



**Class X<sup>th</sup> NEW NCERT**  
**Chapter-1**



1068CH01

# RESOURCES AND DEVELOPMENT



Can you identify and name the various items used in making life comfortable in our villages and towns. List the items and name the material used in their making.

Everything available in our environment which can be used to satisfy our needs, provided, it is technologically accessible, economically feasible and culturally acceptable can be termed as 'Resource'.

The process of transformation of things available in our environment involves an interactive relationship between nature, technology and institutions. Human beings interact with nature through technology and create institutions to accelerate their economic development.

Do you think that resources are free gifts of nature as is assumed by many? They are not. Resources are a function of human activities. Human beings themselves are essential components of resources. They transform material available in our environment into resources and use them. These resources can be classified in the following ways-

- (a) On the basis of origin – biotic and abiotic
- (b) On the basis of exhaustibility – renewable and non-renewable
- (c) On the basis of ownership – individual, community, national and international
- (d) On the basis of status of development – potential, developed stock and reserves.

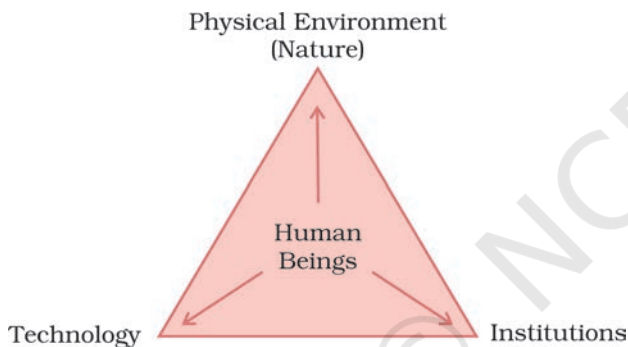


Fig. 1.1: Interdependent relationship between nature, technology and institutions

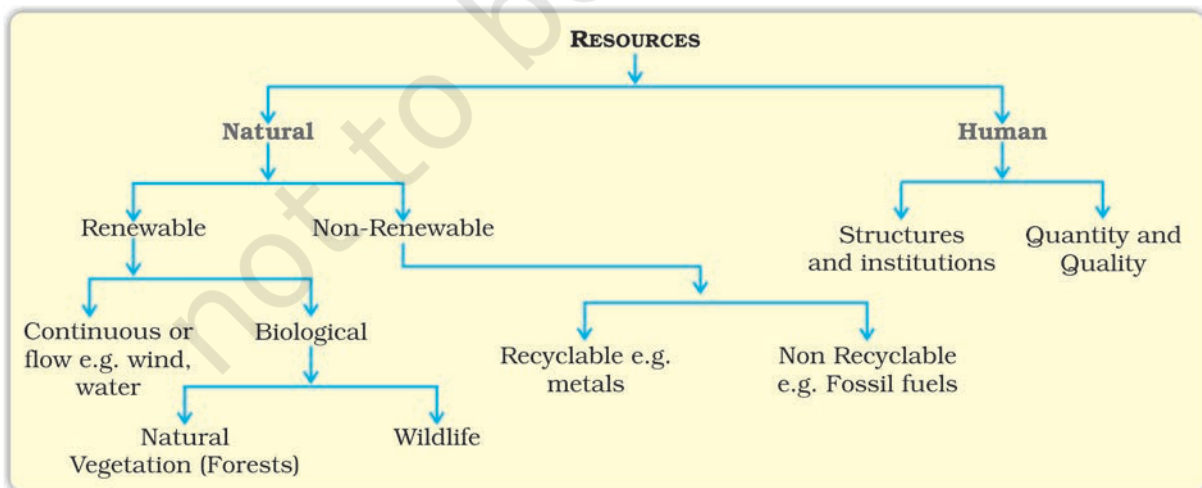


Fig. 1.2: Classification of resources

## DEVELOPMENT OF RESOURCES

Resources are vital for human survival as well as for maintaining the quality of life. It was believed that resources are free gifts of nature. As a result, human beings used them indiscriminately and this has led to the following major problems.

- Depletion of resources for satisfying the greed of a few individuals.
- Accumulation of resources in few hands, which, in turn, divided the society into two segments i.e. haves and have nots or rich and poor.
- Indiscriminate exploitation of resources has led to global ecological crises such as, global warming, ozone layer depletion, environmental pollution and land degradation.

### Activity

1. Imagine, if the oil supply gets exhausted one day, how would this affect our life style?
2. Plan a survey in your colony/village to investigate people's attitude towards recycling of the domestic/agricultural wastes. Ask questions about :
  - (a) What do they think about resources they use?
  - (b) What is their opinion about the wastes, and its utilisation?
  - (c) Collage your results.

An equitable distribution of resources has become essential for a sustained quality of life and global peace. If the present trend of resource depletion by a few individuals and countries continues, the future of our planet is in danger.

