

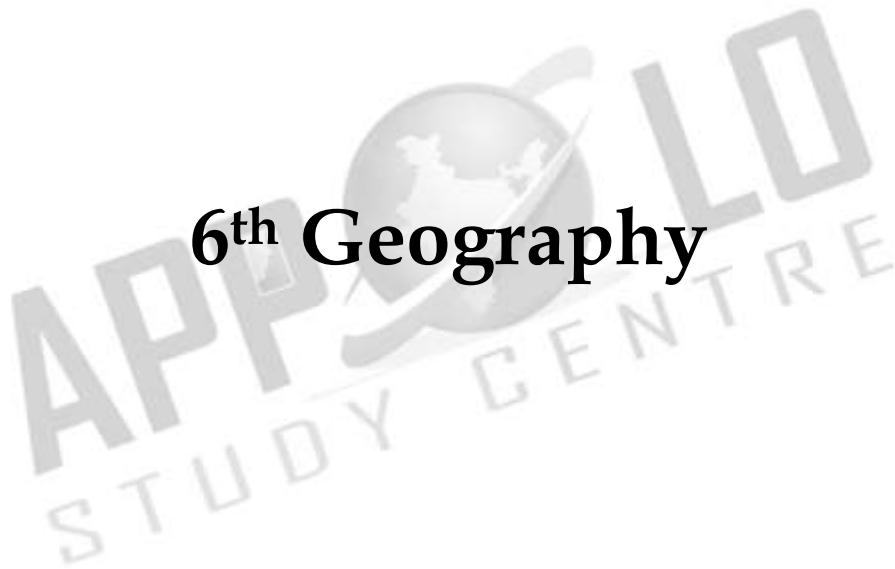
APPOLO STUDY CENTRE

6th, 7th, 8th New School Book

Geography

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6th Geography



1. The Universe and Solar System

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.

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.

Hierarchy of the Universe	
1.	Universe
2.	Galaxy
3.	Solar system
4.	Planets
5.	Satellites

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. 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

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.

The 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.

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. 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.

Mercury (The Nearest Planet): 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.

Venus (The Hottest Planet)

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.

Earth (The Living Planet) 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.

Mars (The Red Planet): 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 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 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 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.

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.

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 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: 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.

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.

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.

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.

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 $23\frac{1}{2}^{\circ}$. It makes an angle of $66\frac{1}{2}^{\circ}$ with the plane of the Earth's orbit.

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.

Revolution

It is the movement of the Earth around the Sun on its elliptical path. The Earth takes $365\frac{1}{4}$ days for it to complete one revolution. It revolves around the Sun at a 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. 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. 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.

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.

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.

NOTE

- ❖ The study of the Universe is called Cosmology. The term Cosmos is derived from the Greek word 'Kosmos'.
- ❖ 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.
- ❖ 1.3 million Earths fit inside the Sun. Imagine how big the Sun is.
- ❖ 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.
- ❖ 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.
- ❖ ISRO launched India's first ever Moon mission, Chandrayaan - 1 in 2008.
- ❖ 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.

- ❖ 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.
- ❖ Perihelion is the Earth's closest position to the Sun. Aphelion is the farthest position of the Earth from the Sun.
- ❖ The Gulf of Mannar Biosphere Reserve in the Indian Ocean covers an area of 10,500 sq.km in the ocean.



2. Land and Oceans

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

Classification of Landforms		
First Order	Second Order	Third Order
Continents	Mountains	Valleys
Oceans	Plateaus	Beaches
	Plains	Sand dunes

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. 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.

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

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

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 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? 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.

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.

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 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.

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.

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.

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. 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.

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 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 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.

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. 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.

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-.

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

NOTE

- ❖ **Isthmus:** A narrow strip of land which connects two large landmasses or separates two large waterbodies.
- ❖ December 11 International Mountain Day
- ❖ Dharmapuri Plateau, Coimbatore Plateau and Madurai Plateau are found in Tamil Nadu.
- ❖ 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.
- ❖ **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.
- ❖ 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-. The Spanish navigator Ferdinand Magellan named the ocean Pacific, meaning calm or tranquil.
- ❖ Palk Strait connects the Bay of Bengal and Palk Bay.
- ❖ 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

3. Resources

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.

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

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.

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 microorganisms 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.

B. On the basis of development: 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.

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.

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.

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.

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

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

Human resource:

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

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.

