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1 Components of Environment


Our environment, We care

Environment in its true sense can be defined as all that surrounds us. Environment is our basic life support system. It provides the air we breathe, the water we drink, the food we eat and the land where we live. It also includes plants, animals and a large variety of man-made things which are necessary for our living. Thus, environment has both **natural** and **man-made elements**. The natural environment can be further bifurcated into two groups, i.e. the **Physical environment** and the **Biological environment**. The Physical environment includes all non-living things like land, water and air. The Biological environment includes all living things, such as plants and animals. Man is the most important component of the biological environment who satisfies all the required needs from both parts (groups) of the environment.

The two components of the natural environment, that is the physical and the biological, are largely interdependent and cannot be separated. Any major change in the physical environment is bound to bring a change in the accompanying biological environment. The change can be sudden or gradual. For example, the development of soil takes years together and cannot be visualised through our senses. On the other hand, some changes are very sudden, like the changes brought about by the occurrence of an earthquake or volcano, etc.

FOUR SPHERES OF ENVIRONMENT

The natural environment can be broadly divided into four spheres, i.e. **Lithosphere, Atmosphere, Hydrosphere** and **Biosphere**. Each of these is unique in its own way and supports others in sustaining life forms on our planet called the **Mother Earth**. Let us understand the importance of each sphere of the natural environment.

Four spheres of environment

Lithosphere

The literal meaning of 'lithosphere' is the 'sphere of rocks'. The earth's solid layer is called **lithosphere**.

The lithosphere is about 100 km in thickness. The uppermost part of the lithosphere is composed of rocks rich in silica and aluminium called **sial**. Below the sial layer, the rocks are mainly rich in silica and magnesium and are called **sima**, which is generally found below the bottom of the ocean basins.

Thus, lithosphere is that part of the earth which provides us land over which we live. It provides soil for the plants and is also a source of all the mineral wealth.

Atmosphere

The literal meaning of 'atmosphere' is the 'sphere of air'. The **atmosphere** is composed of a mixture of gases which forms an envelope around the earth. It is a gaseous envelope extending about 1,600 km above the earth's surface. Of the total mass of the atmosphere, 99 per cent exists within 32 km of height from the earth's surface.

Among the four major elements of environment, atmosphere is the most dynamic in nature where changes occur not only from one season to another but also within a short period of time say, a few hours. These sudden changes produce changes in atmospheric conditions which affect our life both directly and indirectly.

Hydrosphere

Hydrosphere refers to the 'sphere of water' which is present in oceans, rivers, lakes and other water bodies on the earth's surface. The planet earth is often called the **Water Planet** or the **Blue Planet** because of abundance of water on its surface. The water bodies that include rivers, lakes, seas and oceans cover 71 per cent of the earth's surface.

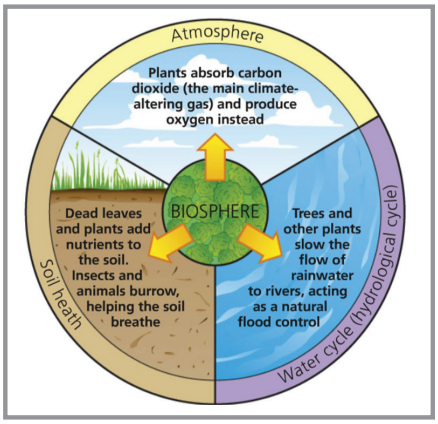
The sea

The distribution of water is not uniform in both the Northern and the Southern Hemispheres. It is estimated that 43 per cent of the total area covered by water lies in the Northern Hemisphere whereas the remaining 57 per cent lies in the Southern Hemisphere. Oceans hold 96.5 per cent water on the earth. Rest of the water is available in the form of ice, water vapours, underground water, rivers and lakes.

Biosphere

The word 'biosphere' literally means the 'sphere of life'. **Biosphere** is the narrow zone of contact between all the other three spheres of environment where all kinds of life exist.

Most of the living organisms like plants, animals and microbes present on the earth are found on or near the earth's surface of the land, water and air. Human beings are an important part of the biosphere. They are capable of changing it.



