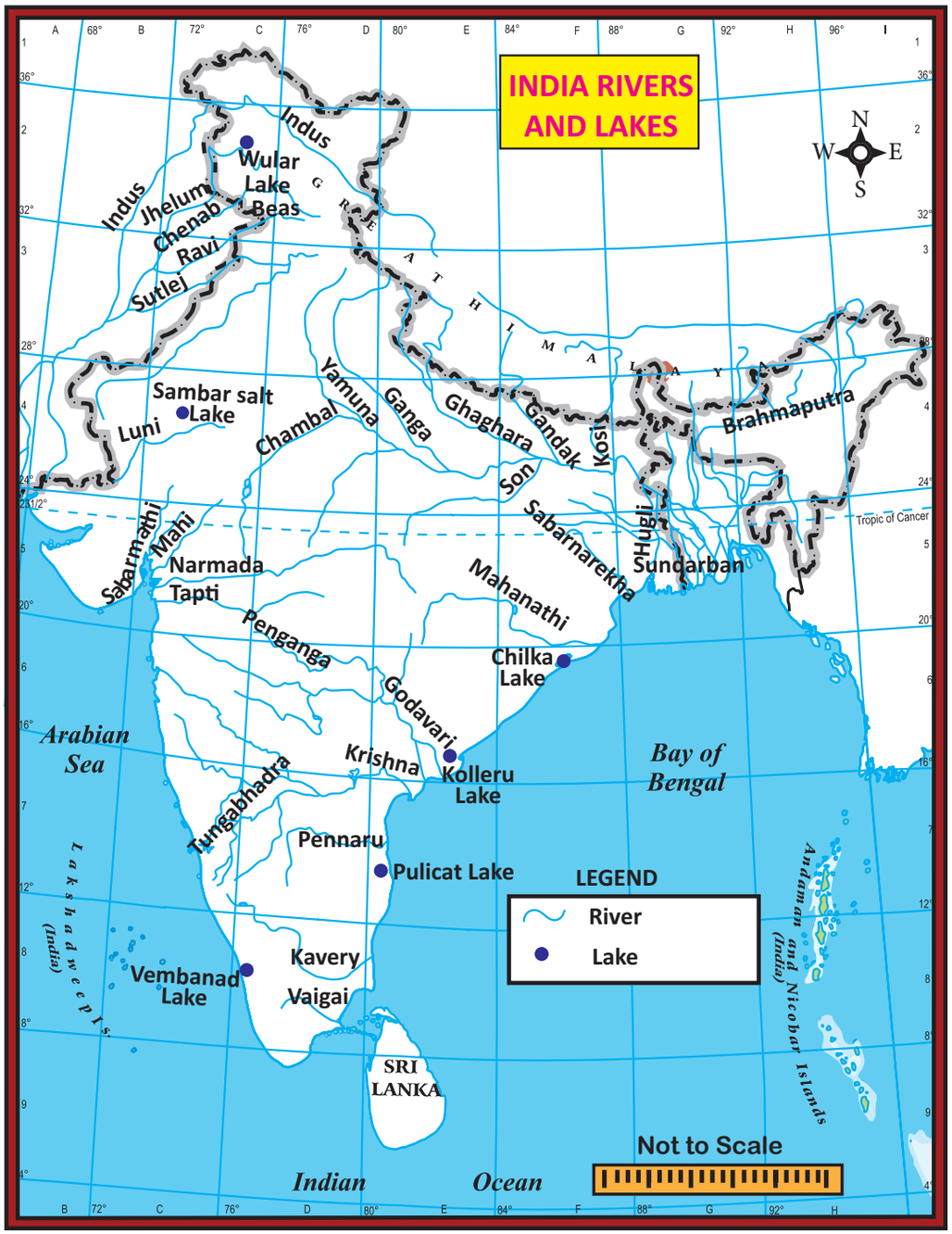
The river Krishna originates from a spring at a place called Mahabaleshwar in the Western Ghats of Maharashtra. Its length is 1,400 km and an area of 2.58 lakh sq km. It is the second longest Peninsular river Bhima, Peddavagu, Musi, Koyna and Thungabhadra are the major tributaries of this river. It also flows through Andhra Pradesh and joins in Bay of Bengal, at Hamasaladeevi.

### d) Kaveri

The river Kaveri originates at Talakaveri, Kudagu hills of Karnataka. Its length is 800 km. The river kaveri is called Dhakshin Ganga or Ganga of south Harangi, Hemavati, Kabini, Bhavani, Arkavathy, Noyyal, Amaravathi etc are the main tributaries of the river Kaveri. In Karnataka the river bifurcates twice, forming



Aatchiyar Kalvi
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the sacred islands of Srirangapatnam and Sivasamudram. While entering Tamil Nadu, the Kaveri continues through a series of twisted wild gorges until it reaches Hogenakkal Falls and flows through a straight, narrow gorge near Salem. The Kaveri breaks at Srirangam Island with two channels, river Coleroon and Kaveri. At last, it empties into the Bay of Bengal at Poompuhar.

### 1.3.4 West Flowing Rivers

#### a) Narmada

This river rises in Amarkantak Plateau in Madhya Pradesh at an elevation of about 1057 m and flows for a distance of about 1,312 km it covers and area of 98,796 sq km and forms 27 km long estuary before outfalling into the Arabian Sea through the Gulf of Cambay. It is the largest among the west flowing rivers of Peninsular India. Its principal tributaries are



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch01.indd 94 10-04-2019 09:45:21

Burhner, Halon, Heran, Banjar, Dudhi, Shakkar, Tawa, Barna and Kolar.

### b) Tapti

The Tapti is one of the major rivers of Peninsular India with the length of about 724 km. It covers an area of 65,145 sq km. Tapti river rises near Multai in the Betul district of Madhya Pradesh at an elevation of about 752 m. It is one of only the three rivers in Peninsular India that run from east to west - the others being the Narmada and the Mahi. The major tributaries are Vaki, Gomai, Arunavati, Aner, Nesu, Buray, Panjhra and Bori. It outfalls into the Arabian Sea through the Gulf of Cambay.




In which river the Gerosappa (jog) fall is found?

## Recap

- India has been physiographically divided into five divisions. They are **Northern Mountains, Northern Great Plains, The Plateau region, Coastal Plains and Islands**.
- Northern Mountains are classified into three divisions as Trans-Himalayas, Himalayas and Eastern Himalayas.
- Northern Great Plains are divided into four as Rajasthan Plains, Punjab-Haryana Plains, Gangetic Plains and Brahmaputra Plains.
- The Plateau region of India has two divisions namely the Central Highlands and the Deccan Plateau.
- Andaman and Nicobar Islands and Lakshadweep are the two major island groups of India.
- The Drainage System of India is classified into the north Indian (Himalayan) and Peninsular rivers.
- The Indus River system, the Ganga River system and the Brahmaputra River system have made the agricultural lands of north India as fertile land. These rivers are perennial in nature.
- Narmada, Tapti, Mahi and Sabarmathi rivers confluence with the Arabian Sea.
- Mahanadi, Godavari, Krishna and Cauvery are the major east flowing rivers and drain into Bay of Bengal.

## A-Z GLOSSARY

**Back waters:** The part of a river which are stagnant and do not reach the sea as they are pushed by the current.

**Distributary:** A branch or outlet which leaves a main river and does not rejoin it, carrying its water to the sea or a lake.

**Doab:** A land between the two converging rivers.

**Estuary:** Mouth of a river where it enters the sea through a single channel with a hollow.

**Perennial Rivers:** The rivers which flow throughout the year and have permanent source of water.

**Pass:** A narrow gap through the mountains providing a route or passage way.

**Peninsula:** The land area covered with ocean on three sides. **Subcontinent:** A large area of a continent that stands distinct from the rest of the continent and possesses almost all the characteristics of a continent.

**Standard Time:** The local time of central meridian of ones country.

**Tributary:** A river or stream which contributes its water to main river.



Aatchiyar Kalvi
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## EXERCISE

### Characteristics of South Indian Rivers

EGWSPV

- Originate from Western Ghats
- Short and narrow
- Non perennial in nature
- Suitable for hydro power generation
- Not useful for navigation

## I. Choose the correct answer

1. The north-south extent of India is
   a. 2,500 km b. 2,933 km
   c. 3,214 km d. 2814 km
2. The Southern most point of India is
   a. Andaman b. Kanniyakumari
   c. Indira Point d. Kavaratti
3. The extent of Himalayas in the east-west is about
   a. 2,500 km b. 2,400 km
   c. 800 km d. 2,200 km
4. _____ River is known as 'Sorrow of Bihar'.
   a. Narmada b. Godavari
   c. Kosi d. Damodar
5. Deccan Plateau covers an area of about _____ sq.km.
   a. 8 lakh b. 6 lakh
   c. 5 lakh d. 7 lakh
6. A landmass bounded by sea on three sides is referred to as _____.
   a. Coast b. Island
   c. Peninsula d. Strait
7. The Palk Strait and Gulf of Mannar separates India from _____
   a. Goa b. West Bengal
   c. Sri Lanka d. Maldives
8. The highest peak in South India is
   a. Ooty b. Kodaikanal
   c. Anaimudi d. Jindhagada
9. _____ Plains are formed by the older alluviums.
   a. Bhabar b. Tarai
   c. Bhangar d. Khadar
10. Pulicat Lake is located between the states of
    a. West Bengal and Odisha
    b. Karnataka and Kerala
    c. Odisha and Andhra Pradesh
    d. Tamil Nadu and Andhra Pradesh

## II. Match the following

| | | |
|---|---|---|
| 1. Tsangpo | — | Tributary of River Ganga |
| 2. Yamuna | — | Highest peak in India |
| 3. New alluvium | — | River Brahmaputra in Tibet |
| 4. Mt. Godwin Austen (K2) | — | Southern part of East Coastal Plain |
| 5. Coromandel Coast | — | Khadhar |

## III. Give Reasons

1. Himalayas are called young fold moutains
2. North Indian Rivers are perennial
3. Chottanagpur Plateau is rich in mineral resources
4. The great Indian desert is called Marusthali
5. The Eastern states are called seven sisters
6. The river Gothavari is often referred as Vridha Ganga.

## IV. Distinguish between the following

1. Himalayan rivers and Peninsular rivers.
2. Western Ghats and Eastern Ghats.
3. Himadri and Himachal.
4. Western Coastal Plains and Eastern Coastal Plains.



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TN_GOVT_X_Std_Geography_Ch01.indd 96 10-04-2019 09:45:22

## V. Answer in brief

1. Name the neighbouring countries of India.
2. Give the importance of IST.
3. Write a short note on Deccan Plateau.
4. State the west following rivers of India.
5. Write a brief note on the island group of Lakshadweep

## VI. Answer in a paragraph

1. Explain the divisions of Northern Mountains and its importance to India.
2. Give an account on the major peninsular rivers of India.
3. Give a detailed account on the basin of the Ganga.

## VII. Map exercises

**Mark the following in the outline map of India**

1. Major mountain ranges – Karakoram, Ladakh, Zaskar, Aravalli, Western Ghats, Eastern Ghats.
2. Major rivers – Indus, Ganga, Brahmaputra, Narmada, Tapti, Mahanadi, Godavari, Krishna & Kaveri.
3. Major plateaus – Malwa, Chotanagpur, Deccan.

## VIII. Activities

1. Observe the Peninsular Plateau map of India and mark the major plateau divisions of India
2. Prepare a table showing the major West flowing and East flowing rivers of peninsular India.
3. Assume that you are travelling from West Bengal to Gujarat along the beautiful coasts of India. Find out the states which you would pass through?
4. Find out the states through which the river Ganga flows.
5. Prepare a table showing the major rivers in India and findout it's tributaries, origin, length and area.

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Unit - 2

# Climate and Natural Vegetation of India



## Learning Objectives

- To describe the factors controlling the climate of India.
- To understand the characteristics of different seasons in India.
- To know about the rainfall distribution.
- To study the different types of natural vegetation and wild life in India.

7NTJBX

## Introduction

We drink more water during summer and do not drink the same amount of water during winter. Why do we wear cotton or lighter clothes during summer season and heavy woollen clothes during cold weather season in north India? Why do not we wear woollen clothes in south India? This is because of the prevalence of varying weather conditions between north and south India. In the previous chapter, you have learnt about the landforms and drainage of our country, which dealt with the natural environment. In this chapter, you will learn about the climate, rainfall distribution, natural vegetation and wildlife of our country.

DO YOU KNOW?

Equable climate is also called as the British climate, Which is neither too hot nor too cold.

## 2.1 The factors affecting the climate

Climate of India is affected by the factors of latitude, distance from the seas, monsoon wind, relief features and jet stream.

### 2.1.1 Latitude

Latitudinally, India lies between 8°4'N and 37°6'N latitudes. The Tropic of cancer divides the country into two equal halves. The area located to the south of Tropic of cancer experiences high temperature and no severe cold season throughout the year whereas, the areas to the north of this parallel enjoys sub-tropical climate. Here, summer temperature may rise above 40°C and it is close to freezing point during winter.

### 2.1.2 Altitude

When the altitude increases, The temperatures decreases. Temperature decreases at the rate of 6.5ºC for every 1000 metres of ascent. It is called **normal lapse rate.**



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TN_GOVT_X_Std_Geography_Ch02.indd 98 10-04-2019 09:46:48

Hence, places in the mountains are cooler than the places on the plains. That is why the places located at higher altitudes even in south India have cool climate. Ooty and several other hill stations of south India and of the Himalayan ranges like Mussourie, Shimla etc., are much cooler than the places located on the Great Plains.




Find out the temperature of Ooty (2240m) if it is 35ºC in Chennai (6.7m)

### 2.1.3 Distance from the Sea

Distance from the sea does not cause only temperature and pressure variations but also affects the amount of rainfall. A large area of India, especially the peninsular region, is not very far from the sea and this entire area has a clear maritime influence on climate. This part of the country does not have a very clearly marked winter and the temperature is equable almost throughout the year. Areas of central and north India experience much seasonal variation in temperature due to the absence of influence of seas. Here, summers are hot and winters are cold. The annual temperature at Kochi does not exceed 30°C as its location is on the coast while it is as high as 40°C at Delhi, since it is located in the interior part. Air near the coast has more moisture and greater potential to produce precipitation. Due to this fact, the amount of rainfall at Kolkata located near the coast is 119 cm and it decreases to just 24 cm at Bikaner which is located in the interior part.

### 2.1.4 Monsoon Wind

The most dominant factor which affects the climate of India is the monsoon winds. These are seasonal reversal winds and India remains in the influence of these winds for a considerable part of a year. Though, the sun's rays are vertical over the central part of India during the mid-June, the summer season ends in India by the end of May. It is because the onset of southwest monsoon brings down the temperature of the entire India and causes moderate to heavy rainfall in many parts of the country. Similarly, the climate of southeast India is also influenced by northeast monsoon.




- Weather refers to the state of atmosphere of a place at a given point of time.
- Climate is the accumulation of daily and seasonal weather events of a given location over a period of 30-35 years.

### 2.1.5 Relief

Relief of India has a great bearing on major elements of climate such as temperature, atmospheric pressure, direction of winds and the amount of rainfall. The Himalayas acts as a barrier to the freezing cold wind blows from central Asia and keep the Indian subcontinent warm. As such the north India experiences tropical climate even during winter. During southwest monsoon, areas on the western slope of the Western Ghats receive heavy rainfall. On the contrary, vast areas of Maharashtra, Karnataka, Telangana, Andhra Pradesh and Tamil nadu lie in rain shadow or leeward side of the Western Ghats receive very little rainfall. During this season, Mangalore, located on the coast gets the rainfall of about 280 cm whereas the Bengaluru located on the leeward side receives only about 50 cm rainfall.

### 2.1.6. Jet Streams

Jet streams are the fast moving winds blowing in a narrow zone in the upper atmosphere. According to the Jet stream theory, the onset of southwest monsoon is driven by the shift of the sub tropical westerly jet from the plains of India towards the Tibetan plateau. The easterly jet streams cause tropical depressions both during southwest monsoon and retreating monsoon.



Aatchiyar Kalvi
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302

## 2.2 Monsoon

The word '**monsoon**' has been derived from the Arabic word '**Mausim**' which means 'season'. Originally, the word 'monsoon' was used by Arab navigators several centuries ago, to describe a system of seasonal reversal of winds along the shores of the Indian Ocean, especially over the Arabian Sea. It blows from the south-west to north-east during summer and from the north-east to south-west during winter.

Monsoons are a complex meteorological phenomenon. Meteorologists have developed a number of concepts about the origin of monsoons. According to the Dynamic concept, Monsoon wind originates due to the seasonal migration of planetary winds and pressure belts following the position of the sun. During summer solstice, the sun's rays fall vertically over the Tropic of cancer. Therefore, all the pressure and wind belts of the globe shift northwards. At this time, **Inter -Tropical Convergence Zone** (ITCZ) also moves northward, and a major part of Indian landmass comes under the influence of southeast trade winds. While crossing equator this wind gets deflected and takes the direction of southwest and becomes south-west monsoon. During the winter season, the pressure and wind belts shift southward, thereby establishing the north-east monsoon (trade winds) over this region. Such systematic change in the direction of planetary winds is known as monsoon.

DO YOU KNOW?

Atacama desert is the driest place on the earth.



### 2.2.1 Seasons

T3D6IE

The meteorologists recognize the four distinct seasons in India. They are;

1. **Winter or cold weather season (January - February).**
2. **Pre Monsoon or summer or hot weather season (March - May).**
3. **Southwest monsoon or rainy season (June - September).**
4. **Northeast monsoon season (October - December).**

### 1. Winter or cold weather season

During this period, the vertical rays of the sun falls over tropic of capricorn which is far away from India. Hence, India receives the slanting sun's rays which results in low temperature. The cold weather season is characterized by clear skies, fine weather, light northerly winds, low humidity and large day time variations of temperature. During this season a high pressure develops over north India and a north-westerly wind blows down the Indus and Ganges valleys. In south India, the general direction of wind is from east to west. The mean temperature increases from north to south, the decrease being sharp as one moves northwards in the north-western part of the country. The mean daily minimum temperatures range from 22°C in the extreme south, to 10°C in the northern plains and 6°C in Punjab. The rain during this season generally occurs over the Western Himalayas, Tamil nadu and Kerala. Western disturbances and associated trough in westerlies are main rain bearing system in northern part of the country. The jet stream plays a dominant role in bringing these disturbances to India. These disturbances cause rainfall in Punjab, Haryana and Himachal Pradesh, and snowfall in the hills of Jammu and Kashmir. This rainfall is very useful for the cultivation of winter wheat.



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## 2. Pre Monsoon or summer or hot weather season

During this season, the vertical rays of the sun falls over the peninsular India. Hence, there is a steady increase in temperature from south to north. It is practically hot and dry in the entire country in the initial part of this season. Weather over the land areas of the country is influenced by thunderstorms associated with rain and sometimes with hail mostly in the middle and later part. During this season, temperature starts increasing all over the country and by April, the interior parts of south India record mean daily temperatures of 30°C–35°C. Central Indian land mass becomes hot with day-time maximum temperature reaching about 40°C at many locations. Many stations in Gujarat, North Maharashtra, Rajasthan and North Madhya Pradesh exhibit high day-time and low night-time temperatures during this season.

Because of the atmospheric pressure conditions, the winds blow from southwest to northeast direction in Arabian Sea and Bay of Bengal. They bring pre monsoon showers to the west coast during the month of May. There are few thunder showers called "**Mango Showers**" which helps in quick ripening of mangoes along the coast of Kerala and Karnataka. "**Norwesters**" or "**Kalbaisakhis**" are the local severe storms or violent thunderstorms associated with strong winds and rain lasting for short durations. It occurs over the eastern and north eastern parts over Bihar, West Bengal and Assam during April and May. They approach the stations from the northwesterly direction.

## 3. Southwest monsoon or Rainy Season

The southwest monsoon is the most significant feature of the Indian climate. The onset of the southwest monsoon takes place normally over the southern tip of the country by the first week of June, advances along the Konkan coast in early June and covers the whole country by 15th July. The monsoon is influenced by global phenomenon like **ElNino**.

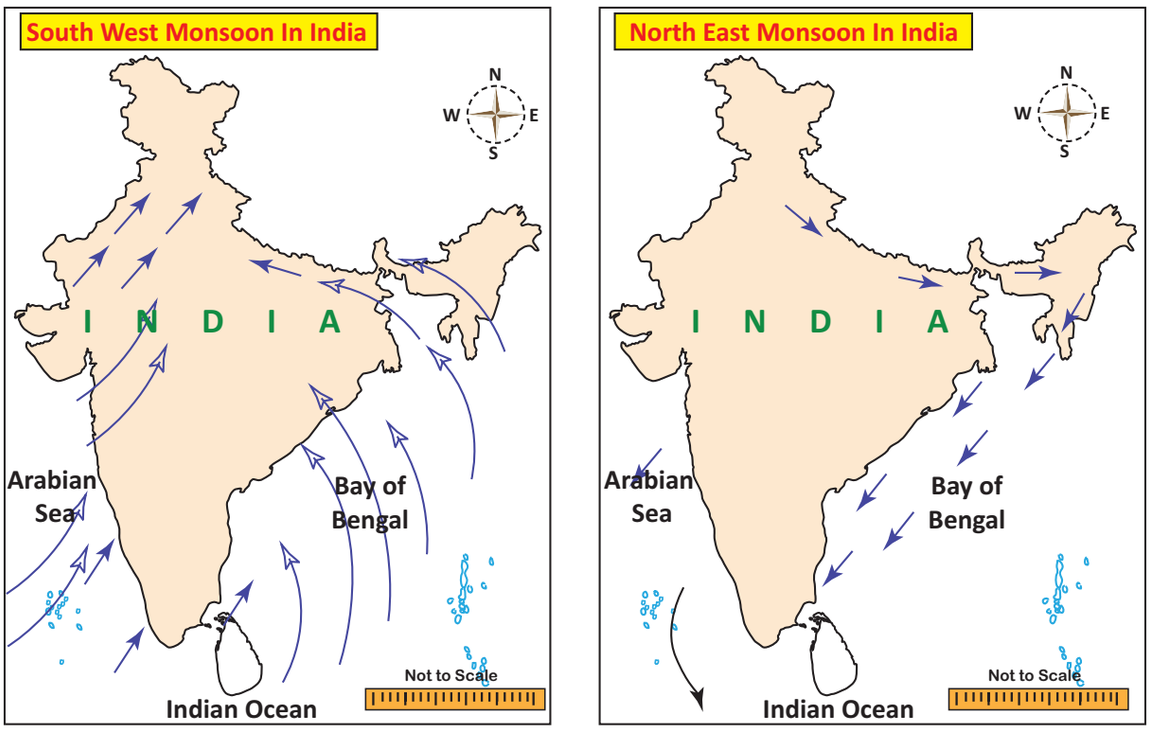
Prior to the onset of the southwest monsoon, the temperature in north India reaches upto 46°C. The sudden approach of monsoon wind over south India with lightning and thunder is termed as the '**break**' or '**burst of monsoon**'. It lowers the temperature of India to a large extent. The monsoon wind strikes against the southern tip of Indian land mass and gets divided into two branches. One branch starts from Arabian sea and the other from Bay of Bengal. The Arabian sea branch of southwest monsoon gives heavy rainfall to the west coast of India as it is located in the windward side of the Western Ghats. The other part which advances towards north is obstructed by Himalayan Mountains and results in heavy rainfall in north. As Aravalli Mountain is located parallel to the wind direction, Rajasthan and western part do not get much rainfall from this branch. The wind from Bay of Bengal branch moves towards northeast India and Myanmar. This wind is trapped by a chain of mountains namely Garo, Khasi and Jaintia are mainly responsible for the heaviest rainfall caused at **Mawsynram** located in Meghalaya. Later on, this wind travel towards west which results in decrease in rainfall from east to west. Over all about **75% of Indian rainfall is received from this monsoon**. Tamil nadu which is located in the leeward side receives only a meagre rainfall.

## 4. Post monsoon or Retreating or Northeast monsoon season

The southwest monsoon begins to retreat from north India by the end of September due to the southward shifting pressure belts. The southwest monsoon wind returns from Indian landmass and blows towards Bay of Bengal. The coriolis force deflects this wind and makes it



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**India Monsoons**

to blow from northeast. Hence, it is known as Northeast monsoon or Post-monsoon season. The season is associated with the establishment of the north-easterly wind system over the Indian subcontinent. Andhra Pradesh, Tamil nadu, Kerala and south interior Karnataka receive good amount of rainfall accounted for 35% of their annual total. Many parts of Tamil nadu and some parts of Andhra Pradesh and Karnataka receive rainfall during this season due to the storms forming in the Bay of Bengal. Large scale losses to life and property occur due to heavy rainfall, strong winds and storm surge in the coastal regions. The day time temperatures start falling sharply all over the country. The mean temperature over north-western parts of the country shows a decline from about 38°C in October to 28°C in November.




Mawsynram, the place which receives highest rainfall (1141 cm) in the world. It is located in Meghalaya.




**Hots**

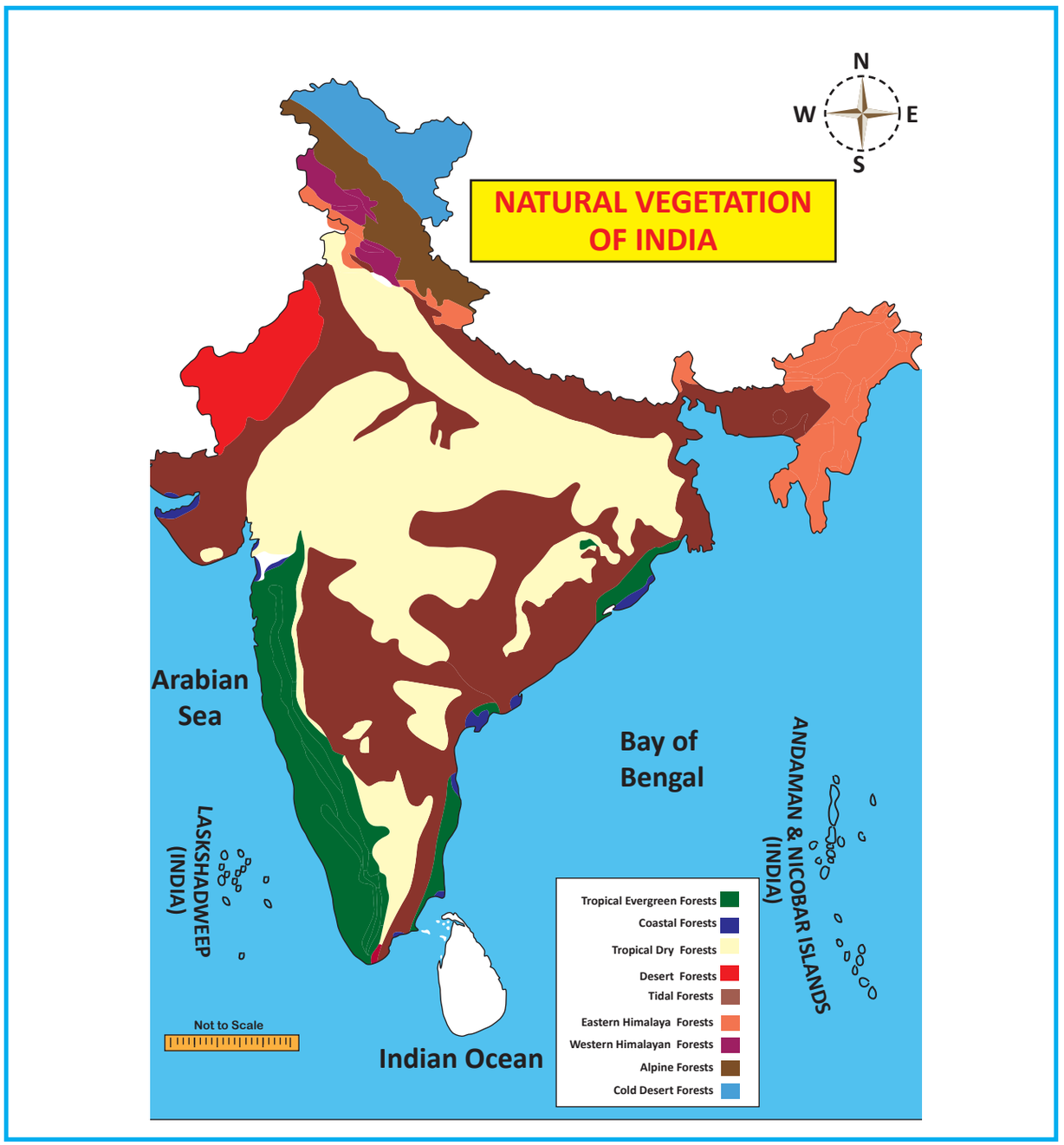
Why is Mawsynram, the wettest place in the world.

## 2.3 Distribution of rainfall

**The average annual rainfall of India is 118 cm**. However, spatial distribution of rainfall in the country is highly uneven. About 11% area receives over 200 cm of annual rainfall, 21% area receives 125 to 200 cm, 37% area receives 75 to 125 cm, 24% area gets 35 to 75 cm and 7% area gets less than 35 cm. The Western coast, Assam, South Meghalaya, Tripura, Nagaland and Arunachal Pradesh are the heavy rainfall areas which get more than 200 cm rainfall. The whole of Rajasthan, Punjab, Haryana, Western and Southwestern parts of Uttar Pradesh, Western Madhya Pradesh, the entire Deccan Trap or Plateau region east of Western Ghats except for a narrow strip along Tamil nadu coast receive a low rainfall of less than 100 cm. The rest of the areas receive a rainfall ranging between 100 and 200 cm.



Aatchiyar Kalvi
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## 2.4 Natural Vegetation

Natural vegetation refers to a plant community unaffected by man either directly or indirectly. It has its existence in certain natural environment. Natural vegetation includes all plant life forms such as trees,

bushes, herbs and forbs etc, that grow naturally in an area and have been left undisturbed by humans for a long time. Climate, soil and landform characteristics are the important environmental controls of natural vegetation.

On the basis of the above factors the natural vegetation of India can be divided into the following types.

### 2.4.1 Tropical Evergreen Forest

These forests are found in areas with 200 cm or more annual rainfall. The annual temperature is about more than 22°C and the average annual humidity exceeds 70 percent in this region. Western Ghats in Maharashtra, Karnataka,



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch02.indd 103 10-04-2019 09:46:49
306

Kerala, Andaman-Nicobar Islands, Assam, West Bengal, Nagaland, Tripura, Mizoram, Manipur and Meghalaya states have this type of forests. The most important trees are rubber, mahogany, ebony, rosewood, coconut, bamboo, cinchona, candes, palm, iron wood and cedar. These have not been fully exploited due to lack of transport facilities.

### 2.4.2 Tropical Deciduous Forest

These are found in the areas with 100 to 200cm. annual rainfall. These are called '**Monsoon Forests**'. The mean annual temperature of this region is about 27°C and the average annual relative humidity is 60 to 70 percent. The trees of these forests drop their leaves during the spring and early summer. (Sub Himalayan - Region from Punjab to Assam, Great Plains- Punjab, Haryana, Uttar Pradesh, Bihar, West Bengal, Central India - Jharkhand, Madhya Pradesh, Chattisgarh, South India - Maharashtra, Karnataka, Telangana, Andhra Pradesh, Tamilnadu and Kerala states are notable for this type of natural vegetation.) Teak and sal are the most important trees. Sandalwood, rosewood, kusum, mahua, palas, haldu, amla, padauk, bamboo and tendu are the other trees of economic importance. These forests also provide fragrant oil, varnish, sandal oil and perfumes.

### 2.4.3 Tropical Dry Forest

These are found in the areas with 50 to 100 cm. annual rainfall. They represent a transitional type of forests. These are found in east Rajasthan, Haryana, Punjab, Western Uttar Pradesh, Madhya Pradesh, Eastern Maharashtra, Telangana, West Karnataka and East Tamilnadu. The important species are mahua, banyan, amaltas, palas, haldu, kikar, bamboo, babool, khair etc.,

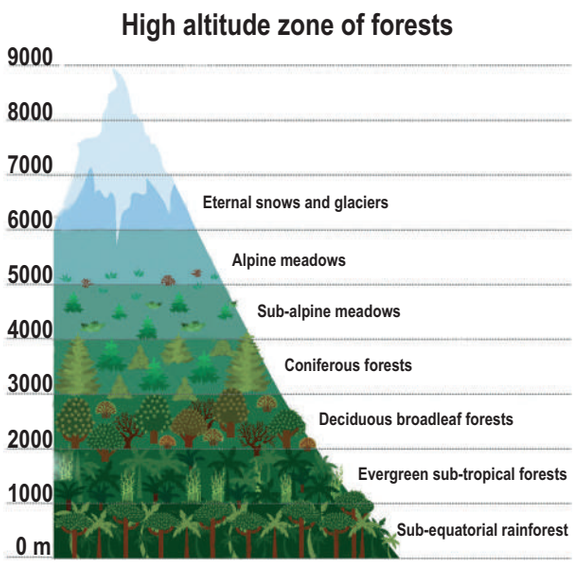
Desert and Semi-desert Vegetation: These are also called as 'Tropical thorn forests'. These are found in the areas having annual rainfall of less than 50 cm. They have low humidity and high temperature. These forests are found in north-west India which includes west Rajasthan, south-west Haryana, north Gujarat and south-west Punjab. They are also found in the very dry parts of the Deccan plateau in Karnataka, Maharashtra and Andhra Pradesh. Babul, kikar and wild palms are common trees found here.

### 2.4.4 Mountain or Montane Forest

These forests are classified on the basis of altitude and amount of rainfall. Accordingly two different types of forests namely Eastern Himalayas Forests and Western Himalayas Forests.

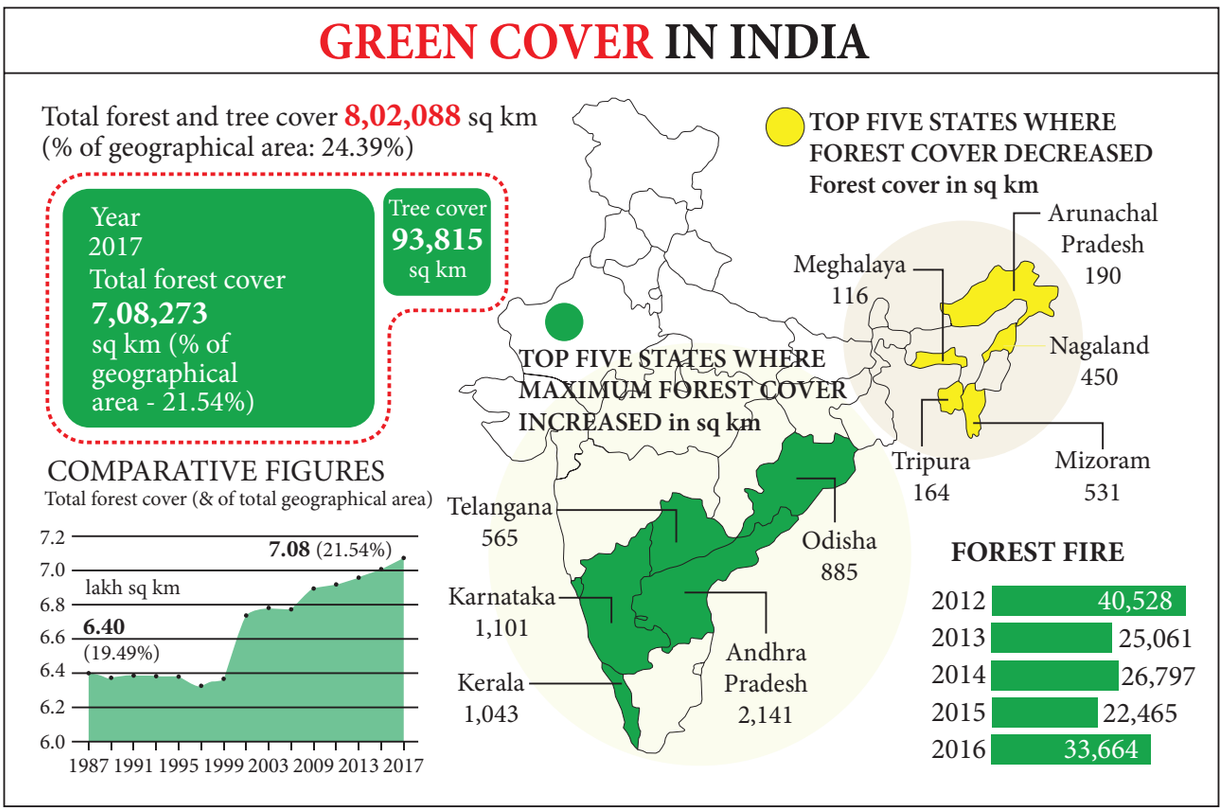
i. **Eastern Himalayan Forest:** These are found on the slopes of the mountains in north-east states. These forests receive rainfall of more than 200 cm. The vegetation is of evergreen type. The Altitude between 1200-2400 m found in this type of forest sal, oak, laurel, amura, chestnut, cinnamon are the main trees from 1200 to 2400 m altitude oak, birch, silver, fir, fine, spruce and juniper are the major trees from 2400 to 3600 m height.

(ii) **Western Himalayan Forest:** The rainfall of this region is moderate. These forests are found in the states of Jammu and Kashmir, Himachal Pradesh and Uttarakhand. Upto 900 m altitude semi desert vegetation is found and it is known for bushes and small trees. In altitude from 900 to 1800 m, chir tree is the most common tree. The other important trees of this region are sal, semal, dhak, jamun and jujube. (height






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from 1800 to 3000 m is covered with semi temperate coniferous forests.) Chir, deodar, blue pine, poplar, birch and elder are the main trees of this region.

### 2.4.5 Alpine Forest

It occurs all along the Himalayas with above 2400 m altitude. These are purely having coniferous trees. Oak, silver fir, pine and juniper are the main trees of these forests. The eastern parts of Himalayas has large extent of these forests.

### 2.4.6 Tidal Forest

These forests occur in and around the deltas, estuaries and creeks prone to tidal influences and as such are also known as delta or swamp forests. The delta of the Ganga-Brahmaputra has the largest tidal forest. The deltas of Mahanadi, Godavari and Krishna rivers are also known for **tidal forests**. These are also known as **mangrove forest**.

### 2.4.7 Coastal Forest

These are littoral forests. Generally, coastal areas have these types of forests. Casurina, palm and coconut are the dominant trees. Both the eastern and western coasts have this type of forests. The coasts of Kerala and Goa are known for this type.

### 2.4.8 Riverine Forest

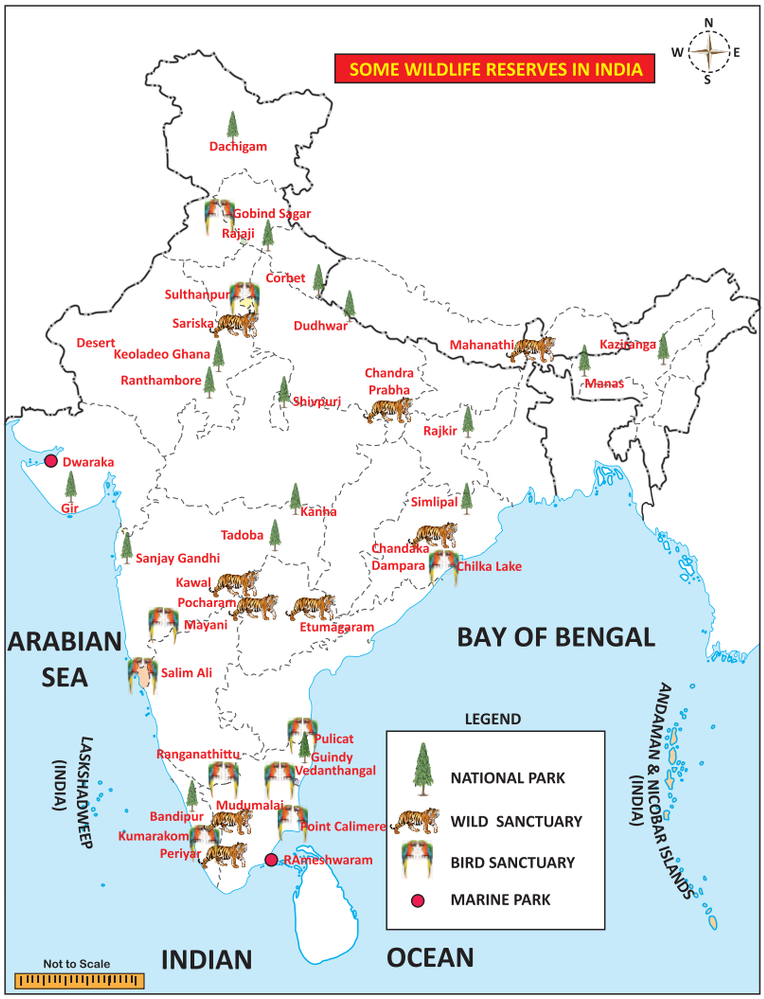
These forests are found along the rivers on Khadar areas. These are known for tamarisk and tamarind trees. The rivers of Great Plains are more prominent for this type of natural vegetation.

## 2.5 Wildlife

The term '**Wildlife**' includes animals of any habitat in nature. Wild animals are non-domesticated animals and include both vertebrates (fish, amphibians, reptiles, birds and mammals) and invertebrates (bees, butterflies, moths etc.). India has a rich and diversified wildlife. The Indian fauna consists of about 81,251 species of animals out of the world's total of about 1.5 million species. The faunal diversity of the country consists of about 6500 invertebrates, 5000 molluscs, 2546 fishes, 1228 birds, 458 mammals, 446 reptiles, 204 amphibians, 4 panthers and about 60,000 species of insects.