Therefore, resource planning is essential for sustainable existence of all forms of life. Sustainable existence is a component of sustainable development.

## Sustainable development

Sustainable economic development means 'development should take place without damaging the environment, and development in the present should not compromise with the needs of the future generations.'

## Rio de Janeiro Earth Summit, 1992

In June 1992, more than 100 heads of states met in Rio de Janeiro in Brazil, for the first International Earth Summit. The Summit was convened for addressing urgent problems of environmental protection and socio-economic development at the global level. The assembled leaders signed the Declaration on Global Climatic Change and Biological Diversity. The Rio Convention endorsed the global Forest Principles and adopted *Agenda 21* for achieving Sustainable Development in the 21<sup>st</sup> century.

## Agenda 21

It is the declaration signed by world leaders in 1992 at the United Nations Conference on Environment and Development (UNCED), which took place at Rio de Janeiro, Brazil. It aims at achieving global sustainable development. It is an agenda to combat environmental damage, poverty, disease through global co-operation on common interests, mutual needs and shared responsibilities. One major objective of the Agenda 21 is that every local government should draw its own local Agenda 21.

## RESOURCE PLANNING

Planning is the widely accepted strategy for judicious use of resources. It has importance in a country like India, which has enormous diversity in the availability of resources. There are regions which are rich in certain types of resources but are deficient in some other



resources. There are some regions which can be considered self sufficient in terms of the availability of resources and there are some regions which have acute shortage of some vital resources. For example, the states of Jharkhand, Chhattisgarh and Madhya Pradesh are rich in minerals and coal deposits. Arunachal Pradesh has abundance of water resources but lacks in infrastructural development. The state of Rajasthan is very well endowed with solar and wind energy but lacks in water resources. The cold desert of Ladakh is relatively isolated from the rest of the country. It has very rich cultural heritage but it is deficient in water, infrastructure and some vital minerals. This calls for balanced resource planning at the national, state, regional and local levels.

### Activity

Prepare a list of resources found in your state and also identify the resources that are important but deficit in your state.

### Resource Planning in India

Resource planning is a complex process which involves : (i) identification and inventory of resources across the regions of the country. This involves surveying, mapping and qualitative and quantitative estimation and measurement of the resources. (ii) Evolving a planning structure endowed with appropriate technology, skill and institutional set up for implementing resource development plans. (iii) Matching the resource development plans with overall national development plans.

India has made concerted efforts for achieving the goals of resource planning right from the First Five Year Plan launched after Independence.

The availability of resources is a necessary condition for the development of any region, but mere availability of resources in the absence of corresponding changes in

### Find out

What resources are being developed in your surroundings by the community/village panchayats/ward level communities with the help of community participation?

technology and institutions may hinder development. There are many regions in our country that are rich in resources but these are included in economically backward regions. On the contrary there are some regions which have a poor resource base but they are economically developed.

*Can you name some resource rich but economically backward regions and some resource poor but economically developed regions? Give reasons for such a situation.*

The history of colonisation reveals that rich resources in colonies were the main attractions for the foreign invaders. It was primarily the higher level of technological development of the colonising countries that helped them to exploit resources of other regions and establish their supremacy over the colonies. Therefore, resources can contribute to development only when they are accompanied by appropriate technological development and institutional changes. India has experienced all this in different phases of colonisation. Therefore, in India, development, in general, and resource development in particular does not only involve the availability of resources, but also the technology, quality of human resources and the historical experiences of the people.

**Conservation of Resources:** Resources are vital for any developmental activity. But irrational consumption and over-utilisation of resources may lead to socio-economic and environmental problems. To overcome these problems, resource conservation at various levels is important. This had been the main concern of the leaders and thinkers in the past. For example, Gandhiji was very apt in voicing his concern about resource conservation in these words: "There is enough



for everybody's need and not for any body's greed." He placed the greedy and selfish individuals and exploitative nature of modern technology as the root cause for resource depletion at the global level. He was against mass production and wanted to replace it with the production by the masses.

At the international level, the Club of Rome advocated resource conservation for the first time in a more systematic way in 1968. Subsequently, in 1974, Gandhian philosophy was once again presented by Schumacher in his book **Small is Beautiful**. The seminal contribution with respect to resource conservation at the global level was made by the Brundtland Commission Report, 1987. This report introduced the concept of 'Sustainable Development' and advocated it as a means for resource conservation, which was subsequently published in a book entitled **Our Common Future**. Another significant contribution was made at the Earth Summit at Rio de Janeiro, Brazil in 1992.