NOTE

- ❖ 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).
- ❖ Marine yeast have greater potential than the terrestrial yeast. They can be used in baking, brewing, wine, bio-ethanol and pharmaceutical protein production.
- ❖ Tropical rain forests are called the 'World's largest Pharmacy' as 25% of the natural vegetation are medicinal plants. (e.g.) Cinchona.
- ❖ 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.

4. Asia and Europe

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 km².

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 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.

The Hindukush range, the Sulaiman range, the Himalayan range and the Tian Shan range radiate from the Pamir 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 Verkhoyansk 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. Intermundane 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)

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.

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).

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

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.

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:

S. 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, Komoda 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

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 oil. 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.

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.

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. 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 cultivation 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 important 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.

- 1. 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.
- 2. Industrial Regions:** In China, Manchurian, Shanghai- Wuhan, Peking—Shenyang, Guangdong - 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.
- 3. Transport:** 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.
- 4. 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).
- 5. 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. The 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.

6. **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.

Cultural Mosaic of Asia

1. **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 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.

2. **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.

3. **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.

4. **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.

5. **Dance and Music:** In Asia, Yangee, Dragon Dance, Kabaki are popular in East Asia Ram 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.

6. Festivals: 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.

7. 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'.

NOTE

- ❖ There are 12 landlocked countries in Asia. Among these, only one is doubly landlocked which means it is surrounded entirely by other landlocked countries. That is UZBEKISTAN. It is surrounded by 5 countries (Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan)
- ❖ 'Knot' refers to the convergence of mountain ranges.
- ❖ 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.
- ❖ 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.
- ❖ 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 south-eastern part of Saudi Arabia.
- ❖ **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.
- ❖ **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.

Europe

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.

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.

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.

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. 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'.

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.

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

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. 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.

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 north western 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.

Natural vegetation: The natural vegetation of Europe can be classified as follows:

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 or Taiga vegetation's 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) 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 south western European Russia, France and Italy. Rice (northern Italy) and citrus fruits, olive trees (Spain, Sicily) depend on irrigation.

The northernmost countries grow few cereals (mainly oats) and concentrate on animal husbandry, especially cattle and dairying. Mixed farming and the use of well-trying crop rotations are widely practised. Viticulture is mostly practised in Italy, France and Germany. As for industrial crops, European Russia, Ukraine, and Belarus are large producers of flax and hemp, sugar beets and sunflower seeds. Tobacco 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 / km². 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 / km²) as well as in the world. Iceland has a very low density of population (3 persons/ km²).

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.

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.

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.

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 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.

NOTE

- ❖ Europe is called as the 'Peninsula of Peninsulas'.
- ❖ **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 (€).
- ❖ **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.
- ❖ **Fjord:** A fjord is a narrow and deep sea inlet between steep cliffs. It helps in the following ways.
 - ✓ It reduces the speed of wind, irrespective of its direction.
 - ✓ The force of sea waves are also controlled.Hence, areas with fjords are best suited for natural harbours.
- ❖ **Black forest:** The lush and dark coloured fig and pine trees give black colour to this region.
- ❖ **The Matterhorn:** The pyramid-shaped Matterhorn Mountain is located in the Swiss Alps a height of 4478 m. It is popular for its shape.
- ❖ **Climate Divider:** The Alps Mountain separates the Mediterranean climate from the cold climate of the north.
- ❖ **North Atlantic Drift** is a warm ocean current which brings warmth to the western Europe. The westerly wind further transports warmth across Europe.

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' 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 Asia
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

5. Globe

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. 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. 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 $23\frac{1}{2}^{\circ}$. The globe is also inclined at an angle of $23\frac{1}{2}^{\circ}$. The axis is an imaginary line. It is not actually found on the Earth.

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.