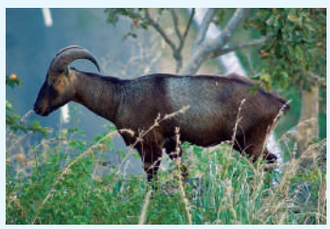
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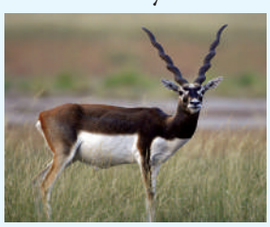


The Nilgiri Tahr is facing a major threat in the Western Ghats. Continuous poaching activities and Eucalyptus cultivation hampering its habitat, the Nilgiri Tahr population is continuously decreasing.






The Black Buck is the state animal of Andhra Pradesh, Haryana and Punjab.



Our country is home to tigers, lions, leopards, snow leopards, pythons, wolves, foxes, bears, crocodiles, rhinoceroses, camels, wild dogs, monkeys, snakes, antelope species, deer species, varieties of bison and the mighty Asian elephant. Hunting, poaching, deforestation and other anthropogenic interferences in the natural habitats have caused extinction of some species and many are facing the danger of extinction. In view of this and the role of wild life in maintaining ecological balance, conservation and management of biodiversity of India is necessary at present situation.

The **Indian Board for Wildlife** (IBWL) was constituted in 1952 to suggest means of protection, conservation and management of wildlife to the government. The Government of India enacted Wildlife (Protection) Act in 1972 with the objective of effectively protecting the wild life of the country and to control poaching, smuggling and illegal trade in wildlife and its diversities. United Nations **Convention on Biological Diversity** (CBD) in 1992 recognizes the sovereign rights of states to use their own Biological Resources.

To preserve the country's rich and diverse wildlife a network of **102 National Parks** and about **515 Wildlife Sanctuaries** across the country have been created.

## 2.5 Biosphere Reserves

Biosphere reserves are protected areas of land coastal environments wherein people are an integral component of the system.



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TN_GOVT_X_Std_Geography_Ch02.indd 106 10-04-2019 09:46:52




The Indian government has established **18 Biosphere Reserves** in India which protect larger areas of natural habitat and often include one or more National Parks preserves along with buffer zones that are open to some economic uses.

Eleven of the eighteen biosphere reserves (Gulf of Mannar, Nandadevi, the Nilgiris, Nokrek, Pachmarhi, Simlipal, Sundarbans Agasthiyamalai, Great Nicobar, Kanjanjunga and Amarkantak) of India fall under the list of Man and Biosphere programme of UNESCO.



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TN_GOVT_X_Std_Geography_Ch02.indd 107 10-04-2019 11:19:32

| S. No. | Biosphere Reserves | State |
|---|---|---|
| 1 | Achanakmar-Amarkantak | Madhya Pradesh, Chattisgarh |
| 2 | Agasthyamalai | Kerala |
| 3 | Dibru Saikhowa | Assam |
| 4 | Dihang Dibang | Arunachal Pradesh |
| 5 | Great Nicobar | Andaman and Nicobar Islands |
| 6 | Gulf of Mannar | Tamil nadu |
| 7 | Kachch | Gujarat |
| 8 | Kanchenjunga | Sikkim |
| 9 | Manas | Assam |
| 10 | Nanda Devi | Uttarakhand |
| 11 | The Nilgiris | Tamil nadu |
| 12 | Nokrek | Meghalaya |
| 13 | Pachmarhi | Madhya Pradesh |
| 14 | Simlipal | Odisha |
| 15 | Sundarbans | West Bengal |
| 16 | Cold desert | Himachal Pradesh |
| 17 | Sesahachalam hills | Andhra Pradesh |
| 18 | Panna | Madhya Pradesh |




Project Tiger was launched in April 1973 with the aim to conserve tiger population in specifically constituted "Tiger Reserves" in India.

This project is benefited tremendously, with an increase of over 60% - the 1979 consensus put the population at 3,015 - while other equally disturbed species like the barasingha (swamp deer), rhino and elephants also fought back from the brink of oblivion.



## Recap

- Climate of India is labelled as "Tropical Monsoon Type".
- There are four seasons in India. They are winter season, hot weather, southwest monsoon, and northeast monsoon.
- Prior to the onset of the southwest monsoon, the temperature in north India reaches upto 46°C. The sudden approach of monsoon wind over south India with lightning and thunder is termed as – 'the break' or 'burst of monsoon'.
- Natural vegetation refers to a plant community unaffected by man either directly or indirectly.
- Natural vegetation can be classified as tropical evergreen forests, tropical deciduous forests, tropical dry forests, desert and semi desert vegetation, mountain forests, Alpine forests, Tidal forests, etc.,
- Biosphere reserves are protected areas of land coastal environment whereby people are an integral component of a system.

## A-Z GLOSSARY

**Climate:** The weather conditions prevailing in an area in general or over a long period.

**Meteorology:** The branch of science concerned with the processes and phenomena of the atmosphere, especially as a means of forecasting the weather.

**Season:** Each of the four divisions of the year (spring, summer, autumn, and winter) marked by particular weather patterns and daylight hou.

**Weather:** The state of the atmosphere at a particular place and time as regards heat, cloudiness, dryness, sunshine, wind, rain, etc.

**Wildlife:** Wild animals collectively; the native fauna (and sometimes flora) of a region.



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TN_GOVT_X_Std_Geography_Ch02.indd 108 10-04-2019 09:46:53

## EXERCISE

### I. Choose the correct answer.

LA9X5G

1. Meteorology is the science of _____.
   a) Weather
   b) social
   c) political
   d) human

2. We wear cotton during _____.
   a) Summer b) Winter
   c) Rainy d) Northeast monsoon

3. Western disturbances cause rainfall in _____.
   a) Tamilnadu b) Kerala
   c) Punjab d) Madhya Pradesh

4. _____ helps in quick ripening of mangoes along the coast of Kerala and Karnataka.
   a) Loo b) Norwester
   c) Mangoshowers d) Jetstream

5. _____ is a line joining the places of equal rainfall.
   a) Isohyets b) Isobar
   c) Isotherm d) Latitudes

6. Climate of India is labelled as _____.
   a) Tropical humid
   b) Equatorial climate
   c) Tropical monsoon climate
   d) Temperate climate

7. The monsoon forests are otherwise called as _____.
   a) Tropical evergreen forest
   b) Deciduous forest
   c) Mangrove forest
   d) Mountain forest

8. _____ forests are found above 2400m Himalayas.
   a) Deciduous forests
   b) Alpine forests
   c) Mangrove forests
   d) Tidal forests

9. Sesahachalam hills, a Biosphere reserve is situated in _____.
   a) Tamilnadu b) Andhra Pradesh
   c) Madhya Pradesh d) Karnataka

10. _____ is a part of the world network biosphere reserves of UNESCO
    A) Nilgiri b) Agasthiyamalai
    c) Great Nicobar d) Kachch

### II. Match the following.

| | | | |
|---|---|---|---|
| 1. | Project Elephant | — | Desert and semi desert vegetation |
| 2. | Biodiversity hotspot | — | October-December |
| 3. | North east monsoon | — | Littoral forest |
| 4. | Tropical thorn forests | — | Protect the elephants |
| 5. | Coastal forests | — | The Himalayas |

### III. Consider the given statements and choose the correct option from the given below ones.

1. **Assertion(A):** Monsoons are a complex meteorological phenomenon

   **Reason(R):**Meteorologists have developed a number of concepts about the origin of monsoons.
   a) Both (A) and (B) are true: R explains A
   b) Both (A) and (B) are true: R does not explain A
   c) (A) is correct (R) is false
   d) (A) is false (R) is true



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2. **Assertion(A):** The Himalayas acts as a climatic barrier.

   **Reason(R):** The Himalayas prevents cold winds from central Asia and keep the Indian Sub-continent warm.(Give option for this questions)

   a) Both (A) and (B) are true: R explains A
   b) Both (A) and (B) are true: R does not explain A
   c) (A) is correct (R) is false
   d) (A) is false (R) is true

## IV. Choose the inappropriate answer.

1. Tidal forests are found in and around____.
   (a) Desert
   (b) The deltas of Ganga and Brahmaputra
   (c) The delta of Godavari
   (d) The delta of Mahanadhi
2. Climate of India is affected by_____.
   (a) Latitudinal extent
   (b) Altitude
   (c) Distance from the sea
   (d) Soil

## V. Answer briefly.

1. Define 'Meteorology'.
2. What is meant by 'normal lapse rate'?
3. What are 'jet streams'?
4. Write a short note on 'Monsoon wind'.
5. Name the four distinct seasons of India.
6. What is 'burst of monsoon'?
7. Name the areas which receive heavy rainfall.
8. State places of mangrove forest in India.
9. Name the trees of tropical evergreen forest.
10. Write any five biosphere reserves in India.
11. What is 'Project Tiger'?

## VI. Distinguish between.

1. Weather and climate
2. Tropical evergreen forest and deciduous forest.
3. North east monsoon and South west monsoon.

## VII. Give reasons for the following topics.

1. Western coastal plain is narrow.
2. India has a tropical monsoon climate.
3. Mountains are cooler than the plains.

## VIII. Write in detail.

1. Write about southwest monsoon.
2. Describe the forests of India.
3. Write the names of biosphere reserves and their location in India.

## IX. Map.

**Mark the following on the outline map of India.**

1. Direction of south west monsoon wind.
2. Direction of north east monsoon wind.
3. Areas of heavy rainfall.
4. Mountain forests.
5. Panna biosphere reserve
6. Agasthiyamalai biosphere reserve

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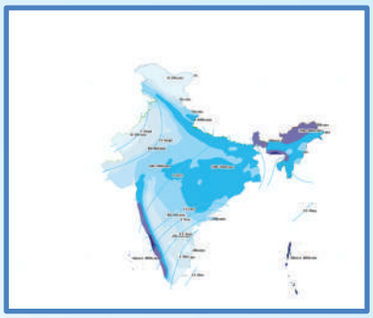

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# ICT CORNER

## Unit-2 CLIMATE AND NATURAL VEGETATION OF INDIA

Visit **school Bhuvan?**

School Bhuvan visualizes natural resources, environment and their sustainable development in India.



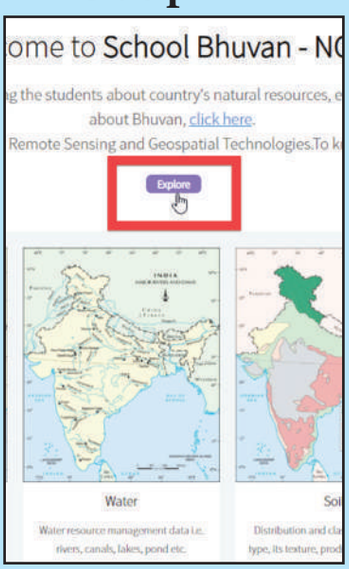
## Steps

- Open the Browser and type the URL given below (or) Scan the QR Code.
- Scroll Down and click on 'Explore'
- Click on 'Climate' in left side menuandSelect 'Annual Rainfall'

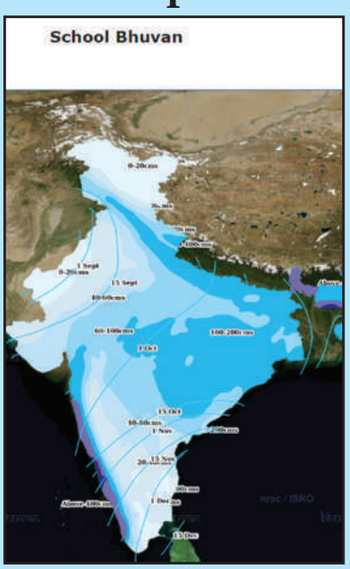
**Step -1**




**Step -2**




**Step -3**




**Website URL:**

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Unit - 3

# Components of Agriculture



## Learning Objectives

- To understand the nature of India's soil types and their distribution.
- To know about the importance of irrigation and multi-purpose projects in India.
- To study about the agriculture, its types and importance.
- To understand the livestock and fishing resources of India
- To comprehend the problems of farming in India.

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## Introduction

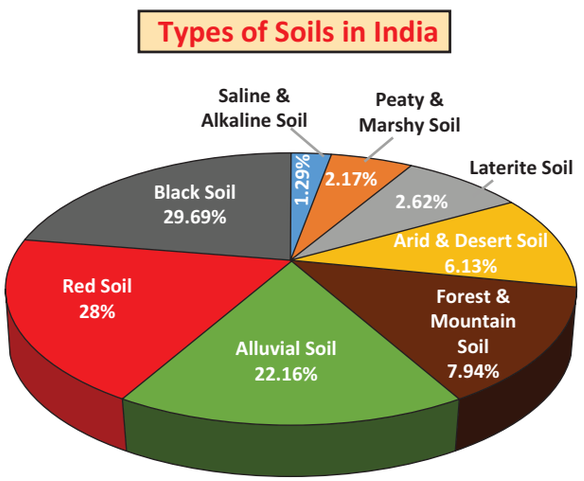
Soil is one of the most important natural resources. India's varied natural environments resulted in a great variety of soils compared to any other country of similar size in the world. The rich, deep and fertile soils support high density of population through agricultural prosperity.

## 3.1 Soils

Soil is the uppermost layer of the land surface, usually composed of minerals, organic matter, living organisms, air and water. Grains in the soil are of three categories namely, clay, silt, and sand. Soils are generally formed by the weathering of rocks under different conditions. Some soils are formed by the deposition of agents of denudation. Soils can vary greatly from one region to the other.

### 3.1.1 Types of Soils

The Indian Council of Agriculture Research (ICAR) set up in 1953 divides the soils of India into the following eight major groups.






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| Soil Type | Characteristics | Distribution | Crops growing |
|---|---|---|---|
| **Alluvial soil** | **Khadar** – light coloured, more siliceous.<br>**Bhangar** – the older alluvium composed of lime nodules and has clayey composition. It is dark in colour.<br>**Formation** - sediments deposited by streams and rivers when they slowly loose<br>**Chemical properties** - rich in potash, phosphoric acid, lime and carbon compounds but poor in nitrogen<br>**Nature** –Sandy-loam-silt-clay<br>profile shows no marked differentiation | Ganga and Brahmaputra river valleys; Plains of Uttar Pradesh, Uttaranchal, Punjab, Haryana, West Bengal and Bihar | Rice,<br>Wheat,<br>Sugarcane and<br>Oilseeds |
| **Black soils** | **Formation** - Derived from basalts of Deccan trap.<br>**Colour** - black colour, due to presence of titanium, iron.<br>**Chemical properties** - Consist of calcium and magnesium arbonates, high quantities of iron, aluminium, lime and magnesia.<br>Rich in potash lime, Aluminium calcium and magnesium poor in Nitrogen Phosphoric acid and humus<br>**Nature** - Sticky when wet<br>High degree of moisture retentivity | Maharashtra and Malwa plateaus, Kathiawar peninsula, Telangana and Rayalaseema region of Andhra Pradesh and northern part of Karnataka | Cotton, Millets, Tobacco and Sugarcane |
| **Red soils** | **Formation** - decomposition of ancient crystalline rocks like granites and gneisses and from rock type<br>**Chemical properties** - rich in minerals such as iron and magnesium.<br>Deficient in nitrogen, humus, phosphoric acid and lime.<br>**Nature** - Light texture, porous friable presence of limited soluble salts Clay fraction of the red soils generally consists of Kaolinitic minerals. | Eastern parts of Deccan plateau, southern states of Kerala, Tamil Nadu, Karnataka and Chota Nagpur plateau (Jharkhand) | Wheat, Rice, Cotton, Sugarcane and Pulses |
| **Laterite soils** | **Formation** - formed in the regions where alternate wet and hot dry conditions prevail. It is formed by the process of leaching<br>**Chemical properties** - Composed mainly of hydrated oxides of iron and aluminium,<br>**Nature** - More acidic on higher areas poor in high level, cannot retain moisture while plains they consist of heavy loam and clay and easily retain moisture | Assam hills, hill summits of Kerala and Karnataka and eastern Ghats and region of Odisha | Coffee, Rubber, Cashew nut and Tapioca |



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TN_GOVT_X_Std_Geography_Ch03.indd 113 10-04-2019 09:49:15

| Soil Type | Characteristics | Distribution | Crops growing |
|---|---|---|---|
| **Forest and mountain soils** | Differ from region to region depending on climate.<br>**Formation** - due to mechanical weathering caused by snow, rain, temperature variation<br>**Chemical properties** - are deficient in potash, Phosphorus and lime.<br>**Nature** - light, sandy, thin and found with the pieces of rock. Their character changes with the parent rocks. Very rich in humus. slow decomposition makes it acidic | Coniferous forest belts of Jammu and Kashmir, Himachal Pradesh, Uttarakhand and Sikkim. Eastern and Western Ghats | Coffee, tea, rice, maize, potato, barley, tropical fruits and various types of spices |
| **Arid and desert soils** | **Formation** - Due to prevalence of the dry climate, hightemperature and accelerated evaporation, the soil is dry, it also lacks humus content due to the absence of vegetative cover<br>**Chemical properties** - Contain high percentages of soluble salts, alkaline with varying degree of calcium carbonate and are poor in organic matter; rich enough in phosphate though poor in nitrogen<br>**Nature** - light in colour, low humus,friable structure, low in moisture | Rajasthan, Northern Gujarat and southern Punjab | millets,<br>barley, cotton, maize and pulses<br>(with irrigation) |
| **Saline and alkaline soils** | **Formation** - formed due to ill drainage which causes water logging, injurious salts are transferred from subsurface to the top soil by the capillary action, it causes the salinisation of soils<br>**Chemical properties** - liberate sodium, magnesium and calcium salts and sulphurous acid<br>**Nature** - Consists of un decomposed rock and mineral fragments which on weathering | Andhra Pradesh and Karnataka. In the drier parts of Bihar, Uttar Pradesh, Haryana, Punjab, Rajasthan and Maharashtra | |
| **Peaty and marshy soils** | **Formation** - formed in humid regions from the organic matter. It is found in the areas of heavy rainfall and high humidity Peaty soils are black, heavyand highly acidic.<br>**Chemical properties** - deficient in potash and phosphate. Contain considerable amount of soluble salts and 10-40 per cent of organic matter; and high proportion of vegetable matter.<br>**Nature** - Contain considerable amount of Soluble salts and 10-40 per cent of organic matter; and high proportion of vegetable matter. | Kottayam and Alappuzha districts of Kerala; and coastal areas of Odisha and Tamil Nadu, Sundarbans of West Bengal, in Bihar and Almora district of Uttarakhand | Paddy, jute |

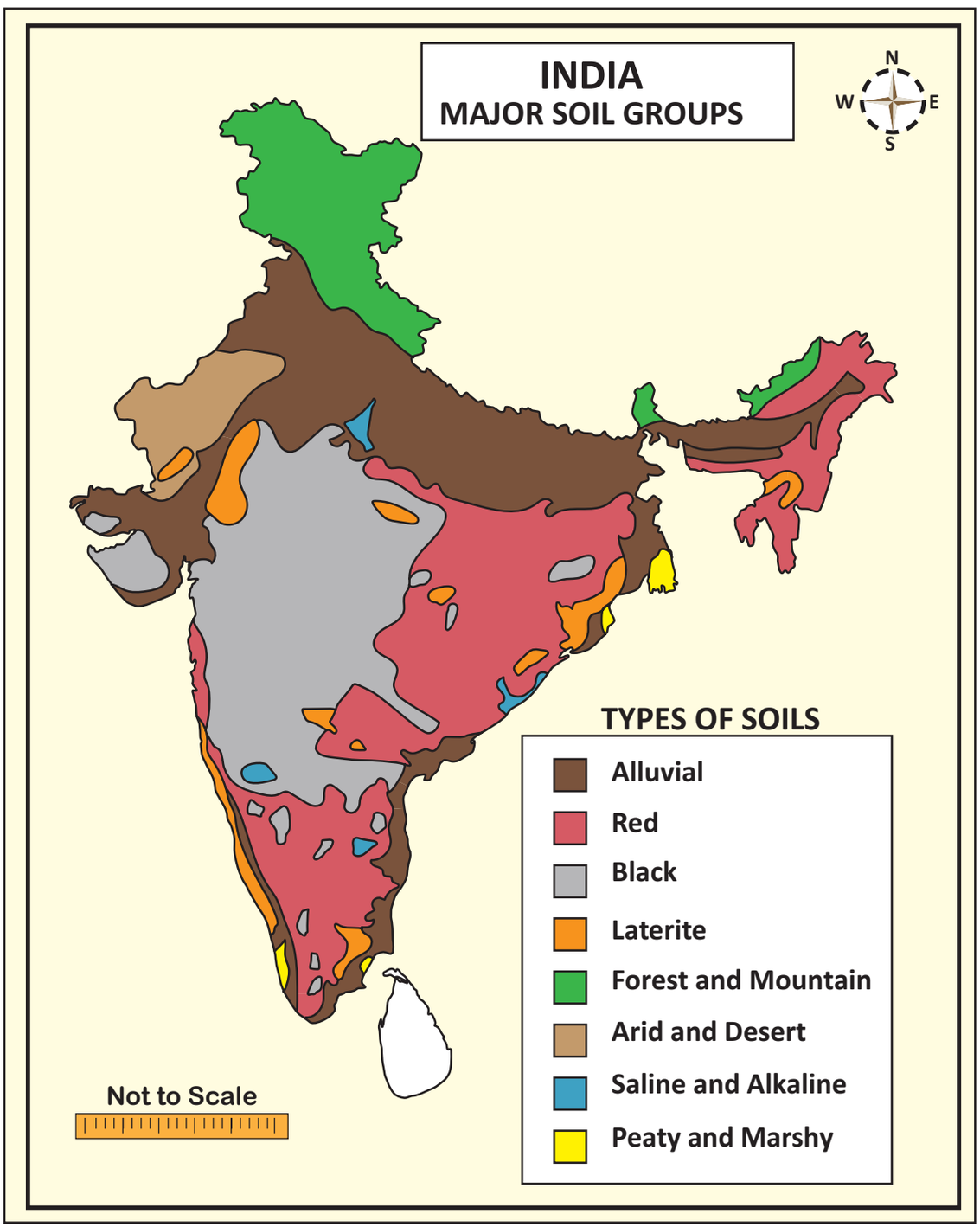


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## Activity

Soil Texture (sand, silt, clay) influence on some properties of soils including water holding capacity. Find out water holding capacity of soils which given above based on following table.

| Property/behaviour | sand | silt | clay |
|---|---|---|---|
| Water holding capacity | low | Medium to high | high |






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## Soil degradation

Soil degradation is an acute problem in India. According to a 2015 report of the Indian institute of remote sensing (IIRS). The estimated the amount of soil .erosion that occurred in India was 147 million hectares.

The main problems of the Indian soils are i) soil erosion (sheet erosion, Rill erosion, Gully erosion, Ravine and Badland) ii) Degradation of Soil, iii) Water-logging, iv) Saline and Alkaline, and v) Salt Flats, types of soils are different erotion.

## Methods of Conservation and Management of Soil

1. **Afforestation**
2. **Constructing Dams and Barrages**
3. **Prevention of Overgrazing**
4. **Improved methods of Agricultural practices**
   - **Contour method**
   - **Rotation of crops**
   - **Contour bunding**
   - **Strip cropping**
   - **Planting of shelter belts**
   - **Adopting the techniques of sustainable agriculture are different conservation methods for better soil management.**



# 3.2 Irrigation

Watering of agricultural plants through artificial means is called irrigation. Being a hot country with seasonal and irregular rainfall, it always needs irrigation to carry out agricultural activities during dry period. Beside erratic rainfall, prevalence of high temperature, cultivation of annual crops and hydrophytes, commercial farming and porous soil make irrigation an essential one for the agriculture of our country.

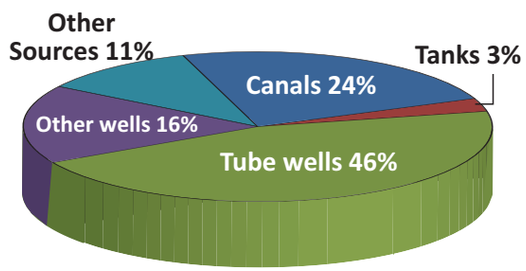
## 3.2.1 Sources of Irrigation

In India, different sources of irrigation are used depending upon the topography, soils, rainfall, availability of surface or groundwater, nature of river (whether perennial or non-perennial), requirements of crops etc. The main sources of irrigation used in different parts of the country are

- Canal irrigation
- Well irrigation and
- Tank irrigation

### a) Canal Irrigation

It is the second most important source of irrigation in our country. Percentage of area under canal irrigation in our country is 24% (source:Statistical year book 2017 during 2013-2014)




**Area under Irrigation**

Canals are the effective source of irrigation in areas of low level relief, deep, fertile soils, perennial source of water and extensive command area. The canals are of two types:

1. **Inundation Canals:** In this, water is taken out directly from the rivers without making any kind of barrage or dam. Such canals are useful for the diversion of flood water from the rivers and remain operational during rainy season.
2. **Perennial Canals:** These are developed from perennial rivers by constructing barrage to regulate the flow of water. In our country, most of the canals fall under this category. These canals are useful for irrigation.



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In India the total area under canal irrigation is about 15.8 million hectares in 2014. About 60 percent of the canal irrigated area falls in the northern plains of India, particularly in Uttar Pradesh, Punjab, Haryana, Rajasthan, and Bihar. In south and central India, Andhra Pradesh, Maharashtra, Karnataka, Madhya Pradesh, Chattisgarh, Odisha, and Tamil Nadu are the important states where canal irrigation is found.

## b) Well Irrigation

A well is a hole or trough, usually vertical, excavated in the earth for bringing groundwater to the surface. Well irrigation is the most important source of irrigation as it contributes about 62 percent of net irrigated area in India. It is a cheap, dependable, and popular source of irrigation in the country. Well irrigation is unavoidable in the region of low rainfall and becomes an essential one where the canals and tank irrigation are not available. Wells are of two types: i) Open wells and ii) Tube wells




As per the Irrigation – Statistical Year Book India – 2017, the following states are the top five with respect to the percentage of areas under well irrigation during 2013-14.

| Sl. No. | Name of the State | Area in % |
|---|---|---|
| 1. | Uttar Pradesh | 26.6 |
| 2. | Madhya Pradesh | 14.6 |
| 3. | Rajasthan | 13.1 |
| 4. | Gujarat | 7.8 |
| 5. | Punjab | 7.1 |

**Source:** Irrigation-Statistical Year Book of India – 2017

1. **Open Wells:** This type of irrigation is widely practiced in the areas where groundwater is sufficiently available. The areas are in Ganga Plains, the deltaic region of Mahanadi, Godavari, Krishna, Cauvery and parts of Narmada and Tapti valleys.
2. **Tube Wells:** Tube wells are developed in the areas of low water table, sufficient power supply and soft subsurface geological units. Tube wells are predominant in the states of Gujarat, Maharashtra, Punjab, Madhya Pradesh and Tamil Nadu.

## c) Tank Irrigation

A tank is a natural or man-made hollow on the surface developed by constructing a small bund around it across a stream. It is used to collect and store water for irrigation and other purposes. Irrigation by tanks is a very old system in India. It also includes irrigation from lakes and ponds.

The tank irrigation is popular in the peninsular India due to the following reasons:

- The undulating relief and hard rocks make difficult to dig canals and wells.
- Natural depressions serve as reservoirs.
- Absence of perennial rivers.
- Impermeable rock structure which do not permit percolation.
- The scattered nature of population and agricultural fields

The following table shows the **five leading states in tank irrigation**:

| Sl. No. | Name of the State | Area in Lakh Hectares (2013-14) |
|---|---|---|
| 1. | Tamil Nadu | 3.78 |
| 2. | Andhra Pradesh | 3.40 |
| 3. | Madhya Pradesh | 2.64 |
| 4. | Telangana | 2.30 |
| 5. | Karnataka | 1.54 |

**Source:** Irrigation – Statistical Year Book India – 2017



Aatchiyar Kalvi
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## Modern irrigation methods

There are many ways in Modern Irrigation among them mostly practiced and following in India are using drips, sprinklers and poly houses central pivot irrigation

Drip System is used to watering like drops at near the roots of plant. It will cover a tiny area at plant, but suitable for big trees and horticulture plants too which used to grow bigger

**Rain Gun:** Rain gun used to spread water like rain as in name and used to serve for crops which used to grow upto 4 feets or high also but we have to adjust sprinklers height as per crop size. typical usage of Rain guns are in sugarcane, maize crops.



**Pivot irrigation**

**Center-pivot irrigation** (sometimes called **central pivot irrigation**), also called **water-wheel** and **circle irrigation**, is a method of crop irrigation in which equipment rotates around a pivot and crops are watered with sprinklers

## 3.2.2 Multipurpose River Valley Projects

It is a scientific management of water resources in our country. Construction of dam across rivers is aimed at many purposes. Hence,

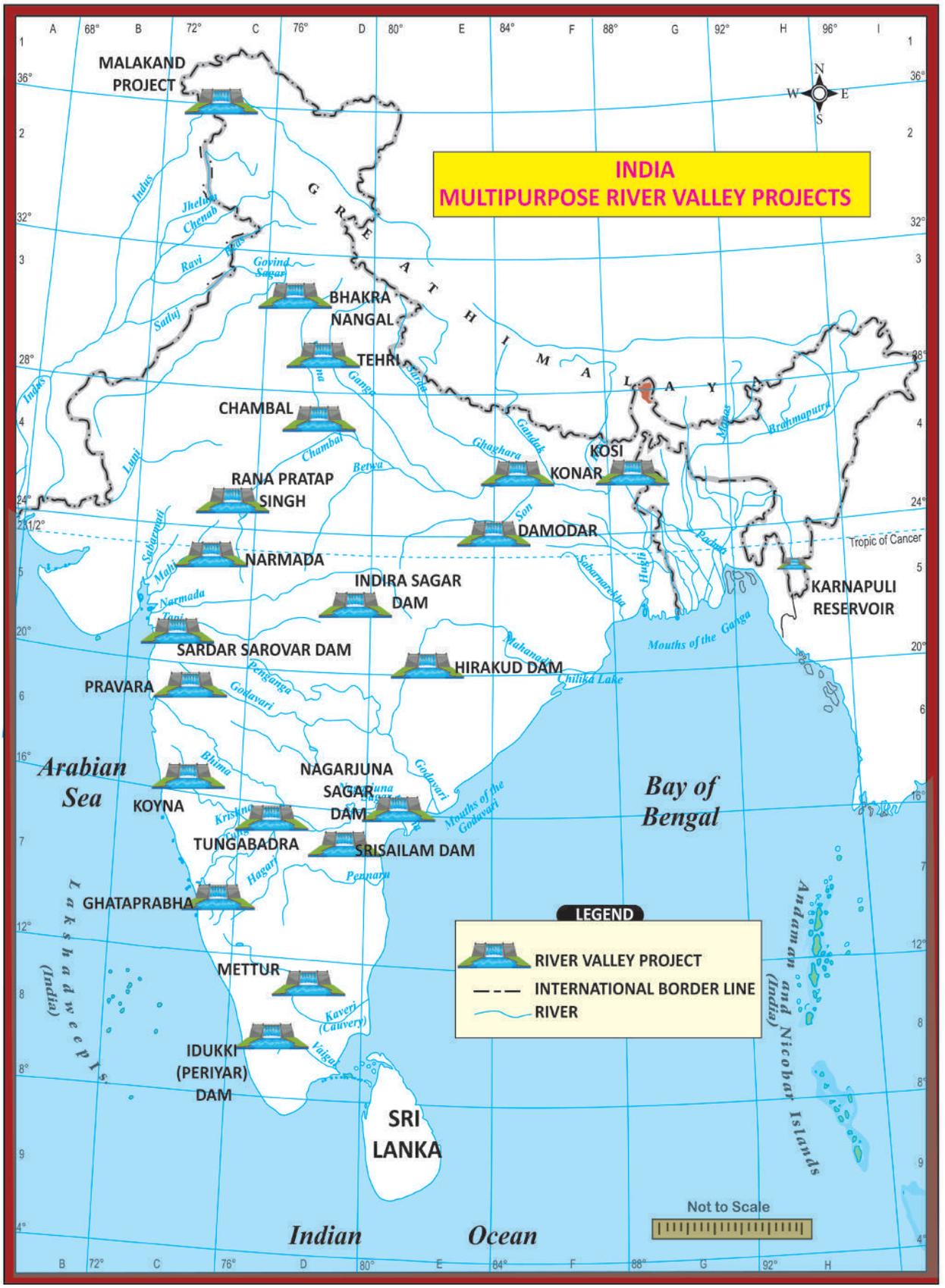
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| Name of projects | River | Benefit States | Irrigation (sq km) | Hydropower (Megawatts) |
|---|---|---|---|---|
| Damodar Valley project | Damodar | Jharkhand, West Bengal | 5,150 | .260 |
| Bhakra-Nangal Project (highest gravity dam in the world) | Sutlej | Punjab, Haryana and Rajasthan | 52,609 | 1,500 |
| Hirakud Project (longest dam in the world) | Mahanadi | Orissa | 1,41,600 | 347.5 |
| Kosi Project | Kosi '(Sorrow of Bihar'.) | Bihar & Nepal | 8,750 | 19.2 |
| Tungabhadra Project | Tungabhadra | Andhra Pradesh and Karnataka | 1,968 | 35. |
| Tehri Dam: | Bhagirathi | Uttarakhand | 6000 | 1,000 MW |
| Chambal Valley Project | Chambal | Rajasthan and Madhya Pradesh | - | - |
| Nagarjuna Sagar Project | Krishna | Andhra Pradesh | | |
| Sardar Sarover Project | Narmada | Madhya Pradesh, Maharashtra, Rajasthan | 18,450 | 250 |
| Indira Gandhi Canal Project | Satlaj | Rajasthan, Punjab and Haryana | - | - |
| Mettur Dam | Kaveri | Tamil Nadu | - | 40 |



Aatchiyar Kalvi
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Aatchiyar Kalvi
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322

it is termed as multi-purpose river valley projects. The various purposes of a dam serves are irrigation, hydro power generation, water supply for drinking and industrial purpose, controlling floods, development of fisheries, navigation etc. Generally, majority of multipurpose projects are combination of irrigation and hydro-power which are the major aims of the projects.

## 3.3 Agriculture

Agriculture is the process of producing food for people, fodder for cattle, fiber and many other desired products by the cultivation of certain plants and the raising of domesticated animals (livestock). Though India is industrially a fast developing nation, still the agriculture in India employs more than 50 percent of the population of the country and accounts for about 25 percent of the national income.

### 3.3.1 Determinants of Agriculture

Agriculture in India is determined by a set of factors. Some of the important factors:

1. Physical factors: relief, climate and soil.
2. Institutional factors: Size of farm holdings, land tenure, and land reforms.
3. Infrastructural factors: Irrigation, power, transport, credit, market, insurance and storage facilities.
4. Technological factors: High yielding varieties of seeds, chemical fertilisers, insecticides and machinery.

### 3.3.2 Types of Farming

Owing to variations in the physical environment and culture, a variety of farming practices and cultivation systems have evolved in different parts of India.

#### a) Subsistence Farming

A considerable proportion of farmers in the country practice subsistence farming. In this, agricultural land holding is small. As the farmers are poor, they can't apply the modern inputs which cost more. They grow crops with the help of family members and consumes almost the entire farm produce with little surplus to sell in the market. Preference is given to food crops. In addition to the food crops, sugarcane, oilseeds, cotton, jute and tobacco are also cultivated. Traditional farming method results in low productivity. In Punjab, some parts of Rajasthan, Uttar Pradesh and Madhya Pradesh subsistence farming is practiced.

#### b) Shifting Agriculture

This type of agriculture is performed by tribal people in a piece of forest land after clearing the trees through felling and burning the trunks and branches. Once the land is cleared, crops are grown for two to three years and the land will get abandoned as the fertility of the soil decreases. The farmers then move to new areas and the process will be repeated. They cultivate some grains and vegetable crops using the manual labour. It is also called as "Slash and burn" cultivation.

**Different names of shifting agriculture in different regions in India**

| Name | Place |
|---|---|
| Jhum | Assam |
| Poonam | Kerela |
| Podu | Andhra Pradesh, Odisha |
| Beewar, Mashan, Penda, Beera | Various Parts of Madhya Pradesh |

#### c) Intensive Farming

Intensive farming is an agricultural intensification and mechanization system that aims to maximize yields from available land through various means, such as heavy use of pesticides and chemical fertilizers. This intensification and mechanization has also been applied to the raising of livestock with billions of animals, such as cows, pigs and chickens, being held indoors. They have become known as factory farms. Intensive farming is practiced in Punjab, parts of Rajasthan, Uttar Pradesh, and Madhya Pradesh in India.



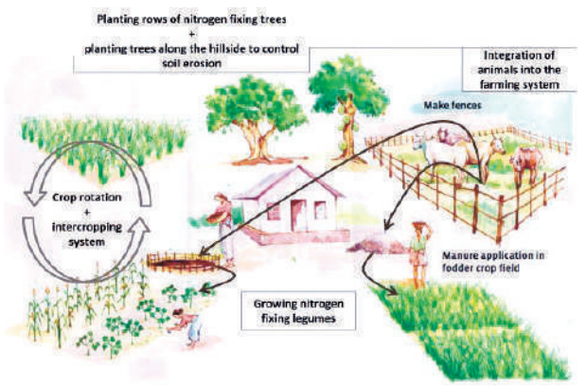
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## d) Dry Farming

This type of farming is practiced in arid areas where irrigation facilities are lacking. Crops cultivated in these areas can withstand dry conditions. The crops grown generally with the help of irrigation are also grown under dry farming. In such circumstances, the yields are generally low. Most of the areas under dry cultivation entertain only one crop per year. This is practiced in drier parts of Rajasthan, Gujarat, Madhya Pradesh etc.

## e) Mixed Farming Agriculture

Mixed farming is defined as a system of farm which includes crop production, raising livestock, poultry, fisheries, bee keeping etc. to sustain and satisfy as many needs of the farmer as possible.




**Mixed Farming Agriculture**




**PER DROP MORE CROP:** (Improving water use efficiency) - Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)

The Government of India has been implementing Centrally Sponsored Scheme on Micro Irrigation with the objective to enhance water use efficiency in the agriculture sector by promoting appropriate technological interventions like drip & sprinkler irrigation technologies and encourage the farmers to use water saving and conservation technologies.

The following are the five leading states which account for 78% of the total progress under Micro Irrigation scheme: 1. Andhra Pradesh, 2. Karnataka, 3. Gujarat, 4. Maharashtra, and 5. Tamil Nadu.

## f) Terrace Cultivation

This type of cultivation is practiced specially in hilly areas, where lands are of sloping nature. The hill and mountain slopes are cut to form terraces and the land is used in the same way as in permanent agriculture. Since the availability of flat land is limited, terraces are made to provide small patches of level land. Soil erosion is also checked

**Cropping Seasons in India**

| Cropping Seasons | Major crops cultivated | |
|---|---|---|
| | Northern States | Southern States |
| **Kharif Season** June–September | Rice, Cotton, Bajra, Maize, Jowar, Tur | Rice, Ragi, Maize, Jowar, Groundnut |
| **Rabi Season** October–March | Wheat, Gram, Rapeseeds, Mustard, Barley | Rice, Maize, Ragi, Groundnut, Jowar |
| **Zaid Season** April–June | Vegetables, Fruits, Fodder | Rice, Vegetables, Fodder |



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch03.indd 121 10-04-2019 09:49:18

due to terrace formation on hill slopes. In our country, terrace cultivation takes place in the states of Punjab, Meghalaya, Haryana, Uttar Pradesh, Himachal Pradesh, and Uttrakhand.



**Terrace Cultivation**

## 3.4 Major Crops Cultivated in India

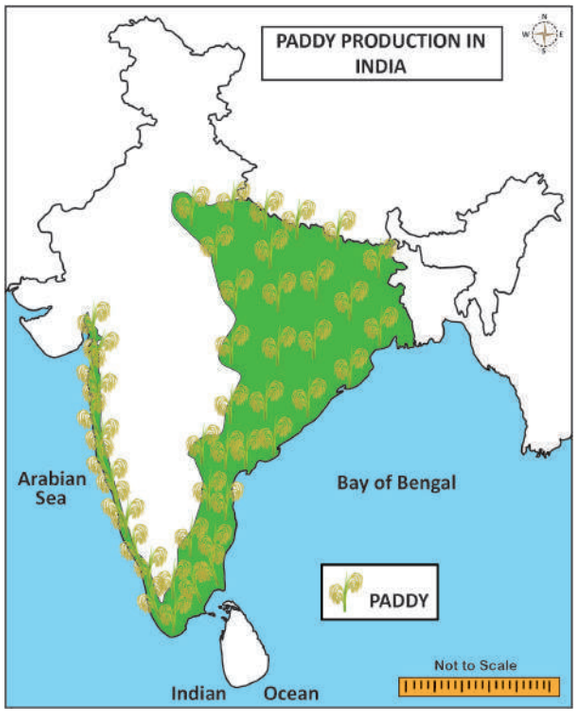
The major crops of India are divided into four major categories as follows:

1. Food crops (wheat, maize, rice, millets, pulses etc.).
2. Cash crops (sugarcane, tobacco, cotton, jute, oilseeds etc.).
3. Plantation crops (tea, coffee and rubber).
4. Horticulture crops (fruits, flowers and vegetables).