## LAND RESOURCES

We live on land, we perform our economic activities on land and we use it in different ways. Thus, land is a natural resource of utmost importance. It supports natural vegetation, wild life, human life, economic activities, transport and communication systems. However, land is an asset of a finite magnitude, therefore, it is important to use the

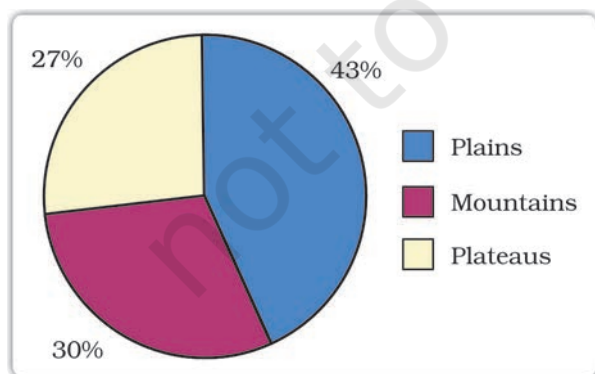


Fig 1.3: India : Land under important Relief Features

available land for various purposes with careful planning.

India has land under a variety of relief features, namely; mountains, plateaus, plains and islands. About 43 per cent of the land area is plain, which provides facilities for agriculture and industry. Mountains account for 30 per cent of the total surface area of the country and ensure perennial flow of some rivers, provide facilities for tourism and ecological aspects. About 27 per cent of the area of the country is the plateau region. It possesses rich reserves of minerals, fossil fuels and forests.

## LAND UTILISATION

Land resources are used for the following purposes:

1. Forests
2. Land not available for cultivation
  - (a) Barren and waste land
  - (b) Land put to non-agricultural uses, e.g. buildings, roads, factories, etc.
3. Other uncultivated land (excluding fallow land)
  - (a) Permanent pastures and grazing land,
  - (b) Land under miscellaneous tree crops groves (not included in net sown area),
  - (c) Culturable waste land (left uncultivated for more than 5 agricultural years).
4. Fallow lands
  - (a) Current fallow-(left without cultivation for one or less than one agricultural year),
  - (b) Other than current fallow-(left uncultivated for the past 1 to 5 agricultural years).
5. Net sown area- the physical extent of land on which crops are sown harvested is known as net sown area. Area sown more than once in an agricultural year plus net sown area is known as *gross cropped area*.

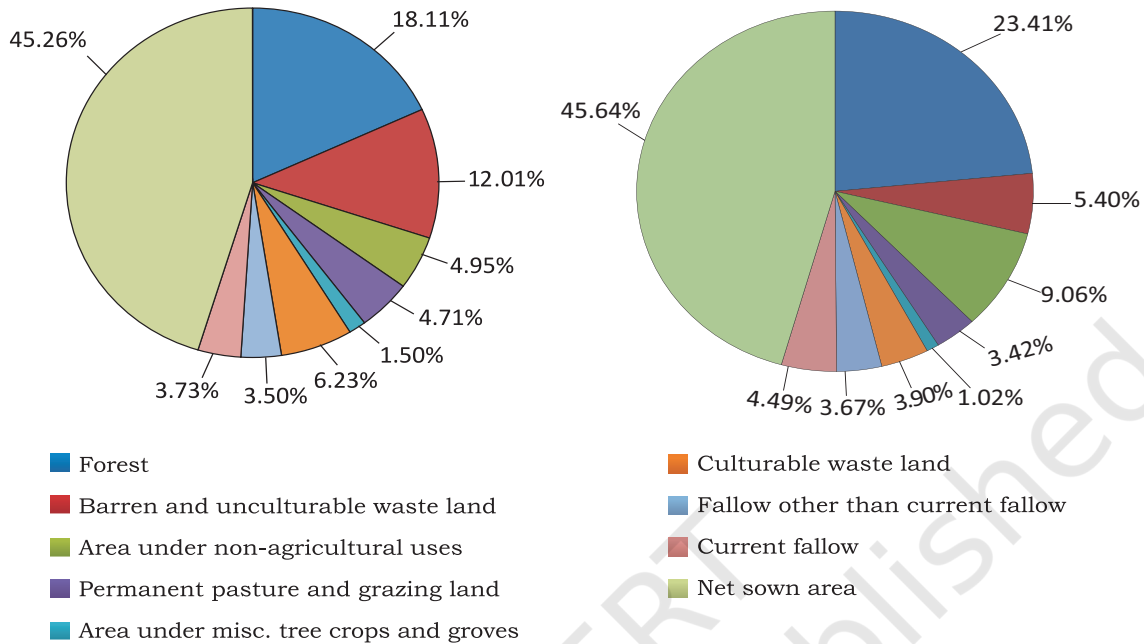
## LAND USE PATTERN IN INDIA

The use of land is determined both by physical factors such as topography, climate, soil types as well as human factors such as population density, technological capability and culture and traditions etc.