Biosphere

The earth is full of diversities. There is diversity in land, soil, plants and animals. This process of diversification has occurred largely over long period of time resulting in the emergence of new species of plants and animals. These changes create biodiversity on the earth.

The Government of India has passed the Wildlife Protection Act in 1972 to protect and conserve this biodiversity. Under this Act poaching and hunting are prohibited. Violation of this Act is a punishable crime under law. It is not only the duty of the government to protect and preserve wildlife but all of us are responsible.

Do You Know?

Some critically endangered species of animals in India are Forest Owlet, Ganges Shark, Tiger Toad, Flying Frog, Leatherback Turtle, etc. Presently, there are 102 National Parks and 515 Wildlife Sanctuaries in India.

Human beings, as an important part of the environment, are well-equipped to exploit, consume or utilise different plant and animal species existing on the earth's surface. It is the need of the present times that we should live in harmony with our surroundings. This will allow the earth to sustain all forms of life on it and to produce newer ones in the course of time.

Keywords

- biodiversity: it is a variety of life on earth comprising of plants, animals and micro-organisms.
- microbes: very small organisms.
- national park: a well demarcated reserved area for the protection of wildlife. It does not allow any human activity.
- ocean: vast expense of saline water on the earth's surface.
- wildlife sanctuary: a geographical area meant for the conservation of biodiversity. Limited human activities are permitted.

Something To Know

A. Tick (✔) the correct option.

1. Which one is not a part of biological environment?

   (a) plants ☐ (b) water ☐

   (c) animals ☐ (d) human beings ☐

2. Volcanoes erupt due to–

   (a) internal disturbance of the earth. ☐ (b) external disturbance of the earth. ☐

   (c) climate change. ☐ (d) man-made changes on the earth. ☐

3. Which one brings a sudden change in the environment?

   (a) formation of a river ☐ (b) rainfall ☐

   (c) growth of a plant ☐ (d) formation of a mountain ☐

4. Identify by the term that stands for the topmost layer of the earth comprising of loose material–

   (a) minerals ☐ (b) soil ☐

   (c) sial ☐ (d) sima ☐

5. In which year was the Wildlife Protection Act passed in India?

   (a) 1971 ☐ (b) 1972 ☐

   (c) 1973 ☐ (d) 1974 ☐

B. Give a single term for each of the following sentences.

1. A situation or condition in which an organism lives. _____
2. The only planet in our solar system where life exists. _____
3. The uppermost part of the lithosphere which is rich in silica and aluminium. _____
4. The sphere of air that envelopes the earth. _____
5. Mass of water on the earth's surface. _____

C. Match the following:

1. Physical environment includes	a. Atmosphere
2. It is the most dynamic in nature	b. Human beings
3. A narrow zone supporting life	c. Non-living things
4. They are capable of modifying environment	d. Biosphere
5. Rocks rich in silica and magnesium	e. Sima

D. Answer the following questions in brief.

1. Name the major components of the environment.
2. What is meant by Sima and Sial?
3. Mention the distribution of water in the Northern and Southern hemispheres.
4. Give the literal meaning of four spheres of environment.
5. What is the atmosphere composed of?

E. Answer the following questions.

1. Differentiate between the physical and the biological environment.
2. Why is the earth called the 'Blue Planet'?
3. Define biosphere. Why is it important for us?
4. Explain with the help of an example how physical and biological components of the environment are interdependent.
5. Explain two ways in which human beings are disturbing the natural environment.

Value Based Question

On 25 April 2015, a massive earthquake of 7.8 magnitude struck 77 km north-west of Nepal's capital, Kathmandu. It was the most powerful earthquake to have hit Nepal since 1934. It led to heavy loss of life and property. During this earthquake four men were trapped under the 10 feet rubble. They were rescued by NASA technology, FINDER (Finding Individuals for Disaster and Emergency Response) which sensed their heartbeats. This was the first time when this technology was used in a real-life situation. This is indeed a big step towards disaster management. But this, in no way, reduces our responsibilities as human beings.

- Under the circumstances, what best can we do after such a disaster?
- Suggest any five ways in which we can help the victims of other types of disasters.

Map Skill

On an outline map of the world, show the given National Parks.