### 1. Food Crops

Due to its large population, Indian agriculture is largely dominated by the food crops. Food crops include cereals and pulses, amongst which rice, wheat, jowar, bajra, maize, barley, ragi, gram and tur are important.

**Rice:** Rice is an indigenous crop. India is the second largest producer of rice in the world after China. It is mainly a tropical crop, growing mainly with mean temperatures of 24°C and annual rainfall of 150 cm. Deep fertile clayey or loamy soils are suited well for rice cultivation. It also needs abundant supply of cheap labour. Rice in India is sown in three ways: i) Broadcasting, ii) Ploughing or drilling, and iii) Transplanting. Due to increased use of High Yielding Variety (HYV) seeds (CR Dhan 205, AR Dhan 306, CRR 451 etc.), many of the indigenous varieties were disappeared. In 2016, the first 10 leading rice producing states are West Bengal (First in India) Uttar Pradesh, Punjab, Tamil Nadu, Andhra Pradesh, Bihar, Chhattisgarh, Odisha, Assam, and Haryana.






**Paddy Cultivation**

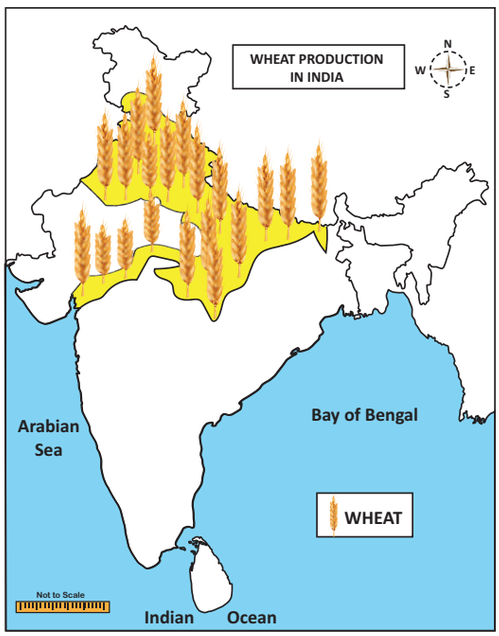
**Wheat:** Wheat is the second most important food crop of the country, after rice. It accounts for 22 percent of the total area and 34 percent of the total production of food grains in the country. It requires 10-15°C at the time of sowing and 20-25°C at the time of ripening of grains.

Over 85% of the India's wheat production comes from 5 states namely Uttar Pradesh,



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TN_GOVT_X_Std_Geography_Ch03.indd 122 10-04-2019 09:49:18

Punjab, Haryana, Rajasthan and Madhya Pradesh. Apart from these regions, the black soil tract of the Deccan covering parts of Maharashtra and Gujarat also contribute a major wheat production.




**Jowar:** Jowar is the third important food crop of our country. It is an indigenous plant of Africa. The plant has a tendency to grow in adverse climatic conditions. Its grains are rich in carbohydrates, protein, minerals, and vitamins. Hence, it provides cheap food to the large section of the poor population. It is also used as fodder in many parts of the country. Jowar is essentially a crop of the Peninsular India. Maharashtra, Karnataka, and Madhya Pradesh are the leading producers of Jowar.

**Bajra:** Bajra is an indigenous plant of Africa. This forms the staple food for poor people. Its stalks are used as fodder for cattle and for thatching purposes. Bajra is a crop of dry region. Rajasthan is the largest producer of bajra followed by Uttar Pradesh, Haryana, Gujarat and Maharashtra.

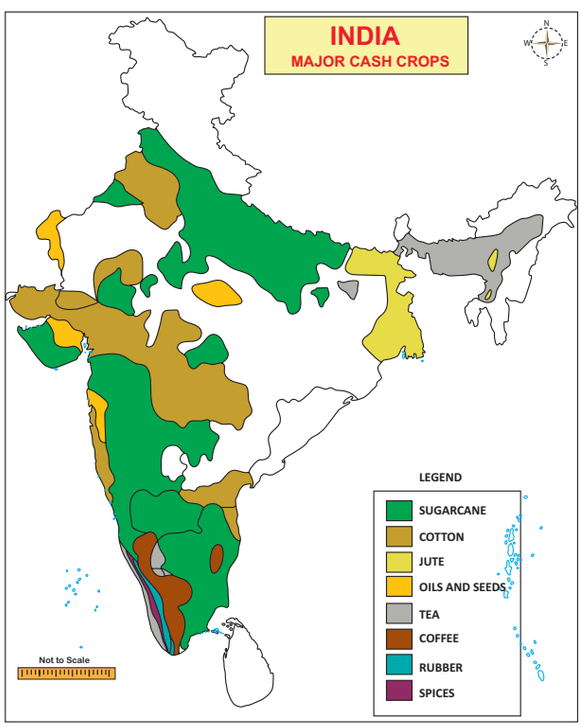
**Barley:** Barley is one of the important cereals of our country. Besides, being poor man's diet, it is used for making barley water, beer and whiskey. Rajasthan and Uttar Pradesh are the two leading producers of Barley.

**Pulses:** Pulses include a large number of crops which are mostly leguminous and rich in vegetable protein. They are used as human food and feeding cattle. They fix atmospheric nitrogen in the soil and hence are usually rotated with other crops. India is the largest producer of pulses. The major pulse growing areas are Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra and Andhra Pradesh.

## 2. Cash Crops

The crops which are cultivated for commercial purpose are called cash crops. These crops include sugarcane, tobacco, fibre crops (cotton, jute, and mesta) and oilseeds.

**Sugarcane:** Sugarcane is the most important cash crop of India and is the second largest producer in the world. This crop provides raw material for the sugar industry which is the second largest industrial category of our country. Besides providing sugar, gur and khandsari, it supplies molasses for alcohol industry and bagasse for paper industry. India is ranked third in sugar production in the world after Cuba and Brazil. At the state level, Uttar Pradesh is the leading producer of sugarcane followed by Maharashtra, Karnataka, Tamil Nadu and Gujarat.




**India - Cash crops**



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch03.indd 123 10-04-2019 09:49:18

**Cotton:** Cotton is the most important cash crop of India. It provides raw material to the largest industry of India. India ranks second next to China in the production of cotton.

About 79% of the total area and production in the country were contributed by four states viz., Gujarat, Maharashtra, Andhra Pradesh and Punjab.

**Jute:** It is a tropical fibre crops, grows well in the alluvial soil. It provides raw material for Jute industry. It is used for manufacturing of gunny bags, carpets, hessian, ropes and strings, rugs, clothes, tarpaulins, upholstery etc. West Bengal is the leading state both in cultivation and production of jute. The other cultivators of jute are Bihar, Assam and Meghalaya.

**Oil Seeds:** Oil seeds, the premier source of fat in the Indian diet are derived from number of crops like groundnut, rapeseed, mustard, sesame, linseed, sunflower, castor seed, cotton seed, niger seed etc. These provide oil and oilcake which are used for making lubricants, varnish, medicine, perfume, candles, soaps, manure and cattle feed. Gujarat is India's largest oilseeds producing state. Other major producer of oilseeds are followed by Rajasthan Madhya Pradesh, Maharashtra and Andhra Pradesh. In groundnut production, India is the second largest producer in the world after China.

## 3. Plantation Crops

Plantation crops are cultivated for the purpose of exports. These are cultivated in large estates on hilly slopes. Cultivation near the coast is preferable as it facilitates exports. Tea, coffee, rubber and spices are the major plantation crops of India.

**Tea:** Tea is an evergreen plant that mainly grows in tropical and subtropical climates. Tea is a labour intensive and grows faster under light shade. Tea plants require high rainfall but its root cannot tolerate water logging. Two major varieties of tea are cultivated in India. They are i) **Bohea** originated from China and ii) **Assamica** from India. A number of hybrid varieties have been developed by mixing these two. India is the second largest producer of tea after China in the world. Assam is the larger producer of tea in India. Other states are Tamil Nadu, Kerala and West Bengal.

**Coffee:** Coffee is grown in shade and it grows effectively in the altitudes between 1,000 and 1,500 m above mean sea level. There are two main varieties of coffee. They are i) **Arabica** (High quality-cultivated more in India) and ii) **Robusta** (Inferior quality).

India is the 7th largest producer of coffee globally. Karnataka is the leading producer of coffee in India. It produces 71% in India, and 2.5 % in the world (source; coffee board of India-2018).

**Rubber:** Rubber plantation were first established in Kerala in 1902. It needs hot and wet climatic conditions (temperature above 20°C and rainfall above 300cm). Most of the land under rubber belongs to small land holders. The major rubber growing areas are Tamil Nadu, Kerala, Karnataka and Andaman and Nicobar Islands.

**Spices:** India has been world famous for its spices since ancient times. These spices mostly used for flavouring or tampering cooked food and for preparing medicines, dyes etc. Pepper, chillies, turmeric, ginger, cardamom, clove and areca nut are the major spices cultivated in India. Kerala is the leading producer of spices in India.

## 4. Horticulture Crops

It refers to the cultivation of fruits, flowers and vegetables. Fruits and vegetables are important supplement to the human diet, as they provide essential minerals, vitamins, and fibres required for maintaining health. India is in the second position in the production of fruits and vegetables. Apple is mostly produced in Himachal Pradesh, Jammu and Kashmir and Uttarakhand. Production of banana is concentrated in Tamil Nadu and Maharashtra. Orange is cultivated in Maharashtra, Uttarakhand, Himachal Pradesh, Jammu and



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TN_GOVT_X_Std_Geography_Ch03.indd 124 10-04-2019 09:49:19
327

Kashmir, Tamil Nadu and Karnataka. Grape is cultivated mainly in Uttarakhand, Himachal Pradesh, Jammu and Kashmir, Maharashtra, Andhra Pradesh, Tamil Nadu and Karnataka. India contributes about 13% of the world's production of vegetables.

## 3.5 Livestock

Livestock is an integral component of the farming system in India. The livestock sector is socially and economically very significant due to its multi-functional outputs and contribution to socio-cultural security. It also helps to improve food and nutritional security by providing nutrient-rich food products, generate income and employment and act as a cushion against crop failure, provide draught power and manure inputs to the crop subsector.

Livestock sector contributes approximately 4 percent of national GDP (Gross Domestic Product) and 25.6 percent to agriculture GDP. As per 19th Livestock Census, conducted in 2012 (Government of India, 2014), India's livestock sector is one of the largest in the world with 11.6 percent of world livestock population, which consists of cattle (37.3 percent), goats (26.4 percent), buffaloes (21.2 percent), sheep (12.7 percent) and pigs (2.0 percent) etc.

**Distribution of Livestock in India in 2012**

| Sl. No. | Name of the State | Total No. of Livestock in Lakhs (2012) |
|---|---|---|
| 1. | Uttar Pradesh | 687.2 |
| 2. | Rajasthan | 577.3 |
| 3. | Andhra Pradesh | 561.0 |
| 4. | Madhya Pradesh | 363.3 |
| 5. | Bihar | 329.4 |
| **Source:** 19th Livestock Census, Department of Animal Husbandry, Dairying & Fisheries | | |

### 3.5.1 Cattle

Cattle constitute 37.3 percent of livestock population in India. India has second largest cattle population after Brazil at World level. Among the states, Madhya Pradesh leads with 10.3 percent followed by Uttar Pradesh (10.2 percent) and West Bengal (8.7 percent). Cattle population in India belongs to different breeds. These include: 1) Milch Breed, 2) Draught breed, and 3) Mixed or General breed.

**The following table shows the Livestock population of India in 2012**

| Sl. No. | Name of the Livestock | Population in Lakhs (2012) |
|---|---|---|
| 1. | Cattle | 1.91 |
| 2. | Goats | 1.35 |
| 3. | Buffaloes | 1.09 |
| 4. | Sheep | 0.65 |
| 5. | Pigs | 0.10 |
| **Source:** 19th Livestock Census, Department of Animal Husbandry, Dairying & Fisheries | | |

### 3.5.2 Goats

The goat is the poor man's cow providing milk, meat, skin and hair. It is the main source of meat for the country. While looking at the current status of goat population among Indian states, Rajasthan records first with 16 percent followed by Uttar Pradesh and Bihar.

### 3.5.3 Buffaloes

Buffaloes are an important source of milk supply for India. Uttar Pradesh has the highest number of buffaloes (28.2%) followed by Rajasthan (9.6%) and Andhra Pradesh (7.9%).




**Livestock Census:** First Livestock Census in India was conducted with the title of Dairy Cattle Census in 1919. Following this, the 19th Livestock census was conducted in October 2012 and it takes place at every five years.



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch03.indd 125 10-04-2019 09:49:19

DO YOU KNOW?

How is livestock census conducted in Tamil Nadu?

State Government is conducting Livestock Census with the help of Department of Animal Husbandry at state level and Regional Joint Director at Distric level under the guidelines of Government of India Ministry of Agriculture and farmers welfare, Department of Animal Husbandary Dairying and Fisheries.

The Livestock Census in the country started in the year 1919 – 1920. Since then it has been conducted once in every 5 years. So far 19 livestock census has been conducted and the last census was held in the year 2012. The 20 th Live stock Census – 2017 was scheduled to be conducted from 16 th July and will end on 15 th October 2017.

Source: Government of India – Instruction manual 201th Livestock Census.



**Livestock**

### 3.5.4 Dairy, Meat and Wool Production

According to State / UT Animal Husbandry Department, during 2016-17, the total production of milk in our nation is 163.7 million tonnes. At this time, the leading producer was Uttar Pradesh with 27.6 million tonnes (16.8 percent) followed by Rajasthan with 19.4 million tonnes (11.8 percent) and Madhya Pradesh with 13.4 million tonnes (8.2 percent) in total milk production.

While looking at the meat, the total production is 7.4 million tonnes. Uttar Pradesh is the leading producer with 1.3 million tonnes (18.2 percent), where Maharashtra and West Bengal are estimated with 0.8 million tonnes (11.4 percent) and 0.7 million tonnes (9.6 percent) respectively in the total country's production.

The total wool production of our nation is 43.5 million kilograms. The leading state in the wool production is Rajasthan with 14.3 million kilograms (32.9 percent) followed by Jammu and Kashmir with 7.3 million kilograms (16.7 percent) and Karnataka with 6.6 million kilograms (15.1 percent) in country's total wool production.

## 3.6 Fisheries

Fisheries in India are a very important economic activity and a flourishing sector with varied resources and potentials. Fishing in India is a major industry in its coastal states, employing over 14 million people. It produces about 3 percent of World's fish and occupies second place among the fish producing nations of the world after China. It also helps in augmenting food supply, generating employment, raising nutritional level and earning valuable foreign exchange. The length of Indian coastline is 7,517 km including the coastline of the islands, however the mainland's length is 6,100 km. In India, fishing is categorised into two types: they are



**Fisheries**



Aatchiyar Kalvi
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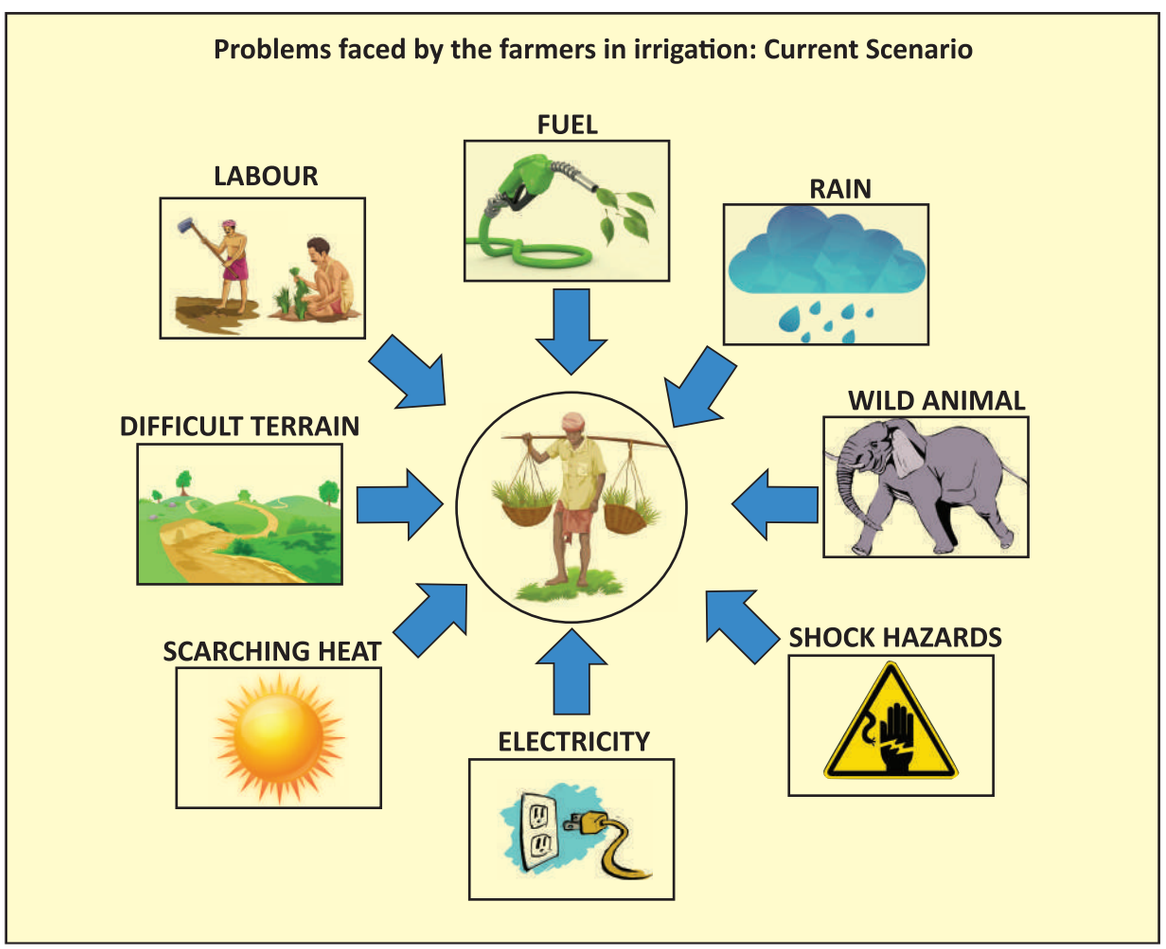
1. **Marine or Sea Fisheries:** It includes coastal, off-shore and deep sea fisheries mainly on the continental shelf upto a depth of 200 m. Among the coastal states, Kerala leads in the marine fish production in India.
2. **Inland or Fresh Water Fisheries:** Rivers, lakes, canals, reservoirs, ponds, tanks etc. are the sources of fresh water and provide fresh water fisheries. About 50 percent of the country's total fish production comes from the inland fisheries and Andhra Pradesh is the leading producer in India.

In India, the important varieties of fishes caught by the fisherman are Cat fish, Herrings, Mackerels, Perches, Eels, Mullets etc. In 2014-15, the total inland or fresh water fish production was 65.77 lakh tonnes and the total marine fish production was 34.91 lakh tonnes. In India, the top five fish producing states are Andhra Pradesh, West Bengal, Gujarat, Kerala, and Tamil Nadu.

## 3.7 Major issues faced by farmers in india

Indian agriculture and Indian farmers are plagued by several problems; some of them are natural and some others are manmade.

- **Small and fragmented land-holdings:** The problem of small and fragmented holdings is more serious in densely populated and intensively cultivated states in India. About 67 percent of operational land holdings in India are marginal holdings (< 1 hectare).
- **High Costs of Inputs:** Seed is a critical and basic input for attaining higher crop yields and sustained growth in agricultural production. Unfortunately, good quality




**Major Issues of Farmers**



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch03.indd 127 10-04-2019 09:49:19

seeds are out of reach for many small and marginal farmers due to their high price.

- **Infertile Soil:** Indian soils have been used for growing crops over thousands of years without caring much for replenishing. This has led to depletion and exhaustion of soils resulting low productivity.
- **Lack of Irrigation:** Only one-third of the cropped area falls under irrigated area. To make agriculture reliable, irrigation facility has to be developed.
- **Lack of mechanization:** In spite of the large scale mechanization of agriculture in some parts of the country, most of the agricultural operations in larger parts are carried on by human hand using simple and conventional tools.
- **Soil erosion:** Large tracts of fertile land suffer from soil erosion by wind and water. Such kind of areas must be properly treated and restored to its original fertility.
- **Agricultural marketing:** In rural India, agricultural marketing continues in a bad shape. Due to the absence of sound marketing facility, the farmers have to depend on local traders and middlemen for the disposal of their farm products which is sold at low price. Besides, there is a fluctuation in the prices of agriculture products.
- **Inadequate storage facilities:** Storage facilities in the rural areas are either totally absent or grossly inadequate. Under such conditions the farmers are compelled to sell their products immediately after the harvest irrespective of the condition of market.
- **Inadequate transport:** One of the main handicaps with Indian agriculture is the lack of cheap and efficient means of transportation. Even at present there are lakhs of villages which are not well connected with main roads or with market centres.
- **Scarcity of capital:** Agriculture is an important industry which requires a huge capital. The role of capital plays a major role in the purchase of advanced farm machineries and equipments.

**List of important Agricultural Revolutions in India**

| Revolution | Related Product |
|---|---|
| Yellow Revolution | Oil seed Production (Especially Mustard and Sunflower) |
| Blue Revolution | Fish Production |
| Brown Revolution | Leather / Cocoa / Non-Conventional Products |
| Golden Fibre Revolution | Jute Production |
| Golden Revolution | Fruits / Honey Production / Horticulture Development |
| Grey Revolution | Fertilizers |
| Pink Revolution | Onion Production / Pharmaceuticals / Prawn Production |
| Evergreen Revolution | Overall Production of Agriculture |
| Silver Revolution | Egg Production / Poultry Production |
| Silver Fibre Revolution | Cotton |
| Red Revolution | Meat Production / Tomato Production |
| Round Revolution | Potato |
| Green Revolution | Food Grains |
| White Revolution | Milk Production |



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch03.indd 128 10-04-2019 09:49:19

## Recap

- Soil is the finest particle found on the earth surface.
- Alluvial soil, black soil, red soil and laterite soil are the major types of soil in India.
- The main sources of irrigation found in India are canal irrigation, well irrigation and tank irrigation etc.
- Damodar valley projects, Bhakra-Nangal project and Hirakud project are the important Multipurpose projects of India.
- Kharif, Rabi, and Zaid are the three cropping seasons of India.
- The agricultural crops of India can be divided into food crops, cash crops, plantation crops and horticultural crops.
- Fishing in India is categorized into marine fishing and inland fishing

| GLOSSARY | |
|---|---|
| Soil | Soil is the uppermost layer of the land surface composed of minerals, organic matter, living organisms and water |
| Khadar | Newer alluvium soil found in valley flooded almost every year |
| Bhangar | Older alluvium soil found in30 mts above flood level |
| Soil erosion | Removal of top soil |
| Soil conservation | Prevention of soil from erosion and protecting its fertility. |
| Irrigation | Watering of plants through artificial means. |
| Multipurpose projects | Construction of dams across rivers aimed at many purposes |
| Agriculture | It is the process of producing food, feed, fibre and many other desired products by the cultivation of certain plants and the raising of domesticated plants |

## EXERCISE

### I. Choose the correct answer

WWB7QD

1. The soil which is rich in iron oxides is _____.
   a) Alluvial b) Black
   c) Red d) Alkaline
2. Which of the following organization has divided the Indian soils into 8 major groups?
   a) Indian Council of Agricultural Research
   b) Indian Meteorological Department
   c) Soil Survey of India
   d) Indian Institute of Soil Science
3. The soils formed by the rivers are:
   a) Red soils b) Black soils
   c) Desert soils d) Alluvial soils
4. _____ dam is the highest gravity in India.
   a) Hirakud dam
   b) Bhakra Nangal dam
   c) Mettur dam
   d) Nagarjuna Sagar dam
5. _____ is a cash crop.
   a) Cotton b) Wheat
   c) Rice d) Maize



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch03.indd 129 10-04-2019 09:49:19

6. Black soils are also called as:
   a) Arid soils b) Saline soils
   c) Regur soils d) Mountain soils
7. The longest dam in the world is _____.
   a) Mettur dam b) Kosi dam
   c) Hirakud dam d) Bhakra-Nangal dam
8. The leading producer of rice in India is _____.
   a) Punjab b) Maharashtra
   c) Uttar Pradesh d) West Bengal
9. Which crop is called as "Golden Fibre" in India?
   a) Cotton b) Wheat
   c) Jute d) Tobacco
10. The state which leads in the production of coffee is
   a) West Bengal b) Karnataka
   c) Odisha d) Punjab

## II. Consider the given statements and choose the right option given below

1. **Assertion (A):** Horticulture involves cultivation of fruits, vegetables, and flowers.
   **Reason (R):** India ranks first in the world in the production of mango, banana, and citrus fruits.
   (a) Both (A) and (R) are true and (R) explains (A)
   (b) Both (A) and (R)are true: (R) does not explain (A)
   (c) (A) is correct (R) is false
   (d) (A) is false (R) is true
2. **Assertion (A):** Alluvial soil is formed by the deposition of eroded and decayed materials brought by the rivers.
   **Reason (R):** Paddy and wheat are grown well in the soil.
   (a) Both (A) and (R) are true and (R) explains (A)
   (b) Both (A) and (R)are true and (R) does not explain (A)
   (c) (A) is correct (R) is false
   (d) (A) is false (R) is true

## III. Pick the odd one out

1. a) Wheat b) Rice
   c) Millets d) Coffee
2. a) Khadar b) Bhangar
   c) Alluvial soil d) Black soil
3. a) Inundational canals
   b) Perennial canals
   c) Tanks
   d) Canals

## IV. Match the following

| | |
|---|---|
| 1. Sugar bowl of India | a) Mahanadi |
| 2. Coffee | b) Golden revolution |
| 3. Tehri | c) Karnataka |
| 4. Hirakud | d) Uttar Pradesh and Bihar |
| 5. Horticulture | e) Highest dam in the India |

## V. Answer in brief

1. Define soil.
2. Name the types of soil found in India.
3. State any two characteristics of black cotton soil.
4. What is Multipurpose project?
5. Define Agriculture.
6. State the types of agriculture practices in India?
7. Name the seasons of agriculture in India?
8. Mention the plantation crops of India.
9. What do you mean by livestock?
10. Write a brief note on the categories of fisheries in India?

## VI. Give reasons

1. Agriculture is the backbone of India.
2. Rain water harvesting is necessary.
3. Small farms are predominant in India.



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## VII Distinguish between the following

1. Rabi and Kharif crop seasons.
2. Inundational canal and perennial canal.
3. Marine fishing and Inland fishing.
4. Alluvial soils and Black soils.

## VIII. Answer in a paragraph

1. State the types of soil in India and explain the characteristics and distribution of soil.
2. Write about any two Multipurpose projects of India.
3. Bring out the characteristics of Intensive and Plantation farming.
4. Examine the geographical conditions favourable for the cultivation of rice and wheat.

## IX. Hot questions

1. Can you imagine a world without agriculture?
2. Can you give solutions for the prevailing water disputes in South India (construction of dams / raising of dams / cleaning of tanks)?

## X. Map exercise

1. Demarcate the major tracts of alluvial soils.
2. Delineate the main regions of black soil.
3. Locate the Hirakud dam, Mettur dam and Damodar dam.
4. Shade the regions of jute cultivation..
5. Mark any three tea and coffee growing areas.
6. Demarcate the regions of desert soil.
7. Locate the fishing hubs: Tuticorin, Chennai, Cochin, Mumbai, Machilipatnam
8. Demarcate: Cauvery delta, Godavari delta

## ACTIVITY - 2

Complete the following table by your day to day life experience.

| Sl. No. | Food | Sources |
|---|---|---|
| 1. | Main Food | Rice / Wheat / Millets / _____ |
| 2. | Milk | Cow / Buffalo / Goat / _____ |
| 3. | | |
| 4. | | |
| 5. | | |

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Unit - 4

# Resources and Industries



## Learning Objectives

- To learn about the resource and its types.
- To understand the concept of renewable and non- renewable resources.
- To identify the different types and distribution of industries in India.
- To analyse the problems of Indian industries.

IAUTWU

## Introduction

Any matter or energy derived from the environment that is used by living things including humans is called a natural resource. Natural resources include air, water, soil, minerals, fossil fuels, plants, wild life etc. Many natural resources are used as raw materials. They play a vital role in the economic development of any region. Natural resources are classified on several basis. Based on continued availability, the resources are categorised into two types. Renewable Resources are those which have natural regeneration after their utilisation.

Solar energy, wind energy, biogas, tidal energy, wave energy etc. are the renewable resources. Non- Renewable resources are the sources that cannot be replaced again after utilisation. Coal, petroleum, natural gas etc. fall under this category.

## 4.1 Minerals

Mineral is a natural substance of organic or inorganic origin with definite chemical and physical properties. The process of extracting mineral from the earth is known as mining. The mines near the earth crust are known as open pit mines while the deep mines are known as shaft mines.

### 4.1.1 Types of Minerals

On the basis of chemical and physical properties, minerals are broadly grouped under two categories. They are metallic and non-metallic minerals.

DO YOU KNOW?

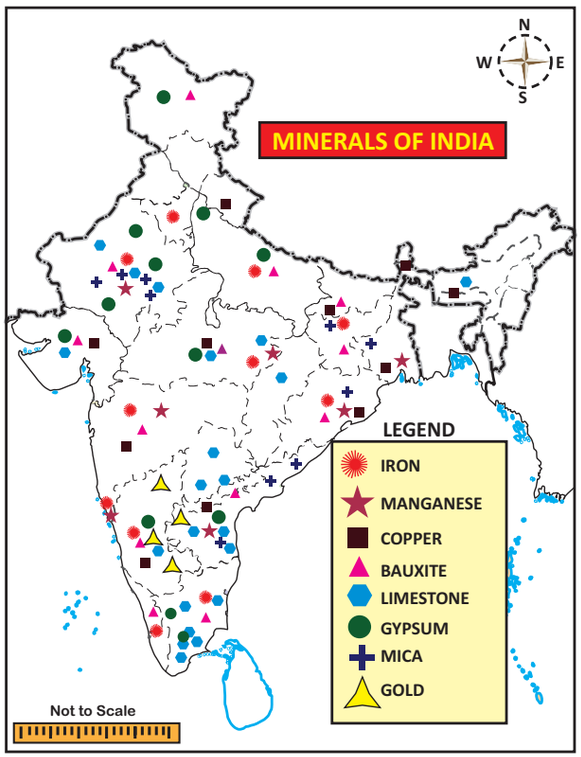
The organisations associated with minerals in India are the Geological Survey of India (Headquarter is at Kolkata), Indian Bureau of Mines (Headquarter at Nagpur) and Non-Ferrous Material Technology Development Centre (NFTDC), located at Hyderabad. The Ministry of Mines is responsible for the administration of all mines and minerals (Development and Regulation Act, 1957).

#### a) Metallic Minerals

Metallic minerals are the minerals which contain one or more metallic elements in them.



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Metallic minerals occur in rare, naturally formed concentrations known as mineral deposits. These deposits consist of a variety of valuable metals such as iron, manganese, copper, bauxite, nickel, zinc, lead, gold etc.

## i) Iron ore

Iron ore is the most widely distributed elements of the earth crust, rarely occurs in a free state. It enters into the composition of many rocks and minerals especially from igneous and metamorphic rocks. The total recoverable reserves of iron ore in India are about 9602 million tons of haematite and 3408 million tons of magnetite. About 79% haematite deposits are found in Assam, Bihar, Chhattisgarh, Jharkhand, Odisha and Uttar Pradesh. About 93% magnetite deposits occur in Andhra Pradesh, Goa, Karnataka, Kerala and Tamil Nadu. Karnataka alone contributes about 72% of magnetite deposits of India.

Jharkhand is the leading producer of iron ore with 25% the country's production. Singhbhum, Hazaribagh, Dhanbad and Ranchi districts are its major producers. Odisha with 21% production ranks second. Sundargarh, Mayurbhanj, Sambalpur and Keonjhar districts are its major producers. The magnetite production of Chhattisgarh is 18% (Rajgarh and Bilaspur are its leadings districts) and the Karnataka is 20% (Chikmangalur, Chitradurga, Shimoga and Dharwad districts are its major producers). Andhrapradesh and Karnataka produce about 5% each. Kurnool, Guntur, Cuddapah and Anantapur districts in Andhra Pradesh and Salem, Namakkal, Tiruvannamalai, Tiruchirappalli, Coimbatore, Madurai and Tirunelveli districts in Tamil Nadu are notable for the production of iron ore.

SAIL (Steel Authority of India Limited): The Ministry of Steel is responsible for planning and development of iron and steel industry in India.

DO YOU KNOW?

Iron ores are rocks and minerals from which metallic iron can be economically extracted. The ores are usually rich in iron oxides and vary in colour from dark grey, bright yellow, or deep purple to rusty red. The iron is usually found in following form.

| Form of Iron ores | Iron Content (%) |
|---|---|
| Magnetite | 72.4% |
| Hematite | 69.9% |
| Goethite | 62.9% |
| Limonite | 55% |
| Siderite | 48.2% |

## ii) Manganese

Manganese is a silvery grey element. It is very hard and brittle in nature. It is always available in combination with iron, laterite and other minerals. It is an important mineral used for making iron and steel and serves as basic raw material for alloying. It is the most important mineral for making iron and steel. Nearly 10 kg manganese is required for



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TN_GOVT_X_Std_Geography_Ch04.indd 133 10-04-2019 09:51:44

manufacturing one ton of steel. It is also used in the manufacturing of bleaching powder, insecticides, paints and batteries.

**MOIL- Manganese Ore India Limited** state-owned manganese-ore mining company headquartered in Nagpur. With a market share of 50%, it was the largest producer of manganese ore in India.

Manganese deposits occur mainly as metamorphosed bedded sedimentary deposits. Th e largest deposits of manganese is found in Odisha(44%) followed by Karnataka (22%), Madhya Pradesh (12%), Maharashtra & Goa(7% each), Andhra Pradesh (4%) and Jharkhand (2%). Rajasthan, Gujarat, Telengana and West Bengal together constitute about 2% of the India's manganese resource. Nagpur, Bhandara and Ratnagiri districts in Maharastra and Balaghat and Chhindwara districts in Madhya Pradesh are the leading producers. Odisha is the third largest producer with 24% (Sundargarh,Kalahandi, Koraput and Bolangir districts are the major ones). Other producers are Andhra Pradesh (13%) and Karnataka (6%). Srikakulam, Visakhapatnam, Cuddapah and Guntur districts in Andhra Pradesh and the districts of Shimoga, Bellary, Chitradurga and Tumkur are the important districts of Karnataka. It is the most important mineral for making iron and steel. India is the fift h largest producer of manganese in the world.

## iii) Copper

Copper is the first metal that prehistoric man has started using for many purposes. Being flexible, it can be made into utensils of any shape. Brass and Bronze are obtained when the copper alloys with zinc and tin respectively. Copper has been commonly used for making cooking utensils and other objects of common utility. In modern days, it is extensively used in vast variety of electrical machinery, wires and cables

Largest reserves of copper ore is in the state of Rajasthan (53.81%) followed by Jharkhand (19.54%) and Madhya Pradesh (18.75%). Th e states of Andhra Pradesh, Gujarat, Haryana, Karnataka, Maharashtra, Meghalaya, Nagaland, Odisha, Sikkim, Tamil Nadu, Telangana, Uttarakhand and West Bengal account for 7.9% of the total copper reserves of India.

**Hindustan Copper Ltd** is a Government-owned-corporation in the central public Enterprise under the Ministry of minies, India. HCL is the only vertically integrated copper producer in India engaged in a wide spectrum of activities ranging from Mining, Beneficiation, Smelting, Refining and Continuous Cast Rod manufacturer.

Jharkand is the largest producer of copper with 62% of India's production. Singhbhum and Hazaribagh districts are its leading producers of copper. Odisha is the other major producer with 50.2% production. Rajasthan ranks third with 28% production. Th e districts of Khetri, Alwar and Bhilwara are notables in this state. Th e states of Uttarakhand(Dehradun and Garhwal districts),Andhra Pradesh (Guntur, Kurnool and Nellore districts), Karnataka (Chitradurga and Hassan districts) and Tamil Nadu contributes about 7% of production each.

## iv) Bauxite

Bauxite is an important ore from which aluminium is extracted. It is found in the rock consisting mainly of hydrated aluminium oxides. Bauxite is widely distributed as surface deposits in the areas of laterite soil.




Bauxite is an oxide of aluminium; the name has been derived after the French word Le Baux.



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TN_GOVT_X_Std_Geography_Ch04.indd 134 10-04-2019 09:51:45

Being light in weight and tough, aluminium is used in the manufacture of aircraft s and automobile engines. Bauxite is also used in the manufacture of cement and chemicals.

The main bauxite deposits occur in Odisha – 50.2%, Gujarat – 15.8% (Junagadh, Amreli and Bhavnagar districts), Jharkhand – 11.9% (Ranchi and Gumila districts), Maharashtra – 9.9% (Sindhu durg and Ratnagiri), Chhattisgarh – 6.2% (Ballarpur and Durg districts), and Tamil nadu – 2.7%. Being light in weight and tough, aluminium is used in the manufacture of aircraft s and automobile engines. Bauxite is also used in the manufacture of cement and chemicals. Orissa is the largest producer of bauxite in India with approx. 1,370.5 million tonnes. India's State and Central Government is very supportive in production of Bauxite and other Industrial Minerals in Orissa, Jharkand, Tamil Nadu.

**National Aluminium Company Limited,** abbreviated as NALCO, (incorporated 1981) has units in Odisha at places like Angul and Damanjodi. It was incorporated as a public sector enterprise of the Ministry of Mines, Government of India in 1981.

नालको NALCO

## b) Non-Metallic Minerals

These minerals do not contain metal in them. Mica, limestone, gypsum, nitrate, potash, dolomite, coal, petroleum etc are the non- metallic minerals.

### i) Mica

In ancient time, Mica was used in ayurvedic medicine. Mica became very popular with the development of electrical industry. Abhrak is a good quality mica. It is translucent, easily splitable into thin sheets, flat, colourless, elastic and incompressible. Mica is used in making of insulating properties, as it withstands high voltage and has low power loss factor. Since it is a non conductor of electricity, it is exclusively used in electrical goods. It is also used in making of lubricants, medicines, paints and varnishes.

The major deposits of mica are found in Andhra Pradesh(41%) with Nellore, Visakhapatnam, West Godavari and Krishna are its major districts. Other important states in mica deposits are Rajasthan(21%) and Odisha(20%). Bhilwara, Jaipur and Ajmer are the notable districts in Rajasthan and, Rayagada, Bolangir and Sundargarh districts are the major producers in Odisha. Dhanbad, Palamu, Ranchi and Singhbum districts are the major mica mines in Jharkhand state.

### ii) Lime Stone

Limestone is associated with rocks composed of either calcium carbonate or the double carbonate of calcium and magnesium or mixture of both. Limestone also contains small quantities of silica, alumina, iron oxides, phosphorous and sulphur. Limestone is used in the industries of chemicals for soda ash, caustic soda, bleaching powder, paper, cement, iron and steel, glass and fertilizers. The major producing areas: Andhra Pradesh produces about 20% with major concentration in Cuddapah, Kurnool and Guntur districts. Telengana also accounts for about 20% of the country's production with the districts of Nalgonda, Adilabad, Warangal and Karimnagar as major producers. Rajasthan produces about 18% (Jodhpur, Ajmer, Bikhaner and Kota districts), Madhya Pradesh about 12% (Jabalpur and Satna districts) and Tamilnadu about 8.4% (Salem, Kancheepuram, Tiruchirappalli, Thoothukkudi, Tirunelveli and Virudhunagar districts) of limestone production of India. In terms of the reserves of limestone, the state of Karnataka leads with 27%, followed by Andhra Pradesh and Rajasthan (12% each), Gujarat (10%), Meghalaya (9%), Telangana (8%), Chhattisgarh and Madhya Pradesh (5% each) and the remaining by other states.



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TN_GOVT_X_Std_Geography_Ch04.indd 135 10-04-2019 09:51:45

### iii) Gypsum

Gypsum is a hydrated sulphate of calcium which occurs as white, opaque or transparent minerals in beds of sedimentary rocks such as limestone, sandstone and shale. Gypsum is used in the manufacture of cement, fertilizers, wall board, plaster of paris and in soil conditioning. The state of Rajasthan alone accounts for 81% of its reserves. 14% of its reserves is found in Jammu and Kashmir and 2% in Tamil nadu. The remaining 3% resources are found in the states of Gujarat, Himachal Pradesh, Karnataka, Uttarakhand, Andhra Pradesh and Madhya Pradesh.

Rajasthan produces 82% of the country's production. Jodhpur, Bikaner and Jaisalmer are notable districts. Jammu and Kashmir produces 14% of country's gypsum. Baramula, Doda and Uri districts are its major producers. The states of Gujarat (Bhavnagar and Jamnagar districts), Uttarkhand (Dehradun and Mussourrie districts), Andra pradesh (Nellore, Guntur and Prakasam districts) and Tamil nadu are the other producers with about 4% each.

## 4.2 Energy Resources

The resources from which the electricity generated are called energy resources. Electricity is an important component of our life. No day to day activity takes without the use of this energy. It is also the key factor for all economic activities and industrial development. Energy resources can be classified into renewable and non-renewable. Coal, petroleum, natural gas and nuclear minerals are the sources of non renewable energy. Water, sun light, wind, bio gas, tides etc., are the sources of renewable energy.

BHRKIW

### 4.2.1 Non-Renewable Energy

### a) Coal

Coal is an inflammable organic substance composed mainly of hydrocarbons.