General land use categories–1960–61

General land use categories–2019–20

Reporting Area: 100 Per cent



Source : Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, Government of India, 2023

Fig. 1.4

Total geographical area of India is 3.28 million sq km. Land use data, however, is available only for 93 per cent of the total geographical area because the land use reporting for most of the north-east states except Assam has not been done fully. Moreover, some areas of Jammu and Kashmir occupied by Pakistan and China have also not been surveyed.

Activity

Try to do a comparison between the two pie charts (Fig. 1.4) given for land use and find out why the net sown area and the land under forests have changed from 1960-61 to 2019-20 very marginally.

The land under permanent pasture has also decreased. How are we able to feed our huge cattle population on this pasture land and what are the consequences of it? Most of the other than the current fallow lands are either of poor quality or the cost of cultivation

of such land is very high. Hence, these lands are cultivated once or twice in about two to three years and if these are included in the net sown area then the percentage of NSA in India comes to about 54 per cent of the total reporting area.

The pattern of net sown area varies greatly from one state to another. It is over 80 per cent of the total area in Punjab and Haryana and less than 10 per cent in Arunachal Pradesh, Mizoram, Manipur and Andaman Nicobar Islands.

Find out reasons for the low proportion of net sown area in these states.

Forest area in the country is far lower than the desired 33 per cent of geographical area, as it was outlined in the National Forest Policy (1952). It was considered essential for maintenance of the ecological balance. The livelihood of millions of people who live on the

fringes of these forests depends upon it. A part of the land is termed as waste land and land put to other non-agricultural uses. Waste land includes rocky, arid and desert areas and land put to other non-agricultural uses includes settlements, roads, railways, industry etc. Continuous use of land over a long period of time without taking appropriate measures to conserve and manage it, has resulted in land degradation. This, in turn, has serious repercussions on society and the environment.

### LAND DEGRADATION AND CONSERVATION MEASURES

We have shared our land with the past generations and will have to do so with the future generations too. Ninety-five per cent of our basic needs for food, shelter and clothing are obtained from land. Human activities have not only brought about degradation of land but have also aggravated the pace of natural forces to cause damage to land.

Some human activities such as deforestation, over grazing, mining and quarrying too have contributed significantly in land degradation.

Mining sites are abandoned after excavation work is complete leaving deep scars and traces of over-burdening. In states like Jharkhand, Chhattisgarh, Madhya Pradesh and Odisha deforestation due to mining have caused severe land degradation. In states like Gujarat, Rajasthan, Madhya Pradesh and Maharashtra overgrazing is one of the main reasons for land degradation. In the states of Punjab, Haryana, western Uttar Pradesh, over irrigation is responsible for land degradation due to water logging leading to increase in salinity and alkalinity in the soil. The mineral processing like grinding of limestone for cement industry and calcite and soapstone for ceramic industry generate huge quantity of dust in the atmosphere. It retards the process of infiltration of water into the soil after it settles down on the land. In recent years, industrial effluents as waste have become a major source of land and water pollution in many parts of the country.

There are many ways to solve the problems of land degradation. Afforestation and proper management of grazing can help to some extent. Planting of shelter belts of plants, control on over grazing, stabilisation of sand dunes by growing thorny bushes are some of the methods to check land degradation in arid areas. Proper management of waste lands, control of mining activities, proper discharge and disposal of industrial effluents and wastes after treatment can reduce land and water degradation in industrial and suburban areas.

### SOIL AS A RESOURCE

Soil is the most important renewable natural resource. It is the medium of plant growth and supports different types of living organisms on the earth. The soil is a living system. It takes millions of years to form soil upto a few cm in depth. Relief, parent rock or bed rock, climate, vegetation and other forms of life and time are important factors in the formation of soil. Various forces of nature such as change in temperature, actions of running water, wind and glaciers, activities of decomposers etc. contribute to the formation of soil. Chemical and organic changes which take place in the

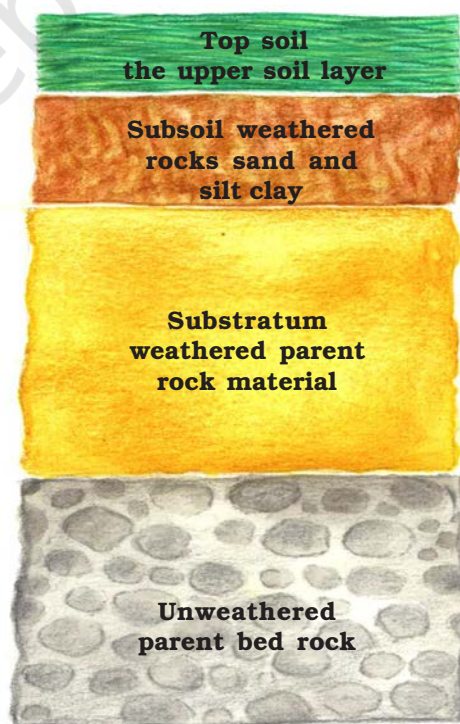


Fig. 1.5: Soil Profile



soil are equally important. Soil also consists of organic (humus) and inorganic materials (Fig. 1.5).