(a) Gir National Park—India

(b) Jim Corbett National Park—India

(c) Yellowstone National Park—USA

(d) Serengeti National Park—Tanzania

(e) Fiord land National Park—New Zealand

Something To Do

1. Hold a class discussion on good and bad environment.
2. Prepare a coloured diagram showing different spheres of the environment.
3. Prepare 20 flash cards showing the wildlife species of India (flora and fauna both). Based on this, hold a quiz in the class showing one flash card at a time. For every card, ask the questions, like–
   (a) Who has seen it live and where?
   (b) If not, where can we see it live?

2 The Earth and the Changes on It

The surface of the earth never remains the same. It constantly undergoes changes. These changes can be sudden or gradual. The sudden changes originate inside the earth, due to volcanic or earthquake activities. These forces bring radical changes and are easily visible. On the other hand, some changes are very slow and take place gradually over a very long time. This could be due to natural forces, such as carrying of soil by rain water, changes in the course of a river, winds carrying soil particles with them, etc.

Human factors can play an equally important role in changing the surface of the earth. The examples are cutting down of forests, construction of roads, bridges and railway lines, large-scale mining, building of dams, etc. In this Chapter, we will study about the processes that are involved in bringing gradual changes upon the earth's surface.

EXTERNAL PROCESS

Any process working on the earth's surface and bringing changes on it, is known as **external process.** The external process may lower the level of land by wearing away rock particles. It can also raise the level of land where the soil particles are deposited. External processes include changes on account of weathering and gradation.

Do You Know?

Geomorphology is the science of study of landforms.

Weathering

The term **weathering** refers to the process that breaks rocks into smaller particles. It includes erosion and deposition. They disintegrate as they are exposed to all types of weather changes. The effect of weathering can also be seen on stone monuments and buildings where pieces of stones get flaked off and iron railings get rusted.

Weathering

Do You Know?

Gradation means levelling of land. It occurs in two ways –agradation and degradation. **Agradation** means adding of sediments and raising the level of land. **Degradation** means breaking and wearing away of sediments and lowering the level of land.

Erosion

Erosion or **Denudation** refers to gradual wearing and carrying away of all those loose particles of disintegrated rocks which lie exposed on the earth's surface by the weathering agents of gradation, i.e. running water, wind, moving ice and sea waves.

Deposition

Deposition refers to the laying down of sediments which have been carried from distant parts of the earth's surface by various agents of gradation. The continuous process of deposition results in the formation of soil at other places.

The rate at which erosion take place depends upon the temperature of a place, vegetation cover, rainfall, slope of the land, type of soil and changes in land use.

AGENTS OF GRADATION

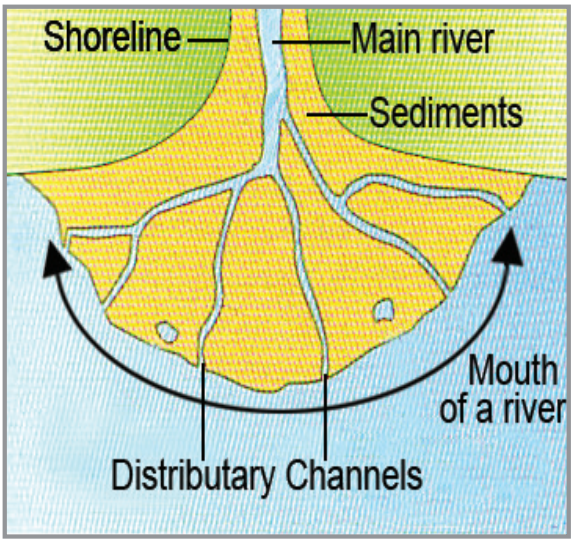
Running Water

It is an important agent of gradation. A river, like any living form, has a 'life cycle'. It takes birth in a mountain or a hill, becomes larger where it is met by a number of tributaries, flows over plains and finally ends when it reaches the sea.

In its early stage, the river is young. It flows over steep mountains where its rate of erosion is maximum. Due to down cutting work of a river, it forms striking youthful features like 'I' shaped and 'V' shaped valleys, waterfalls, etc. As the river enters into the plains, it comes to the stage of maturity. Here, the volume of water increases and the slope of land decreases, resulting in slow speed of the river. During this stage, the river is said to flow through **meanders**.