Coal is available in the form of sedimentary rocks. It is used in the generation of thermal power. It has close association with the industrial development of any country. Since it is a valuable one, it is called as "**Black Gold**". Based on carbon content, it is classified in to the following types.

**Anthracite:** contains 80 to 90% carbon

**Bituminous:** contains 60 to 80% carbon

**Lignite:** contains 40 to 60% carbon

**Peat:** contains less than 40% carbon

Coal is an important source of energy in India with its varied and innumerable uses. It can be converted into gas, oil, electricity and thermal power. Besides, it forms a basic raw material for the production of chemicals, dyes, fertilizers, paints, synthetic and explosives.

Indian coal is mostly associated with Gondwana series of rocks and is primarily found in Peninsular India. The states of Jharkhand, odisha, West Bengal and Madhya Pradesh alone account for nearly 90% of coal reserves of the country. About 2% of India's coal is of tertiary type and is found mostly in Assam and Jammu & Kashmir.

Jharkhand is the largest coal producing state in the country followed by odisha, Chhattisgarh, West Bengal, Madhya Pradesh, Andhra Pradesh and Maharashtra. The major coal fields of Jharkhand are Bokaro, North Karanpura, South Karanpura, Giridih, Ramgarh, Daltongunj and Rajmahal. Talcher and Ranapur in Odisha, Korba and Chirmiri in Chhattisgarh, Umaria and Singrauli in Madhya pradesh, Tandur, Singareni, Kothagudem and Ramagundam in

Coal India Limited (CIL) is an Indian state-controlled coal mining company headquartered in Kolkata, West Bengal, its field offices are located at Dhanbad, Ranchi, Bilaspur, Nagpur, Sambalpur, Kothagudam and Asansol. It is the largest coal-producing company in the world.



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TN_GOVT_X_Std_Geography_Ch04.indd 136 10-04-2019 09:51:45

Andhra Pradesh, Wardha, Ballarpur, Chanda and Kampati in Maharastra and, Raniganj, Asansol and Mejia in West Bengal are the other major coal fields of India.

Indian lignite (brown coal) deposits occur in the southern and western parts of Peninsular India particularly in Tamil nadu, Pudhucherry and Kerala.

The Ministry of coal has over all responsibility of determining policies and strategies in respect of exploration and development of coal resource in India. Coal India Limited (CIL), NLC India Limited (NLCIL) and Singareni Collieries Company limited (SCCL) are its public sector under takings.

## b) Petroleum (or) Crude oil

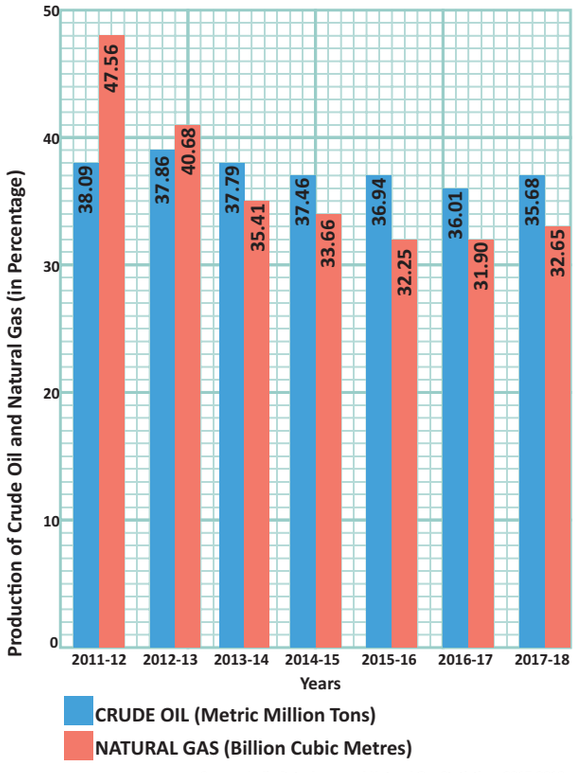
The word petroleum has been derived from two Latin words petro (meaning – Rock) and oleum (meaning oil). Thus petroleum is oil obtained from rocks of the earth. Therefore, it is also called mineral oil. Petroleum is an inflammable liquid that is composed of hydrocarbons which constitute 90-95% of petroleum and the remaining is chiefly organic compounds containing oxygen, nitrogen, sulphur and traces of organ metallic compounds.

Petroleum is used as a source of power and fuel for automobiles, aeroplanes, ships and locomotives. Lubricants, kerosene, vaseline, tar, soap, terylene and wax are its by products. Oil in India is obtained from both from on-shore and off-shore areas.

The Ministry of Petroleum and Natural Gas (MOP&NG) is a ministry of the Government of India. It is responsible for the exploration, production, refining, distribution, marketing, import, export, and conservation of petroleum, natural gas, petroleum products, and liquefied natural gas in India.

सत्यमेव जयते

**Crude oil and Natural Gas Production in percentage**




As of 2017, the total estimated crude oil reserves of the country is 604.10 million tons. From this, 324.24 million tons (54%) are found in onshore and 279.86 million tonnes (46%) are in offshore areas.

The production of crude oil fluctuates from year to year from 2011-12 to 2017-18 but only with marginal variations. The change is invariably in negative. In natural gas production also the trend is negative except the last year. The change is high in the first three years and it is low to moderate in the remaining years.



**India - Oil refinery**



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TN_GOVT_X_Std_Geography_Ch04.indd 137 10-04-2019 09:51:45

| Western coast offshore oil fields | Eastern coast offshore Fields |
|---|---|
| 1. Mumbai high oil fields (largest 65%) | Bharmaputra valley (Dibrugarh and Sibsagar districts of upper Assam.) |
| 2. Gujarat coast (2nd largest) | Digboi oil feilds (oldest fields in country) |
| 3. Basseim oil feild, south of Mumbai high | Nahoratiya oil fields (south west of digboi) |
| 4. Aliabet oil feild, south of Bhavanagar | Moran-Hugrijan oil field (Southwest of Nahoratiya) |
| 5. Ankleshwar | Rudrasagar-Lawa oil feilds (sibsagar districs of assam) |
| 6. Cambay-Luni Region | Surrma valley (Badarpur, Masimpur, Patharia) |
| 7. Ahemedabad-Kalol Region | offshore of Andaman and Nicobar, Gulf of mannar, Baleshwar coast, Punjab, Haryana and Uttar Pradesh. |

## c) Natural Gas

Natural gas usually accompanies the petroleum accumulations. It is naturally occurring hydro carbon gas mixture consisting primarily of methane, but commonly includes varying amounts of other higher alkanes and sometimes a small percentage of carbon dioxide, nitrogen and hydrogen sulphides. It is formed when layers of decomposed plants and animals are exposed to intense heat and pressure over thousands of years. It is used as a source of energy for heating, cooking and electricity generation. It is also used as fuel for vehicles and as a chemical feedstock in the manufacture of plastics and other commercially important organic chemicals.

India has a very large proportion of tertiary rock and alluvial deposits

Gail (India) Limited (GAIL) (formerly known as Gas Authority of India Limited) is the largest state-owned natural gas processing and distribution company in India. It is headquartered in New Delhi. It has the following business segments: natural gas, liquid hydrocarbon, liquefied petroleum gas transmission, petrochemical, city gas distribution, exploration and production, GAILTEL and electricity generation.






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TN_GOVT_X_Std_Geography_Ch04.indd 138 10-04-2019 09:51:45

particularly in the extra peninsular India. These sedimentary rocks, which were once under the shallow seas, hold the possibility of harbouring oil and gas deposits. The highest concentration of natural gas is found in the Bombay high and basseim oil fields. Jagatia and Gogha in Gujarat, Nahorkatiya and Moran in Assam, Neypaltur, Mangmadam in Thanjavur district in Tamil nadu, Baranura and Atharnure ranges in Tripura, Barmer and Charaswala in Rajasthan, Miao Pung and Laptang areas in Arunachal Pradesh, Firozpur district in Punjab, Mausar and Maradpur areas in Jammu and Kashmir and Medinipur in West Bengal are the other areas where natural gas reserves have been discovered.

The Gas Authority of India Ltd [GAIL] is doing pioneer work in the field of natural gas exploration. Discovery of gas made rapid strides in the 1985. Oil strikes at Cauvery offshore, at Nanda in Cambay basin and Tarot in Jaisalmer basin in Rajasthan were major discoveries during 1988-89. Recently, it has been found that Krishna- Godavari delta has reserves of Natural gas.




Compressed natural gas (CNG) (methane stored at high pressure) is a fuel which can be used in place of gasoline, diesel fuel and propane/LPG. In comparison to other fuels, natural gas poses less of a threat in the event of a spill, because it is lighter than air and disperses quickly when released. Biomethane – cleaned-up biogas from anaerobic digestion or landfills – can be used. Natural gas vehicles are increasingly used in Delhi, Ahmedabad, Mumbai, Pune, Kolkata Lucknow, Kanpur, Varanasi, etc.

### 4.2.2 Conventional Energy Sources

#### a) Thermal power

Thermal power is generated using fossil fuels like coal, diesel, petroleum and Natural gas. National Thermal Power Corporation [NTPC] was established in 1975. At present NTPC has 13 coal based super thermal power projects and 7 gas / liquid fuel based combined cycle projects in the states of Assam, Bihar, Jharkhand, Chhattisgarh, Mizoram and West Bengal. It accounts for over 90% of the installed capacity. Tamil nadu produces about 5% of the total thermal electricity produced in India. Neyveli, Mettur, Thoothukudi and Ennore (Chennai) are the important thermal power stations in Tamil nadu.

#### b) Nuclear power

The energy released during nuclear fission or fusion is used to generate electricity.

Nuclear energy is generated mainly from the minerals of Uranium and Thorium. Nuclear power programme in India was initiated in 1940's when 'Tata Atomic research commission was incorporated in August 1948. The first nuclear power station was setup at Tarapur near Mumbai in 1969 with the capacity of 320 mw. Later atomic reactors were installed at Rawatbhata (335 MW), near Kota in Rajasthan (100 MW), Kalpakkam (440 MW) and Kudankulam (2,000 MW) in Tamil nadu and Narora (235 MW) in Uttar Pradesh, Kaiga in (235 MW) in Karnataka and Kakarapara (235 MW) in Gujarat.

The Nuclear Power Corporation of India Limited (NPCIL) is an Indian public sector undertaking based in Mumbai, Maharashtra. It is wholly owned by the Government of India and is responsible for the generation of nuclear power for electricity. NPCIL is administered by the Department of Atomic Energy (DAE) is responsible for designing, constructing and operating the nuclear power stations in India.



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TN_GOVT_X_Std_Geography_Ch04.indd 139 10-04-2019 09:51:45

### 4.2.3 Renewable or Non-Conventional Energy Resources

#### a) Hydro power

Power generated from water is termed as hydroelectricity. Hydro power is the energy harnessed from running water. Hydro power is considered as one of the most economic and non-polluting sources of energy. It contributes nearly 7% of global electricity production. The cost of production of hydroelectricity is relatively low, making it a competitive source of renewable energy. It is also a flexible mode of power generation as the quantity of production can either be increased or decreased very quickly adapting to changing demands.

NHPC Limited (National Hydroelectric Power Corporation) is located in Faridabad, India

India is fortunate to have a large potential of hydro- power potential. It is quite unevenly distributed in India. Of the total hydro-electric potential of the country, rivers of Assam, Arunachal Pradesh, Manipur, Nagaland and Tripura account for 30.4%, eastward flowing rivers of the peninsular India 20.9%, westward flowing rivers of the western Ghats (South of the Tapti) 10.5%, the Ganga Basin (excluding the potential of Nepal) 11.7%, the Indus Basin 16.0% and the rivers of central India 10.5%.

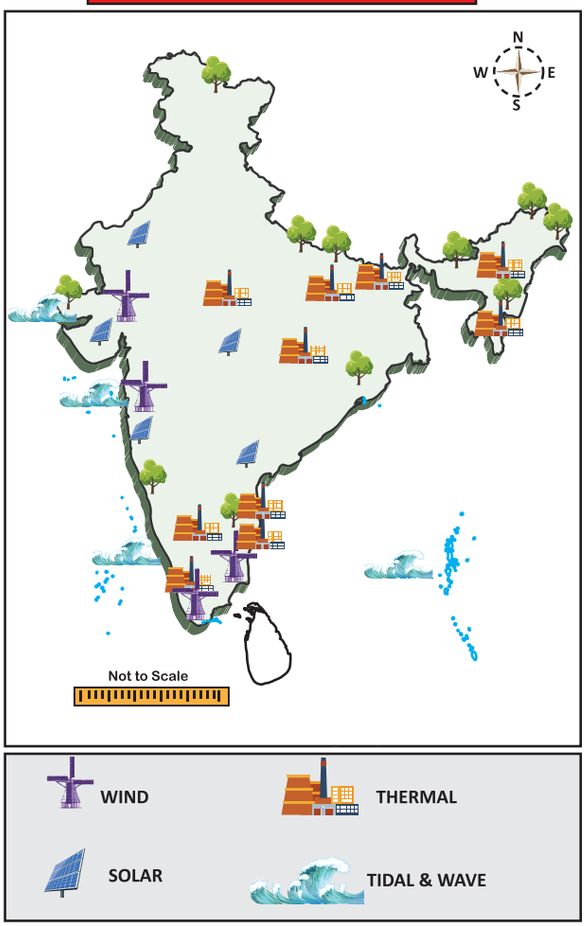
DO YOU KNOW?

The first hydro-electric power station in India was established at "Darjeeling" in 1897.

#### b) Solar Energy

Solar Power is the conversion of sunlight into electricity, either directly using photovoltaics (PV) or indirectly using concentrated solar power (CSP). Concentrated solar power systems use lenses or mirrors and tracking system to focus a large area of sunlight into a small beam. Photovoltaics convert light into an electric current using the photovoltaic effect.

RENEWABLE RESOURCES OF INDIA




**Solar Energy Corporation of India Limited**

(A Government of India Enterprise) head quarter is located at New Delhi.

The mass objectives of the solar thermal energy programme, being implemented by the Ministry of Non-Conventional Energy Source (MNES) are market development,



Aatchiyar Kalvi
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commercialisation and utilisation of heat energy requirement of different applications in domestic, institutional and industrial sectors. Solar power is used in water heaters, refrigerators, drying, street lighting, cooking, pumping, power generator, photovoltaic cells, salon parts etc. Andhra Pradesh, Gujarat, Rajasthan, Maharashtra and Madhya Pradesh are the major solar power producers.

### c) Wind Energy

Wind energy is extracted from air flow using wind turbines. It is a cheap and pollution free source of energy. Power from wind mills are used for pumping water and to sail propel ships. Wind power is plentiful, renewable, widely distributed, clean and produces no greenhouse gas emissions during operation. These plants occupy only a less space.




Tamil nadu has the largest installation of wind turbines in the country in the Muppandal-Perungudi area near Kanniyakumari is the largest concentrations of wind farm capacity at a single location in the world.

The development of wind power in India began in 1986 with first wind farms were set up in coastal areas of Gujarat (Okha), Maharashtra (Ratnagiri) and Tamil nadu (Thoothukudi) with 55 KW Vestas wind turbines. The capacity has significantly increased in the last few years. India has the fourth largest installed wind power capacity in the world.

The National Institute of Wind Energy (NIWE), Chennai was established in Tamil Nadu in 1998 as an autonomous institution under the administrative control of the Ministry of New and Renewable Energy. CIWE main activities include resource assessment and testing & certification.

### d) Biomass Energy

Bio energy may be obtained through bio-degradable materials like animal dung, kitchen wastes, water hyacinth, agricultural residues and city wastes etc. It is clean and cheap source of energy. India has a potential of about 18 GW of energy from Biomass. Currently, about 32% of total primary energy used in India is derived from Biomass. Energy derived from biomass is mostly used for domestic purposes.

### e) Tidal and wave Energy

There are two main sources of ocean energy. They are Ocean tides and Ocean waves. It is estimated that India possesses 8,000-9,000 MW of tidal energy potential. The Gulf of Cambay is the best suited area with about 7,000 mw potential of tidal energy. This is followed by Gulf of Kachch (1,000MW) and sunderbans (100MW). At present a 900mw tidal power plant is proposed to be set up in the Gulf of Kachch region.

Wave energy potential in India is estimated to be 40,000 MW. An wave energy power plant of 150 KW(maximum) has been installed at vizhinjam near Thiruvananthapuram. An another plant of this kind has been set up near Andaman& Nicobar Islands.

## 4.3 Industries

It refers to the activities which converts the raw materials into finished products. This sector is called as the value addition sector. On the basis of the source of raw materials, Industries are classified into the Agro based industries, Forest based industries and Mineral based industries.

### 4.3.1 Agro based industries

These industries draw their raw materials from agricultural sector. The following part discusses the agro based industries in India.

### a) Cotton Textile Industry

Textile is a broad term which includes cotton, jute, wool, silk and synthetic fibre textiles. This sector in India with 3400 textiles



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch04.indd 141 10-04-2019 09:51:49

mills with installed capacity of more than 50 million spindles and 842000 rotors is the second largest in the world.

DO YOU KNOW?

The first cotton textile mill was established at Fort Gloster near Kolkata in 1818.

Traditional sectors like hand loom, handicrafts and small power-loom units are the biggest source of employment for millions of people in rural and semi urban areas. The cotton textile industries contribute about 7% of industrial output, 2% of India's GDP and 15% of the country's export earnings. It is one of the largest sources of employment generation in the country. With over 45 million employees, the total employment in this industry is well over 25million worker. At present there are 1,719 textiles mills in the country. Out of which 188 mills are in public sector, 147 in cooperative sector and 1,284 in private sector.



DO YOU KNOW?

Byssinosis, also called "brown lung disease" or "Monday fever", is an occupational lung disease caused by exposure to cotton dust in inadequately ventilated working environments.

Currently, India is the third largest producer of cotton and has the largest loom arc and ring spindles in the world. At present, cotton textile industry is the largest organized modern industry of India. About 16% of the industrial capital, 14% of industrial production and over 20% of the industrial labour of the country are engaged in this industry.

Ginning is the process of cotton fiber is separated from the cotton seed.

The higher concentration of textile mills in and around Mumbai, makes it as "**Manchester of India**". Presence of black cotton soil in Maharastra, humid climate, presence of Mumbai port, availability of hydro power, good market and well developed transport facility favour the cotton textile industries in Mumbai.

The major cotton textile industries are concentrated in the states of Maharashtra, Gujarat, West Bengal, Uttar Pradesh and Tamil nadu. Coimbatore is the most important centre in Tamil nadu with 200 mills out of its 435 and called as "**Manchester of South India"**. Erode, Tirupur, Karur, Chennai, Thirunelveli, Madurai, Thoothukudi, Salem and Virudhunagar are the other major cotton textiles centres in the state.

## b) Jute Textiles

Jute is a low priced fibre used mainly for making package materials like gunny bags. Today jute is blended with cotton and wool to produce textiles. India is the largest producer of jute goods contributing 35% of the world's total output. This is the second important textile industry in India after cotton textiles. Jute is the golden fibre which meets all the standards of goods packing with its natural, renewable, bio degradable and eco-friendly products.

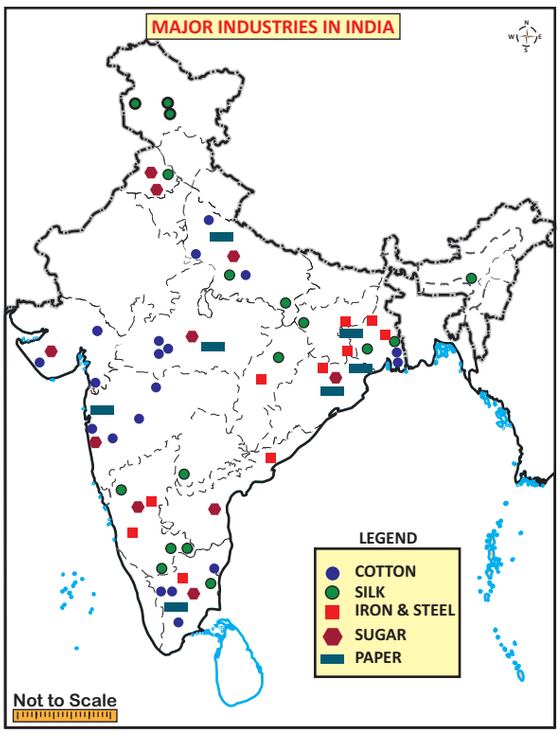
National jute board is headquarter at Kolkata.

NATIONAL JUTE BOARD

The first jute mill in India was established at Rishra near, Kolkata in 1854 by the English man George Auckland. India tops in the production of raw jute and jute goods and second in the export of jute goods next to Bangladesh. Jute production includes gunny bags, canvas, pack sheets, jute web, carpets, cordage, hessians and twines. Now jute is also being used in plastic furniture and insulation bleached fibres to blend with wool. It is also mixed with cotton to make carpet and blankets. The major jute producing areas are in West Bengal and concentrated along the Hooghly river within the radius of six kilometre of Kolkata. Titagarh, Jagatdat, Budge-



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch04.indd 142 10-04-2019 09:51:49




Budge, Haora and Bhadreshwar are the chief centres of jute industry. Andhra Pradesh, Bihar, Uttar Pradesh, Assam, Chhattisgarh and Odisha are the other jute goods producing areas.

DO YOU KNOW?

The first attempt to produce iron and steel unit was set up at Porto Novo in Tamil nadu in 1830.

## c) Silk Industry

CSTRI is the only research institute in the country dedicated to the Research & Developmental activities related to silk technology. CSTRI was established in the year 1983 by the Central Silk Board, Ministry of Textiles, Govt. of India having head quarter at Bangalore

India has been well known for the production of silk. Since the ancient times, India is the second largest producer of raw silk next only to China. Sericulture is a labour intensive industvry and provides employment to 7.56 million people make to weaker and marginalised sections of society.

SILK MARK

Karnataka is the largest producer of silk with an average of 8200 metric tons every year which is about one third of the total silk production of India. Other major producers of silk are West Bengal, Jammu Kashmir, Bihar, Jharkhand, Chhattisgarh, Uttar Pradesh, Punjab, Assam and Tamil nadu states. India exports exclusively silk fabrics, silk scarves, dress material and sarees. It exports to the principal countries like Europe, U.S.A, U.K, Russia, Saudi Arabia, Kuwait and Singapore.

DO YOU KNOW?

Development Commissioner for Handlooms was set up as an attached non-participating office on 20th November, 1975 under the Ministry of Commerce. At present it is functioning under the Ministry of Textiles having headquarters at Udyog Bhawan, New Delhi.

## d) Sugar Industry

Sugar can be produced from sugar cane, sugar-beets or any other crop which have sugar content. In India, sugar cane is the main source of sugar. At present this is the second largest agro based industry of India after cotton textiles. India is the world's second largest producer of sugar cane after Brazil. This industry provides employment to 2.86 lakh workers. Sugar industry is decentralized and located near the sugarcane growing areas as they are weight loosing and bulky to transport.

Uttar Pradesh is the largest producer of sugar, producing about 50% of the country's



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TN_GOVT_X_Std_Geography_Ch04.indd 143 10-04-2019 09:51:50

total. Other major producers are Maharashtra, Uttar Pradesh, Karnataka, Andhra Pradesh, Tamil nadu, Bihar, Punjab, Gujarat, Haryana and Madhya Pradesh states. These states account for more than 90% of the sugar mills and sugar production.

### 4.3.2 Forest based industries

Forest provide us with different types of material which are used as raw material for certain industries like paper, lac, sports goods, plywood etc.

#### a) Paper industry

Paper Industry has emerged as a diversified and specialized industry in India that produces numerous types of papers that comes in various use such as sheet paper, paper boxes, tissues, paper bags, stationery, envelopes and printed-paper products such as books, periodicals, and newspapers. In India the Soft wood is the principal raw material used for making paper especially newsprint and high class printing papers. Paper is the pre-requisite for education and literacy and its use is an index of advancement in these two fields as well as the overall well being of the society.



Paper Industry in India




The first paper mill of India was started in 1812 at Serampore in West Bengal.

The first successful effort was made in 1867 with the setting up of the Royal Bengal paper mills at Ballyganj near Kolkata. Subsequent successful efforts were made at Lucknow in 1879, Titagarh in 1882, Pune in 1887, Raniganj in 1892, Kankinra in 1892 and Naihati in 1918.The raw materials for paper industry includes wood pulp, bamboo, salai and sabai grasses, waste paper and bagasse. West Bengal is the largest producer of paper in the country followed by Madhya Pradesh, Odisha and Tamil nadu states.




National Newsprint and Paper Mills (NEPA) is at Nepanagar in Burhanpur District of Madhya Pradesh.

### 4.3.3 Mineral based industries

Mineral based industries use both metallic & non metallic minerals as raw materials. The major mineral based industry of country is the iron steel industry

#### a) Iron and steel industries

Iron and steel industry is called a basic metallurgical industry as its finished product is used as raw material by host of other industries. Several industries like engineering, heavy machines and machine tools, automobile, locomotives and railway equipment industries use iron and steel as their primary raw material. Due to this, the steel producing capacity of a country is generally taken as an indicator of its level of industrial development.




Chennai is nicknamed as the "Detroit of Asia" due to the presence of major automobile manufacturing units and allied industries around the city.

The modernization of the industry was started in 1907 with the establishment of Tata Iron and Steel Company at Sakchi, now called Jamshedpur. Iron and steel industry of India is mainly concentrated in the states of Jharkhand,



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch04.indd 144 10-04-2019 09:51:50

| S.No | Name of Industry | Place | Establishment Year | Product |
|---|---|---|---|---|
| 1 | Tata Iron and Steel Company(TISCO) | Jamshedpur, Jharkhand | 1911 | Pig Iron |
| 2 | Indian Iron and Steel Company (IISCO) | Burnpur,Hirapur, Kulti, West Bengal | 1972 | Pig Iron & Crude steel |
| 3 | Visweshwaraya Iron Steel Ltd(VISL) | Bhadravati,Karnataka | 1923 | Alloy and Sponge steel |
| 4 | Hisdustan Steel Ltd (HSL) Collaborated with Russia | Bhilai, Chattisgarh | 1957 | Railway Equipments and Ship Building |
| 5 | Hindustan Steel Ltd(HSL) Collaborated with Germany | Rourkela,Odisha | 1965 | Hot and Cold rolled sheets, Galvanized sheets and electrical plates |
| 6 | Hindustal Steel Ltd(HSL) Collaborated with United kingdom | Durgapur,West Bengal | 1959 | Alloy steel, Construction materials and railway equipments |
| 7 | Hisdustan Steel Ltd(HSL) Collaborated with Russia | Bokaro, Jharkhand | 1972 | Sludge and Slog |
| 8 | Salem Steel Ltd | Salem, Tamil Nadu | 1982 | Stainless Steel |
| 9 | Vijayanagar Steel Plant | Tornagal,Karnataka | 1994 | Flat steel and Long Steel |
| 10 | Visakhapatnam Steel Plant(VSP) | Visakhapatnam, Andhra Pradesh | 1981 | Hot Metal |

West Bengal and Odisha. Proximity to the coal fields of Jharia, Raniganj, Bokaro and Karanpura and the iron ore mines of Mayurbhanj, Keonjar and Brona are responsible for this. This area also has sufficient deposits of limestone, dolomite, manganese, silicon and dolomite which are required for the industry.

### 4.3.4 Automobile Industry

India is set to emerge not only as a large domestic market for automobile manufacturers, but also as a crucial link in the global automotive chain. It is one of the most dynamic industrial groups in India.

The first automobile industry of India was started in 1947. The industry is the Premier Automobiles Ltd located at Kurla (Mumbai). It was followed by the Hindustan Motors Ltd at Uttarpara (Kolkata) in 1948. At present, India is the 7th largest producer of automobile manufacturers which include two wheelers, commercial vehicles, passenger car, jeep, scooty, scooters, motor cycles, mopeds and three wheelers. Major centres are at Mumbai, Chennai, Jamshedpur, Jabalpur, Kolkata, Pune, New Delhi, Kanpur, Bengaluru, Sadara, Lucknow and Mysuru.

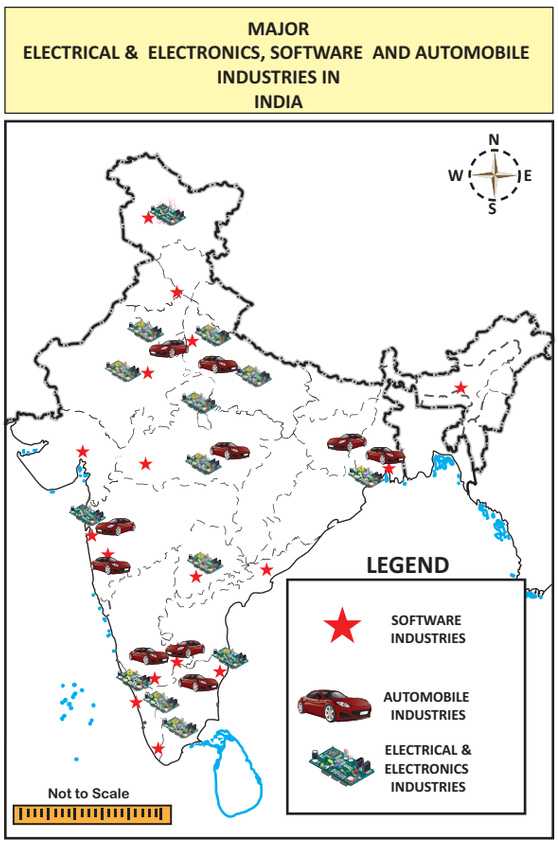



Make in India program was launched in 2014 to put India on the world map as a major hub for global design and manufacturing.

Tata Motors, Maruti Suzuki, Mahindra & Mahindra and Hindustan Motors are the largest passenger car manufacturers of Indian companies in the country. Presence of foreign car companies such as Mercedes Benz, Fiat, General Motors, Toyota and the recent entry



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch04.indd 145 10-04-2019 09:51:50




of passenger car manufacturers BMW, Audi, Volkswagen and Volvo makes the Indian automobile sector a special one. Tata Motors, Ashok Leyland, Eicher Motors, Mahindra & Mahindra and Ford Motors are the major Indian companies which manfacture commercial vehicles. MAN, ITEC, Mercedes-Benz, Scania and Hyundai are the foreign companies engage in the manfacture of commercial vehicles. Two-wheeler manufacturing is dominated by Indian companies like Hero, Bajaj Auto and TVS.

The automobile industries are found in four clusters viz; Delhi, Gurgaon and Manesar in North India, Pune, Nasik, Halol and Aurangabad in West India, Chennai, Bengaluru and Hosur in South India and Jamshedpur and Kolkata in East India.

### 4.3.5 Electrical and Electronic Industries

Heavy electrical industries manufacture equipment used for power generation, transmission and utilization. Turbines for steam and hydro power plants, boilers for thermal power plants, generators, transformers, switch gears etc. are the chief products of this industry. The most important company in the field of heavy electrical is Bharat Heavy Electricals Ltd (BHEL). It has its plants at Hardwar, Bhopal, Hyderabad, Jammu, Bengaluru, Jhansi and Tiruchirappalli. This Industry covers a wide range of products including television sets, transistor sets, telephone exchanges, cellular telegram, computers and varied equipments for post and railway, defence and meteorological department.

Bengaluru is the largest producer of electronic goods in India, hence it is called as the "Electronic Capital of India". The other major producers of electronic goods centers are Hyderabad, Delhi, Mumbai, Chennai, Kolkata, Kanpur, Pune, Lucknow, Jaipur and Coimbatore.

### 4.3.6 Software Industry

India is home to some of the finest software companies in the world. The software companies in India are reputed across the globe for their efficient IT and business related solutions. The Indian Software Industry has brought about a tremendous success for the emerging economy.



**Tidel Park, Chennai**

In India, software industry began in 1970 with the entry of Tata Consultancy



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch04.indd 146 10-04-2019 09:51:53

Services (TCS). Along with this, L & T, Infotech, i-Flex, Accenture, Cognizant, GalexE Solutions India Pvt Ltd and ITC Infotech are the major software industries in the country. At present, there are more than 500 software companies all over India. It exports software service to nearly 95 countries in the world.

The main centres of IT parks are located in Chennai, Coimbatore, Thiruvananthapuram, Bengaluru, Mysuru, Hyderabad, Visakhapatnam, Mumbai, Pune, Indore, Gandhi Nagar, Jaipur, Noida, Mohali and Srinagar.

### 4.3.7 Major challenges of Indian Industries

Industries in India face many problems. Some major problems are listed below.

- Shortage and fluctuation in Power Supply.
- Non- availability of large blocks of land.
- Poor access to credit.
- High rate of interest for borrowed loan.
- Non- availability of cheap labourers.
- Lack of technical and vocational training for employees.
- Inappropriate living conditions nearby industrial estates.




**Challenges of Indian Industries**

## Recap

- Natural resource - raw materials obtained naturally from the earth.
- Renewable resource – the resources that can be replenished.
- Non renewable resource - the energy that cannot be replenished easily.
- Agro based industry – the industries that depend on agriculture for their raw materials.
- Mineral based industries – the industries that use minerals as raw materials.
- Forest based industries – the industries run with the help of forest products.

## A-Z GLOSSARY

**Biogas:** The production of methane and carbon- di- oxide from plants and animal wastes.

**Fossil fuel:** Any naturally occurring carbon or hydrocarbon coal, oil and natural gas.

**Ore:** It is a deposit in the earth crust with one or more value minerals

**Solar power:** Heat radiation from the sun converted into electricity.

**Thermal power station:** An electricity generating plants which burns coal or oil.



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch04.indd 147 10-04-2019 09:51:53

## EXERCISE

### I. Choose the correct answer.

Q47YCF

1. Manganese is used in_____.
   a) Storage batteries
   b) Steel Making
   c) Copper smelting
   d) Petroleum Refining
2. The Anthracite coal has _____.
   a) 80 to 95% Carbon
   b) Above 70% Carbon
   c) 60 to 7% Carbon
   d) Below 50% Carbon
3. The most important constituents of petroleum are hydrogen and
   a) Oxygen b) Water
   c) Carbon d) Nitrogen
4. The city which is called as the mancestor of south India is
   a) Chennai b) Salem
   c) Madurai d) Coimbatore
5. The first Jute mill of India was established at
   a) Kolkata b) Mumbai
   c) Ahmedabad d) Baroda
6. The first Nuclear Power station was commissioned in
   a) Gujarat b) Rajasthan
   c) Maharashtra d) Tamil nadu
7. The most abundant source of energy is
   a) Bio mass b) Sun
   c) Coal d) Oil
8. The famous Sindri Fertilizer Plant is located in
   a) Jharkhand b) Bihar
   c) Rajasthan d) Assam
9. The nucleus for the development of the chotanagpur plateau region is
   a) Transport
   b) Mineral Deposits
   c) Large demand
   d) Power Availability
10. One of the shore based steel plants of India is located at _____.
    a) Kolkata b) Tuticorin
    c) Goa d) Visakhapatnam

### II. Match the following.

1.

| | | | |
|---|---|---|---|
| a. | Bauxite | 1) | Cement |
| b. | Gypsum | 2) | Aircraft |
| c. | Black Gold | 3) | Electrical goods |
| d. | Iron ore | 4) | Coal |
| e. | Mica | 5) | Magnetite |

2.

| | | | |
|---|---|---|---|
| a. | Detroit of India | 1) | Gujarat |
| b. | Thermal power plant | 2) | Thiruvananthapuram |
| c. | Wind farm | 3) | Andhra Pradesh |
| d. | Tidal energy | 4) | 1975 |
| e. | Solar power | 5) | Chennai |

### III. Answer the following Questions briefly.

1. Define the resource and state its types.
2. Name the states that lead in the production of Iron ore in India.
3. What are the minerals and its types?
4. State the uses of magnesium.
5. What is natural gas?
6. Name the different types of coal with their carbon content.
7. Mention the major areas of jute production in India.
8. Name the important oil producing regions of India.



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch04.indd 148 10-04-2019 09:51:53
351

## IV. Distinguish between.

1. Renewable and non-renewable resources.
2. Metallic and non-metallic minerals.
3. Agro based industry and mineral based industry.
4. Jute industry and sugar industry.
5. Conventional energy and non- conventional energy.

## V. Answer the following in a paragraph.

1. Write about the distribution of cotton textile industries in India.
2. Explain the factors responsible for the concentration of jute industries in the hoogly region.
3. Write an account on the major iron and steel industries of India.

## VI. On the outline map of India mark the following.

1. Iron ore production centres.
2. Centres of Petroleum and Natural Gas production.
3. Coal mining centres.
4. Areas of cultivation of cotton.
5. Iron and Steel industries.

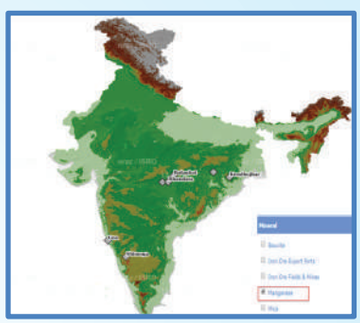
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## ICT CORNER

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### Steps

- Open the Browser and type the URL given below (or) Scan the QR Code.
- Scroll Down and click on 'Explore'
- Click on **'Thematic Serious 2'** in top menuandSelect **'Mineral'**

**Website URL:**

https://bhuvan-app1.nrsc.gov.in/mhrd_ncert/

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Unit - 5

# India - Population, Transport, Communication & Trade



## Learning Objectives

- To study the levels of urbanization and its impacts in India.
- To know about the Human Development in India.
- To learn the transport systems of India.
- To understand the communication system of India.
- To assess the nature of trade in India.

4PNC5Y

## Introduction

The study on human population is one of the most important aspects in geography of any region. The human population has many components but the most fundamental are its number, composition, distribution and density. Therefore, it is essential to study these components. The study on these aspects also would reveal the workforce of the country.

The population of India as per 2011 census is 1,210.19 million (1,21,01,93,422). It shows an increase of 19.31crores from the population of 2001. Population Census of India provides the detailed information about the demography of India. Along with population, we will study about the transport and communication of India in this chapter.

## 5.1 Population

The total number of people residing in a country at a specified period of time is called the **'Population'** of that country. India is the second most populous country in the world next only to china. India covers only 2.4 percent of the land area of the world, but is the home of about 17.5 percent of the world's population. It shows that the proportion of population of India is far higher than the proportion of its area. Thus, a little more than one out of every six persons in the world is from India. Our population is almost equal to the combined population of the USA, Indonesia, Brazil, Pakistan, Bangladesh and Japan and total population of these six countries is 1214.3 million.

### 5.1.1 Census

Population census is the total process of collecting, compiling, analysing or otherwise disseminating demographic, economic and social data pertaining, at a specific time, of all persons in a country or a well-defined part of a country. It happens in an interval of ten years. The data collected through the census are used for administration, planning, policy making as well as management and evaluation of various programmes by the government.



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch05.indd 150 10-04-2019 09:54:10

### 5.1.2 Distribution and Density of Population

The term **'Population Distribution'** refers to the way the people are spaced over the earth's surface. The distribution of population in India is quite uneven because of the vast variation in the availability of resources. Population is mostly concentrated in the regions of industrial centres and the good agricultural lands. On the other hand, the areas such as high mountains, arid lands, thickly forested areas and some remote corners are very thinly populated and some areas are even uninhabited. Terrain, climate, soil, water bodies, mineral resources, industries, transport and urbanization are the major factors which affect the distribution of population in our country.




In India the first census was carried out in the year 1872. But the first complete and synchronous census was conducted in 1881. And the 2011 census represents the fifteenth census of India.

Uttar Pradesh is the most populous state in the country with a population of 199.5 million followed by Maharashtra (112.3 million), Bihar (103.8 million) West Bengal (91.3 million) and the combined Andhra Pradesh (84.6 million). These five states account for about half of the country's population. More than one fourth of the population live only in the two states of U.P and Maharashtra. Sikkim is the least populous state of India(0.61 million). Delhi with 16.75 million population tops among the Union territories.

The uneven distribution of population in the country is the result of several factors such as physical, socio-economic and historical ones. The physical factors include relief, climate, water, natural vegetation, minerals and energy resources. Socio-economic factors consists of the religion, culture, political issues, economy, human settlements, transport network, industrialization, urbanization, employment opportunity etc.

**Hots**

What could be the reasons for uneven distribution of population in India?

### 5.1.3 Density of population

Population density is a better measure of understanding the variation in distribution of population. It is expressed as number of persons per unit area usually per sq km. According to 2011, the average density of population of India is 382 persons per sq.km. India is one of the most thickly populated ten countries of the world. The most densely populated state of India is Bihar and the state with least population density is Arunachal Pradesh. Among the union territories, Delhi is the densely populated one with 11,297 per sq.km, while Andaman and Nicobar Islands have the lowest density of population.

**Hots**

What are the reasons for the rapid growth of population in India?