On the basis of the factors responsible for soil formation, colour, thickness, texture, age, chemical and physical properties, the soils of India are classified in different types.

### Classification of Soils

India has varied relief features, landforms, climatic realms and vegetation types. These have contributed in the development of various types of soils.

#### Alluvial Soils

This is the most widely spread and important soil. In fact, the entire northern plains are made of alluvial soil. These have been deposited by three important Himalayan river systems – the Indus, the Ganga and the Brahmaputra. These soils also extend in Rajasthan and Gujarat through a narrow corridor. Alluvial soil is also found in the eastern coastal plains particularly in the deltas of the Mahanadi, the Godavari, the Krishna and the Kaveri rivers.

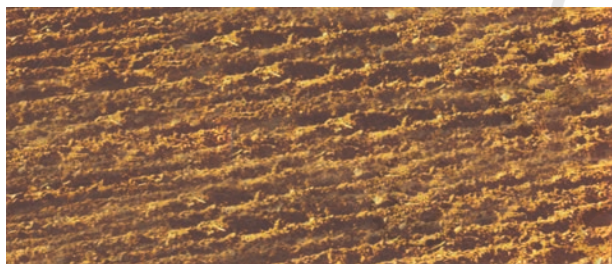


Fig. 1.6: Alluvial Soil

The alluvial soil consists of various proportions of sand, silt and clay. As we move inland towards the river valleys, soil particles appear somewhat bigger in size. In the upper reaches of the river valley i.e. near the place of the break of slope, the soils are coarse. Such soils are more common in piedmont plains such as Duars, Chos and Terai.

Apart from the size of their grains or components, soils are also described on the basis of their age. According to their age alluvial soils can be classified as old alluvial (Bangar) and new alluvial (Khadar). The bangar soil has higher concentration of kanker

nodules than the Khadar. It has more fine particles and is more fertile than the bangar.

Alluvial soils as a whole are very fertile. Mostly these soils contain adequate proportion of potash, phosphoric acid and lime which are ideal for the growth of sugarcane, paddy, wheat and other cereal and pulse crops. Due to its high fertility, regions of alluvial soils are intensively cultivated and densely populated. Soils in the drier areas are more alkaline and can be productive after proper treatment and irrigation.