Meander

Before meeting the sea, the river becomes large and sluggish and gets divided into several distributaries. It now comes to its old stage. The river, thus, deposits silt, sand and sediments over a large area near its mouth. This large deposition helps in the formation of a **delta**. The delta of Ganga and Brahmaputra is the largest in the world.



Delta

Glacier

It is believed that a million years ago, the climatic condition of the earth's surface was much cooler than what it is now. The earth's surface was covered by ice but later, the temperature began to rise gradually. This rise in temperature resulted in melting of the ice. The mass of moving ice is called a **Glacier.** In India, the glaciers are found on high altitudes of the Himalayas where temperature is below freezing point.


Siachin Glacier

Like running water, moving ice also erodes loose particles or parts of rocks. It takes them along and deposits them behind, when it melts. Huge masses of ice which cover large area of a continent are called **Continental glaciers** like Antarctica and Greenland. Other glaciers which occupy small areas over the mountains are called **Mountain glaciers** like Siachin glacier and Gangotri glacier of the Himalayas in India.

Do You Know?

The **snow line** is a line on the high mountains above which the snow never melts.

Wind

In the regions where there is little rainfall and meagre vegetation, the land is exposed to strong winds. The loose rock particles are easily blown away by the strong wind. Thus, the wind is also an agent of gradation. The action of the wind is most common in the desert regions.

Do You Know?

Air can neither be seen nor felt but the swift horizontal movement of air is felt and it is called **wind.**

The strong wind has the capacity to rub and scrap rocks, resulting in strange shaped rocks like mushroom rock. The carried material is then deposited at a new place whenever the speed of wind slows down. This forms various types of **sand dunes**. Sand dunes can be found in the western parts of Rajasthan in India.

Sand dunes

Sea Waves

Along the sea shore, sea waves are the most powerful agent of gradation. The continuous striking of sea waves breaks the rocks. Such continuous erosion forms steep sided **cliffs** facing the sea. The eroded material may then be deposited along the coast forming beaches.

Cliffs

Human beings also play a crucial role in changing the face of the land. Over-growing population and industrialisation has disturbed the natural environment to a large extent. The human activity involves diverse land use like clearing of forests for agriculture, construction of roads and new human settlements, etc. These are a few examples which change the land surface. Human beings need to take care of all the resources for maintaining ecological balance. This can be achieved by sustainable development.

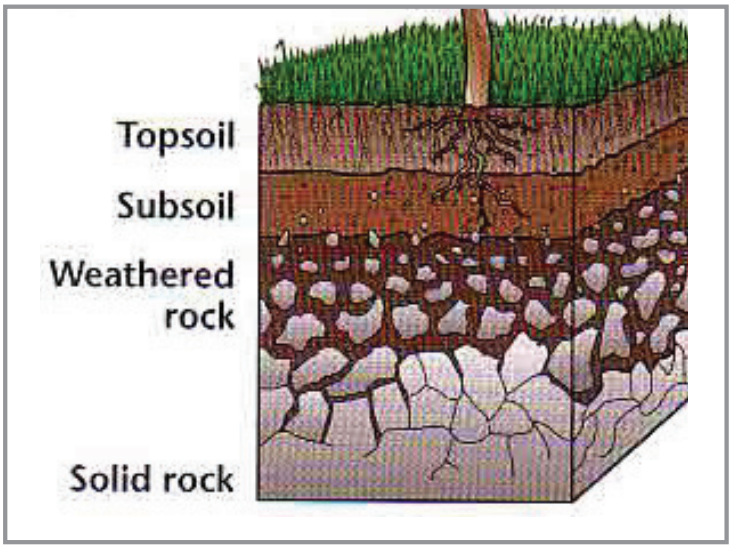
SOIL

Soil is the loose material found on the surface of the earth. It is made of organic and inorganic particles. The organic particles are derived from dead remains of plants and animals. In the course of time, these particles get decomposed and change into a dark coloured material called **humus**. The humus present in the soil contributes to the fertility of the land. This is rapidly formed in humid areas due to heavy growth of plants and rich animal life. However, humus is low in desert soil.