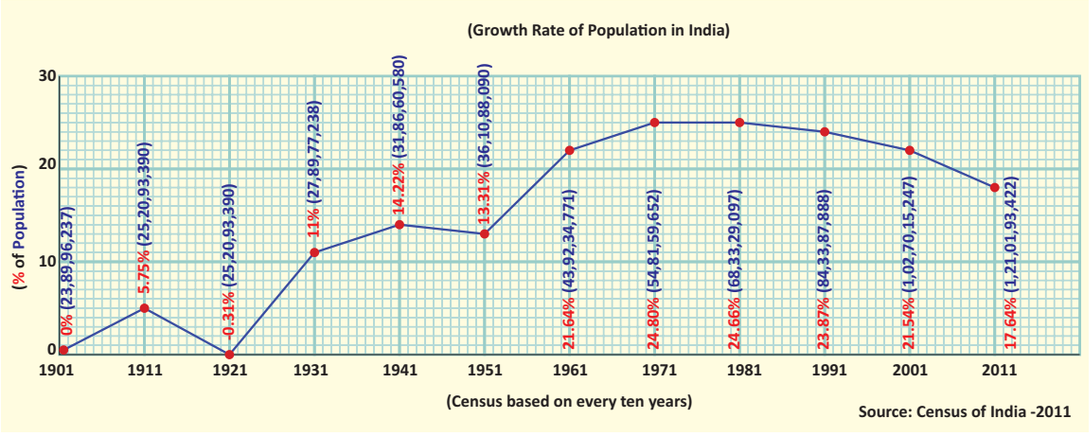
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| Spatial pattern of population Density | |
|---|---|
| Density | Places |
| Very Low Density<br>(less than 150 persons per sq.km) | Arunachal Pradesh (17), Andaman and Nicobar Islands (46), Mizoram (52), Sikkim (86) Nagaland (120), Manipur (122), Himachal Pradesh (123), Jammu and Kashmir (124) and Meghalaya (132) |
| Low Density<br>(150 to 300 persons per sq.km) | Arunachal Pradesh (17), Andaman and Nicobar Islands (46), Mizoram (52), Sikkim (86) Nagaland (120), Manipur (122), Himachal Pradesh (123), Jammu and Kashmir (124) and Meghalaya (132) |
| Moderate Density<br>(300 to 500 persons per sq.km.) | Gujarat (308), The combined Andhra Pradesh (308), Karnataka (319), Tripura (350), Maharashtra (365), Goa (394), Assam (397) and Jharkhand (414) are the states with moderate population density. Assam has tea estates, Andhra Pradesh, Karnataka and Jharkhand |
| High Density<br>(500 to 1000 persons per sq km.) | Punjab (550), Tamil Nadu (555), Haryana (573), Uttar Pradesh (828) and Kerala (859) The union territory of Dadra and Nagar Haveli(698) |
| Very High Density<br>(greater than 1000 persons per sq km) | West Bengal (1029), Bihar (1102), Lakshadweep (2013), Daman and Diu (2169), Puducherry (2598), Chandigarh (9252) and Delhi (11,297). |

### 5.1.4 Population Growth and Change

The growth rate of population is an important demographic feature. It not only helps in understanding the population change that a society has undergone in the past but also helps in predicting the future demographic characteristics of an area. Population growth refers to the change in the number of inhabitants of a country/territory during a specified period of time. The growth of population is expressed in percentage and is described as the growth rate of population. The following table shows the decadal growth rate of population from 1901 to 2011.

Growth of population in India has gone through the different phases. Population of the country in 1901 was 238 million and it grew to 1,210 million over a period of little more than a century. The following are the different stages of population growth of India.






Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch05.indd 152 10-04-2019 09:54:11

**The Period of Stagnant Population (1901-1921):** During the first phase of 20 years (1901-1921), the population of India grew by 15 million. The year 1921 registered a negative growth rate of -0.31% which happened only once throughout the demographic history of India and is called the year of Great Demographic Divide.

**The Period of Steady Growth (1921-1951):** During the second phase of 30 years (1921-1951), the population of India grew by 110 million.

**The Period of Steady Growth (1951-1981):** During the third phase (1951-1981), the population of India grew from 361 million in 1951 to 683 million in 1981. Growth rate in this period is almost doubled when compared to the previous phase of growth rate. This period is often referred to as the period of population explosion.

**The period of High Growth with Definite Signs of Slowing Down (1981-2011):** Population of India increased from 685 million to 1210 million during this phase. The growth rate of population decreased from one census to other. This marks the beginning of a new era in the demographic history of India.

**Population change** refers to an increase or decrease of population of an area from one period to another period. Population growth is influenced by the birth rate, death rate and migration. These three make the changes in population.

Birth rate refers to the number of live births per thousand people in a year and the Death rate refers to the number of deaths per thousand people in a year. The rapid decline in death rate is the major cause of the rapid growth of population in India.

## 5.2 Migration

It is the movement of people across regions and territories. It can be internal (within a country) or international (between the countries). Internal migration does not change the size of population of a country but it influences the distribution of population in a nation. It plays an important role in changing the composition and distribution of population. In India, the mass migration is from rural to urban. Unemployment and under employment in the rural areas are the push factors and the employment opportunity and higher wages in the urban areas caused by the industrial development are the pull factors of migration in the country. 45 out of 121 crores of people in India are reported to be migrants as per 2011 census. Migrants constitute about 37% of population. Migrants are 48% from female and 52% from male.



**Activity**

Collect the pictures and make an album of various types of migration.

### 5.2.1 Population composition

Population composition refers to the characteristics such as age, sex, marital status, caste, religion, language, education, occupation etc. The study of composition of population helps us to understand the social, economic and demographic structure of population.

### 5.2.2 Age composition

The age composition of population refers to the number of people in different age groups in a country. It is one of the most basic characteristics of a population. It helps us



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch05.indd 153 10-04-2019 09:54:11
356

to understand the proportion of population in dependent and independent category. Population of a nation is generally grouped in to three broad categories. In India, the children who has less than 15 years of age constitute 29.5% and the people above 60 years constitute 8.0%. So, the dependent population in India is 37.5%and the independent population (16-59 yrs) is 62.5%. It shows that our country has enormous manpower.

### 5.2.3 Sex Ratio

Sex ratio is defined as the number of females per 1000 male population. This is an important social indicator to measure the extent of equality between males and females in a society at a given time.

**Hots**

The sex ratio in our country is always unfavourable to females. Give reasons.

According to 2011 census, the sex ratio of the country is 940 females per 1000 males. This suggests that the size of female population is lower than males. Only in the state of Kerala and the union territory of Puducherry the sex ratio is greater than 1000. It is 1084 in Kerala and 1038 in Puducherry. The lowest sex ratio is recorded in the union territory of Daman and Diu(618).




The ratio between the economically active and economically inactive of population is termed as Dependency Ratio.

### 5.2.4 Literacy Rate

The people who are able to read and write are known as **literates**. It is an important indicator of quality of people. The percentage of literate people to the total population is termed as **literacy rate**. There has been a steady improvement in the literacy levels in India. India's literacy rate as per 2011 census is 74.04%. From this, the literacy rate of male is 82.14% and the female is 65.46%. It shows that still there is a vast gap (16.68%) between the male and female literacy rates. Kerala ranks first in the country with a literacy rate of 93.91% followed by union territory Lakshadweep with 92.28%. The lowest literacy rate is found in Bihar (63.82 %).

### 5.2.5 Occupational structure

The economically active part of a country's population is enumerated during the census operations and stated as workers. Workers are placed under three fold categories in census record. They are main workers, marginal workers and non-workers. According to the Census of India, all those who had worked for the major part of the preceding year (at least 6 months or 183 days) are recorded as main workers. Those who worked for less than six months are recorded as marginal workers and the people who have not worked at all comes under non workers. Work participation rate denotes the percentage of total workers i.e., total main and marginal workers to the total population in an area. The work participation rate in India is 39.79% in 2011, out of which the work participation rate of male is 53.25% and the female is 25.51%. From the workers, main workers constitute 75.23% and the remaining 24.77% of the people belong to marginal workers.

### 5.2.6 Population Dynamics

Human population dynamics is a field that tracks factors related to changes in the size of population and its characteristics. Predicting population changes is an important aspect of population studies. The demographic trend affects the economic, social, and environmental systems. An increase in human population can affect the quality of natural resources like biodiversity, air, land, and water. The size of Population and characteristics undergoes changes constantly. These changes are reflected clearly in every other aspect of our country.



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch05.indd 154 10-04-2019 09:54:11

### 5.2.7 Problems of over Population

In India, growing pressure of Population on resource base, created many socio-economic, cultural, political, ecological and environmental problems. The Population problems vary in space and time and differ from region to region. Some of the major issues created by the overpopulation in our country are overcrowding, unemployment and under employment, low standard of living, malnutrition, mismanagement of natural and agricultural resources, unhealthy environment etc.

## 5.3 Urbanization

The process of society's transformation from rural to urban is known as urbanization. The level of urbanization of a place is assessed based on the size of population of the towns and cities and the proportion of population engaged in non agricultural sectors. These two are closely linked to the process of industrialization and expansion of the secondary and tertiary sectors of economy.

IB4PYH

### 5.3.1 Urbanization in India

The level of urbanization is measured in terms of percentage of urban population. The level of urbanization in the country has increased more than three times from 1901 to 2011. The percentage of urban population of India was 27.82% in 2001 and it rose to 31.16% in 2011 shows an increase of 3 % in a decade.

The level of urbanization varies widely among the states. Goa is the most urbanized state with 62.17% of urban population. Himachal Pradesh is the least urbanized state with 10.04% of urban population. Among the Union territories, Delhi is the most (97.50 %) urbanized region followed by Chandigarh (97.25%). Among the major states, Tamil Nadu continues to be the most urbanized state with 48.4% percent of urban population followed by Kerala (47.7%) and Maharashtra (45.2%).

| S. No. | Type of Towns/ UAs/OGs | 2001 (in Numbers) | 2011 (in Numbers) |
|---|---|---|---|
| 1 | Statutory towns | 3799 | 4041 |
| 2 | Census Towns | 1362 | 3894 |
| 3 | Urban Agglomeration | 384 | 475 |
| 4 | Out Growths | 962 | 981 |
| **Source:** Statistical data 2011 | | | |

As per 2011 Census, there are 7,935 towns (statutory and census) in the country. The number of towns has increased to 2,774, from 2001 census. In 2011, 475 Urban agglomeration (UAs) with 981 outgrowths (OGs) have been identified as Urban Agglomerations as against 384 UAs with 962 OGs in 2001 Census. Out of 468 UAs belongs to Class I category, 53 UAs have the population of one million and above each and these urban centres are known as **"Million Cities"**. These are the major urban centres in the country. Among the Million Cities, there are three major Urban Agglomerations with more than 10 million population each and are known as "Mega Cities". They are Greater Mumbai UA (18.4 million), Delhi UA (16.3 million) and Kolkata UA (14.1million).

### 5.3.2 Impact of Urbanization

Urbanization and population concentration go hand – in – hand and are closely related to each other. A rapid rate of urbanization in a society is taken as an indicator of its economic development. Urbanization is increasing rapidly in the developing countries including India. Rural to urban migration leads to population explosion in urban areas. Metropolitan cities like Mumbai, Kolkata and Delhi have more population than that can accommodate.

The urban population of India had already crossed the 377million in 2011, which



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch05.indd 155 10-04-2019 09:54:11

is more than the total population of USA. By 2030, more than 50% of India's population is expected to live in urban areas. The following are the **major problems of urbanization** in India.

- It creates urban sprawl.
- It makes overcrowding in urban centres.
- It leads to shortage of houses in urban areas.
- It leads to the formation of slums.
- It increases traffic congestion in cities.
- It creates water scarcity in cities.
- It creates drainage problem.
- It poses the problem of solid waste management.
- It increases the rate of crime.

### 5.3.3 Human Development

Dr. Mahabub-ul-haq defined as "it is a process of enlarging the range of people's choice, increasing their opportunities for education, health care, income and empowerment. It covers the full range of human choices from a sound physical environment to economic, social and political freedom".

### 5.3.4 Human Development Indicators: (as per UNDP)

Population trends, health outcomes, education achievements, national income and composition of resources, work and employment, human security, human and capital mobility, supplementary indicators: perceptions of well-being and status of fundamental rights treaties are the human development indicators.

### 5.3.5 Measuring of Human Development

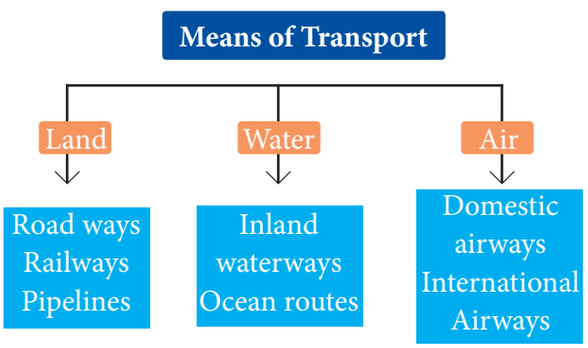
Human Development Index (HDI) is a composite index focusing on three basic dimensions of human development: i) Health - Life expectancy at birth ii) Education - Expected years of schooling for school age children and average years of schooling for the adult population. iii) Income - Measured by gross national income and percapita income.

### 5.3.6 Human Development Classification

HDI classifications are based on HDI fixed cut off points, which are derived from the quartiles of distributions of the component indicators. The HDI of less than 0.550 is used for low human development, 0.550 - 0.699 stands for medium human development, 0.700 - 0.799 for high human development and 0.8 or greater for very high human development.

## 5.4 Transportation

Transport is a system in which passengers and goods are carried from one place to another. Transport system is considered as the **lifeline of a country**. Earlier man travelled on foot or used animals for transport. With the discovery of wheel, transport was made easier and gradually different means of transport were developed. There are three major means of transport in the world.




### 5.4.1 Transport Network in India

Transport is one of the most important components of infrastructure and it is essential for economic development of a country, especially for a large country like India. India has a good transport network of roads, railways, airways and waterways providing necessary connectivity between different parts of the country.



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch05.indd 156 10-04-2019 09:54:11

## 5.4.2 Roadways

Roads play an important role in carrying goods and passengers for short, medium and long distances. It is highly suitable for short distance services. It is comparatively easy and cheap to construct and maintain roads. Road transport system can establish easy contact between farms, fields, factories and markets and can provide door to door transport services. Roads are the most universal mode of transport. Indian roads are cost efficient. It is used by all sections of people in the society. India has the second longest road network in the world with a total length of 56,03,293 km as of 2016. About 85% of passengers and 70 % of freight traffic are carried by roads every year.

**DO YOU KNOW?**

Sher shah suri built the shahi (Royal) road to strengthen and consolidate his empire from the Indus valley to the Sonar valley in Bengal. This road from Kolkata to Peshawar was renamed as **Grand Trunk**(GT) road during the British period. At present, it extends from Amristar to Kolkata. It is bifurcated into 2 segments: (a) (NH)-1 from Delhi to Amristar, and (b) NH-2 from Delhi to Kolkata.

For the purpose of construction and maintenance, roads are classified into National Highways (NH), State Highways (SH), District Roads, Rural Roads (Village roads), Border Roads and International Highways.

### 1. Classification of Roads in India

### a) National Highways (NH)

National Highways form the most important system of road transportation in India. These highways are running through length and breadth of the country connecting capitals of states, major Ports, rail junctions, industrial and tourist centres. Ministry of Road Transport and Highways of India,




**India - Roads**

**FIND OUT**

The import and National Highways in India and label it on the outline map of India.



is responsible for the development and maintenance of National Highways in India. The total length of the National Highways (NHs) in India is 1,01,011 km which accounts for 1.8 % of the total road network length in 2016. The longest National highway is NH-7 which runs from Varanasi in Uttar Pradesh to Kanniyakumari in Tamil Nadu covering a distance of 2369 km. The shortest national highway is NH-47A, which runs from Ernakulum to Kochi port (Willington Island) covering a distance of 6 km.



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch05.indd 157 10-04-2019 09:54:13

## b) State Highways

The state highways are usually roads that link important cities, towns and district headquarters within the state and connect them with national highways or highways of neighbouring states. These roads are administered and financed by state governments. State Highway runs to the length of 1, 76,166 km as of 2016.

## c) District Roads

District Roads provide connectivity between the district and taluk headquarters with the state highways and national highways. District Roads are constructed and maintained by the Public Works Department of the states. The total length of the road of this category is 5,61,940 km(16.81%) in 2016.

## d) Rural Roads (Village Roads)



Rural roads connectivity is a key component of rural development. These roads are vital for providing links in the rural areas. It links the different villages with their neighbouring towns. They are maintained by Village Panchayats. The total length of rural roads in India is 39,35,337 km as of 2016. Rural roads consist of Panchayat roads, (Zilla Parishad, Panchayat Samiti, Gram Panchayat); roads of the Pradhan Mantri Gram Sadak Yojana (PMGSY) and those constructed by the State PWDs.

**Hots**

Find out what are the functions of NHAI.




National Highways Authority of India (NHAI) was established in 1995. It is an autonomous body under the Ministry of Surface Transport.

## e) Border Roads

These are the roads of strategic importance in border areas. They are constructed and maintained by Border Roads Organization. It was established in 1960 for the development of the roads of strategic importance in the northern and northeastern border areas. Border Roads Organization has constructed world's highest road joining Chandigarh and Leh in Ladakh. This road runs at an average altitude of 4,270 meters.

**Golden Quadrilateral:** 5,846 km long road of 4/6 lanes connecting, India's four metropolitan cities: Delhi-Kolkata-Chennai-Mumbai-Delhi. This project was launched in 1999.

**North–South and East-West Corridors:** North-South corridor aims at connecting Srinagar in Jammu and Kashmir with Kaniyakumari in Tamil Nadu (including Kochi-Salem Spur) with 4,076km long road. The East-West corridor has been planned to connect Silchar in Assam with the port town of Porbandar in Gujarat with 3,640km of road length. The two corridors intersect at Jhansi.

**Hots**

What are the highlights and benefits of the Golden Quadrilateral Highways?

## f) Expressways

These are multi-lane good quality highways for high speed traffic. Some of the important expressways are; (i)Mumbai-Pune Road, (ii) Kolkata-Dumdum Airport road (iii) Durgapur-Kolkata road and (iv) Yamuna expressway between Delhi and Agra.



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch05.indd 158 10-04-2019 09:54:15



**Mumbai-Pune Road**

### g) International Highways

These are the roads that link India with neighbouring countries for promoting harmonious relationship with them. These highways have been constructed with an aid from world bank under an agreement with the Economic and Social Commission for Asia-Pacific (ESCAP). These roads connect important highways of India with those of the neighbouring countries such as Pakistan, Nepal, Bhutan, Bangladesh and Myanmar. In India the densest road network is found in the northern plains where it is relatively easy to construct roads. In mountainous area, it is quite difficult to construct roads. Road density is the highest in Kerala and lowest in Jammu &Kashmir.

## 5.4.3 Railways

Indian railway system is the main artery of the country's inland transport. Railways cater to the needs of large scale movement of traffic, both for freight and passenger, thereby contributing to economic growth. Railways are considered as the backbone of the surface transport system of India. It promotes national integration by bringing people together. It also promotes trade, tourism, education etc. Railways help in the commercialization of the agriculture sector by facilitating the quick movement of perishable goods. Its role in transporting raw materials to industries and finished goods to markets is invaluable. Indian railways network is the largest in Asia and second largest in the world. The length of Indian railways network as of 2017 is 67,368 km with 7,349 railway stations.

DO YOU KNOW?

The first train steamed off from Mumbai to Thane in 1853, covering a distance of 34 km. In 1951, the systems were nationalized as one unit "**The Indian Railways**". The headquarter of Indian Railways is **New Delhi.**

For operations and management, the Indian Railways is organized into 16 zones. 1) Northern Railway - Delhi 2) North-Western Railway - Jaipur 3) North-Central Railway- Allahabad 4) North-Eastern Railway - Gorakhpur 5) North-East Frontier Railway - Guwahati 6) Eastern Railway - Kolkata 7) East coast Railway - Bhubaneswar 8) East-Central Railway - Hazipur 9) West-Central Railway - Jabalpur 10) Central Railway - Mumbai (VT) 11) Western Railway - Mumbai (Churchgate) 12) Southern Railway - Chennai 13) South-Central Railway - Secunderabad 14) South Eastern Railway - Kolkata 15) South-Western Railway - Hubball and 16) South East Central Railway - Bilaspur. The Northern Railway accounts for the longest route length, followed by the Western Railway.

**Activity**

Prepare a seminar topic about "Role of Railways in Indian Economy"

On the basis of width of the track, the Indian railways fall under four categories. Broad gauge with a width of 1.676 meter, Meter gauge with a width of 1 meter and Narrow gauge with a width of 0.762 meter and Light gauge with 0.610 meter.

In recent times, many developments have taken place in the Indian railways. The arrival of Konkan Railway Corporation (KRC), Mass Rapid Transit System (MRTS), Metro and Sub-Urban railways provide easy and efficient means of transport. These are



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch05.indd 159 10-04-2019 09:54:15


Baramulla
Leh
Jammu
Srinagar
Kargil
Amritsar
Ferozpur
Kalka
Chandigarh
Shimla
Ambala
Yamunanagar
Bikaner
Jaisalmer
Jodhpur
Ajmer
Sawai Madhopur
Kota
Gwalior
Jhansi
Agra
Mathura
Delhi
Meerut
Moradabad
Bareilly
Lucknow
Kanpur
Varanasi
Allahabad
Gorakhpur
Muzaffarpur
Patna
Darbhanga
Siliguri
Guwahati
Jorhat
Dibrugarh
Tinsukia
Itanagar
Kumbhigram
Bhuj
Rajkot
Porbandar
Veraval
Vadodara
Ahmedabad
Surat
Bhopal
Itarsi
Jabalpur
Katni
Satna
Ranchi
Jamshedpur
Asansol
Durgapur
Kharagpur
Kolkata
Haldia
Balasore
Bhubaneshwar
Cuttack
Paradwip
Visakhapatnam
Rourkela
Raipur
Bilaspur
Nagpur
Akola
Bhusaval
Nashik
Pune
Mumbai
Solapur
Gulbarga
Wadi
Hyderabad
Secunderabad
Warangal
Vijayawada
Guntakal
Tirupati
Chennai
Gudur
Nellore
Renigunta
Arakkonam
Katpadi
Puducherry (Pondicherry)
Salem
Erode
Coimbatore
Tiruppur
Karur
Dindigul
Madurai
Tiruchirappalli
Thanjavur
Kumbakonam
Virudhunagar
Tirunelveli
Nagercoil
Thoothukudi
Kanyakumari
Ramanathapuram
Mangalore
Kannur
Kozhikode
Shoranur
Ernakulam
Kottayam
Thiruvananthapuram
Bodinayakanur
Kovaipudur
Thrissur
Palakkad
Pollachi
Ooty
Mettupalayam
Arakkonam
Jolarpettai
Hosur
Dharmapuri
Krishnarajapuram
Whitefield
Yelahanka
Yesvantpur
Tumkur
Hubli
Londa
Miraj
Kurduvadi
Latur
Parbhani
Manmad
Jalgaon
Bhusaval
Akola
Wardha
Ballarshah
Chandrapur
Gondia
Nagpur
Raipur
Bilaspur
Jharsuguda
Rourkela
Balasore
Kharagpur
Haldia
Asansol
Durgapur
Howrah
Kolkata
Bhubaneshwar
Cuttack
Paradwip
Visakhapatnam
Vijayawada
Guntur
Nellore
Chennai
Gudur

### 5.4.4 : Pipeline transport:

Pipelines provided a very convenient mode of transport to connect oil and natural gas fields, refineries and to the markets. In the past, these were used to transport water to cities and industries. Now solids can also be transported through a pipeline when converted into slurry. The initial cost of laying pipeline is high but subsequent running cost is minimum. It can be laid through difficult terrain as well as under water. It ensures steady supply of goods and reduces the transshipment losses and delays are the major advantages of pipeline transport. Oil field in upper Assam to Kanpur, from Salaya in Gujarat to Jalandhar in Punjab and gas pipeline from the Hazira in Gujarat ot Jagadispur in Uttar Pradesh are the three important network large network of pipeline in the country.

### 5.4.5 Waterways

A waterway is an important mode of transport for both passenger and cargo traffic in India. It is the oldest and also the cheapest means of transport and most suitable for carrying heavy and bulky materials from one country to another. It is a fuel-efficient and eco-friendly mode of transport. The water transport is of two types- Inland Waterways and Ocean water ways(sea routes).

#### a) Inland Waterways

India has an extensive network of inland waterways in the form of rivers, canals, lakes and backwaters. It depends upon the depth and width of the waterways and the continuity of the water flow. The total navigable length of our country is 14,500 km, out of which about 5,200 km length of rivers and 4,000 km length of canals can be used by mechanized crafts. The total cargo carried by inland waterways is just about 0.1% of the total inland traffic of India. For the development, maintenance and regulation of national waterways in the country, the Inland water ways Authority was setup in 1986. The major national waterways are: National Waterway 1: It extends between Haldia and Allahabad, measures 1620 km and includes the stretches of the Ganga-Bhagirathi-Hooghly river system. National Waterway 2: This waterway includes the stretch of the Brahmaputra river between Dhubri and Sadiya a distance of 891 km. National Waterway 3: This waterway extends between Kollam and Kottapuram in the state of Kerala. It is the first national waterway in the country with 24 hour navigation facilities along its entire stretch of 205 km.

#### b) Oceanic Routes

Oceanic routes play an important role in the transport sector of India's economy. About 95% of India's foreign trade by volume and 70 percent by value moves through ocean routes.

Coastal shipping plays an important role in transport of bulk goods in India. Shipping is not only the most economical mode of transport, it is also an environment friendly mode. The sea and oceanic routes are mainly used for international trade and are connected through ports. There are 13 major and 200 minor or intermediate ports in India. The major ports are administered by the Central Government and minor ports are managed and administered by various state governments. The major ports on the east coast are Kolkata (including Haldia Dock), Paradip, Visakhapatnam, Chennai, Ennore and Tuticorin. The major ports on the west coast are Kandla, Mumbai, Nhava Seva (Jawaharlal Nehru Port), New Mangalore, Marmagao and Kochi.

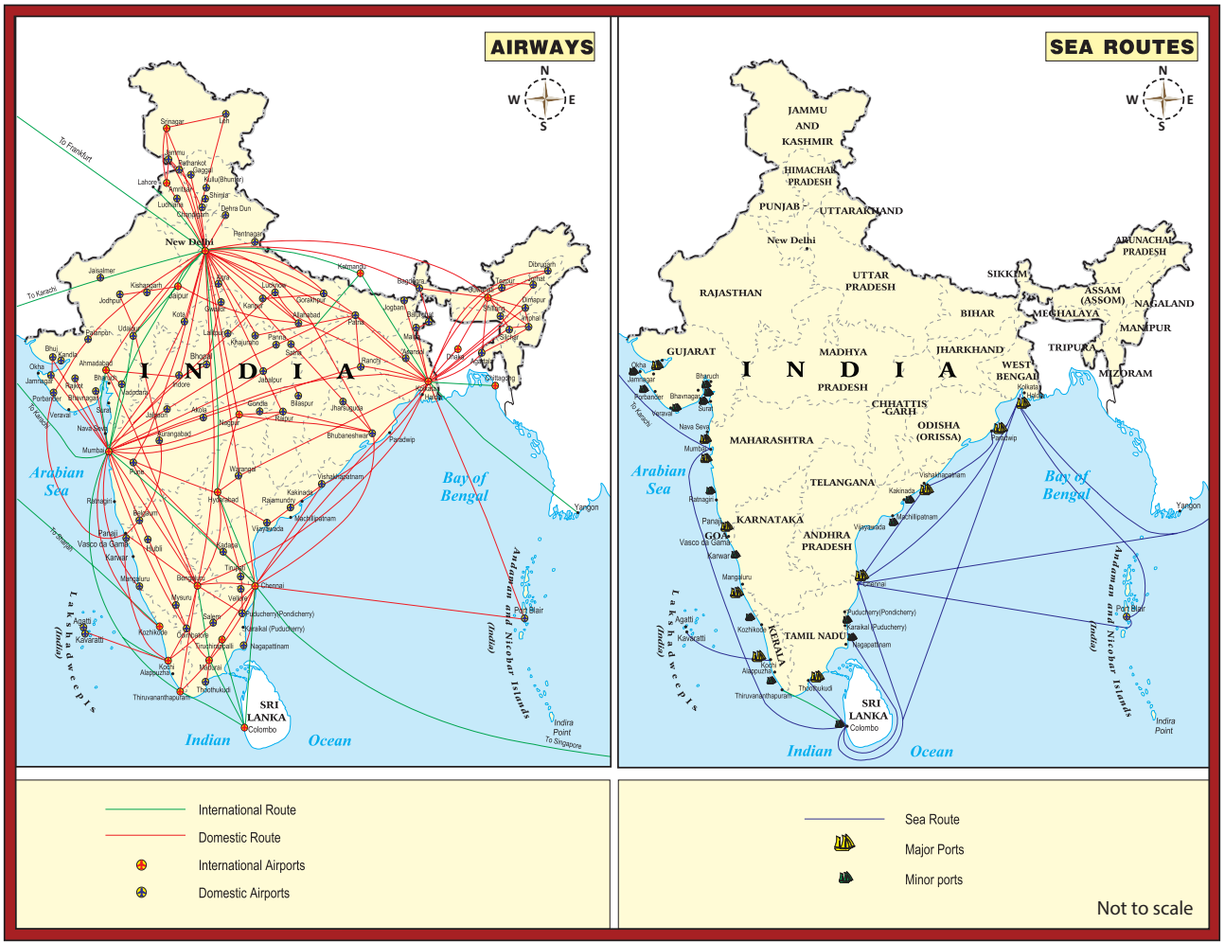
India has four major shipyards. Hindustan shipyard in Vishakhapatnam, Garden Reach workshop in Kolkata, Mazagaon Dock in Mumbai, Kochi Shipyard in Kochi. India is the second largest ship owning country in Asia and ranks 16th in the World.

### 5.4.6 Air Transport

Airways are the quickest, costliest, most modern and comfortable means of transport, Air transport facilitates connectivity on a national, regional and international scale. It has made accessibility easier by connecting difficult



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch05.indd 161 10-04-2019 09:54:16
364




terrains like high mountains and sandy deserts. It carries passengers, freight and mail. Air transport plays a key role in times of emergency as well as in the event of natural and man-made calamities like floods, epidemics and wars.

Air transport in India made a beginning on 18th February, 1918 when Henry Piquet carried a mail from Allahabad to Naini. In 1953, eight different airlines which were in operation in the country were nationalised.

**Domestic Airways** fly within the boundaries of a country and **International Airways** connect major cities of the world. The Indian Air lines and Air India are the two airline services run by the government of India. **Indian Air lines** provides the domestic air services and **Air India** provides international air services. Presently, there are 19 designated international airports available in the country. These airports are managed by Airports Authority of India. Some of them are Netaji Subhash Chandra Bose International Airport, Kolkata, Chennai International Airport, Chennai, Indira Gandhi International Airport, Delhi, Chhatrapati Shivaji International Airport, Mumbai, Thiruvananthapuram International Airport, Thiruvananthapuram, Sardar Vallabh Bhai Patel International Airport, Ahmedabad, Bangalore International Airport, Bengaluru, Rajiv Gandhi International Airport, Hyderbad etc. Besides this, there are about 80 domestic airports and about 25 civil enclaves at defence air fields.

## Hots

Why is air travel preferred in the north eastern states?



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch05.indd 162 10-04-2019 09:54:16

### a) Pavan-Hans Helicopter Ltd

Pavan-Hans Helicopter Ltd has been providing Helicopter support services to the petroleum sector, including ONGC and oil India Ltd. It is a public sector company based in New Delhi. Its operations are based at the Juhu Aerodrome in Vile Parle (West) Mumbai. Pavan-Hans is a Mini Ratna–I category public sector undertaking. It often provides services to various state governments in India particularly north east India Inter Island, Ferry services in Andaman & Nicobar Islands, services to Lakshadweep Island etc.,

### b) Airports Authority of India (AAI)

Airports Authority of India (AAI) was constituted in 1995. It provides security to Indian Airports. AAI under the ministry of Civil Aviation is responsible for creating, upgrading, maintaining and managing civil aviation infrastructure in India.

## 5.5 Communication

Communication is a process that involves exchange of information, thoughts and ideas. Technology does wonders in communication fields. Communication is categorized in to personal and mass communications.

### 5.5.1 Personal Communication

The exchange of information between the individuals is called personal communication. It includes post and telegraph services, telephone, mobile phone, short message services, fax, internet, e-mail etc. Personal Communication system enables the user to establish direct contact.

The Indian postal network is the largest in the world with 1,55,000 post offices. Of these more than 1,39,000 post offices are located in rural areas. The postal service was opened to the public in the country in 1837. The first Indian postal stamp was issued in 1852 in Karachi. Collecting and delivering mail is the primary function of the department of posts. It introduced the Quick Mail Service in 1975 and today it covers the entire country. The Quick Mail Service functions on the basis of the system of PIN (Postal Index Number) code which was introduced in 1972. The premium products include the Money order, e-money order, Speed Post, Express Parcel Post, Business Post, Media Post, Satellite Post, Retail Post, Greeting Post, Data Post, Speed Net and Speed Passport Services.




In 2007, the Government of India merged the Air India and Indian Airlines under National Aviation Corporation of India Limited **(NACIL).** In which **NACIL (A)** provides international services, **NACIL (I)** provides domestic services and services to neighboring countries in south east Asia and middle East.

Cards and envelopes are considered first-class mail and are airlifted between stations covering both land and air. The second-class mail includes book packets, registered newspapers and periodicals. They are carried by surface mail, covering land and water transport.To facilitate quick delivery of mails in large towns and cities, six mail channels have been introduced recently. They are called Rajdhani Channel, Metro Channel, Green Channel, Business Channel, Bulk Mail Channel and Periodical Channel.

India has one of the largest telecommunication networks in Asia. Apart from the urban areas more than two-thirds of the villages in India have already been covered with **Subscriber Trunk Dialing (STD)** telephone facility, while International communication can be made through **ISD (International Subscriber Dialing).** There is an uniform rate of STD facilities all over India. Telephone is a form of oral communication. It is considered very essential for the growth of commerce. It is the most preferred form as it provides instant communication. Mobile phone, fax and internet are the other personal communication used in the country.



Aatchiyar Kalvi
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366

### 5.5.2 Mass Communication Systems

Mass Communication enables millions of people to get the information at the same time. It is a great way to provide education as well as entertainment. It helps in creating awareness among the people regarding various national policies and programmes. The Mass Communication Systems can provide the information to people in two methods. They are Print Media and Electronic Media.

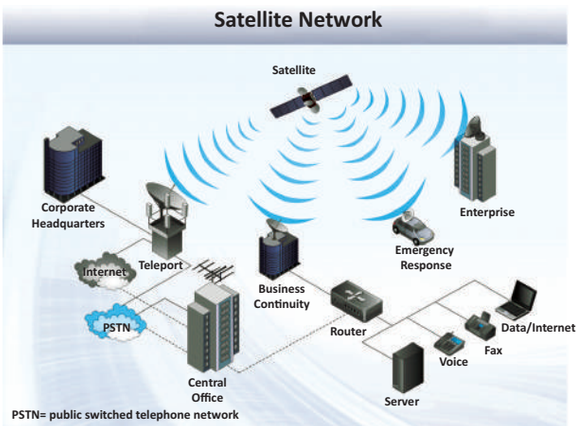
**Electronic Media:** Radio broadcasting in India was started in 1923 by the Radio club of Bombay. Since then it gained immense popularity and changed the social and cultural life of people. It was named as All India Radio (AIR) in 1936 and again it was renamed as Akashwani in 1957. It broadcasts a variety of programs related to information, education and entertainment. Special news bulletins are also broadcasted on special occasions like session of parliament and state legislatures.

**Television** broadcasting has emerged as the most effective audio-visual medium for disseminating information and educating the masses. Television network in India is known as Doordarshan (DD) which started Common National Program (CNP) services and it is extended to the backward and remote rural areas.

**Internet** (contraction of **interconnected network**) is the global system of interconnected computer networks that use the Internet protocol suite to link devices worldwide. **Social media** are interactive computer-mediated technologies that facilitate the creation and sharing of information, ideas, career interests and other forms of expression via virtual communities and networks. With over 460 million internet users, India is the second largest online market, ranked only behind China. By 2021, there will be about 635.8 million internet users in India. Despite the large base of internet users in India, only 26 percent of the Indian population accessed the internet in 2015. This is a significant increase in comparison to the previous years, considering the internet penetration rate in India stood at about 10 percent in 2011. Furthermore, men dominated internet usage in India with 71 percent to women's 29 percent.

**Print Media:** Newspapers are the most common but powerful means of communication come under print media. India has many newspapers which carry information on local, national and international events to the people.

### 5.5.3 Satellite Communication




The use of Satellite in getting a continuous and synoptic view of larger area has made this communication system very vital for the country. Satellite images are used for weather forecasting, monitoring of natural calamities, surveillance of border areas etc. The communication through satellites emerged as a new era in communication in our country after the establishment of **Indian Space Research Organization (ISRO)** in 1969.

Satellite system in India can be grouped into two-the Indian National Satellite System (INSAT) and the Indian Remote Sensing Satellite System (IRS).The INSAT, established in 1983, is a multipurpose system for telecommunication, meteorological observation and for various other programs. The INSAT series are used for relaying signals to television, telephone, radio, mobile phone.



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TN_GOVT_X_Std_Geography_Ch05.indd 164 10-04-2019 09:54:17

It is also useful in weather detection, internet and military applications.

The INSAT series, GSAT series, KALPANA-1, HAMSAT, EDUSAT are the major communication satellite used for communication purpose. GSAT–7A is the recent launch (December 19, 2018) for communication programs. INSAT-1B launched on 30th August 1983 is the first communication satellite in INSAT series.

## 5.6 Trade

Trade is an important phenomenon that decides the economic growth of a country. Trade is an act (or) process of buying, selling or exchanging of goods and services. The primitive method of trade was known as the Barter system where goods were exchanged for goods. Later on, money was introduced as a medium of exchange in buying and selling of goods. The difference in value between the imports and exports is called balance of trade. The situation in which the value of exports exceeds the value of imports is termed as favourable balance of trade and the reverse position is termed as unfavourable balance of trade.

**Activity**

Collect the names fo different types of goods and differentiate it and make a table as perishable and non-perishable goods.

### 5.6.1 Types of Trade

Trade in general, is of two types. They are Internal and International. The trade carried on within the domestic territory of a country is termed as **Internal trade.** It is also called as **Domestic trade** or **Local trade.** Land transport (roadways and railways) plays a major role in this trade. Local currency is used in internal trade. It helps to promote a balanced regional growth in the country i.e, tea from Assam, coffee from Karnataka, Rubber and spices from Kerala, minerals from Jharkhand etc., are supplied to different parts of our country.

Trade carried on between two or more countries is called **International trade.** It is also called as external trade or foreign trade. Export and Import are two components of International trade. Export means goods and services sold for foreign currency. Import means goods and services bought from overseas producers. Waterways and Airways play a vital role in this type of trade. Foreign currency is involved in international trade. The trade between any two countries is called **Bilateral trade.** The trade between more than two countries is called **Mutilateral Trade.**

**Hots**

Find out the major trade blocs which are useful for multilateral trade.

### 5.6.2 Exports

The major exports of India are tea, marine products, ores and minerals, leather products, gems and jewels, sports goods, chemicals and related products, plastics and rubber articles, articles of stones, plaster, cement, asbestos, mica, glass ware, paper and related products, base metals, optical, medical and surgical instruments, electronic items, machinery, office equipments, textiles and allied products.

### 5.6.3 Imports

The major imports are petroleum products, pearls, precious stones and semi-precious stones, gold and telecom instruments.

**Activity**

Collect the countries names and make it as a table of Bilateral trade and multilateral trade countries.

### 5.6.4 India's Trade Performance

The volume of India's foreign trade has increased many fold since independence. During 2008 -2009, the volume of trade was 840755 crores and it rose to 1039797 crores in 2016-2017. The import during 2008-2009 was 1374436 crores and was with a deficit of



Aatchiyar Kalvi
TN_GOVT_X_Std_Geography_Ch05.indd 165 10-04-2019 09:54:17

40679 crores. The import during 2016–2017 rose to 1396352 crores and was with the deficit of 356555 crores. It reveals that not only the balance of trade is unfavourable but also the increase in the level of deficit.

## Recap

- The total number of people residing in a country at a specified period of time is called the size of population of that country.
- The growth of population is determined by the birth rate, death rate and migration of people.
- The process of society's transformation from rural to urban is known as urbanization.
- Communication is classified into the personal and mass communications.
- Trade is an exchange of goods and services. Internal and International trades are its types. Import and exports are the components of an International Trade.

## GLOSSARY

**Barter:** A direct exchange of goods between any two parties.No money is involved in the trade.

**Foreign exchange:** The mechanism or process by which payments between any two places operating under different national currency systems are effected without passing of actual money or gold, etc.

**Harbour:** An extensive stretch of deep water near the seashore where vessels can anchor securely. It is used for exports and imports of goods.

**Port:** The commercial part of a harbour with the facility of loading and unloading of goods and space for the storage of cargo.

## EXERCISE

### I. Choose the correct answer

1. The scientific study of different aspects of population is called
   a) Photography
   b) Demography
   c) Choreography
   d) Population density.