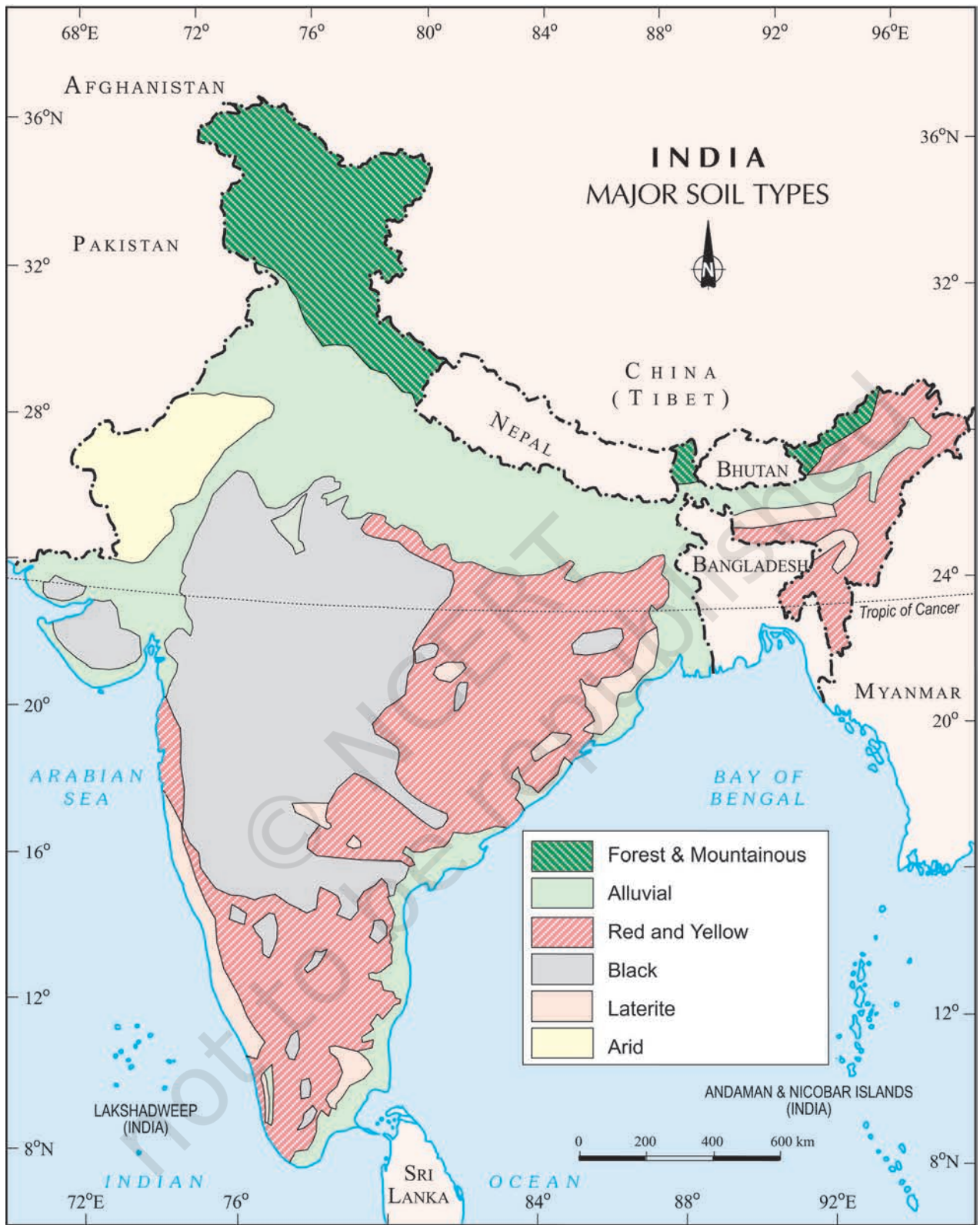
#### Black Soil

These soils are black in colour and are also known as regur soils. Black soil is ideal for growing cotton and is also known as black cotton soil. It is believed that climatic condition along with the parent rock material are the important factors for the formation of black soil. This type of soil is typical of the Deccan trap (Basalt) region spread over northwest Deccan plateau and is made up of lava flows. They cover the plateaus of Maharashtra, Saurashtra, Malwa, Madhya Pradesh and Chhattisgarh and extend in the south east direction along the Godavari and the Krishna valleys.



Fig. 1.7: Black Soil

The black soils are made up of extremely fine i.e. clayey material. They are well-known for their capacity to hold moisture. In addition, they are rich in soil nutrients, such as calcium carbonate, magnesium, potash and lime. These



India: Major Soil Types



soils are generally poor in phosphoric contents. They develop deep cracks during hot weather, which helps in the proper aeration of the soil. These soils are sticky when wet and difficult to work on unless tilled immediately after the first shower or during the pre-monsoon period.

### Red and Yellow Soils

Red soil develops on crystalline igneous rocks in areas of low rainfall in the eastern and southern parts of the Deccan plateau. Yellow and red soils are also found in parts of Odisha, Chhattisgarh, southern parts of the middle Ganga plain and along the piedmont zone of the Western Ghats. These soils develop a reddish colour due to diffusion of iron in crystalline and metamorphic rocks. It looks yellow when it occurs in a hydrated form.

### Laterite Soil

Laterite has been derived from the Latin word 'later' which means brick. The laterite soil develops under tropical and subtropical climate with alternate wet and dry season. This soil is the result of intense leaching due to heavy rain. Lateritic soils are mostly deep to very deep, acidic (pH<6.0), generally deficient in plant nutrients and occur mostly in southern states, Western Ghats region of Maharashtra, Odisha, some parts of West Bengal and North-east regions. Where these soils support deciduous and evergreen forests, it is humus rich, but under sparse



Fig. 1.8: Laterite Soil

vegetation and in semi-arid environment, it is generally humus poor. They are prone to erosion and degradation due to their position on the landscape. After adopting appropriate soil conservation techniques particularly in the hilly areas of Karnataka, Kerala and Tamil Nadu, this soil is very useful for growing tea and coffee. Red laterite soils in Tamil Nadu, Andhra Pradesh and Kerala are more suitable for crops like cashew nut.

### Arid Soils

Arid soils range from red to brown in colour. They are generally sandy in texture and saline in nature. In some areas the salt content is very high and common salt is obtained by evaporating the water. Due to the dry climate, high temperature, evaporation is faster and the soil lacks humus and moisture. The lower horizons of the soil are occupied by *Kankar* because of the increasing calcium content downwards. The *Kankar* layer formations in the bottom horizons restrict the infiltration of water. After proper irrigation these soils become cultivable as has been in the case of western Rajasthan.



Fig. 1.9: Arid Soil

### Forest Soils

These soils are found in the hilly and mountainous areas where sufficient rain forests are available. The soils texture varies according to the mountain environment where they are formed. They are loamy and silty in valley sides and coarse grained in the upper slopes. In the snow covered areas

of Himalayas, these soils experience denudation and are acidic with low humus content. The soils found in the lower parts of the valleys particularly on the river terraces and alluvial fans are fertile.