The inorganic particles are derived from rocks. They include loose disintegrated particles of different sizes. The large sized particles are called **gravel**, while the smaller ones are called **sand, silt** and **clay**. A mixture of these particles gives rise to different types of soil as per their proportion. These are called **sandy, loamy** and **clayey** soils.

Formation of Soil

It is a very slow process. It takes thousands of years to form a thin layer of soil. As mentioned earlier, the weathering process breaks the rocks into small particles. These are then carried away by water, wind, etc., and later get deposited at a new place. Such soil is called **transported soil**. But, when the soil is formed by the weathering of a parent rock and remains present on the same site, it is called **residual soil**.



Soil layers

The soil forming process continues over a long span of time. It starts developing in layers, one over the other. These layers are called **horizons**. From bottom to top, the lowest horizon is called **bed rock**, then comes the horizon of **weathered rock** and it is followed by the **sub soil** and **top soil**. The topmost horizon is rich in humus.

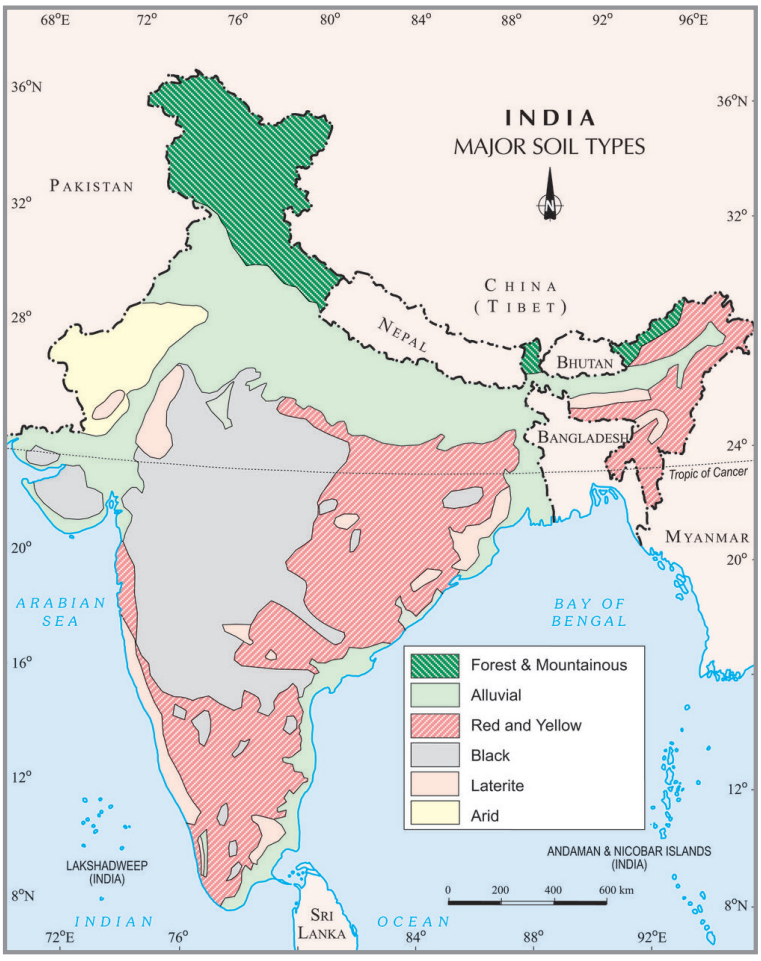
Distribution of Major Soil Types

Soil is generally classified on the basis of colour and texture.

Alluvial soil: It is found over a large part of India. It is mainly formed by the deposition of sediments by river and is confined to northern and coastal plains. This type of soil is very fertile and forms major agricultural land of our country.

Black soil: It is found in Deccan plateau. This type of soil is confined to some parts of Gujarat, Maharashtra and Karnataka. This soil has an ability to retain moisture and become sticky when wet. It is largely used for growing cotton and thus, is popularly known as **cotton soil**.

Red soil: As the name suggests, this soil is red in colour due to the presence of iron



Major soil types

particles. Red soil is confined to peninsular India and some patches of north-eastern parts of India. It is highly porous, fine grained and deep.

Laterite soil: It is found over the hill slopes of peninsular plateau. The laterite soil is found in the regions of heavy rainfall. It is formed by the leaching process.