WWK3S1

2. The state with highest literacy rate as per 2011 census is _____.
   a) Tamil nadu b) Karnataka
   c) Kerala d) Uttarpradesh.
3. Human Development is measured in terms of _____.
   a) Human Resource Index
   b) Per capita index
   c) Human Development Index
   d) UNDP
4. _____ transport provides door to door services.
   a) Railways b) Roadways
   c) Airways d) Waterways.
5. The length of Golden Quadrilateral superhighways in India is
   a) 5846 km b) 5847 km
   c) 5849 km d) 5800 km
6. The length of navigable Inland waterways in India is
   a) 17,500 km b) 5000 km
   c) 14,500 km d) 1000 km
7. The National Remote sensing Centre(NRSC) is located at _____.
   a) Bengaluru b) Chennai
   c) Delhi d) Hyderabad
8. The transport useful in the inaccessible areas is



Aatchiyar Kalvi
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Unit - 6

# Physical Geography of Tamil Nadu



## Learning Objectives

NTME8G

- To know the history of formation of the state
- To study the major physiographic divisions of the state
- To understand the nature of climate, soils and natural vegetation
- To familiarise the students with the geographical conditions of their living places
- To know the major natural disasters and their occurrences in Tamil Nadu

## Introduction

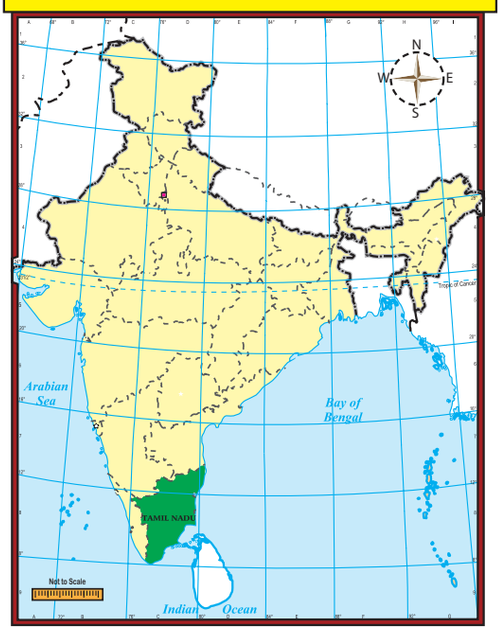
The study of one's own region is the first step to become a global citizen. The purpose of studying our local territory is to understand life in our environment. In the last five lessons, you have learnt about various geographical characterstics of our country. In this lesson and those that follow, we shall learn about the geography of Tamil Nadu. You will get to know about the etymology, history of formation, location, size, physical divisions, rivers, climate, soil and natural vegetation of Tamil Nadu in this chapter.

Our state Tamil Nadu has a hoary past with a variety of cultural practices and traditions. Its exquisite physiography and climate makes our state unique in India. It has long and sunny beaches, waterfalls, hills, forests and varied flora and fauna.




As per, the States Reorganisation Act, 1956, state boundaries were reorganised on some linguistic basis.

LOCATION OF TAMIL NADU IN INDIA







- Name the first state of India created on linguistic basis.
- Why was the capital of Tamil Nadu renamed?
- What is the meaning of the word **'Chennai'**?



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## 6.1 Formation of Tamil Nadu

During Sangam age, the Tamizham was ruled by three great emperors – Cheras, Cholas and Pandyas – and virtuous kings ruling small kingdoms like Adhiyaman and Pari. For a short time, the Tamil country was ruled by the Kalabras, but not much about their time is recorded or known.

After the Kalabras, the Tamil country came under the control of the Pallavas, Cholas, Pandyas, Marathas, Mughals and Vijayanagara empires in succession until the British took administrative control over the entire country, starting from Madras.

During the British period, our country was divided into three presidencies, namely Madras, Bombay and Calcutta for political and military purposes. Tamil Nadu and parts of Andhra Pradesh, Kerala, Karnataka and Orissa (Odisha) constituted the Madras Presidency. After independence, following the linguistic division of states, Telugu-speaking areas were bifurcated from the Madras state. After bifurcation, there were only 13 districts in Madras state. The Madras state was renamed as Tamil Nadu by C.N. Annadurai, former Chief Minister of Tamil Nadu, on January 14, 1969.

### 6.1.1 Location and Size

Tamil Nadu is one of the 29 states of India, located in the southern most part of the country. This landmass extends from 8°4'N to 13°35'N latitudes and from 76°18'E to 80°20'E longitudes. Its eastern and western extremities are defined by the Point Calimere and the hills of Anaimalai respectively. The northern extremity of the state is marked by Pulicat lake and the southernmost point is Cape Comorin.

It covers an area of 1,30,058 sq.km and is the 11$^{th}$ largest state in India. It covers 4% of the area of our country.

### 6.1.2 Boundaries and Neighbours

Tamil Nadu is bounded by Bay of Bengal in the east, Kerala in the west, Andhra Pradesh in the north, Karnataka in the northwest and Indian Ocean in the south. Gulf of Mannar and Palk Strait separate Tamil Nadu from the Island of Sri Lanka, which lies to the southeast of India. The state has 1,076 km long coastline, the second-longest in India after Gujarat.

### 6.1.3 Administrative Divisions

Already we have learnt that the state of Tamil Nadu had only 13 districts at the time of its formation. After that, the state was reorganised several times for the purpose of administrative convenience. At present there are 35 districts in Tamil Nadu, including the newly created districts such as Kallakurichi, Tenkasi and Chengalpet. The administrative divisions of the state are given in the following table.

| Divisions | Numbers |
|---|---|
| Districts | 35 (32+3) |
| Revenue Divisions | 76 |
| Taluks | 226 |
| Firkas | 1,127 |
| Revenue Villages | 16,564 |
| Municipal Corporations | 15 |
| Municipalities | 125 |
| Panchayat Unions (Blocks) | 385 |
| Town Panchayats | 561 |
| Village Panchayats | 12,618 |
| Lok Sabha Constituencies | 39 |
| Assembly Constituencies | 234 |
| **Source:** maps of india.com 2019 | |

**Activity**

- Find out the coastal districts of Tamil Nadu with the help of a map.
- Group the districts of Tamil Nadu which share their boundary with the states of Andhra Pradesh, Karnataka and Kerala separately.

## Physiographic Divisions

We have learnt about endogenetic and exogeniec processes in 9$^{th}$ std. Have you ever thought what kind of landforms on which you live? Have you ever noticed the landscapes,



Aatchiyar Kalvi
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371

# TAMIL NADU - POLITICAL




**DO YOU KNOW?**

All districts of Tamil Nadu except the Chennai, The Nilgiris and Kanyakumari were bifurcated at different points of time.

**FIND OUT**

■ Between in which latitude and longitude, is your school located?



Aatchiyar Kalvi
10th_Geography_Unit_6.indd 87 02-08-2019 16:53:27
372

you come across while travelling from one place to another? Have you ever wondered how these landforms were formed? Let's see the major physical features of Tamil Nadu and their characteristics.

Tamil Nadu is located on the Peninsular Plateau, known as Deccan Plateau. It is also a part of the ancient Gondwana land that broke away 135 million years ago during Cretaceous Period. Tamil Nadu has many unique land features which include high eroded mountains, shallow deep valleys and plains. The topography of the state slopes towards east. Based on the major differences in relief, Tamil Nadu is divided into the physical divisions of Western Ghats, Eastern Ghats, Plateaus, Coastal and Inland plains.

## 6.2 Western Ghats

Western Ghats extends from the Niligris in the north to Marunthuvazh Malai at Swamithope in Kanyakumari district in the south. Height of the Western Ghats ranges from 2,000 to 3,000 metres. It covers an area of about 2,500 sq.km. Though the Western Ghats is a continuous range, it has some passes. The passes are Palghat, Shencottah, Aralvaimozhi, and Achankoil. The Niligris, Anaimalai, Palani hills, Cardamom hills, Varusanadu, Andipatti and Agasthiyar hills are the major hills of Western Ghats .

### 6.2.1 Nilgiri Hills



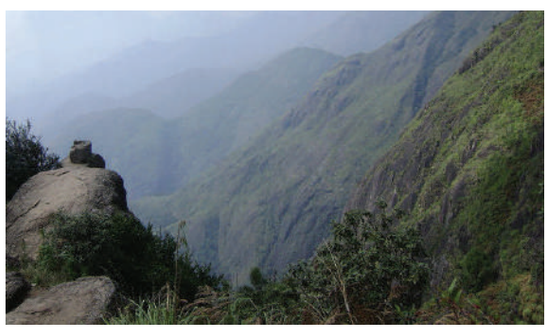
Doddabetta

The Nilgiri hills is located in the Northwestern part of Tamil Nadu. It consists of 24 peaks with more than 2,000 metres height. Doddabetta is the highest peak (2,637 metres) of this hills followed by Mukkuruthi (2,554 metres). Ooty and Coonoor are the major hill stations located on this hills. It has more than 2,700 species of flowering plants and the state animal Nilgiri Tahr is found in this hill. Much of the Nilgiris natural montane grasslands and shrublands have been disturbed or destroyed by extensive tea plantations and cattle grazing.

### 6.2.2 Anaimalai

Anaimalai is located in the border of Tamil Nadu and Kerala. It is located to the south of Palghat Gap. Anaimalai Tiger Reserve, Aliyar Reserved Forest, Valparai hill station, Kadamparai hydroelectric Power Plant are located on this hills. Aliyar and Tirumurthy dams are located at the foothills of this range.

### 6.2.3 Palani Hills



Palani Hills

Palani hills are the eastward extension of the Western Ghats. Except its western part, these hills are located in Dindigul district. Vandaravu (2,533 metres) is the highest peak in the Palani hills. Vembadi Shola (2,505 metres) is its second highest peak. The hill station of Kodaikanal (2,150 metres) lies in the south central portion of the range.

### 6.2.4 Cardamom Hills

These hills are also known as Yela Mala hills located in the southwestern part of Tamil Nadu. It acquires its name from the cardamom spice, which is commonly grown here. Pepper and coffee are the other crops cultivated over the hills. They meet the Anaimalai hills in the northwest, the Palani



Aatchiyar Kalvi
10th_Geography_Unit_6.indd 88 02-08-2019 16:53:28
373

| Peaks in Western Ghats | Height(m) |
|---|---|
| Doddabetta | 2,637 |
| Mukkuruthi | 2,554 |
| Vembadisolai | 2,505 |
| Perumalmalai | 2,234 |
| Kottaimtalai | 2,019 |
| Pagasura | 1,918 |

hills in the northeast and Varusanadu and Andipatti hills in the southeast.

### 6.2.5 Varusanadu and Andipatti Hills

Another eastward extension of Western Ghats is Varusanadu and Andipatti hills. Megamalai (the highway mountain), Kalugumalai, Kurangani hill station, and Suruli and Kumbakarai waterfalls are found on these hills. Srivilliputhur Grizzled Squirrel Wild life Sanctuary is located in the southern slope of these hills in Virudhunagar district. Vaigai river and its tributaries originate in this region.

### 6.2.6 Pothigai Hills

Its major part lies in Tirunelveli district with its southern slope in the Kanyakumari district. Pothigai hills are called with different names such as the Shiva Jothi Parvath, Agasthiyar hills and Southern Kailash. These hills feature richest biodiversity in the Western Ghats. This area is known for its rich evergreen forest, waterfalls and ancient temples. Kalakkad Mundanthurai Tiger Reserve is located in this region.

### 6.2.7 Mahendragiri Hills

This continous range is situated along the border of Kanyakumari and Tirunelveli districts and is a part of the southern range of the Western Ghats. Its average height is 1,645 metres. ISRO Propulsion Complex, a test facility for Indian Space Research Organisation's launch vehicles and satellite propulsion systems, is situated on the lower slopes of this mountain.

## 6.3 The Eastern Ghats

Unlike Western Ghats, Eastern Ghats is a discontinuous and irregular one. It is dissected at many places by the rivers, which drain into the Bay of Bengal. Its height ranges from 1,100 to 1,600 metres. These hills separate the plains from plateaus. Javadhu, Servarayan, the Kalrayan, Kollimalai and Pachaimalai are the major hills of the Eastern Ghats of Tamil Nadu and are located in northern districts of the state.

### 6.3.1 Javadhu Hills

Javadhu hills are an extension of the Eastern Ghats spread across parts of Vellore and Tiruvannamalai districts and separates these two districts. Many peaks with the height of 1,100–1,150 metres are located in this range. Melpattu is its highest peak. The Vainu Bappu Observatory (VBO) Kavalur, which began operations in 1967, is located on these hills. Many parts of this range are covered with bluish grey granites. It is noted for its fruit bearing trees, medicinal herbs and sandalwoods. Due to illegal logging, sandalwood trees are disappeared now.

### 6.3.2 Kalvarayan Hills

The name 'Kalvarayan' comes from the word 'Karalar', the ancient name of the present tribes. It is another major range of hills in the Eastern Ghats of Tamil Nadu. This range, along with the Pachaimalai, Aralvaimalai, Javadhu and Servarayan hills, separates the river basins of Cauvery and Palar. The height of this hill ranges from 600 to 1,220 metres. These hills have two sections. The northern section is referred as the Chinna Kalvarayan and the southern one the Periya Kalvarayan. The average height of Chinna Kalvarayan is 825 metres and the Periya Kalvarayan is 1,220 metres.

### 6.3.3 Servarayan Hills

It is a mountain range located near the Salem city with the height ranging from 1,200

| Peaks in Eastern Ghats | Height(m) |
|---|---|
| Shervarayan temple | 1,623 |
| Mazhamalai | 1,500 |
| Urgamalai | 1,486 |
| Kuttirayan | 1,395 |
| Muganur | 1,279 |
| Valsamalai | 1,034 |



Aatchiyar Kalvi
10th_Geography_Unit_6.indd 89 02-08-2019 16:53:28
374

| Districts | Hills |
|---|---|
| Coimbatore | Maruthamalai, Velliangiri and Anaimalai |
| Dharmapuri | Theertha malai, Chitteri and Vathalmalai |
| Dindigul | Pazhamalai and Kodaikanal |
| Erode | Chenni hills and Sivan hills |
| Vellore | Javadhu, Yelagiri and Rathinamalai hills |
| Namakkal | Kolli hills |
| Salem | Servarayan, Kanjamalai and Chalk hills |
| Villupuram | Kalvarayan and Gingee hills |
| Perambalur | Pachaimalai |
| Kanyakumari | Marunthuvazhmalai |
| Tirunelveli | Mahendragiri and Agasthiyarmalai |
| The Nilgiris | Nilgiri hills |

**Major hills in Tamil Nadu**

to 1,620 metres. The name of the range comes from a local deity, Servarayan. The highest peak in the southern part of the Eastern Ghats is located in this range. The peak is Solaikaradu and its height is 1,620 metres. The hill station Yercaud, which is known as poor man's Ooty, is located on this range. Servarayan temple is its highest point (1623 metres).

### 6.3.4 Kolli Hills

It is a small mountain range located in Namakkal district. It covers an area of about 2,800 sq.km. It rises up to 1300 metres. This is a mountain range that runs almost parallel to the east coast of South India. Arpaleeswarar temple located on this range is an important pilgrim centre. It has the largest cover of evergreen or shola forest when compared to other parts of the Eastern Ghats. Several coffee plantations, fruits, flowers and silver-oak estates are found in this region.

FIND OUT

Why are mountain heights measured from mean sea level and not from ground level?

### 6.3.5 Pachaimalai

It is the lowest hill range, spreads over the districts of Perambalur, Tiruchirapalli and Salem. In Tamil language, pachai means green. The vegetation in this range is greener than the vegetative cover of the other hills in this region. Hence it is named as '**Pachai malai**'. Jackfruit is a popular seasonal agricultural product of this hills.

FIND OUT

1. Name the hill resorts of Western Ghats and Eastern Ghats in Tamil Nadu.
2. Is Ooty located on Western Ghats?
3. Name the hill stations located in Western and Eastern Ghats of Tamil Nadu.
4. Why is the Nilgiri hills called as Blue Mountains?
5. What is the kind of landform on which you live and what is its height?

## 6.4 Plateaus

Plateaus of Tamil Nadu are located between the Western Ghats and the Eastern Ghats. It is roughly triangular in shape and covers an area of about 60,000 sq.km. Its height increases from east to west. Its height ranges between 150 and 600 metres. This plateau is broader in the north and very narrow in the south. It has many subdivisions.

Bharamahal plateau is a part of the Mysore plateau situated in the northwestern part of Tamil Nadu. Its height ranges from 350 to 710 metres. Dharmapuri and Krishnagiri districts are located in this region.

Coimbatore plateau lies between the Nilgiris and Dharmapuri districts. Its height varies from 150 to 450 metres. This region includes Salem, Coimbatore and Erode districts. The area of this plateau is about 2,560 sq.km. Its height varies from 352 to 710 metres. Moyar river separates this plateau from the Mysore plateau.



Aatchiyar Kalvi
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375

# TAMIL NADU - PHYSICAL






Aatchiyar Kalvi
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376

Rivers like Bhavani, Noyyal and Amaravathi, which originate from Western Ghats, form valleys in this region. Many intermontane plateaus are found in the region of the Nilgiris. Sigur plateau is one such plateau.

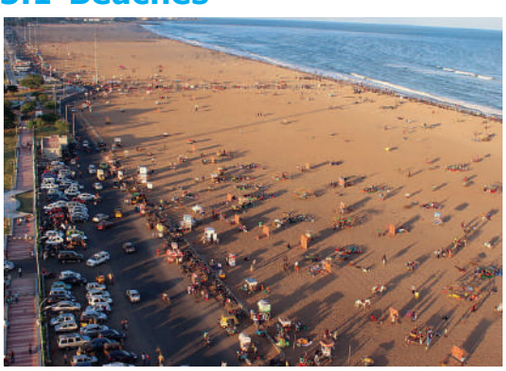
Madurai plateau found in Madurai district extends up to the foothills of the Western Ghats. Vaigai and Thamirabarani basins are located in this zone.

## 6.5 Plains

The plains of Tamil Nadu may be divided into two, namely inland plains and coastal plains. Inland plains are drained by the rivers Palar, Ponnaiyar, Cauvery and Thamirabarani. Cauvery plains is one of the most important fertile plains of the state. The plains of Cauvery is found in Salem, Erode, Karur, Tiruchirapalli, Pudukottai, Thanjavur, Tiruvarur and Nagapattinam districts.

Coastal plains of Tamil Nadu are also called Coromandel or Cholamandalam (land of Cholas) plain, which extends from Chennai to Kanyakumari. It is formed by the rivers that flow towards east drain in the Bay of Bengal. It is more than 80 kilometres wide at some places. Though it is an emerged coast, some parts are submerged into the sea. The sand dunes formed along the coast of Ramanathapuram and Thoothukudi districts are called **Teri**. Coral rocks are found at the head of Gulf of Mannar in the east coastal plain.

### 6.5.1 Beaches



Marina Beach

The Coromandel Coast along the Bay of Bengal consists of many beautiful and exotic beaches. The golden sands of Tamil Nadu beaches are scattered with palm and casuarinas groves. Marina and Elliot beaches of Chennai, Kovalam and Silver beaches of Kanyakumari are some of the famous beaches in Tamil Nadu.

## 6.6 Drainage

Rivers of Tamil Nadu are its lifeline. Though it has many rivers, the rivers of Cauvery, Palar, Ponnaiyar, Vaigai and Thamirabarani are the notable ones. Most of the rivers of Tamil Nadu originate from Western Ghats and flow towards east and drain into the Bay of Bengal. All the rivers of the state are non-perennial except Thamirabarani. It is perennial as it is fed by both the southwest and northeast monsoons.

### 6.6.1 Cauvery

The river Cauvery originates at Talacauvery in the Brahmagiri hills of Kodagu(coorg) district of Karnataka in the Western Ghats. About 416 km of its course falls in Tamil Nadu. It serves as the boundary between Karnataka and Tamil Nadu for a distance of 64 km. It forms Hogenakkal waterfalls in Dharmapuri district. Mettur Dam, also called as the Stanley Reservoir, is located across this river in Salem district. A tributary called Bhavani joins Cauvery on the right bank about 45 km from the Mettur Reservoir. Thereafter, it takes easterly course to enter into the plains of Tamil Nadu. Two more tributaries, Noyyal and Amaravathi, confluence the river on the right bank at Thirumukkudal 10 km from Karur. The river is wider in this region, where it is called as 'Agandra Cauvery'.

In Tiruchirappalli district, the river branches into two parts. The northern branch is called Coleroon or Kollidam and




Pamban, Hare, Krusadai, Nallathanni Theevu, Pullivasal, Srirangam, Upputanni, Island Grounds, Kattupalli Island, Quibble Island and Vivekananda Rock Memorial are some major islands of Tamil Nadu



Aatchiyar Kalvi
10th_Geography_Unit_6.indd 92 02-08-2019 16:53:29
377

the southern branch remains Cauvery. From here, the Cauvery delta begins. After flowing for about 16 km, the two branches join again to form the '**Srirangam Island**'. The Grand Anaicut, also called as Kallanai was built across the river Cauvery. After Kallanai, the river breaks into a large number of distributaries and forms a network all over the delta. The network of distributaries within the delta of Cauvery in the coast is called as the '**Garden of Southern India**'. It merges into Bay of Bengal to the south of Cuddalore.

### 6.6.2 Palar

The Palar river rises beyond Talagavara village in the Kolar district of Karnataka. The Palar drains an area of 17,871 sq.km, out of which nearly 57% lies in Tamil Nadu and the rest in the states of Karnataka and Andhra Pradesh. Ponnai, Goundinya Nadhi, Malattar, Cheyyar and Kiliyar are its major tributaries. Its total length is 348 km, out of which 222 km of its course falls in Tamil Nadu. It flows through the districts of Vellore and Kancheepuram before entering into Bay of Bengal near Kuvattur.

### 6.6.3 Then Pennaiyar/Then Ponnaiyar

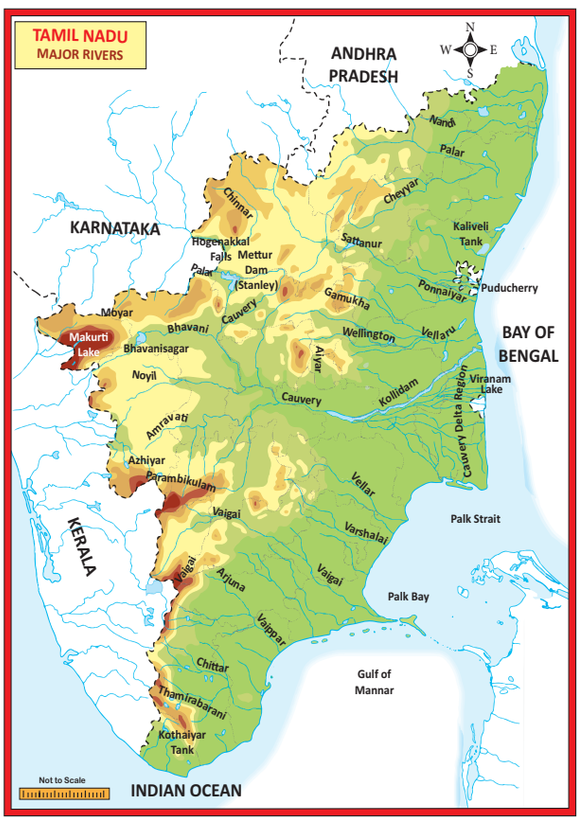
It originates from the eastern slope of Nandi Durga hills in eastern Karnataka. It drains an area of 16,019 sq.km, of which nearly 77% lies in Tamil Nadu. It flows for a distance of 247 km in the southeasterly direction in the districts of Krishnagiri, Dharmapuri, Vellore, Tiruvannamalai, Cuddalore and Villupuram. It branches into two, viz. Gadilam and the Ponnaiyar near Tirukoilur Anaicut. Gadilam joins the Bay of Bengal near Cuddalore and Ponnaiyar near the Union Territory of Puducherry. Chinnar, Markandanadhi, Vaniar and Pambar are its tributaries. Heavy rain at the river's source cause sudden but short-lived floods. The river is extensively dammed for irrigation, especially in Tamil Nadu. There are reservoirs at Krishnagiri and Sathanur across this river. The **Ponnaiyar** is considered sacred by Hindus and festivals are held during the Tamil month of Thai (January–February).

### 6.6.4 Vaigai

Vaigai river rises from the eastern slopes of the Varusanadu hills of Western Ghats of Tamil Nadu. It drains an area of 7,741 sq.km, which lies entirely in the state of Tamil Nadu. It flows through the districts of Madurai, Sivaganga and Ramanathapuram. Its length is 258 km. It discharges its water into the Ramnad Big Tank and some other small tanks. The surplus water from the tanks is finally discharged into Palk Strait near Ramanathapuram.

### 6.6.5 Thamirabarani

The name is interpreted as Thamiram (copper) and Varuni (streams of river). The water of this river gives a copper like appearance due to the presence of dissolved suspended red soil. It originates from a peak in Pothigai hills on the Western Ghats above Papanasam in the Ambasamudram taluk. The origin of the river is associated with Sage Agasthiyar. It courses through the districts of Tirunelveli and Thoothukudi and finally flow into the Bay of Bangal near Punnaikayal in Thoothukudi district. Karaiyar, Servalar, Manimuthar, Gadananathi, Pachaiyar, Chittar and Ramanathi are its main tributaries.






Aatchiyar Kalvi
10th_Geography_Unit_6.indd 93 02-08-2019 16:53:29
378

| District | Waterfalls |
|---|---|
| Dharmapuri | Hogenakkal |
| Thirunelveli | Kalyanatheertham, Courtallam |
| Theni | Kumbakkarai and Suruli |
| Namakkal | Agayagangai |
| The Nilgiri | Catherine and Pykara |
| Salem | Kiliyur |
| Virudhunagar | Ayyanar |
| Coimbatore | Vaideki, Sengupathi, Siruvani and Kovaikutralam |
| Tiruppur | Tirumurthy |
| Madurai | Kutladampatti |
| Kanyakumari | Tirparappu, Kaalikesam, Ulakkai and Vattaparai |

**Major waterfalls in Tamil Nadu**

## 6.7 Climate

You have already learnt that the Tropic of Cancer divides India roughly into two equal parts and the state Tamil Nadu lies to the south of Tropic of Cancer, which is near the Equator. As it receives vertical sunrays, the temperature of the state is relatively high throughout the year. Though the state falls within the hot climatic zone, the east coast of Tamil Nadu enjoys tropical maritime climate. The Bay of Bengal and Indian Ocean influence the climate of the coastal regions. The annual temperature ranges from 18° to 43° and the annual rain fall is 958.5 mm.

While the east coast experiences tropical maritime climate, the western region of the state enjoys the mountainous climate. This climate prevails over the Blue Mountains, Anaimalai and the Kodaikanal hills. Thick forests and high altitude make the climate of these areas cool and pleasant. Thus stations in this region attract thousands of people during the summer season. Low altitude and distance from the sea are the reasons for high temperature and dry conditions in the central part of Tamil Nadu. The migration of vertical sun's rays leads to the formation of different seasons in Tamil Nadu as follows.

| Seasons of Tamil Nadu | |
|---|---|
| **Season** | **Period** |
| Winter Season | January-February |
| Summer Season | March- May |
| Southwest Monsoon | June-September |
| Northeast Monsoon | October –December |

### 6.7.1 Winter Season

During January and February, the vertical rays of the sun fall between the Tropic of Capricorn and the Equator. Hence, Tamil Nadu and India on the whole receive slanting rays from the sun. So, the weather is slightly cooler during these months. The difference between summer and winter temperature is not very high. Winter temperature in Tamil Nadu varies from 15°C to 25°C. However, in the hill stations, the winter temperature drops below 5°C occasionally. Some valleys in the Nilgiris record even 0°C. This drop in temperature leads to the formation of thick mist and frost. This season is practically dry.

### 6.7.2 Summer Season

The apparent migration of the sun towards north during March, April and May results in the reception of vertical sun's rays by South India. Thus there is a steady rise in temperature from the equator. Hence, Tamil Nadu located to the south of Tropic of Cancer, experiences high temperature. Generally the temperature varies from 30°C to more than 40°C. During this season particularly in the month of May, southern part of the state receives some rainfall from pre-monsoon showers (Mango/Blossom showers) and some parts experience convectional rainfall.




1. What is Agni Nakshatram?
2. Group the districts of Tamil Nadu into low, moderate and heavy rainfall regions.

### 6.7.3 Southwest Monsoon

The intense heating of the landmass of the north by the sun during March to May creates a well-developed low pressure in North India, which draws wind from the Indian Ocean.



Aatchiyar Kalvi
10th_Geography_Unit_6.indd 94 02-08-2019 16:53:30

This results in the formation of southwest monsoon. During this season, Tamil Nadu is located in the rain shadow region for the wind, which blows from the Arabian Sea. As a result, Tamil Nadu receives only a meagre rainfall from this monsoon. Rainfall during this season decreases from west to east. Coimbatore plateau receives an average of 50 cm rainfall. However, the southern districts like Kanyakumari, Tirunelveli and The Nilgiris record 50–100 cm rainfall during this period. The rainfall is scanty in the eastern part of the state.

**Coriolis Force:** An apparent force acts as a result of the earth's rotation deflects moving objects (such as projectiles or air currents) to the right in the northern hemisphere and to the left in the southern hemisphere.

### 6.7.4 Northeast Monsoon

The northeast monsoon season commences from the month of October and lasts till mid-December. The high pressure created over Central Asia and northern part of India becomes the source for the northeast monsoon winds. The apparent migration of the sun from Tropic of Cancer to the Tropic of Capricorn causes a change in receiving temperature and air pressure during this season. It makes the wind to blow towards Bay of Bengal from North India. After reaching Bay of Bengal, the wind gets deflected by Coriolis force and takes the northeast direction. Hence it is known as northeast monsoon. As the northeast monsoon is a part of returning of southwest monsoon wind, it is also called as the retreating monsoon. This is the main rainy season for Tamil Nadu, accounting for its 48% of annual rainfall. Coastal districts of the state get nearly 60% of their annual rainfall and the interior districts get about 40–50% of the annual rainfall during this season.

Tropical cyclones are common during this season. Cyclone originating from the Bay of Bengal bring heavy rainfall to the east coastal regions of Tamil Nadu. More than 50% of the state's rainfall is received from tropical cyclones during this period and east coastal region receives 100 to 200 cm of rainfall. The rainfall received by the central and northwestern parts is 50–100 cm. The cyclones sometimes disturb the cultivation of crops and cause severe damage to life and property.



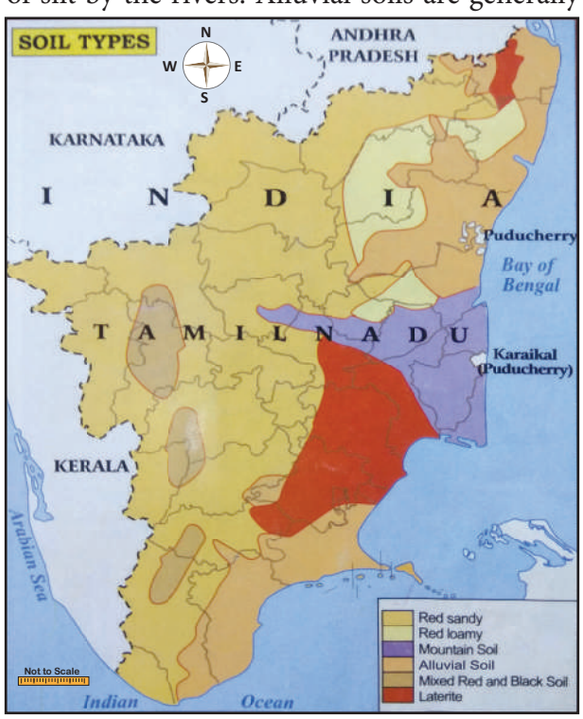

Chinnakallar near Valparai is the 3rd wettest place in India and the wettest place in Tamil Nadu.

## 6.8 Soils of Tamil Nadu

Soil is the loose material mainly formed by the weathering and erosion of rocks. It forms an important element of agriculture. It provides essential minerals and nutrients for the growth of vegetation. Soil is one of the important non-renewable resources in the world. It takes 300–1,000 years to form two inches of soil. The soil of a place depends on the factors like climate, parent rocks and vegetative cover of the respective places. The soils in Tamil Nadu are broadly classified into five types according to their characteristics. They are alluvial, black, red, laterite and saline soils.

### 6.8.1 Alluvial Soil

Alluvial soils are formed by the deposition of silt by the rivers. Alluvial soils are generally






Aatchiyar Kalvi
10th_Geography_Unit_6.indd 95 02-08-2019 16:53:33
380

fertile as they are rich in minerals such as lime, potassium, magnesium, nitrogen and phosphoric acid. It is deficient in nitrogen and humus. It is porous and loamy. Paddy, sugarcane, banana and turmeric are cultivated in this soil. It is found in the river valley regions and the coastal plains of Tamil Nadu. Generally this type of soil is found in the districts of Thanjavur, Tiruvarur, Nagapattinam, Villupuram, Cuddalore, Tirunelveli and Kanyakumari. It is also found to a small extent along the river valleys in few interior districts.

### 6.8.2 Black Soil

Black soils are formed by the weathering of igneous rocks. It is also known as regur soil. As cotton grows well in this soil, it is also called as black cotton soil. This soil is developed over the Deccan lava granite region under semi-arid conditions. It is fine textured and clayey in nature. It is poor in phosphoric acid, nitrogen and organic matter. Chief minerals found in this soil are calcium, magnesium, carbonates, potash and lime. Cotton, sorghum, cumbu and fodder crops are the major crops cultivated in the black soil regions of Tamil Nadu. Black soils are found extensively in the districts of Coimbatore, Madurai, Virudhunagar, Tirunelveli and Thoothukudi.

### 6.8.3 Red Soil

Red soils cover over two-thirds of the total area of Tamil Nadu. They are found particularly in the central districts of the state. This soil is sandy and loamy in texture. However, the characteristic features of the red soil vary according to its formation and climatic condition under which the soil was formed. Red soil is porous, friable and non-retentive of moisture. The colour of the soil is due to the presence of high content of iron oxides. This soil is poor in nitrogen, phosphorus, acids and humus. paddy, ragi, tobacco and vegetables are the chief crops grown in this soil. Almost all types of crops can be grown in this soil with the application of manure and irrigation facilities. It is dominantly found in Sivagangai and Ramanathapuram districts.

### 6.8.4 Laterite Soil

This soil is formed by the process of intense leaching. Laterite soils are found in some parts of Kancheepuram, Tiruvallur and Thanjavur districts and some patches over the mountainous region in the Nilgiris. Crops grown in this soil are paddy, ginger, pepper and plantains. It is also suitable for the cultivation of tea and coffee plants.

### 6.8.5 Saline Soil

Saline soils in Tamil Nadu are confined to the Coromandel coast. Vedaranyam has a pocket of saline soil. However, the tsunami waves on December 26, 2004 brought a lot of sand and deposited it all along the east coast of Tamil Nadu. The tsunami made the coastal areas unsuitable for cultivation to a considerable extent.

## 6.9 Soil Erosion

Soil is a non-renewable resource. It is very difficult to replace the soil once it gets degraded. Deforestation, overgrazing, urbanisation and heavy rain are responsible for soil erosion in Tamil Nadu. Soil erosion reduces the fertility of soils, which in turn reduces agricultural productivity. So, it is necessary to take intensive care to conserve the soil resources.




Desertification is one of the major problems of Tamil Nadu. According to the desertification atlas prepared by the ISRO. about 12% of the total geographical area is under desertification and land degradation. Theni, the Nilgiris and Kanyakumari are the worst affected districts. About 12,000 hectares (120 Sq.km) were affected by sand deposition in Theni and Rajapalayam.

## 6.10 Natural Vegetation

Natural vegetation refers to the forest cover. Landforms, nature of soil, temperature and rainfall are the major factors that control the distribution of natural vegetation. As per



Aatchiyar Kalvi
10th_Geography_Unit_6.indd 96 02-08-2019 16:53:33
381

National Forest Policy, 1988, a minimum of one-third of the total geographical area must be under forest cover. The total forest cover of Tamil Nadu is far lower than this. According to the Tamil Nadu State of Forest Report - 2017 assessment, the area under forest in the state is 26,281 sq.km, which constitutes 20.21% of the total area. Tamil Nadu constitutes 2.99% of India's forest cover. The forest types in the state varies from wet evergreen to scrub forests. The Western Ghats, the longest hill range in the state, is one of the 25 global hotspots of bio-diversity and one of the three mega centres of endemism in India. The following table shows the categories of forest and their areal extent classified under the provision of Indian Forest Act.

| Forest Type | Area(sq.km) |
|---|---|
| Reserved Forest | 19,459 |
| Protected Forest | 1,782 |
| Unclassified Forest | 1,266 |
| Total | 22,507 |

**Source:** Tamil Nadu stastistical Handbook - 2016

## Forest Types

The forest in the state is broadly divided into five types as follows

### 6.10.1 Tropical Evergreen Forest

This forest type is found in the regions that receive heavy rainfall. It is a dense, multi-layered forest. It is found in the upper slopes of Western Ghats of Tirunelveli, Kanyakumari, the Nilgiris and Coimbatore districts. The major tree species of this forest are cinnamon, Malabar ironwood, panasa, java plum/jamun, jack, kindal, ayani and crape myrtle. The semi-evergreen type of forest in the state is found over the regions of sub-tropical climate over the Eastern Ghats. The prominent regions are Servarayan, Kollimalai and Pachaimalai. Species of Indian mahogany, monkey teak, woolly cassia, jack and mango trees are common in this region.

### 6.10.2 Montane Temperate Forest

It is found in sheltered valleys of Anaimalai, Nilgiris and Palani hills over a 1000 metres altitude. They are known as '**Sholas**'. The trees in this forest are evergreen and usually short. Nilgiri champa, wights litsea and rose apple are the common trees found in this forest.

### 6.10.3 Tropical Deciduous Forest

This type of forest lies in the margin of semi-evergreen and evergreen forests. The trees in this forest shed their leaves during the dry season. The trees reach up to a height of 30 metres. Some trees of this forest are silk cotton, kapok, kadamba, dog teak, woman's tounge, axlewood and siris. Bamboos are also common in this type of forests. Some trees of this forest are economically important.

### 6.10.4 Mangroves



Mangrove Forest in Pichavaram

This type of forest is found in the coastal areas, river deltas, tails of islands and over sea faces where accretion is in progress. The vegetation is typically evergreen, moderate in height and has leathery leaves. The vegetation of this forest is adapted to survive in tidal mud and salt water. Asiatic mangrove, white mangrove, wild jasmine/Indian pivot etc. are some of the notable trees of this forest. Pichavaram, Vedaranyam, Muthupet, Chatram and Thoothukudi are the places in Tamil Nadu where the mangrove forest is found to a considerable extent.

**Role of Mangroves in Coastal Zone Management.**

Mangroves helps in the prevention of coastal erosion from waves and storms. It also protects coral reefs and sea grass meadows from being smothered in sediments.



Aatchiyar Kalvi
10th_Geography_Unit_6.indd 97 02-08-2019 16:53:34
382

DO YOU KNOW?

Pichavaram mangrove forest is located near Chidambaram, Cuddalore district. This is the second largest mangrove forest in the world covering about 1,100 hectares (11 sq.km) of area. It is separated from the Bay of Bengal by a sandbar. It consists of species like Avicennia and Rhizophora. It also supports the existence of rare varieties of shell and fin fishes.

### 6.10.5 Tropical Thorn Forest

Thorn forest in Tamil Nadu is found where there is a little rainfall. These forests are found from plains up to 400 meters altitude. The common trees of this forest are rusty acacia, wheel, neem and palm. Shrubs are common vegetation in this type of forest. This type of forest is found in the districts of Dharmapuri, Ramanathapuram, Virudhunagar and some parts of interior districts.

**Districts with prominent forest cover in Tamil Nadu**

| District | Area (sq km) |
|---|---|
| Dharmapuri | 3,280 |
| Coimbatore | 2,627 |
| Erode | 2,427 |
| Vellore | 1,857 |
| The Nilgiris | 1,583 |
| Dindigul | 1,662 |

## 6.11 Wild life

Animals and birds live in forests constitute the wild life. Tamil Nadu has a variety of wild animals, birds and reptiles. hills are an ideal refuge for elephants, bisons, tigers, deer and monkeys.

Several Wildlife sanctuaries and National Parks have been set up to protect the animal life in the state. The hills of the state provide an ideal condition for a variety of animals and plants life. The list of Wild lifeSanctuaries, National parks and Biosphere Reserves of Tamil Nadu are listed in the following tables.

| S.No | Wildlife Sanctuaries in Tamil Nadu | District | Year of Establishment |
|---|---|---|---|
| 1 | Mudumalai Wildlife Sanctuary | The Nilgiris | 1940 |
| 2 | Mundanthurai Wildlife Sanctuary | Tirunelveli | 1962 |
| 3 | Point Calimere Wildlife Sanctuary | Nagapattinam | 1967 |
| 4 | Indira Gandhi Wildlife Sanctuary | Coimbatore | 1976 |
| 5 | Kalakad Wildlife Sanctuary | Tirunelveli | 1976 |
| 6 | Vallanadu Black Buck Sanctuary | Thoothukudi | 1987 |
| 7 | Grizzled Giant Squirrel Wildlife Sanctuary | Virudhunagar | 1988 |
| 8 | Kanyakumari Wildlife Sanctuary | Kanyakumari | 2007 |
| 9 | Sathyamangalam Wildlife Sanctuary | Erode | 2008 |
| 10 | Megamalai Wildlife Sanctuary | Theni and Madurai | 2009 |
| 11 | Point Calimere Wildlife Sanctuary - Block A and Block B | Thanjavur and Tiruvarur Nagapattinam | 2013 |
| 12 | Kodaikanal Wildlife Sanctuary | Dindigul and Theni | 2013 |
| 13 | Gangaikondan Spotted Deer Sanctuary | Tirunelveli | 2013 |
| 14 | Cauvery North Wildlife Sanctuary | Dharmapuri and Krishnagiri | 2014 |
| 17 | Nellai Wildlife Sanctuary | Tirunelveli | 2015 |



Aatchiyar Kalvi
10th_Geography_Unit_6.indd 98 02-08-2019 16:53:34

| S.No | Bird Sanctuaries in Tamil Nadu | District | Year of Establishment |
|---|---|---|---|
| 1 | Vettangudi Birds Sanctuary | Sivaganga | 1977 |
| 2 | Pulicat Lake Birds Sanctuary | Tiruvallur | 1980 |
| 3 | Karikili Birds Sanctuary | Kancheepuram | 1989 |
| 4 | Kanjirankulam Birds Sanctuary | Ramanathapuram | 1989 |
| 5 | Chitrangudi Birds Sanctuary | Ramanathapuram | 1989 |
| 6 | Koonthankulam-Kadankulam Birds Sanctuary | Tirunelveli | 1994 |
| 7 | Vellode Birds Sanctuary | Erode | 1997 |
| 8 | Vedanthangal Birds Sanctuary | Kancheepuram | 1998 |
| 9 | Udayamarthandapuram Birds Sanctuary | Tiruvarur | 1998 |
| 10 | Melaselvanur-Keelselvanur Birds Sanctuary | Ramanathapuram | 1998 |
| 11 | Vaduvoor Birds Sanctuary | Tiruvarur | 1999 |
| 12 | Karaivetti Birds Sanctuary | Ariyalur | 2000 |
| 13 | Theerthangal Bird Sanctury | Ramanathapuram | 2010 |
| 14 | Sakkarakottai Tank Birds Sanctuary | Ramanathapuram | 2012 |
| 17 | Oussudu Lake Birds Sanctuary | Villupuram | 2015 |

| S. No | Biosphere Reserves in Tamil Nadu |
|---|---|
| 1 | Nilgiri Biosphere Reserve |
| 2 | Gulf of Mannar Biosphere Reserve |
| 3 | Agasthiyarmalai Biosphere Reserve |

Tamil Nadu is a state with varied climate, landforms and resources. This makes our state a distinct one among the Indian states. In Tamil Nadu, If the available resources are utilised rationally, it may continue to be at top in the country. So, it is the duty of the every individual to strive towards achieving this goal.