Latitudes

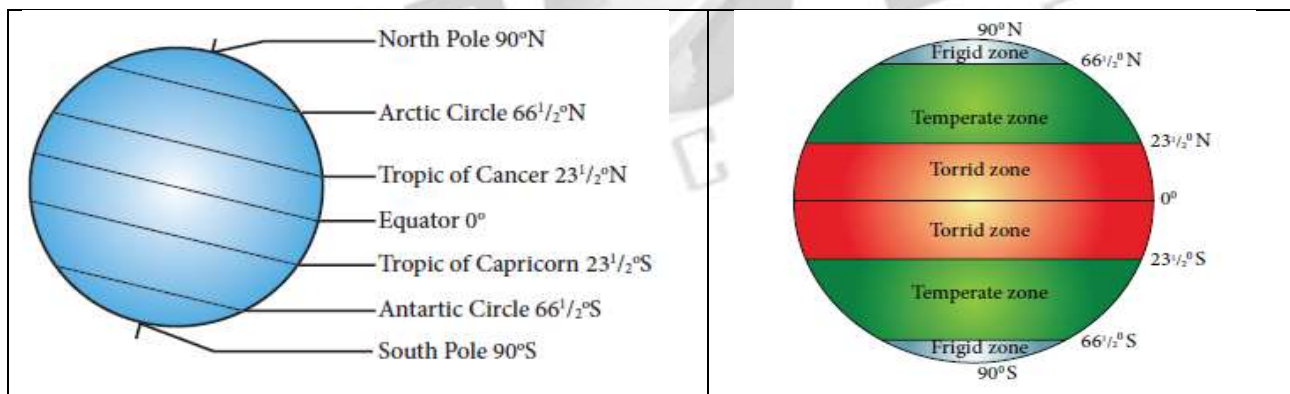
The imaginary lines which are drawn horizontally on East - West direction on the Earth are called the lines or parallels of latitudes. The 0° line of latitude which divides the Earth into two halves is known as the Equator. From the Equator, parallel lines are drawn towards the North and South poles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

- ✓ **Northern Hemisphere:** The area of the Earth found between the Equator (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.
- ✓ **Important lines of latitude:** The earth rotates on its axis at an inclination of $23\frac{1}{2}^{\circ}$. 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.

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 ($23\frac{1}{2}^{\circ}\text{N}$) and the Tropic of Capricorn ($23\frac{1}{2}^{\circ}\text{S}$) 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.

Temperate Zone: From the Tropic of Cancer ($23\frac{1}{2}^{\circ}\text{N}$) to the Arctic Circle ($66\frac{1}{2}^{\circ}\text{N}$) and from the Tropic of Capricorn ($23\frac{1}{2}^{\circ}\text{S}$) to the Antarctic Circle ($66\frac{1}{2}^{\circ}\text{S}$), 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 ($66\frac{1}{2}^{\circ}\text{N}$) to the North Pole (90°N) and from the Antarctic Circle ($66\frac{1}{2}^{\circ}\text{S}$) 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.

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

- ✓ **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.

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 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.

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'. 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.

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.

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 $7\frac{1}{2}^\circ$. It is done in such a way that the variation of standard time from the Greenwich is expressed either as 1 hour or $\frac{1}{2}$ an hour.

Indian Standard Time

The longitudinal extent of India is from $68^\circ 7'$ E to $97^\circ 25'$ E. As many as twenty nine lines of longitude pass through India. Having 29 standard time is not logical. Hence $82\frac{1}{2}^\circ$ E line of longitude is observed as the Prime Meridian to calculate the Indian Standard Time (IST). 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.

NOTE

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

- ❖ 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 rotation on its axis'.
- ❖ The Equator is the longest of all lines of latitude. Hence, it is also known as 'The Great Circle'.
- ❖ 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
- ❖ 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)
- ❖ 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.
- ❖ 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.

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 ° = 1440 / 360 = 4 minutes
 - ✓ In 4 minutes = 1° rotation
 - ✓ In 60 minutes = 60 / 4 = 15° rotation
 - ✓ So, in an hour (60 minutes) the earth rotates 15°
- ❖ 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.
- ❖ a.m. means 'anti Meridiem' (anti - before) - Before Noon.
- ❖ p.m. means 'post Meridiem' (Post - after/after) - After noon.
- ❖ 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.



6. Understanding Disaster

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	
Natural Disasters	Man- Made Disasters
✓ Earthquakes	✓ Fire
✓ Volcanoes	✓ Destruction of buildings
✓ Tsunamis	✓ Accidents in industries
✓ Cyclones	✓ Accidents in transport
✓ Floods	✓ Terrorism
✓ Landslides	✓ Stampede
✓ Avalanches	
✓ Thunder & Lightning	

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.

Natural Disaster:

- 1. 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'.
- 2. Volcanoes:** Volcanoes are openings or vents where lava, small rocks and steam erupt onto the earth's surface.
- 3. Tsunami:** Tsunami are waves generated by earthquake, volcanic eruptions and underwater landslides.
- 4. Cyclones:** A low pressure area which is encircled by high-pressure wind is called a cyclone.