### Soil Erosion and Soil Conservation

The denudation of the soil cover and subsequent washing down is described as soil erosion. The processes of soil formation and erosion, go on simultaneously and generally there is a balance between the two. Sometimes, this balance is disturbed due to human activities like deforestation, over-grazing, construction and mining etc., while natural forces like wind, glacier and water lead to soil erosion. The running water cuts through the clayey soils and makes deep channels as **gullies**. The land becomes unfit for cultivation and is known as **bad land**. In the Chambal basin such lands are called ravines. Sometimes water flows as a sheet over large areas down a slope. In such cases the top



*Fig. 1.10: Soil Erosion*



*Fig. 1.11: Gully Erosion*

soil is washed away. This is known as **sheet erosion**. Wind blows loose soil off flat or sloping land known as wind erosion. Soil erosion is also caused due to defective methods of farming. Ploughing in a wrong way i.e. up and down the slope form channels for the quick flow of water leading to soil erosion.

Ploughing along the contour lines can decelerate the flow of water down the slopes. This is called contour ploughing. Steps can be cut out on the slopes making terraces. Terrace cultivation restricts erosion. Western and central Himalayas have well developed terrace farming. Large fields can be divided into strips. Strips of grass are left to grow between the crops. This breaks up the force of the wind. This method is known as strip cropping. Planting lines of trees to create shelter also works in a similar way. Rows of such trees are called shelter belts. These shelter belts have contributed significantly to the stabilisation of sand dunes and in stabilising the desert in western India.



1. Multiple choice questions.
  - (i) Which one of the following is the main cause of land degradation in Punjab?
    - (a) Intensive cultivation
    - (b) Deforestation
    - (c) Over irrigation
    - (d) Overgrazing
  - (ii) In which one of the following states is terrace cultivation practised?
    - (a) Punjab
    - (b) Plains of Uttar Pradesh
    - (c) Haryana
    - (d) Uttarakhand
  - (iii) In which of the following states black soil is predominantly found?
    - (a) Uttar Pradesh
    - (b) Maharashtra
    - (c) Rajasthan
    - (d) Jharkhand
2. Answer the following questions in about 30 words.
  - (i) Name three states having black soil and the crop which is mainly grown in it.
  - (ii) What type of soil is found in the river deltas of the eastern coast? Give three main features of this type of soil.
  - (iii) What steps can be taken to control soil erosion in the hilly areas?
3. Answer the following questions in about 120 words.
  - (i) Explain land use pattern in India and why has the land under forest not increased much since 1960-61?
  - (ii) How have technical and economic development led to more consumption of resources?

### PROJECT/ACTIVITY

1. Make a project showing consumption and conservation of resources in your locality.
2. Have a discussion in the class – how to conserve various resources used in your school.
3. Imagine if oil supplies get exhausted, how will this affect our life style?
4. Solve the puzzle by following your search horizontally and vertically to find the hidden answers.
  - (i) Natural endowments in the form of land, water, vegetation and minerals.
  - (ii) A type of non-renewable resource.
  - (iii) Soil with high water retaining capacity.
  - (iv) Intensively leached soils of the monsoon climate.



S	F	G	S	F	O	B	R	O	M	S	U	A	P	J
Q	G	A	F	F	O	R	E	S	T	A	T	I	O	N
P	N	R	E	C	P	R	S	L	D	M	I	L	N	F
S	N	A	T	Q	X	U	O	V	A	I	O	L	A	L
O	D	E	I	D	R	J	U	J	L	D	B	N	B	D
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C	G	N	N	S	Z	I	O	P	A	X	T	Y	J	H
K	J	G	K	D	T	D	C	S	L	S	E	G	E	W

- (i) Natural endowments in the form of land, water, vegetation and minerals.
- (ii) A type of non-renewable resource.
- (iii) Soil with high water retaining capacity.
- (iv) Intensively leached soils of the monsoon climate.
- (v) Plantation of trees on a large scale to check soil erosion.
- (vi) The Great Plains of India are made up of these soils.





**Class XI<sup>th</sup> NCERT (Pre-revised)**  
**Chapter-6**

**H**ave you ever thought about the most important factor which supports trees, grasses, crops and numerous life-forms over the earth's surface? Can one grow a blade of grass without soil? While some plants and organisms which are aquatic in nature can sustain in water, do they not derive nutrients from soil through water? You will realise that soil is the most important layer of the earth's crust. It is a valuable resource. The bulk of our food and much of our clothing is derived from land-based crops that grow in the soil. The soil on which we depend so much for our day-to-day needs has evolved over thousands of years. The various agents of weathering and gradation have acted upon the parent rock material to produce a thin layer of soil.