## 6.12 Natural Disasters in Tamil Nadu

A sudden natural catastrophe that causes great damage or loss to lives and properties is called as disaster. The alteration of natural environment by the technology and developmental activities increase the frequency of disasters all over the world. So, it is necessary to aware the measures to be adopted during different types of natural disasters to reduce the risk caused by them.

According to United Nations office for Disaster Risk Reduction, Disaster Risk Reduction( UNDRR) is the concept and practice of reducing disaster risks through systematic efforts to analyse and reduce the causal factors of disasters. This includes reducing exposure to hazards, lessening the vulnerability of people and property, wise management of land and environment, and improving preparedness and early warning for adverse events.

Here we will discuss about the natural disasters in Tamil Nadu and the measures to be adopted before, during and after different disasters.

### 6.12.1 Landslide

A collapse of a mass of earth or rock from a mountain or cliff is called landslide. Water is the most common trigger of a **landslide.** Nilgiris in Tamil Nadu is identified as one of the most vulnerable districts in the country and landslides pose a major threat in this area. The other regions which are prone to land slides are Coimbatore and palani hill of Dindigul district where Kodaikanal hill station is located.



Aatchiyar Kalvi
10th_Geography_Unit_6.indd 99 02-08-2019 16:53:34

**Risk Reduction Measures**

**Before:** Create awareness; stay alert and awake; monitor the news updates; make evacuation plan; listen for any unusual sounds that might indicate moving debris such as trees cracking, boulders knocking and consider leaving the place of landslide if it is safe to do so.

**During**

**If indoors:** Find cover in the section of the building that is farthest away from the approaching landslide; take shelter under a strong table or bench. Hold on firmly and stay until all movement has ceased.



Landslide

**If outdoors**

Move quickly away from its likely path, keeping clear of embankments, trees, power lines and poles; avoid crossing roads and bridges and stay away from the landslide because the slope may experience additional failures for hours to days afterwards.

**After**- Stay away from the slide area; listen to local radio or television stations for the latest emergency information; watch for flooding, which may occur after a landslide or debris flow; check for injured and trapped persons near the slide, without entering the direct slide area.

## 6.12.2 Flood

Flood is a common one in the coastal districts of Tamil Nadu during northeast monsoon. The recent flood occurred in the state was in 2015. The **2015 South Indian floods** resulted from heavy rainfall generated by the annual northeast monsoon in November–December 2015. They affected the Coromandel Coast region of the South Indian states of Tamil Nadu and Andhra Pradesh. More than 500 people were killed and over 1.8 million people were displaced. With the estimates of damages and losses ranging from nearly ₹ 200 billion, the floods were the costliest natural disasters of the year 2015. Tamil Nadu was the worst affected state by this flood. Generally the districts of Kancheepuram, Tiruvallur, Cuddalore, Villupuram, Thanjavur, Tiruvarur, Nagapattinam, Pudukkottai, Ramanathapuram, Tirunelveli and Kanyakumari are the most flood prone districts of the state.



Flood

**Risk Reduction Measures**

**Before:** Know about relief centres and evacuation routes; keep emergency phone numbers and important information; fold and roll up things on to higher ground.

**During:** Be quick, keep safe and ensure that children and elderly are safe by leaving the house to a higher ground; turn off all electrical appliances and gas; leave the area before its get too late; do not drive through the water; stay away from power lines or broken power transmission cables and try to keep away from flood water.

**After:** Make sure to get back inside your house, keep all power and electrical appliances off before it is okay to put them on and wear appropriate dress before cleaning house which is necessary to clean the contamination.



Aatchiyar Kalvi
10th_Geography_Unit_6.indd 100 02-08-2019 16:53:34

## 6.12.3 Cyclone

The coastal regions of Tamil Nadu are often hit by the tropical cyclones formed in Bay of Bengal during northeast monsoon. Occurrence of flood, losses to lives and properties are the recurring one in the state. Based on the cyclone hit areas, the state of Tamil Nadu can be divided into five zones namely very high, high, medium, low and very low cyclone prone zones. Southern part of Chennai, eastern part of kancheepuram, eastern part of Villupuram, northeastern part of Cuddalore and Union Territory of Puducherry fall under the very high cyclone prone zone. Nagapattinam, Tiruvallur, Tiruvarur (except northwestern part), southern part of Thanjavur, eastern part of Pudukkottai, eastern part of Cuddalore, middle portion of Villupuram, eastern part of Tiruvannamalai, western part of kancheepuram, northeastern part of Vellore and northern part of Chennai districts are included in the high cyclone prone zone.



Cyclone

**Risk Reduction Measures**

**Before:** Ignore rumours, stay calm, don't be panic; Keep your mobile phones charged to ensure connectivity; use sms; listen to radio; watch TV; read newspapers for weather updates. Keep your documents and valuables in water proof containers; prepare an emergency kits with essential items for survival; secure your house; carry out repairs; don't leave sharp objects loose; untie cattle/animals for their safety. Fishermen should keep a radio set with extra batteries handy; keep boats and rafts tied up safely and don't venture out in the sea.

**During:** Take care of the old and young, keep all family members inside the house; switch of all electrical appliances, stay in an empty room, movable items should be kept securely tied; try to help your neighbours but, don't go out during cyclone.

**After:** Those who shifted to the cyclone centre must remain there till instructions are received; strictly avoid loose electrical wires after the cyclone; beware of snakes and other animals immediately after the cyclone; clear debris and carcasses from/near the premise after the cyclone and report losses truthfully and accurately to the authorities.

## 6.12.4 Drought

Tamil Nadu is water deficit state. It is almost a regular one and not a seasonal one. It depends mostly on northeast monsoon for its rain. Its failure ends in disastrous. The total assessed water resources in the state amount to 1,587 TMC (Thousand million cubic feet) while the state government's demand estimate is 1,894 TMC. Demand exceeds supply by 19.3%, this happens when rainfall is "normal".

The government classifies groundwater blocks into different categories. Only 145 of 385 such blocks are classified safe. The others are in various stages of depletion: over-exploited, critical and semi-critical. About 2% of the blocks are already saline. About 64% of the total area of the state is drought prone. Coimbatore, Dharmapuri, Kanyakumari, Madurai, Ramanathapuram, Salem, Tirunelveli, and Tiruchirappalli are the districts which are more drought prone.



Drought



Aatchiyar Kalvi
10th_Geography_Unit_6.indd 101 02-08-2019 16:53:35
386

According to the desertification atlas prepared by the ISRO, about 12 percent of the total geographical area is under desertification and land degradation. Theni, Virudhunagar, the Niligris and Kanyakumari are the worst affected districts. To manage the water deficit, rain water harvesting and water conservation methods have to be implemented strictly.

**Some methods of water conservation are:**

Protection of water from pollution; redistribution of water; rational use of groundwater; population control; renovation of traditional water sources; use of modern irrigation methods; increasing forest cover; changing crop pattern; flood management and use of geothermal water are some of the major water conservation methods.

## 6.12.5 Forest Fire

VLZIN2

Tamil Nadu is a tropical state. The high temperature during summer leads to occasional forest fire in deciduous and thorn forests. The recent fire accident in the state took place in 2018. The tragedy happened on March 11 when 37 people from Chennai and Erode regions were returning after a trekking trip to the Kurangani hills in Theni district. The groups were struck in the middle of a forest fire, which ultimately killed 23 people. In the aftermath of the Kurangani forest fire, Tamil Nadu government has banned trekking in the state for two months every year (February15 to April 15).



Forest Fire

**Risk Reduction Measures**

**Before:** Create defensible space to separate your home from flammable vegetation and materials (30 feet); follow all local fire and building codes; keep all trees and shrubs trimmed. Use approved fire resistant materials; make evacuation plans with family members which include several options with an outside meeting place.

**During:** Listen to radio; watch tv; read newspapers for updates; if adequate water are available fill buckets with water. turn a light on a room in case of smoke; turn off gas and electrical appliances and be ready to evacuate all family members.

**After:** Check with fire officials before attempting to return to your home; use caution when re-entering a burned area - flare ups can occur; check grounds for hot spots and check the roof and exterior areas for sparks and embers.

## 6.12.6 Tsunami

Though Tsunami is not a common one in India, its incident in 2004 alerted India and the state of Tamil Nadu on this aspect. Almost all the countries situated around the Bay of Bengal were affected by the tsunami waves in the morning hours of 26 December 2004 (between 09:00 and 10:30 hrs IST). The killer waves were triggered by an earthquake measuring 8.9 on the Richter scale that had an epicentre near the west coast of Sumatra in Indonesia. Waves rose up to 6-10 metres and the impact was felt up to the East African coast affecting Somalia, Tanzania and Kenya.



Tsunami



Aatchiyar Kalvi
10th_Geography_Unit_6.indd 102 02-08-2019 16:53:35

**Tremors and Tidal Waves in South India**

Tremors and Tidal waves hit South India and Large Scale devastation was reported. Over a thousand people have been killed in tidal waves in Tamil Nadu, Andhra Pradesh, and Andaman and Nicobar Islands. Tamil Nadu was the "worst affected" state of India in this incident.

More than 1,500 people have been killed in the state. Casualties reported were very high in Nagapattinam (700), Kanyakumari (250) and Cuddalore (200) districts. Around 125 deaths have been recorded in the state capital of chennai. Earlier, the tsunami was reported in India in 1881 and 1941.

**Risk Reduction Measures**

**Before:** if you live in a coastal area, know about tsunami risk and local warning arrangements; develop household emergency plan; know where the nearest high ground is and how you will reach it.

**During:** Take your get away kit, don't travel areas at risk; move immediately nearest high ground; if you can't escape tsunami, go to an upper storey of the building or climb onto a roof or tree or grab a floating objects; never go to the shore to watch tsunami and listen to local radio stations as emergency management.

**After:** Continue to listen to the radio; don't return to the evacuation zone until authorities have given all clear; check yourself for injuries and get first aid and help others.

## 6.12.7 Earthquakes

India is a vast country which experiences many earthquakes at different periods. Generally high risk zones of the country are located in the north and central parts. The state of Tamil Nadu is located in the moderately low risk zone.

**Earthquakes in Tamil Nadu**

**26 September 2001:** A moderate quake occurred in the Bay of Bengal, off the coast of the Union Territory of Puducherry, resulting in three deaths and minor damage to property in Puducherry and coastal Tamil Nadu. It had a magnitude of 5.6 on Richter scale.

**7 June 2008:** A mild earthquake occurred in the Palar Valley region in Tamil Nadu. It had a magnitude of 3.8 on Richter scale and was felt in many parts of Vellore district.

**12 August 2011:** A mild earthquake occurred in the Cauvery basin in Ariyalur district. It had a magnitude of 3.5 on Richter scale and was felt in several districts in southern Tamil Nadu. It resulted in one death and caused minor damages in the districts of Cuddalore, Villupuram, Perambalur and Tiruchirappalli.

**In 2012,** Chennai experienced a mild tremor with its epicentre in the Indian Ocean.

**Risk Reduction Measures**

**During:** Take cover under a strong table or any other piece of furniture and remain under cover until the shaking stops.

**After:** Proceed cautiously once the earthquake has stopped and always avoid roads, bridges that might have been damaged by the earthquake.

**SUMMARY**

- Physical geography is the branch of geography dealing with the different physical aspects such as landforms, drainage, climate, soil, natural vegetation etc.
- Tamil Nadu is broadly classified into three physical divisions namely mountains (Western and Eastern Ghats), plateaus (Bharamahal, Coimbatore and Madurai) and plains (inland and coastal).
- Cauvery, Palar, Ponnaiyar, Vaigai and Thamirabarani are the major rivers of Tamil Nadu.
- The climate of Tamil Nadu is tropical maritime. Winter, summer, southwest and northeast monsoons are the seasons of Tamil Nadu.



Aatchiyar Kalvi
10th_Geography_Unit_6.indd 103 02-08-2019 16:53:35
388

- Soils of Tamil Nadu are classified into five types according to their characteristics. They are alluvial, black, red, laterite and saline.
- The forest cover of Tamil Nadu is 20.21% of its geographical area. Evergreen, deciduous, mangrove, thorny and montane temperate are its major forest types.
- Disaster Risk Reduction is reducing risks through systematic efforts.
- Natural disasters are earthquakes, volcanoes, landslides, cyclones, droughts and forest fires.

## EXERCISE

A8FWGK

### I. Choose the correct answer

1. The latitudinal extent of Tamil Nadu is
   a) 8°5′N to 13°35′N
   b) 8°5′S to 13°35′S
   c) 8°0′N to 13°5′N
   d) 8°0′S to 13°05′S
2. The longitudinal extent of Tamil Nadu is
   a) 76°18′ E to 80°20′E
   b) 76°18′ W to 80°20′W
   c) 86°18′ E to 10°20′E
   d) 86°18′ W to 10°20′W
3. The highest peak in Tamil Nadu is
   a) Anaimudi b) Doddabetta
   c) Mahendragiri d) Servarayan
4. Which of the following passes is not located in the Western Ghats of Tamil Nadu?
   a) Palghat b) Shencottah
   c) Bhorghat d) Achankoil
5. Which one of the following rivers is flow into the Arabian Sea?
   a) Periyar b) Cauvery
   c) Chittar d) Bhavani
6. The district with largest mangrove forest cover in Tamil Nadu is
   a) Ramanathapuram b) Nagapattinam
   c) Cuddalore d) Theni
7. The forest cover of Tamil Nadu as per 2017 Indian Forest Report is
   a) 20.21% b) 20.31%
   c) 21.20% d) 21.30%
8. Retreating monsoon wind picks up moisture from
   a) Arabian sea b) Bay of Bengal
   c) Indian Ocean d) Timor sea
9. Which of the following district is affected by sand dunes to a large extent?
   a) Theni b) Madurai
   c) Thanjavur d) Ramanathapuram
10. The district which has the largest forest cover in Tamil Nadu is
    a) Dharmapuri b) Vellore
    c) Dindigul d) Erode

### II. Fill in the blanks

1. The plateau which lies between the Nilgiris and Dharmapuri districts is _____.
2. _____ is the highest peak in the southern most part of the Eastern Ghats.
3. The riverine Island of Srirangam is located between _____ and _____ branches of cauvery.
4. _____ soil is suitable for the cultivation of tea and coffee plants.
5. _____is the Tamil Nadu state animal which is found in _____

### III. Match the following

1. Winter season - Pre-monsoon
2. Summer season - June to September
3. Southwest monsoon - March to May
4. North east monsoon - January and February
5. Mango Shower - October to December



Aatchiyar Kalvi
10th_Geography_Unit_6.indd 104 02-08-2019 16:53:35

## IV. Assertion type Question

1. **Assertion (A):** Tamil Nadu does not receive much rainfall from southwest monsoon. **Reason (R):** It is situated in the rain shadow area of the Western Ghats.
   a) Both (A) and (R) are true and (R) explains (A).
   b) Both (A) and (R) are true but, (R) does not explain (A).
   c) (A) is true but, (R) is false.
   d) (R) is true but, (A) is false.
2. **Assertion (A):** Red soil is rich in iron oxides **Reason (R):** It is formed by leaching
   a) Both (A) and (R) are true and (R) explains (A).
   b) Both (A) and (R) are true but, (R) does not explain (A).
   c) (A) is true but, (R) is false.
   d) (R) is true but, (A) is false.

## V. Answer the following in brief

1. State the boundaries of Tamil Nadu.
2. List out the districts of Tamil Nadu which are partly/fully located on Eastern and Western Ghats separately.
3. What is 'Teri'?
4. How is coastal plain formed?
5. Name the major islands of Tamil Nadu.
6. Name the tributaries of river Thamirabarani.
7. Define : Disaster Risk Reduction.
8. During cyclone, how does the Meterological department warn the fishermen?

## VI. Distinguish between the following

1. Western Ghats and Eastern Ghats.
2. Southwest monsoon and Northeast monsoon.
3. Tropical evergreen and Tropical deciduous forests.

## VII. Give reasons for the following

1. Eastern Ghats are not a continuous range.
2. Tamil Nadu receives low rainfall during southwest monsoon.
3. Alluvial soil is fertile.
4. Cuddalore is a multiprone disaster zone.

## VIII. Answer the following in a paragraph

1. Describe the nature of the plateau region of Tamil Nadu.
2. Write an account on river Cauvery.
3. Explain the characteristic features of summer and winter seasons of Tamil Nadu.
4. What is desertification and write about the areas affected by it in Tamil Nadu.
5. Bring out the types and distribution of soils in Tamil Nadu.
6. Name the areas which are affected by landslides. What will you do before, during and after landslides?

## IX. Map study

Mark important rivers, distribution of soil and forest types on different Tamil Nadu maps.

## REFERENCE BOOKS


1. *Geography of Tamil Nadu* by Kumarasamy (2018), Varthamana Publication, T. Nagar, Chennai
2. *Manoramma Year book 2018*


## INTERNET RESOURCES

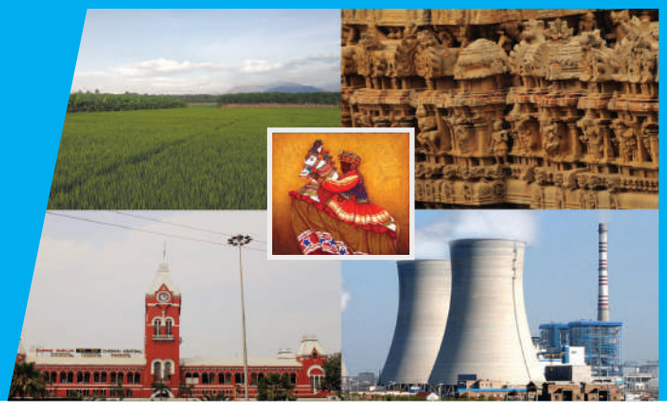
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Aatchiyar Kalvi
10th_Geography_Unit_6.indd 105 02-08-2019 16:53:35

Unit - 7

# Human Geography of Tamil Nadu



## Learning Objectives

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- To understand the agricultural factors, major crops and their distribution in Tamil Nadu
- To learn about the water resources of Tamil Nadu
- To study the mineral and industrial resources of Tamil Nadu
- To analyze the population and its composition in Tamil Nadu
- To learn about the man made disasters in Tamil Nadu

## Introduction

Human geography refers to the study of ways of development of human societies and their operation in relation to their physical environment. This chapter focuses on the distribution, characteristics and utilisation of different resources in Tamil Nadu. We have studied earlier that the earth is endowed with a variety of natural resources such as landforms, rivers, soil, natural vegetation, water and wildlife. These resources are useful only when they are utilised. Human beings use these resources using their intelligence and skill. Thus, the human beings are the most significant resource on the earth surface. They turn all these natural resources into useful products with their skills and abilities.

## 7.1 Agriculture

The word **"agriculture"** is derived from the Latin words **"ager and cultura"**, which means field and growing. Agriculture is a practice of farming that includes the cultivation of crops, rearing of animals, birds, forestry, fisheries and other related activities. Agriculture is the major occupation in Tamil Nadu. Agriculture has been the mainstay of the state's economy since independence with more than 65% of the population depends upon this sector for their living. Agriculture provides employment for rural people on a large scale. There is a strong link between agriculture and economic growth. Agriculture constitutes about 21% of the state's economy. However, it fluctuates from one year to another. Paddy, millets and pulses are the principal food crops of the state. Sugarcane, cotton, sunflower, coconut, cashew, chillies, gingelly, groundnut, tea, coffee, cardamom and rubber are the major commercial crops.

## 7.2 Geographical determinants of Agriculture

Landform, climate, soil and irrigation are the factors that determine the growth of agriculture.

### 7.2.1 Landform

Tamil Nadu is a land of diverse landscape comprising of hills, plateaus and plains. Among them the plains are most suitable



Aatchiyar Kalvi

10th_Geography_Unit_7.indd 106 02-08-2019 16:08:36

for agriculture. The plains with alluvial soil enhances agricultural productivity. Example: Plains of cauvery. Agriculture in the plateau is moderate and is poor on the hills.

### 7.2.2 Climate

Tamil Nadu is situated in the tropical zone, which is nearer to the equator. The state experiences a tropical climate. Hence, the temperature in Tamil Nadu is relatively high almost throughout the year. So, only the tropical crops are cultivated. Water is another limiting factor of agriculture. Northeast monsoon is the major source of rainfall for Tamil Nadu. Therefore, the major cropping season begins with this season. The rainfall in this season and the irrigation facilities affect agriculture to a large extent.

### 7.2.3 Soil

Soil is one of the most essential elements of agriculture. It provides essential minerals or nutrients for the growth of crops and vegetation. The regions of river valleys and the coastal plains are the most agriculturally productive regions of the state as they are covered with fertile alluvial soil.

**Types and regions of Agriculture Practices in Tamil Nadu**

| Farming type | Area practiced |
|---|---|
| Subsistence intensive agriculture | Practiced all over Tamil Nadu with few exceptions. |
| Plantation Agriculture | Hill slopes of Eastern and Western Ghats. |
| Mixed farming | Banks of River Cauvery and Thenpennai. |

### 7.2.4 Irrigation

Monsoon rainfall in the state is highly irregular. Further it is seasonal. Hence, irrigation becomes necessary for successful cultivation of crops in the state. In the dry regions, rain-fed crops are cultivated.

**DO YOU KNOW?**

The Tamil Nadu Rice Research Institute (TRRI) is an Indian research institute working in the field of rice under Tamil Nadu Agricultural University (TNAU).It is situated at Aduthurai, in Thanjavur district, it was established in April, 1985 in TNAU to meet the research requirements of the region with the help of existing Agricultural Colleges and Research centres and perform lead function for rice and rice based cropping system research.

## 7.3 Cropping Seasons in Tamil Nadu

Farmers select different crops for different seasons of cultivation. It is based on the temperature and availability of moisture in the soil. Accordingly, the state has the following cropping seasons.

| Name | Sowing | Harvesting | Major crops |
|---|---|---|---|
| Sornavari (chittirai pattam ) | April-May | August-September | Millets and cotton |
| Samba (Adipattam) | July-August | January-February | Paddy and sugarcane |
| Navarai | November - December | February-March | Fruits, vegetables, cucumber and watermelon |

## 7.4 Distribution of major crops in Tamil Nadu

### 7.4.1 Paddy

Paddy is the most important staple food crop of Tamil Nadu. Ponni and kichadi samba are the major varieties of paddy grown in Tamil Nadu. About 3 million hectares of the state is under rice cultivation. Though it is cultivated all over Tamil Nadu, its cultivation is highly concentrated in Thanjavur, Tiruvarur, Tiruvallur, Kancheepuram, Villupuram, Cuddalore and Tirunelveli districts. It ranks third in the production of rice among the states of India. The deltaic region of river cauvery



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 107 02-08-2019 16:08:36
392

(the undivided Thanjavur district) is the major rice-producing region of Tamil Nadu. So, this region is rightly called as the **"Granary of Tamil Nadu."**



Paddy Cultivation

## 7.4.2 Millets

Millets form staple food of nearly one-third of human population of Tamil Nadu. Sorghum/jowar (cholam), ragi (kezhvaragu) and bajra (kambu) are the major millets. These are grown not only in drier areas but also in the coastal plains. Sorghum is grown in the Coimbatore plateau and Kambam valley. Ragi is grown in Coimbatore, Dharmapuri, Vellore and Cuddalore districts. Bajra is mostly cultivated in Ramanathapuram, Tirunelveli, Karur, Perambalur and Salem districts.

DO YOU KNOW?

India observed 2018 as national year of millets. FAO has decided to observe 2023 as the International year of millets.

## 7.4.3 Pulses

Pulses are the major source of protein. Bengal gram, black gram, green gram, cowpea and horse gram are the important pulses grown in Tamil Nadu. Pulses are grown in a wide range of climatic conditions mostly in drier regions with or without irrigation. Mild cool climate and a low to moderate rainfall are best suited for these crops. Pulses serve as excellent fodder. Pulses are grown in almost all districts in the state except Chennai, Nilgiris and Kanyakumari. Coimbatore leads in the production of Bengal gram. Vellore and Kanyakumari districts produce red gram.

Tiruvarur, Nagapattinam and Thoothukudi districts are the principal producers of green gram and black gram. Horse gram is widely cultivated in Dharmapuri and Krishnagiri districts.

DO YOU KNOW?

To promote organic farming a central scheme named 'National Project on Organic Farming' was launched Apart from general things (creating awareness, promoting organic fertilizers, training, capacity building etc.), the scheme provides financial assistance through Capital Investment Subsidy Scheme for agro-waste compost production units, bio-fertilizers/ bio-pesticides production units, development and implementation of quality control regime, human resource development etc.

## 7.4.4 Oil Seeds

Groundnut, gingelly castor, coconut, sunflower and mustard are some of the oilseeds that are grown in Tamil Nadu. Apart from its use in food preparation, it is used in industries as a lubricant, in the manufacture of varnish, soaps, candles, cosmetics and pharmaceuticals. Groundnut is the major oilseed of the state. The cultivation of groundnut is mostly concentrated in Vellore, Tiruvannamalai, Villupuram, Salem and Pudukottai districts. It is also grown to some extent in Dharmapuri, Cuddalore, Perambalur and Madurai. Erode, Ramanathapuram, Sivagangai and Virudhunagar districts are its minor producers. Coconut is grown in Coimbatore, Thanjavur and Kanyakumari districts.

## 7.4.5 Sugarcane

It is one of the major cash crops of the state. It is an annual crop. It requires high temperature and heavy rainfall. It grows well in the tropical region. Major sugarcane-producing districts are Tiruvallur, Kancheepuram, Vellore, Cuddalore, Tiruchirapalli, Coimbatore, Erode and Tirunelveli.



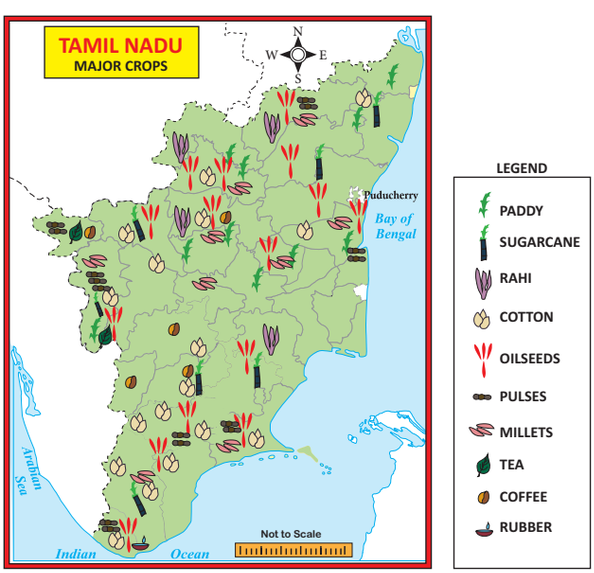
Aatchiyar Kalvi
10th_Geography_Unit_7.indd 108 02-08-2019 16:08:39

### 7.4.6 Cotton

Cotton is a fibre and cash crop. It requires black soil, long frost-free condition and warm and humid weather for its cultivation. Humid weather in the early stages and hot, dry weather during harvest period is suitable for this crop. It is predominantly cultivated in Coimbatore plateau and Vaigai-Vaippar river basins. It is also cultivated in Madurai, Ramanathapuram, Virudhunagar, Tirunelveli, Thoothukudi, Salem and Dharmapuri districts.

### 7.4.7 Plantation crops

Tea, coffee, cashew, rubber and cinchona are the major plantation crops of the state. Tamil Nadu ranks second in area and production of tea in India next to Assam. Tea plantations are found in the hills of the Nilgiris and Coimbatore. The Nilgiris is the notable regions for tea plantations. Coffee plants are grown in the hills of Western Ghats as well as Eastern Ghats. It is also found in the hilly slopes of Dindigul, Madurai, Theni and Salem districts. Yercaud, Kolli Hills and Kodaikanal are notable for coffee plantations. Tamil Nadu stands second in area and production of coffee next to Karnataka. Rubber plantations are significant in Kanyakumari. Pepper is confined to the warm and wet slopes of Eastern and Western Ghats of Tamil Nadu. Cashew is extensively cultivated in Cuddalore district.




Cinchona is planted at heights varying from 1060 to 1280 metres in Anaimalai hills. Cardamom estates are located at few places in the hills of Madurai region at an elevation of 915 to 1525 metres.

DO YOU KNOW?

TANTEA (TANTEA-Tamil Nadu Tea Plantation Corporation Limited) is one of the Biggest Black Tea Producers in India with high quality clonal tea. Its plantation spreads over nearly 4500 hec.

Tamil Nadu Dairy Development Corporation Ltd. was transformed into the newly registered Tamil Nadu Co-operative Milk Producers Federation Limited Popularly known as "**Aavin**".

## 7.5 Livestock/Animal Husbandry

Livestock has remained an integral part of socio-economic fabric of rural people. The number of cattle found in Tamil Nadu is 88,92,473. There are 47,86,680 sheep, 81,43,341 goats and 11,73,48,894 poultry animals.

### 7.5.1 Goat

Goat is also known as **'poor man's cow'** in India. It forms a very important component in dry land farming system. In the marginal or undulating lands unsuitable for rearing of other types of cattle like cow or buffalo, goat is the best alternative. With very low investments, goat rearing can be made into a profitable venture for small and marginal farmers.

### 7.5.2 Sheep

Sheep is used for multiple purposes like wool, meat, milk, skins and manure, and forms an important component of the rural economy, particularly in the arid, semi-arid and mountainous areas of Tamil Nadu. It provides a dependable source of income to the shepherds through the sale of wool and animals.



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 109 02-08-2019 16:08:39

A variety of cattle breeds are reared in the state for the milk and forms a major component of the rural economy. The poultry hub of Tamil Nadu are Namakkal, Salem, Erode and Coimbatore districts.

### 7.5.3 Fishing

Since Tamil Nadu is a coastal state, fishing is one of the major occupations in the state. With widespread reservoirs and rivers, inland fishing also is also seen to a considerable extent. There are about 2500 species of fishes found in different aquatic environments.

### 7.5.4 Marine Fishing

The length of the coastline of Tamil Nadu is 1076 km (13% of the country's coastline). The coastal region of the state covers an area of 0.19 million sq.km. An area of 41,412 sq.km of continental shelves of the state favours coastal fishing and Tamil Nadu is one of the leading states in marine fish production. Marine fishing is also called inshore fish or neritic fishing, carried out in oceans and seas. Large mechanised boats are used for fishing. In ocean or seawaters, fishing within few kilometres from the shoreline is called inshore fishing and the fishing far from the shore typically 20–30 miles out in water hundreds and thousands of feet deep is called off-shore fishing. The fish varieties caught are sharks, flying fish, counch, catfish, silver bellies, and crabs. Chennai, Kanyakumari, Tirunelveli, Nagapattinam, Thanjavur and Ramanathapuram districts contribute about 40% to marine fish production in the state. Their coastal location favours fishing in these regions. The state has three major fishing harbours, three medium fishing harbours and 363 fish landing centres. The export of marine products from the state during 2007–08 accounted for 72,644 metric tons.

### 7.5.5 Inland Fishing

Inland fishing is carried out in lakes, rivers, ponds, estuaries, backwaters and swamps. Oysters and prawns are cultured in original nurseries. Catamaran, diesel boats and floating nets are used in fishing. Tamil Nadu Fisheries Department has introduced several programmes for the betterment of fishing. The major programmes are aquaculture in farm ponds and irrigation tanks, fish seed bank, fish seed rearing, ornamental fish culture and the establishment of Fish Farmer Development Agency. Vellore district leads in the production of inland fish production with 10% of state's production. Cuddalore, Sivagangai and Virudhunagar districts stand second with 9% of inland fish catch each. Fishing sector contributes 1.25% of state's economy.

**Second Green Revolution (Eco-Farming or Organic Farming)**

In organic farming synthetic fertilizers, pesticides, growth regulator and livestock feed additives are not used. This type of farming rely on crop rotation, crop residues, animal manure, off-farm organic wastes and biological pest control to maintain soil productivity. This farming method is being adopted by very few farmers in the state. It has to be increased in number.

## 7.6 Water Resource

Water is the precious gift of nature to humankind and millions of other species living on the earth.

3FCN3M

Tamil Nadu constitutes 4% of India's land area and is inhabited by 6% of India's population, but has only 2.5% percent of India's water resources. More than 95% of the surface water and 80% of the ground water have already been put into use. Major uses of water include human/animal consumption, irrigation and industrial use. The state is heavily dependent on monsoon rains. The annual average rainfall is around



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 110 02-08-2019 16:08:39

930 mm (47% during the northeast monsoon, 35% during the southwest monsoon, 14% in summer and 4% in winter).

| Surface Water Resources | Numbers |
|---|---|
| River Basin | 17 |
| Reservoirs | 81 |
| Tanks | 41,127 |
| Tube wells and other wells | 4,98,644 |
| Open wells | 15,06,919 |
| Total (Million Cubic metres) | 2046788 MCM |
| *Source: Statistical handbook of Tamil Nadu - 2017* | |

### 7.6.1 Multipurpose River Valley Projects

Multipurpose river valley projects are basically designed for the development of irrigation for agriculture and hydropower generation. However, they are used for many other purposes as well.

### 7.6.2 Mettur Dam

The Mettur Dam was constructed in a gorge, where river Cauvery enters the plains. It is one of the oldest dam in India. It provides irrigation to Salem, Erode, Karur, Tiruchirappalli, Thanjavur, Tiruvarur and Nagapattinam districts for about 2,71,000 acres of farmland. The dam, park, major hydroelectric power stations and hills on all sides make this dam an important tourist spot.



Mettur Dam

### 7.6.3 Bhavani Sagar Dam

The Bhavani Sagar Dam is located 80 km away from Coimbatore city in the district of Erode. It has been constructed across the river Bhavani. This dam is one of the biggest earthen dams in the country.

### 7.6.4 Amaravathi Dam

The Amaravathi dam is situated 25 km away from Udumalpet in Tirupur district. The dam has been constructed across the river Amaravathi, a tributary of Cauvery. The dam was built primarily for irrigation and flood control. A small hydropower station has also been installed recently. This reservoir is notable for the significant population of mugger crocodiles. It is also a familiar tourist spot.

### 7.6.5 Krishnagiri Dam

Krishnagiri dam is situated at a distance of 7 km from Krishnagiri towards Dharmapuri. This dam drains an area of 5428 sq.km. This is a famous tourist spot too. This dam is flooded with tourists during the weekends.

### 7.6.6 Sathanur Dam

Sathanur Dam was constructed across the river Thenpennai in Chengam taluk. It is in the midst of Chennakesava hills. The water-holding capacity of the dam is 7321 million cubic feet (full level: 119 feet). About 7183 hectares of land is drained by the left bank canal and 905 hectares by the right bank canal of this dam. It irrigates the land in Thandrampet and Tiruvannamalai blocks. There is also a large crocodile farm and a fish grotto. Parks are maintained inside the dam for tourists and the gardens are used by the film industry.

### 7.6.7 Mullaiperiyar Dam

Mullaiperiyar dam was built by the British administration in 1895. It has been constructed on the Periyar river, which originates from Thekkady hills of Kerala. The dam was built mainly for watering the farming



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 111 02-08-2019 16:08:39

land of Tamil Nadu, which is perennially drought-prone. Though the dam is located in the state of Kerala, most of its water is used to irrigate Tamil Nadu. The dam is 175 feet in height and 1200 feet in length.

### 7.6.8 Vaigai Dam

This dam built across the river Vaigai near Andipatti. The dam with a height of 111 feet can store water up to 71 feet. It is located 7 km from Andipatti and 70 km from Madurai. This dam was opened on 21 January, 1959. The dam has a unique garden that deserves the surname 'Little Brindavan'. It is a popular picnic spot in Theni district.

### 7.6.9 Manimuthar Dam

Manimuthar dam is located about 47 km from Tirunelveli. The gorgeous garden of the dam is located about 5 km from the dam and is accessible through a zig-zag ghat road. Pleasure boating and waterfalls are additional tourist attractions near the dam.

### 7.6.10 The Papanasam Dam

It is also known as Karaiyar dam and is located about 49 km away from Tirunelveli. The dam is used to irrigate 34,861 hectares of land in Tirunelveli and Thoothukudi districts. It generates 28 MW of hydro power.

### 7.6.11 Parampikulam Aliyar Project

It is a joint venture of Tamil Nadu and Kerala states. It envisages the construction of seven interconnected reservoirs by harnessing the water of seven rivers, which include major rivers of Parambikulam and Aliyar.

Parappalar project is located near Ottanchatram. Its storage capacity is 167 million cubic feet of water. It is about 75 km from Madurai and is in Palani taluk.

### 7.6.12 Surface water Resources

The total surface water potential of the state is about 24,864 mcm (million cubic metre). There are 17 major river basins in the state with 81 reservoirs and about 41,262 tanks. Most of the surface water has already been tapped, primarily for irrigation, where water use is largest. An area of 24 lakh hectares of the land are irrigated by surface water through major, medium and minor schemes.

### 7.6.13 Ground Water Resources

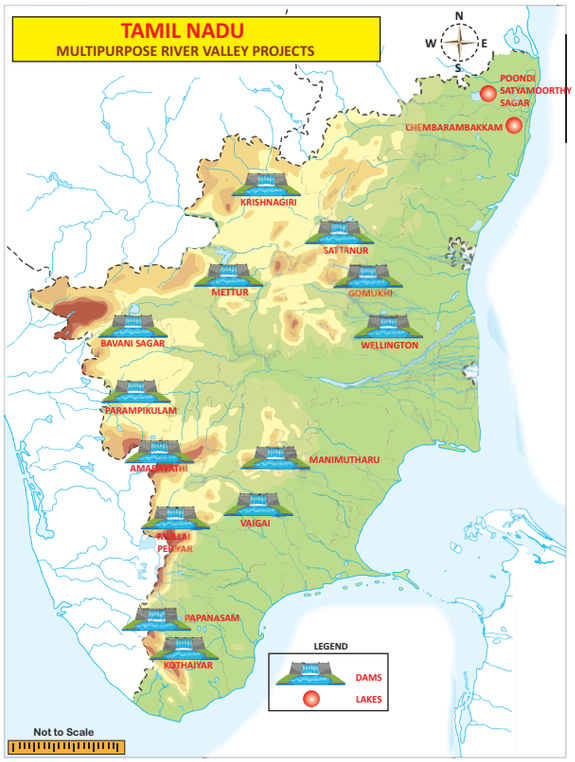
The utilizable groundwater resource of the state is 22,423 mcm. The current level of utilization of water is about 13,558 mcm which is about 60 percent of the available recharge, while about 8875 mcm (40 percent) is the balance available for use.

### 7.6.14 Water Resource Management

Water resource management is the activity of planning, developing, distributing and managing the optimum use of water resources. The demand for water in Tamil Nadu is increasing at a fast rate both due to increasing population and also due to larger per capita needs triggered by economic growth. The per capita availability of water resources is just 900 cubic metres when compared to the national average of 2,200 cubic metres. Agriculture is the largest consumer of water in the state using 75% of the state's water resources. Demands from other sectors such as domestic and industries have been growing significantly. The state is heavily dependent on monsoon rains. Since the state is entirely dependent on rains for recharging its water resources, monsoon failures lead to acute water scarcity and severe droughts. So, it is important to save water for us and the future generation.



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## 7.7 Mineral Resources

Tamil Nadu is the leading holder of country's resources of vermiculite, magnetite, dunite, rutile, garnet, molybdenum and ilmenite. The state accounts for the country's 55.3% of lignite, 75% of vermiculite, 69% of dunite, 59% of garnet, 52% of molybdenum and 30% of titanium mineral resources.

Important minerals are found in the state are as follows: Neyveli has large lignite resources. Coal is also availablein Ramanathapuram. Oil and gas are found in the Cauvery basin.