5. **Floods :** An overflow of a large amount of water, beyond its normal limits, especially on the rainfed areas is called a flood.
6. **Landslide:** The movement of a mass of rocks, debris, soil etc., downslope is called a landslide.
7. **Avalanche:** A large amount of ice, snow and rock falling quickly down the side of a mountain is called an Avalanche.
8. **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.

Man Made Disasters:

1. **Fire:** Massive forest fires may start in hot and dry weather as a result of lightning, and human carelessness or from other causal factors.
2. **Destruction of buildings:** Demolition of buildings by human activities.
3. **Accidents in industries:** Chemical, biological accidents that occur due to human error. (e.g.) Bhopal gas tragedy
4. **Accidents in Transport:** Violation of road rules, carelessness cause accidents.
5. **Terrorism:** The social unrest or differences in principles leads to terrorism.
6. **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 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 vulnerable 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.
- ✓ Don't 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 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.

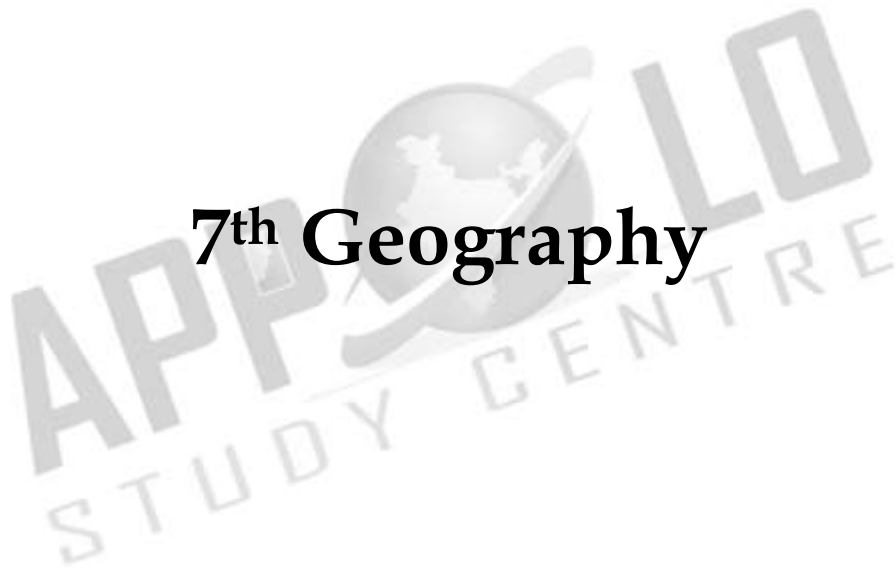
Forecasting and Early Warning

- ✓ 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 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.



7th Geography



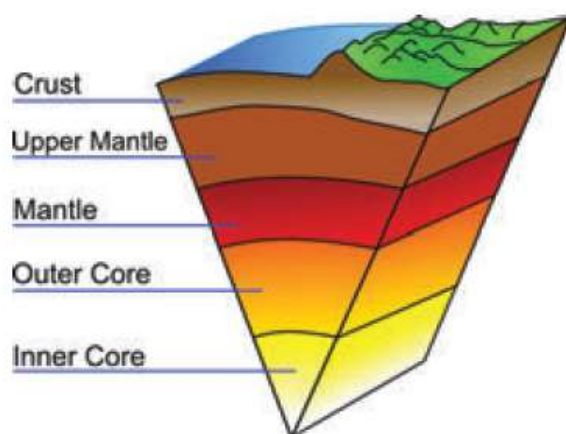
1. Interior of the Earth

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. The crust comprises two of distinct parts. The upper part consists of granite rocks and forms the continents.

Its main mineral constituents are silica and alumina. So it is collectively referred to as Sial. It has an average density of 2.7g/cm^3 . 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/cm^3 . 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 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 are moves in different directions at different rates. 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 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.

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. 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.

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.

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.

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.

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 Northern 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 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.

World Distribution of Earthquakes

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. 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 opening 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 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 cm² 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.

Nature of volcanic eruptions

Sometimes, magma rises slowly to the surface and spreads over a vast area. Th is is known as fi ssure 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 (27th 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 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.