Apart from these four types, there are **desert** and **mountain soils.** They are found in their respective regions.

Removal of the top layer of soil is called **soil erosion**. We must understand that soil erosion is a serious problem affecting land all over the world. In certain areas, the soil erosion has become a menace which causes decline in the crop yield. This is happening due to wrong human practices like cutting of trees, overgrazing by animals, besides many other reasons. Soil erosion needs to be checked through appropriate measures of soil conservation, such as plantation of trees, selective agricultural practices like crop rotation and multiple cropping method, development and management of pasture land. We need mass awareness and adoption of these practices at local level.

Keywords

- denudation: the wearing away of the earth's surface by weathering process and agents of gradation.
- distributary: river channels separating from the main river.
- 'I' shaped valley: erosional feature with narrow and vertical walls formed by a river. It is also called gorge.
- leaching: a natural process in which rainy water dissolves minerals from the soil and carry them away.
- meander: sweeping curves of a river.
- tributary: small streams joining the main river.
- 'V' shaped valley: feature formed by a downward cutting of rocks by a river. It resembles the letter 'V'.

Something To Know

A. Tick (✔) the correct option.

1. Which one of the following is not a human activity?

   (a) diverse land use ☐ (b) cleaning of forests ☐

   (c) new human settlements ☐ (d) formation of mountains ☐

2. Which one is a Continental glacier?

   (a) Siachin ☐ (b) Antarctica ☐

   (c) Gangotri ☐ (d) Yamunotri ☐

3. Which of the following features are formed by a river?

   (a) 'V' shaped valley, meander and delta ☐

   (b) 'U' shaped valley, meander and delta ☐

   (c) 'I' shaped valley, cliff and delta ☐

   (d) 'V' shaped valley, meander and sand dunes ☐

4. Which layer of the soil contains humus?

   (a) bed rock ☐ (b) weathered rock ☐

   (c) sub soil ☐ (d) top soil ☐

5. Which soil type is capable of retaining moisture and becomes sticky when wet?

   (a) alluvial soil ☐ (b) black soil ☐

   (c) red soil ☐ (d) laterite soil ☐

B. Fill in the blanks.

1. Organic matter when gets decomposed in the soil and converts it into dark coloured material is called _____ .
2. _____ soil is found in a large part of our country.
3. _____ and _____ valleys are formed at the youthful stage of a river.
4. A _____ is a steep sided rock facing the sea.
5. _____ river and _____ river form the largest delta of the world.

C. Give a single term for each of the following statements.

1. Mounds of sand deposited by wind action in deserts. _____
2. The process in which a gradual wearing and carrying away of soil particles takes place on the earth's surface. _____
3. The process of laying down of sediments carried by various agents of gradation. _____
4. A mass of moving ice down the slope. _____
5. Removal of the top layer of soil. _____

D. Answer the following questions in brief.

1. Specify two differences between internal and external forces.
2. Name the various agents of gradation.
3. Distinguish between transported and residual soil.
4. How is a delta formed?
5. Why is humus formed more rapidly in humid areas?

E. Answer the following questions.

1. Explain weathering. Mention the factors that affect the rate of weathering and soil erosion.
2. Explain the formation of soil with the help of a labelled diagram.
3. What are the major soil types found in India? Give one important characteristic of each.
4. Describe the journey of a river from its source to its mouth.
5. Why is conservation of soil important? Suggest three different ways of soil conservation.

Value Based Question

Agriculture is the main source of livelihood in India. It depends on the fertility of the soil. When soil erodes, it makes the land less productive and lead to landslides, floods and destroys the habitat of micro-organism. Wrong agricultural practices, deforestation for the expansion of agriculture, industrialisation, construction of roads and railway lines are some of reasons of this menace.

- What will be the after effects of this menace?
- In your opinion, which one of the reasons mentioned above is justified?

Map Skill

Take an outline map of India. Locate and label the areas of major soil types on it. Mention the names of states of each soil type.

Something To Do

1. Complete the table by writing appropriate features in relevant columns.

Agents	Features formed by Erosion	Features formed by Deposition
Running Water		
Wind Action		
Sea Waves		
Moving Ice		

2. Collect pictures of various features formed by various agents of gradation and weathering. Paste these pictures in a scrap file.