Iron deposits are found in Kanjamalai region in Salem district and Kalrayan Malai region of Tiruvannamalai district. Magnesite ores are available near Salem. Bauxite is found in Servarayan Hills, Kotagiri, Udagamandalam, Palani and Kollimalai areas. Gypsum is obtained in Tiruchirappalli, Tirunelveli, Thoothukudi and Virudhunagar districts. Ilmenite and rutile are found in the sands of Kanyakumari beach. Limestone is available in Coimbatore, Cuddalore, Dindigul, Kancheepuram, Karur, Madurai, Nagapattinam, Namakkal, Perambalur, Ramanathapuram, Salem and Tiruvallur districts. Magnesite is obtained in Coimbatore, Dharmapuri, Karur, Namakkal, the Nilgiris, Salem, Tiruchirapalli, Tirunelveli and Vellore districts. Feldspar, quartz, copper and lead are also found in some parts of the state.

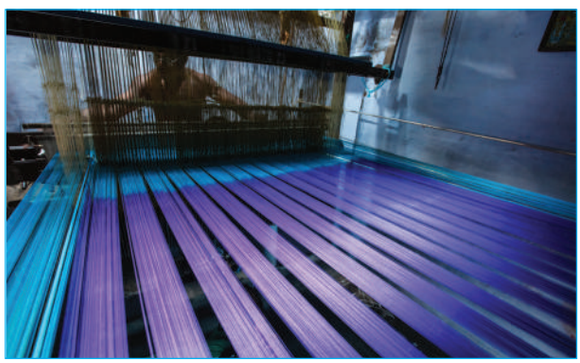
## 7.8 Industries

Industries use raw materials and convert them into usable product or goods. Textiles, sugar, paper, leather, cement, electrical equipment, automobiles, information technology and tourism are the major industries of Tamil Nadu.

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### 7.8.1 Textile Industry

Textile industry is one of the traditionally well-developed industries in Tamil Nadu. The textile mills are concentrated in Coimbatore, Tirupur, Salem, Palladam, Karur, Dindigul, Virudhunagar, Tirunelveli, Thoothukudi, Madurai and Erode. Tamil Nadu has about 3,50,000 power looms manufacturing cotton fabrics and accounts for 30% of India's exports of textiles products. Erode in Tamil Nadu is well known for marketing of handloom, power loom and readymade garments. Coimbatore is also known as the 'Manchester of Tamil Nadu'. Coimbatore, Tirupur and Erode contribute a major share to the state's economy through textiles. So, this region is referred as **'Textile Valley of Tamil Nadu'.** Karur is known as **'The Textile capital of Tamil Nadu'.**



Textile Industry



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 113 02-08-2019 16:08:42

### 7.8.2 Silk Textiles

Tamil Nadu occupies fourth position in the country in silk production. Kancheepuram silk is unique in its quality and is known for its traditional value all over the world. The annual silk production in Tamil Nadu is around 1200 metric tons. Kancheepuram, Arani, Kumbakonam, Salem, Coimbatore, Madurai and Tirunelveli are the important silk-weaving centres in Tamil Nadu. Ramanathapuram has some specialised areas for the manufacturing of synthetic silk clothes.

### 7.8.3 Leather Industry

Tamil Nadu accounts for 60% of leather tanning processes of India and 38% of all leather footwear, garments and components. Hundreds of leather tanneries are located around Vellore and nearby towns, such as Ranipet, Ambur and Vaniyambadi. The Vellore district is the top exporter of finished leather goods in the country. Vellore leather accounts for more than 37% of the country's export of leather and leather-related products (such as finished leathers, shoes, garments and gloves). Central Leather Research Institute (CLRI), a CSIR research laboratory, is located in Chennai.

**GI Tag**

GI(Geographical Indication)is a name or sign used on products which corresponds to a specific geographical location. It provides rights and protection of holders.

Some important GI Tags of Tamil Nadu are:

| Place | Products |
|---|---|
| Arani | Silk |
| Kancheepuram | Silk |
| Coimbatore | Wet Grinder and Coracotton |
| Thanjavur | Paintings, Art plate, Doll and veenai |
| Nagercoil | Temple Jewellery |
| Erode | Turmeric |
| Salem | Venpattu(salem silk) |
| Bhavani | Jamakkalam |
| Madurai | Sungudi |
| Swamimalai | Bronze Icons |
| Nachiarkovil | Kuthuvilakku |
| Pattamadai | Mat |
| Nilgiri | Orthodox Embroidery |
| Mahabalipuram | Stone sculpture |
| Sirumalai | Hill banana |
| Eathomozhi | Coconut |

### 7.8.4 Paper Industry

Many paper industries are located in the state. Tamil Nadu Newsprint and Papers Limited (TNPL) is a government of Tamil Nadu enterprise producing newsprint and printing and writing paper at its mill located at Kagithapuram in Karur district. It was started in 1979 with an installed capacity of 2.45 lakh MT of production per annum. TNPL is one of the most accomplished mills in the world, producing different varieties paper of acceptable quality primarily from bagasse and pulpwood. Other paper mills of the state are found in Pukkathurai of Kancheepuram district, Bhavanisagar, Pallipalayam, Paramathi Vellore, Coimbatore, Udamalaipet, Thoppampatti, Nilakkotai and Cheranmahadevi.

### 7.8.5 Cement Industry

Cement production and consumption continue to grow despite the general recession in the economy. India is one of the largest cement producers and ranked second in the world with an annual production capacity of 181 million tons. Tamil Nadu Cements Corporation Limited (TANCEM) is one among the major cement producers in Tamil Nadu operating two cement units: one at Ariyalur and another at Alangulam. Asbestos cement sheet plant at Alangulam and stoneware pipe unit at Virudhachalam are the other units of TANCEM. Sankar Cement, Zuari Cement, Ultratech Cement, Madras Cement and Dalmia Cement are the major private cement brands produced in Tamil Nadu.

## 7.9 Information Technology

According to National Association of Software and Services Companies (NASSCOM), the southern states continue to account for



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 114 02-08-2019 16:08:42

more than half of the country's total export of software. Tamil Nadu and Andhra Pradesh together account for 59.6% of India's total software exports. Tamil Nadu is the second largest software exporter in the country next to Karnataka.

A special economic zone (SEZ) is an area in which the business and trade laws are different from the rest of the country. SEZs are located within a country's national borders, and their aims include increased trade balance, employment, increased investment, job creation and effective administration.

### 7.9.1 Special Economic Zones

Special economic zones (SEZs) provide an internationally competitive and hassle-free environment for exports. Units in SEZ manufacture goods and provide a range of services. SEZs are located in Nanguneri, Ennore, Hosur and Perambalur. IT & ITES SEZ named TIDEL-II and TIDEL-III and Bio-Pharmaceuticals SEZ are located in Chennai and Coimbatore SEZ called the TIDEL Park–IV is located in the city.

**The list of IT parks in Tamil Nadu**

Tidel Park, Ascendas, Mahindra world city 4 IT & ITES SEZ TIDEL-II, IT & ITES SEZ TIDEL-III, Coimbatore SEZ - Tidel Park

### 7.9.2 Manufacturing & Engineering Industry

The manufacturing industry is one of the vibrant sectors of the state economy and contributes significantly to the industrial output. The manufacturing industry broadly covers manufacture of machinery and equipment, motor vehicles, basic metal and alloy industries, metal products and repair of capital goods.

Tamil Nadu's share of the industrial output is around 11–12% of the country's output and 15% of the country's exports excluding software. Tamil Nadu accounts for about 17% of India's software exports.

### 7.9.3 Automobile Industries

The share of Tamil Nadu in all-India production of automobiles and heavy vehicles is rather significant. Automobile industry plays a crucial role in the state's economy and has been one of the key driving factors. contributing 8 percent to state GDP and giving direct employment to 2,20,000 people.

Tamil Nadu accounts for about 21% of passenger cars, 33% of commercial vehicles and 35% of automobile components produced in India. Major automobile manufacturers like Ford, Hyundai, HM-Mitsubishi, Ashok Leyland, and TAFE have their manufacturing base in Tamil Nadu.



Automobile industry

### 7.9.4 Chemical & Plastic Industry

The chemical industry is one of the fastest growing sectors of industry and the economy. The sector contributes 13% to the state's GDP and constitutes 8% of the total exports of the country.

### 7.9.5 Handlooms and Powerlooms

The handloom sector in the state is the single largest cottage industry providing livelihood to a large number of rural people and promoting export earnings. The handloom sector and its related economic activities generate gainful employment for more than 4.29 lakh weaver households and 11.64 lakh weavers in the state. These societies mainly produce the cloth required for the scheme of 'Free Supply of Uniforms to School Children and Free Distribution of Sarees and Dhotis Scheme'.



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 115 02-08-2019 16:08:43
400

### 7.9.6 Sugar Industry

Sugar industry in Tamil Nadu is an important agro-based industry. It plays a vital role in the economic development of the state, particularly in rural areas. The sugar industry provides large-scale direct employment to several thousands and indirect employment to several lakhs of farmers and agricultural labourers in the rural areas who are involved in cultivation of sugarcane, harvesting, transporting and other services. There are 34 sugar mills in Tamil Nadu, in which 16 are in the cooperative sector and 18 in the private sector.

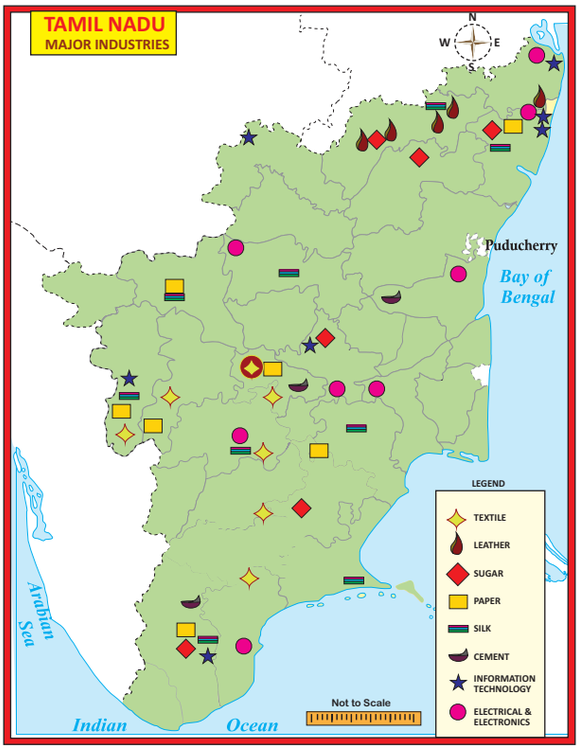
### 7.9.7 Tourism Industry

Tourism is considered as an industry because of its enormous potential in creating employment for a large number of people. In recent years, the state has emerged as one of the leading tourist destinations for both domestic and foreign tourists. Tourism in Tamil Nadu is promoted by Tamil Nadu Tourism Development Corporation (TTDC). The state currently ranks the highest among Indian states with about 25 crore arrivals (in 2013). The annual growth rate of this industry stood at 16%. Approximately 28 lakh foreign and 11 crore domestic tourists visit our state annually. The presence of ancient monuments, pilgrim centres, hill stations, a variety of natural landscapes, long coastline, along with rich culture and heritage make Tamil Nadu the best destination for tourists.

**Activity**

Plan a visit to a manufacturing unit in your city. Find out how raw materials are converted into finished products. Talk to the workers and manager to know more about the industry.

Plan a field visit with your social science teacher to visit a variety of geographical features, pilgrim centres, monuments, hill stations and prepare a field visit report.




## 7.10 Population

The term 'population' refers to the number of people living in a defined area. The statistical study of the characteristics of human population is called demography. Demographers make a deep and detailed study of the population. The rapid increase of population may be responsible for retarding economic growth. Hence, overpopulation is one of the major problems confronting our nation with all its evil effects.

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### 7.10.1 Growth of Population in Tamil Nadu

The total population of Tamil Nadu is 72,140,703 or 7.21 crores as per 2011 Census. Its population was 6.24 crore in 2001 and registered a growth of nearly 1 crore population in a decade. The male and female population of the state in 2011 is 36,137,975 and 36,009,055 respectively and it was 31,400,909 and 31,004,770 in 2001. It shows that the population of the state is shared almost 50% each by male and female. The growth



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 116 02-08-2019 16:08:43

rate of population in the decade 2001–2011 was 15.61% while in the previous decade it was 11.19%. The population of Tamil Nadu forms 5.96% of country's total population as per 2011 Census. In 2001, it was 6.07%.

### 7.10.2 Distribution of Population

Based on the actual size of population, Tamil Nadu is divided into the following regions.

### 7.10.3 Regions of High Population

Chennai has the highest urban population with 4.219 million people, but the city ranks second in the district-wise count, next to Coimbatore district, which had 4.224 million people as per 2011 Census. Coimbatore, Chennai, Tiruvallur, Kancheepuram, Villupuram, Dharmapuri, Salem, Madurai and Tirunelveli are the most populous districts in the state. Agriculture and industrial development are the main causes of high concentration of population of these districts.

### 7.10.4 Regions of Moderate Population

Tiruvannamalai, Cuddalore, Tiruchirapalli and Thanjavur districts have a population 30–35 lakh. Vellore, Dindugal, Virudhunagar and Thoothukudi districts each have a population of 15–20 lakh. Other than agriculture, small-scale industries and fishing along the coastal areas are the major occupations of people in these districts.

### 7.10.5 Regions of Sparse Population

The coastal districts Nagapattinam, Tiruvarur, Pudukottai, Ramanathapuram and Sivagangai have a less than 15 lakh. The Nilgiris district has a population of less than 10 lakh (764,826) population and it is the least populated district as per 2011 Census.

### 7.10.6 Population Density

The density of population in Tamil Nadu is 555 per sq.km as per the 2011 Census, while it was 480 per sq.km in 2001. The state ranks 12th among the Indian states in population density. The national average density of population as per the 2011 Census is 382. Chennai is the densest district with 26,903 persons per sq.km followed by Kanyakumari (1106), Tiruvallur (1049), Kancheepuram (927), Madurai (823), Coimbatore (748), Cuddalore (702), Thanjavur (691), Nagapattinam (668), Salem (663), Vellore (646) and Tiruchirappalli (602). These are the regions with high density of population. The least density of population is recorded in the Nilgiris (288 per sq.km) and the other districts have moderate density of population.

### 7.10.7 Religion

Hinduism, Christianity and Islam are the major religions in the state. The Hindus constitute 87.58% of the population, followed by Christians (6.12%) and Muslims (5.86%). Jainism (0.12%), Sikhism (0.02%) and Buddhism (0.02%) also have a presence in the state.

People of other religions constitute 0.01% and the percentage of people with unstated religion is 0.26%.

### 7.10.8 Urban and Rural Population

As per 2011 Census, the urban population of Tamil Nadu is 3,49,17,440, which constitutes 48.40% of the total population of the state. The rural population of the state is 3,72,29,590, which constitutes 51.60% of the state population.

### 7.10.9 Sex Ratio

The sex ratio represents the number of females per 1000 males. The sex ratio of the state increased from 987 in 2001 to 995 in 2011. The sex ratio in India is 940 in 2011 as against 933 in 2001. It shows that the sex ratio is more favourable in the state than the country.

As per 2011 Census, 15 out of 32 districts have recorded the sex ratio of more than 1000 and a similar trend was noticed in the 2001 Census also. Only Sivagangai has recorded the sex ratio of exactly 1000. It is noted that



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 117 02-08-2019 16:08:43
402

12 districts have the sex ratio of less than 1000 and it ranges between 980 and 1000. The highest sex ratio is found in the Nilgiris district (1041) followed by Thanjavur district (1031). The lowest sex ratio is reported in Dharmapuri district (946) followed by Salem district (954).

### 7.10.10 Literacy Rate

The literacy rate of Tamil Nadu as per the 2011 Census is 80.33%. It was 73.45% in 2001. The male literacy rate is 86.81% and the female literacy rate is 73.86%. The corresponding rates in 2001 were 82.42% for males and 64.43% for females. It may be observed that more than three-fourths of the population is literate among males in all the districts (except Dharmapuri), while more than two-thirds of the population is literate among females in all but eight districts. The districts are Dharmapuri (60.03%), Krishnagiri (64.86%), Tiruvannamalai (65.71%), Villupuram (63.51%), Salem (65.43%), Erode (65.07%), Perambalur (66.11%) and Ariyalur (62.22%).

The literacy rate for India as per 2011 census is 74.04, of which the male literacy rate is 82.14 and the female literacy rate is 65.46. In 2001, the literacy rate of India stood at 64.8. It was 75.3 and 53.7 for males and females, respectively. The district of Kanyakumari has reported the highest literacy rate (92.14%) while Dharmapuri district has the lowest rate (64.71%). A high level of literacy rate is also seen in Chennai (90.33%), Thoothukudi (86.52%), the Nilgiris (85.65%) and Kancheepuram (85.29%) districts.

## 7.11 Transport and Communication

### 7.11.1 Roadways




The State has a total road length of 167,000 km, In which 60,628km are maintained by state Highways Department. It ranks second in India with a share of over 20% in total road projects under operation in the **Public-Private Partnership (PPP)** model.

| Types of the Roads | Length (Km) |
|---|---|
| National Highways | 4994 |
| State Highways | 57291 |
| Corporation & Municipalities Road | 23350 |
| Panchayat Union | 147543 |
| Village Panchayat Union | 21049 |
| Others(Forest Roads) | 3348 |
| Commercial | 12.13 |
| Non commercial | 20.34 Lakhs |
| **Source:** Statistical Handbook of Tamil Nadu - 2017 | |

### 7.11.2 Railways

Tamil Nadu has a well-developed rail network as part of Southern Railway, headquartered at Chennai. The present Southern Railway network extends over a large area of India's southern peninsula, covering Tamil Nadu, Kerala, Puducherry, minor portions of Karnataka and Andhra Pradesh. Tamil Nadu has a total railway track length of 6,693 km with 690 railway stations in the state. The system connects it with most of the major cities in India. Main rail junctions in the state include Chennai, Coimbatore, Erode, Madurai, Salem, Tiruchirappalli and Tirunelveli. Chennai has a well-established suburban railway network, a **Mass Rapid Transport System**(MRTS) and is currently developing a Metro system, with its first underground stretch in operation since May 2017.

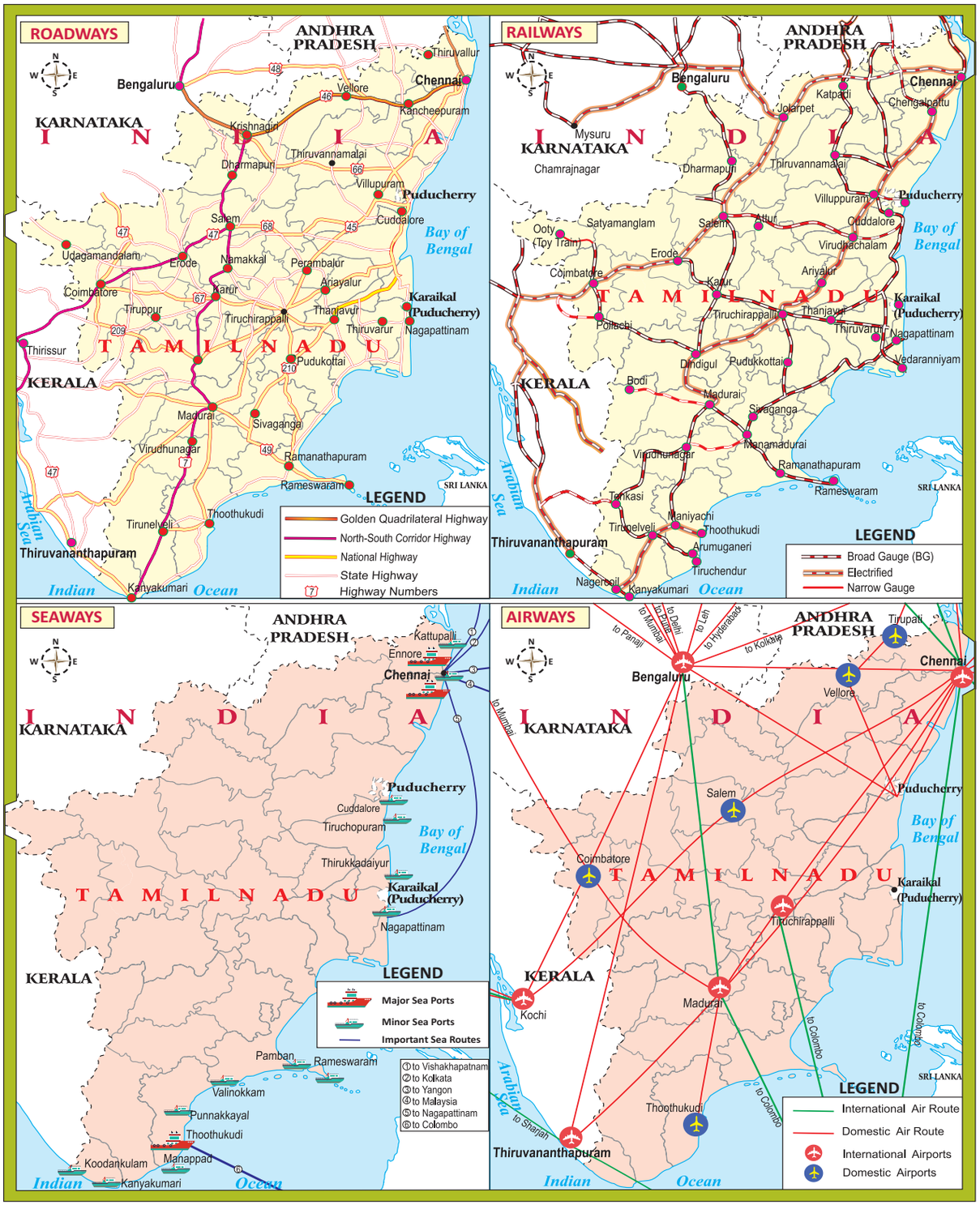
### 7.11.3 Airways

Tamil Nadu has four major international airports. Chennai International Airport is currently the third largest airport in India after Mumbai and Delhi. Other international airports in Tamil Nadu include Coimbatore, Madurai and Tiruchirapalli airports. It also has domestic airports at Tuticorin and Salem connecting several parts of the country. Increased industrial activity has given rise



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# TAMIL NADU - TRANSPORT




Not to Scale



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 119 02-08-2019 16:08:43
404

to an increase in passenger traffic as well as freight movement, which has been growing at over 18% per year.




NH - 44 is the longest national highway in Tamil Nadu which runs from Hosur to Kanniyakumari (627.2 km) Via Dharmapuri-Salem-Karur-Dindigul-Madurai-Tirunelveli.

NH - 785 is the shortest national highway in Tamil Nadu which runs from Madurai to Natham (38 km).

### 7.11.4 Waterways

Tamil Nadu has three major ports. They are in Chennai, Ennore and Tuticorin. It has an intermediate port at Nagapattinam and 15 minor ports. The ports are currently capable of handling over 73 million metric tonnes of cargo annually (24% share of India). All the minor ports are managed by the Tamil Nadu Maritime Board, Chennai Port. This is an artificial harbour and the second principal port in the country for handling containers. It is currently being upgraded to have a dedicated terminal for cars capable of handling 4,00,000 vehicles. Ennore intermediate port was recently converted as a major port and handles the major coal and ore traffic in Tamil Nadu.

## 7.12 Communication

Communication is derived from the Latin word communicare, meaning 'to share'. The act of conveying or exchanging information is called means of communication. They are mass communication and personal communication.

**Postal Districts and Headquarters in Tamil Nadu**

| Zone /districts | Head quarters |
|---|---|
| Chennai | Chennai |
| Western | Coimbatore |
| Central | Thiruchirapalli |
| Southern | Madurai |

## 7.13 Trade

Export and import are the two components of trade. Export means goods and services sold for foreign currency. Tamil Nadu contributes 12.2% to the country's exports. Import refers to goods and services are brought from overseas producers. Tamil Nadu imports many goods from outside. The difference between the values of export and import is called the balance of trade.

| Major Exports of Tamil Nadu | |
|---|---|
| (i) Agricultural Products | tobacco, cereals, cotton, sugarcane, paddy, groundnut, spices and vegetables. |
| (ii) Leather Products | wallets, purses, pouches, handbags, belts, footwear and gloves |
| (iii) Gems and Jewellery | pearls, precious stones, gold jewellery, decorations and antiques |
| (iv) Chemicals and related products | paper, chemicals, rubber and glass. |

## 7.14 Imports of Tamil Nadu

Machineries like transport equipment, machine tools, non-electrical machinery, electrical machinery, pharmaceutical products, petroleum, fertilizers and newsprint are its major imports. The state contributes 10.94% to the country's trade through major ports.

The above discussion shows that Tamil Nadu is an important state of India in terms of size, population, resources and economic development. People in the state are well secured. The new schemes introduced by the state government periodically have enabled notable progress in various fields.



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 120 02-08-2019 16:08:43

## 7.15 Man made Disasters in Tamil Nadu

### 7.15.1 Definition

A disastrous events caused directly or indirectly by human actions are called as manmade disaster. Man-made disaster can include hazardous material spills, fires, groundwater contamination, transportation accidents, structure failures, mining accidents, explosions and acts of terrorism.

### 7.15.2 Industrial Disaster

Disasters caused by industrial companies either by accident, negligence, or incompetence fall under industrial disasters. Electrical faults seem to be the major reason for industrial disasters in the country. Overheating, aging of the material and use of sub-standared quality of electrical gadgets have been the main factors contributing to the increasing fire accidents in industries. Electricity is not just a life line; It can also take away life when handled improperly', Apart from these, explosions, leaking of poisonous gases, injuries and deaths caused by machines are the other causes of industrial disasters.

Sivakasi, is considered the "fireworks capital"of India. Series of industrial accidents causing deaths are reporting frequently in the regions of Virudhunagar and Sivakasi where a number of fireworks and match units are in operation. An explosion occurred on 5 September, 2012 in a private firework company. In this incident 40 workers were killed and more than 70 workers were injured. Various measures are being taken by the Government to reduce the fire accidents and casualties caused by industries. In another industrial accident which took place at Coimbatore on 2nd February 2016 in a tyre melting unit, six migrant workers were critically injured.

### 7.15.3 Stampede

A situation in which a large number of animals or people running in the same direction in an uncontrolled way causing injuries and deaths is called stamping

On 21st April, 2019 seven people were killed and 10 injured in a stampede during a local festival at a temple near Thuraiyur in Tamil Nadu. The incident took place when hundreds of devotees gathered at the Karuppasamy temple in Muthiampalayam village for the 'padikasu' (temple coin) distribution ceremony.



### 7.15.4 Mitigation

Hazard mitigation refers to any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazardous conditions.

- Regular maintenance of machines and wires may reduce the frequency of accidents,
- Creating awareness and training the workers to be cautious during work hours may help them to reduce risk during disasters.
- Wearing specially designed dresses and other safety materials would help the workers to protect themselves from any serious injuries.
- Conducting periodical medical camps would help them to assess their health status. The Provision of having life insurance policies will secure their future.
- Besides these, the administration should be employees friendly and ready to extend their help in case of any untoward incidents.




**Disaster emergency contact number**

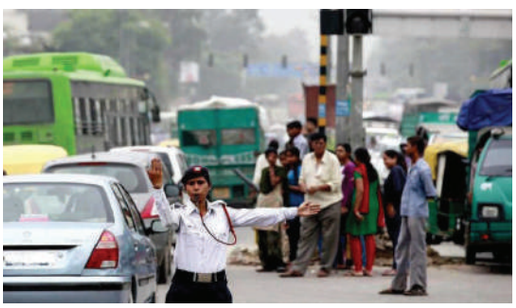
**1077** - Control room of District Collector/Magistrate.



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406

## 7.15.3 Road Accidents

The road accidents in India is on very high level. Tamil Nadu leads in the number of road accidents in the country. Increase in road traffic, high speed of vehicles and violation of traffic rules are the causes of major of accidents. In 2013, 14504 accidents had taken place in the state which resulted in 15563 deaths. In the ten years from 2002-2012, Tamil Nadu tops the list in number of road accidents among the states of India. It is reported that about 15 percent of accidents of the country takes place in Tamil Nadu. The figure of 2017 also puts Tamil Nadu on top with recording of 16157 deaths out of 147913 deaths recorded in the country. Death toll came down rapidly in 2018 to 12213 deaths, a decline of 24.5 percent.



**Risk Reduction Measures**

**Before:** Avoid Speeding, Drunk and driving, use helmets and seat belts and follow traffic rules

**After:** Call police or ambulance; seek medical attention; make an accurate record and exchange information.

**KNOW - RISK...!**
**NO - RISK...!**

## 7.15.6 Basic Road Safety Rules

- Aware of the road signals
- Stop, look and cross
- Listen and ensure whether a vehicle is approaching;
- Don't rush on roads;
- Cross roads in pedestrian crossings;
- Don't stretch hands while driving vehicles;
- Never cross road at bends and stay safe in a moving vehicle.

Accelerated changes in demographic and economic trends disturb the balance which leads to increased frequency and the negative impact of disaster. At present the society face a challenging mix of demographic, ecological and technological condition which make population more vulnerable to the impact of the calamities. Though the number of natural disasters are in decline than they were in the past, the increasing level of magnitude poses a threat. Besides the various measures taken by the government and the public, education on awareness regarding the disasters may help in the reduction of risks during disasters.

For the management of disasters in the state, the following forces and organizations are in service.

(i) State Disaster Management Authority (Chairman-Chief Minister)
(ii) Relief/ Disaster Management Department
(iii) Police
(iv) Forest Department
(v) Fire and Civil Defence Services
(vi) Health Services
(vii) Transport Department
(viii) Public Works Department
(ix) Veterinary Services
(x) Food & Civil Supplied Department.

**The Organizations at District Level**

(i) District Magistrate (Chairman-District Collector)
(ii) Revenue Department
(iii) Civil Administration,
(iv) Local Police,
(v) Civil Defence,
(vi) Fire & Emergency Services,
(vii) Home Guards (also Local Community, Non-Governmental Organisations, Voluntary Agencies) etc.



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 122 02-08-2019 16:08:44

## SUMMARY

- Human Geography is the branch of geography dealing with how human activity affects or is influenced by the nature.
- Tropical crops like paddy, millets, pluses, oilseeds and plantation crops of tea, coffee, cashew, rubber etc are the major crops of Tamil Nadu.
- Tamil Nadu has 55.3% of lignite, 75% of vermiculite, 69% of dunite, 59% of garnet, 52% of molybdenum and 30% of titanium.
- Man made disasters are drowning, Industrial risks, fire accidents stampede and road accidents.

## EXERCISE

E2DXNJ

### I. Choose the correct answer

1. The delta which is known as Granary of South India is
   a) Cauvery delta
   b) Mahanadi delta
   c) Godavari delta
   d) Krishna delta

2. Second staple food of the people of Tamil Nadu is
   a) Pulses b) Millets
   c) Oilseeds d) Rice

3. Literacy rate of Tamil Nadu as per 2011 census is
   a) 80.32% b) 62.33%
   c) 73.45% d) 80.33%

4. A major hydro-electric power project of Tamil Nadu is
   a) Mettur b) Papansam
   c) Sathanur d) Thungabahdra

5. Number of major and minor ports in Tamil Nadu are
   a) 3and15 b) 4 and15
   c) 3 and16 d) 4 and15

### II. Fill in the blanks

1. Agriculture of Tamil Nadu constitutes _____ % of its economy.
2. Sathanur dam is constructed across the river _____.
3. Tamil Nadu ranks _____ in India with a share of over 20% in total road projects under operation in the Public – Private Partnership (PPP).
4. _____ is the third largest airport in India after Mumbai and Delhi.
5. The difference between the value of exports and imports is called _____.

### III. Match the following

| | | |
|---|---|---|
| 1. Bauxite | – | Salem |
| 2. Gypsum | – | Servaroy hills |
| 3. Iron | – | Coimbatore |
| 4. Limestone | – | Tiruchirapalli |

### IV. Questions 1-2 are assertion and reasoning type

1. **Assertion (A):** Coimbatore, Tiruppur and Erode region is called as The Textile Valley of Tamil Nadu.

   **Reason (R):** They contribute a major share to the states economy through textiles.

   (a) Both (A) and (R) are true and (R) explains (A)



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 123 02-08-2019 16:08:44

(b) Both (A) and (R) are true but, (R) does not explain (A)

(c) (A) is true but (R) is false

(d) (A) is false but (R) is true

2. **Assertion (A):** The Nilgiris is the least populated district of Tamil Nadu

**Reason (R):** It is located in the western most part of Tamil Nadu.

(a) Both (A) and (R) are true and (R) explains (A)

(b) Both (A) and (R) are true but, (R) does not explain (A)

(c) (A) is true but (R) is false

(d) (A) is false but (R) is false

## V. Answer the following in brief

1. Explain the cropping seasons of Tamil Nadu
2. Why is Coimbatore called the Manchester of Tamil Nadu?
3. Name the important multipurpose projects of Tamil Nadu.
4. What is MRTS?
5. List out the air ports and sea ports of Tamil Nadu.
6. Have you heard about any stampede in your district? write about that incident briefly.

## VI. Distinguish between the following

1. Marine Fishing and inland fishing
2. Food crops and non- food crops
3. Surface water and ground water

## VII. Give reasons for the following

1. Farmers switch over from inorganic to organic farming.
2. Cities are densely populated than the villages.
3. Karur is Called theTextile Capital of Tamil Nadu.
4. Mostly stampede occurs in Temples

## VIII. Answer the following in a paragraph

1. Write about the plantation farming of Tamil Nadu.
2. Give an account on water resources of Tamil Nadu.
3. Bring out the mineral distribution in Tamil Nadu.
4. State the densely populated regions of Tamil Nadu and account for its high density.
5. Explain the different modes of transport available in Tamil Nadu.
6. Write about Road safety rules

## IX. Map study

Mark the areas of major crops, minerals, dams, air ports and sea ports.

## REFERENCE BOOKS


1. *Geography of Tamil Nadu* by Kumarasamy (2018), Varthamana Publication, T. Nagar, Chennai
2. *Manoramma Year book 2018*


## INTERNET RESOURCES

1. http://www.tn.gov.in/ta/Tamil Nadustate
2. http://www.environment.tn.nic.in/
3. http://agritech.tnau.ac.in/
4. http://www.fisheries.tn.gov.in/
5. https://www.census2011.co.in/census/state/tamil+nadu.html



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 124 02-08-2019 16:08:44

# ICT CORNER

## Tamil Nadu: Disasters And Awareness

Through this activity you will learn about Disaster Management Activities in Tamil Nadu.



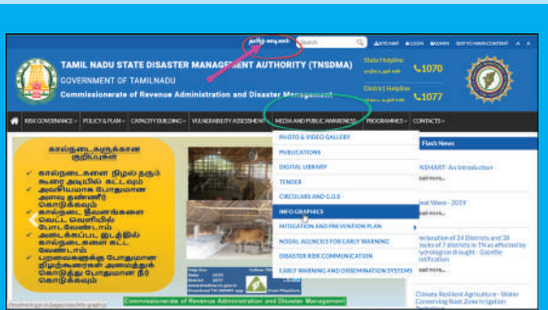

**Step – 1** Open the Browser and type the URL given below (or) Scan the QR Code.

**Step – 2** Change 'Language' in Top menu and go to 'Media and Public Awareness' and select 'Infographics'.

**Step – 3** Click on 'Download' to view details of precautions by Tamil Nadu State Disaster Management Authority




Step-1




Step-2




Step-3

**Website URL:**

https://tnsdma.tn.gov.in/

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* Pictures are indicatives only.

* If browser requires, allow Flash Player or Java Script to load the page



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 125 02-08-2019 16:08:45

## A-Z GLOSSARY

**Agriculture:** It is the process of producing food, feed, fibre and many other desired products by the cultivation of certain plants and the raising of domesticated plants.

**Back waters:** The part of a river which are stagnant and do not reach the sea as they are pushed by the current.

**Barter:** A direct exchange of goods between any two parties.No money is involved in the trade.

**Bay:** A broad inlet of the sea where the land curves inwards

**Beach:** A pebbly or sandy shore, especially by the sea between high- and low-water marks

**Bhangar:** Older alluvium soil found in30 mts above flood level.

**Biogas:** The production of methane and carbon- di- oxide from plants and animal wastes

**Commercial crops:** Crops which are cultivated to be sold to gain profit from sale.

**Cyclone:** A cyclone is a large scale air mass that rotates around a strong centre of low atmospheric pressure.

**Dams:** A barrier constructed to hold back water and raise its level, forming a reservoir used to generate electricity, supply water and other uses.

**Delta:** A triangular shaped alluvial tract formed at the mouth of a river.

**Density of population:** The average number of inhabitants living per sq km area

**Distributary:** A branch or outlet which leaves a main river and does not rejoin it, carrying its water to the sea or a lake.

**Doab:** A land between the two converging rivers.

**Drought:** It is a natural disaster of below average precipitation in a given region resulting water shortage.

**Drowning:** death caused by being underwater and not being able to breath.

**Economic activities:** Actions that involve the production, distribution and consumption of goods and services at all levels within a society

**Endemism:** The ecological state of a species being unique to a defined geographic location, such as an island, nation

**Estuary:** Mouth of a river where it enters the sea through a single channel with a hollow.

**Exports:** Goods dispatched from one country to another.

**Flood:** A large amount of water that has spread from a river

**Foreign exchange:** The mechanism or process by which payments between any two places operating under different national currency systems are effected without passing of actual money or gold, etc.

**Fossil fuel:** Any naturally occurring carbon or hydrocarbon coal, oil and natural gas

**Harbour:** An extensive stretch of deep water near the seashore where vessels can anchor securely. It is used for exports and imports of goods.

**Ghat:** A mountain pass or a flight of steps leading down to a river.

**Imports:** Goods bought into a country from another country.

**Irrigation:** Watering of plants through artificial means.



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 126 02-08-2019 16:08:45

**Khadar:** Newer alluvium soil found in valley flooded almost every year.

**Land slide:** sudden fall of mass of the rocks etc down side of the mountain

**Literates:** The people with the ability to read and write.

**Leaching:** It is a process in rainy seasons which all the soluble minerals are washed away by runoff water so the soil is infertile

**Latitude:** The imaginary parallel lines which run east to west on the globe.

**Longitude:** The imaginary vertical lines which run north to south on the globe.

**Mangroves:** Salt tolerant evergreen forest ecosystem found mainly in tropical and sub-tropical coastal and/or inter-tidal regions.

**Manchester:** An industrial city and metropolitan district in north-western England/items for the home made of cotton, linen, etc., such as sheets, pillowcases, or tablecloths.

**Meteorology:** The science of weather.

**Mineral:** A solid, naturally occurring inorganic substance.

**Mixed farming:** It is a type of farming which involves both the growing of crops and the raising of livestock simultaneously in a land holding.

**Monsoon:** Season

**Multipurpose projects:** Construction of dams across rivers aimed at many purposes.

**Natural resources:** Materials or substances occur in nature and are used for economic gain

**Open Forest:** Lands with forest cover having a canopy density between 10 to 40 percent.

**Ore:** It is a deposit in the earth crust with one or more value minerals

**Perennial Rivers:** The rivers which flow throughout the year and have permanent source of water.

**Plain:** An Extensive area of flat or gently undulating land.

**Plantation agriculture:** Well organized and managed farming with a single crop on a large scale. It is a capital intensive farming. Tea, coffee and rubber are the major plantation crops.

**Plateau:** An extensive elevated area of relatively a flat land.

**Population:** All the people living in a particular country, area, or place

**Population census:** Official enumeration of population along with economic and social attributes of a region at a specified interval.

**Population density:** The average number of people living per unit of area particularly per square km.

**Port:** The commercial part of a harbour with the facility of loading and unloading of goods and space for the storage of cargo.

**Protected Forest(PF):** An area notified under the provisions of the Indian Forest Act or other State Forest Acts, having limited degree of protection. In protected forest all activities are permitted unless prohibited.

**Regions:** An area, especially part of a country or the world having definable characteristics but not always fixed boundaries.

**Religion:** a particular system of faith and worship.

**Reserved Forest (RF):** An area constituted under the provisions of the Indian Forest Act or other State Forest Acts, having full degree of protection.



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 127 02-08-2019 16:08:45

In Reserved forests all activities are prohibited unless permitted.

**Reservoirs:** A large natural or artificial lake used as a source of water supply.

**Sedimentary rock:** A rock which has been formed by the consolidation of sediments.

**Sex ratio:** The number of females per 1000 males.

**Soil:** Soil is the uppermost layer of the land surface composed of minerals, organic matter, living organisms and water

**Soil conservation:** Prevention of soil from erosion and protecting its fertility.

**Soil erosion:** Removal of top soil

**Solar power:** Heat radiation from the sun converted into electricity

**Stampede:** a situation in which a large number of animals or people running in the same direction in an uncontrolled way causing injuries and deaths

**Standard Time:** The local time of central meridian of ones country.

**Strait:** A narrow passage of water connecting two seas or two other large areas of water.

**Subcontinent:** A large area of a continent that stands distinct from the rest of the continent and possesses almost all the characteristics of a continent.

**Subsistence intenensive farming:** It is a type of farming in which crops grown are consumed by the family with little surplus to sell.

**Thermal power station:** An electricity generating plants which burns coal or oil.

**Tributary:** A river or stream which contributes its water to main river.

**Tropical cyclone:** A localized, very intense low-pressure wind system, forming over tropical oceans and with winds of hurricane force.

**Unclassed Forest:** An area recorded as forest but not included in reserved or protected forest category.

**UNESCO World Heritage Site:** Representing the main ecosystem of the planet in which genetic resisources would be protected, and where research on the ecosystem as well as monitoring and training work could be carried.



Aatchiyar Kalvi
10th_Geography_Unit_7.indd 128 02-08-2019 16:08:45