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.
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.
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.

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* Volcanoes 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.

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

- **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.
- **Mid continental belt:** This is the volcanic zone of convergent continental plate boundaries that includes 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.
- **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.

NOTE

- ❖ Earth is called as blue Planet. 71% of the earth is covered by water.
- ❖ 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.
- ❖ **Asthenosphere** - The asthenosphere is the part of the mantle that flows and moves the plates of the earth.
- ❖ 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.

- ❖ There are three types of earthquake waves:
 - P waves or longitudinal waves
 - S waves or transverse waves
 - L waves or surface waves
- ❖ 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. The scientific study of valcanoes are called volcanology. People who study valcanoes are called volcanologists.
- ❖ 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.
- ❖ Stramboli is known as the 'light house of Mediterranean sea'



2. Landforms

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

- ✓ 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.

- ✓ **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.
- ✓ 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.
- ✓ 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.

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.
- ✓ 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 is called Inselbergs. E.g. Inselberg in the Kalahari Desert of South Africa.

- ✓ 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*.
- ✓ 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.

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.
- ✓ 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*.
- ✓ 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*.
- ✓ 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.

NOTE

- ❖ **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.
- ❖ 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.
- ❖ The term 'Meander' has been named on the basis of Meander River of Asia Minor (Turkey), it flows through numerous curves and turns.
- ❖ Northern China loess deposits are brought from the Gobi Desert.
- ❖ 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.

3. Population and Settlement

Introduction

Population Geography is a study of demographic phenomena which includes natality, mortality, 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 as 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)

1. **Causasoid:** The Causasoid is known as European race. This group is the one with fair skin and dark brown eyes, wavy hair and narrow nose. The Causasoid are also found in Eurasia.
2. **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.
3. **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
4. **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, Hiduism 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
Juadism	Synagogue
Zoroqstrianism	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.

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 language of the Dravidian family are Tamil, Telugu, Kannada, Malayalam etc., These languages are mainly spoken in southern India.

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.

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

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 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 are 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 Nilgiris.

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.

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

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.

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 our country to another. Some of the common bases of classification are

- ✓ Size of population
- ✓ Occupational structure
- ✓ Administration

- **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 it from smaller town. City is a nucleated settlement which is 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.
- **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.

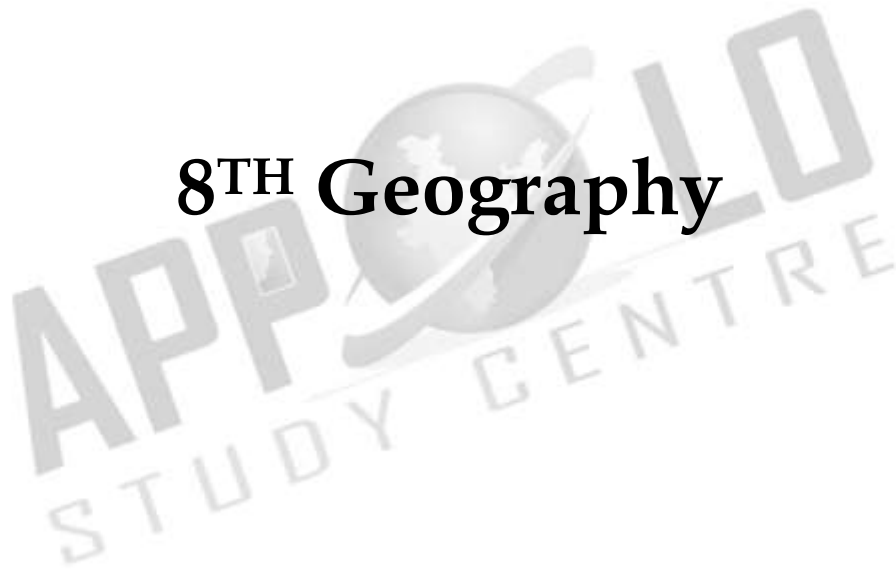
- **Satellite Town:** A satellite town is a town designed to house the over population of a major city, but is located well beyond the limits of that city. Satellite towns are generally located outside the rural urban fringe. In India most satellite towns are purely residential in character. Satellite 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, Dindugul 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

NOTE

- ❖ Human geography is the study of Man and his surroundings to the natural environment
- ❖ **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
- ❖ 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.

8TH Geography



1 - Rocks and Soil

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**

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. 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

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 'Hypabyssal rocks'. Granite, Diorite and Gabbro are the examples of plutonic rocks and Dolerite is an example of hypabyssal rocks. Since the intrusive Igneous rocks consist of large crystals, they are also called as 'Crystalline 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'. Characteristics of Sedimentary rocks

1. They have many layers.
2. They are non-crystalline rocks. easily
3. They contain fossils.
4. They are soft and get eroded easily

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.

- ✓ **Formation of Metamorphic Rocks from Igneous rocks**
 - Granite into gneiss caused by dynamic metamorphism.
 - Basalt into slate caused by thermal metamorphism.
- ✓ **Formation of Metamorphic Rocks from Sedimentary rocks**
 - Sandstone into quartz caused by thermal metamorphism.
 - Shale into slate caused by thermal metamorphism.
- ✓ **Characteristics of Metamorphic Rocks**
 - Metamorphic rocks are mostly crystalline in nature.
 - 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 takes 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.

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 | 6. Kerb stone, |
| 2. Writing chalk, | 7. Ornament, |
| 3. Fire, | 8. Roofing materials, |
| 4. Building materials, | 9. Decorative materials, |
| 5. Bath scrub, | 10. These are valuable source of minerals |
| such | as |
| | gold, diamond, sapphire etc. |

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.

- **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 profile:** The soil profile is defined as the vertical section of the soil from the ground surface and extends downwards.
- **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 deposition of silt by the running water. It is the most productive of all soils. It is suitable for the cultivation of sugarcane, jute, rice, wheat and other food crops.
- **Black soils:** These soils are formed by weathering of igneous rocks. Black soil is clayey in nature. It is retentive of moisture. It is ideal for growing cotton.
- **Red Soils:** These soils are formed by weathering 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 tropical 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 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.

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.

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, 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.

NOTE

- ❖ 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
- ❖ The word **Igneous** is derived from the Latin word 'Ignis' means 'fire'
- ❖ Some major **Active Volcanoes**: Mount Vesuvius, Mt. Stromboli and Mt. Etna in Italy and Mauna Loa and Mauna Kea in Hawaii Islands.
- ❖ Oldest sedimentary rocks of the world has been identified in Greenland and estimated as 3.9 billion years old.
- ❖ Sedimentary rocks are the important source of natural resources like coal, oil and natural gas.
- ❖ One of the world wonders Taj Mahal in India was built by White Marble in a metamorphic rock.
- ❖ 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.,
- ❖ World Soil Day is observed on 5th December, every year
- ❖ **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.

2. Weather and Climate

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 a year. In the 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.

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, 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.

Elements of weather and climate: Temperature, rainfall, pressure, humidity and wind are the major elements of weather and climate.

a. Temperature

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. 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 terrestrial radiation than insolation. 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

b. Factors affecting the distribution of temperature

Latitude, altitude, nature of land, ocean currents, prevailing 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 $[(87^{\circ}\text{F}+73^{\circ}\text{F})/2=80^{\circ}\text{F}]$. 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 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 Antarctic 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 Antarctic 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.

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 Rain gauge.

Air Pressure

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, whereas 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. 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.

Measuring air pressure

Meteorologist uses barometer/aneroid barometer to measure the air pressure. Barograms are used for recording continuous variation in 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.

- ✓ **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)

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.

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.

NOTE

- ❖ 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
- ❖ The word Climate is derived from the ancient Greek word "Klimo" which means "Inclination".
- ❖ Scientific study of weather is called Meteorology and the scientific study of climate is called climatology.
- ❖ 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 .
- ❖ **Highest pressure ever recorded:** The highest ever air pressure at sea level was recorded at Agata, Russia on 31st December, 1968. The pressure was 1083.8mb
- ❖ **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.

- ❖ 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.
- ❖ 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.
- ❖ Al-Balakh, an Arab Geographer collected climatic data from the Arab travellers and prepared the First climatic Atlas of the world
- ❖ 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.

3. Hydrologic Cycle

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 indispensable 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 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.

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
Ground Water	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

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.

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.

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.

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.

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 ranges from a couple of microns to 100 microns. This is the limit beyond which cloud drops become rain drops.

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 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.

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.

Percolation

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, 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.

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

- a. **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.
- b. **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.
- c. **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.

NOTE

- ❖ 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.
- ❖ 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.
- ❖ 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