Soil is the mixture of rock debris and organic materials which develop on the earth's surface. The major factors affecting the formation of soil are relief, parent material, climate, vegetation and other life-forms and time. Besides these, human activities also influence it to a large extent. Components of the soil are mineral particles, humus, water and air. The actual amount of each of these depend upon the type of soil. Some soils are deficient in one or more of these, while there are some others that have varied combinations.

Have you ever dug a pit in the field of your school to plant a tree while celebrating Van-Mahotsava? Was the pit of uniform layer of soil or did you notice different colours from the top to the bottom of the pit?

If we dig a pit on land and look at the soil, we find that it consists of three layers which

are called horizons. 'Horizon A' is the topmost zone, where organic materials have got incorporated with the mineral matter, nutrients and water, which are necessary for the growth of plants. 'Horizon B' is a transition zone between the 'horizon A' and 'horizon C', and contains matter derived from below as well as from above. It has some organic matter in it, although the mineral matter is noticeably weathered. 'Horizon C' is composed of the loose parent material. This layer is the first stage in the soil formation process and eventually forms the above two layers. This arrangement of layers is known as the soil profile. Underneath these three horizons is the rock which is also known as the parent rock or the bedrock. Soil, which is a complex and varied entity has always drawn the attention of the scientists. In order to understand its importance, it is essential to attempt a scientific study of the soil. Classification of the soil is an effort to achieve this objective.

#### CLASSIFICATION OF SOILS

India has varied relief features, landforms, climatic realms and vegetation types. These have contributed in the development of various types of soils in India.

In ancient times, soils used to be classified into two main groups – *Urvara* and *Usara*, which were fertile and sterile, respectively. In the 16th century A.D., soils were classified on the basis of their inherent characteristics and external features such as texture, colour, slope of land and moisture content in the soil. Based on texture, main soil types were identified as

sandy, clayey, silty and loam, etc. On the basis of colour, they were red, yellow, black, etc.

Since Independence, scientific surveys of soils have been conducted by various agencies. Soil Survey of India, established in 1956, made comprehensive studies of soils in selected areas like in the Damodar Valley. The National Bureau of Soil Survey and the Land Use Planning an Institute under the control of the Indian Council of Agricultural Research (ICAR) did a lot of studies on Indian soils. In their effort to study soil and to make it comparable at the international level, the ICAR has classified the Indian soils on the basis of their nature and character as per the United States Department of Agriculture (USDA) Soil Taxonomy.

**ICAR has classified the soils of India into the following order as per the USDA soil taxonomy**

Sl. No.	Order	Area (in Thousand Hectares)	Percentage
(i)	Inceptisols	130372.90	39.74
(ii)	Entisols	92131.71	28.08
(iii)	Alfisols	44448.68	13.55
(iv)	Vertisols	27960.00	8.52
(v)	Aridisols	14069.00	4.28
(vi)	Ultisols	8250.00	2.51
(vi)	Mollisols	1320.00	0.40
(viii)	Others	9503.10	2.92
<b>Total</b>			<b>100</b>

*Source : Soils of India, National Bureau of Soil Survey and Land Use Planning, Publication Number 94*

On the basis of genesis, colour, composition and location, the soils of India have been classified into:

- (i) Alluvial soils
- (ii) Black soils
- (iii) Red and Yellow soils
- (iv) Laterite soils
- (v) Arid soils
- (vi) Saline soils
- (vii) Peaty soils
- (viii) Forest soils.

**Alluvial Soils**

Alluvial soils are widespread in the northern plains and the river valleys. These soils cover

about 40 per cent of the total area of the country. They are depositional soils, transported and deposited by rivers and streams. Through a narrow corridor in Rajasthan, they extend into the plains of Gujarat. In the Peninsular region, they are found in deltas of the east coast and in the river valleys.



**Figure 6.1 : Alluvial Soil**

The alluvial soils vary in nature from sandy loam to clay. They are generally rich in potash but poor in phosphorous. In the Upper and Middle Ganga plain, two different types of alluvial soils have developed, viz. *Khadar* and *Bhangar*. *Khadar* is the new alluvium and is deposited by floods annually, which enriches the soil by depositing fine silts. *Bhangar* represents a system of older alluvium, deposited away from the flood plains. Both the *Khadar* and *Bhangar* soils contain calcareous concretions (*Kankars*). These soils are more loamy and clayey in the lower and middle Ganga plain and the Brahmaputra valley. The sand content decreases from the west to east.

The colour of the alluvial soils varies from the light grey to ash grey. Its shades depend on the depth of the deposition, the texture of the materials, and the time taken for attaining maturity. Alluvial soils are intensively cultivated.

**Black Soil**

Black soil covers most of the Deccan Plateau which includes parts of Maharashtra, Madhya Pradesh, Gujarat, Andhra Pradesh and some parts of Tamil Nadu. In the upper reaches of the Godavari and the Krishna, and the north

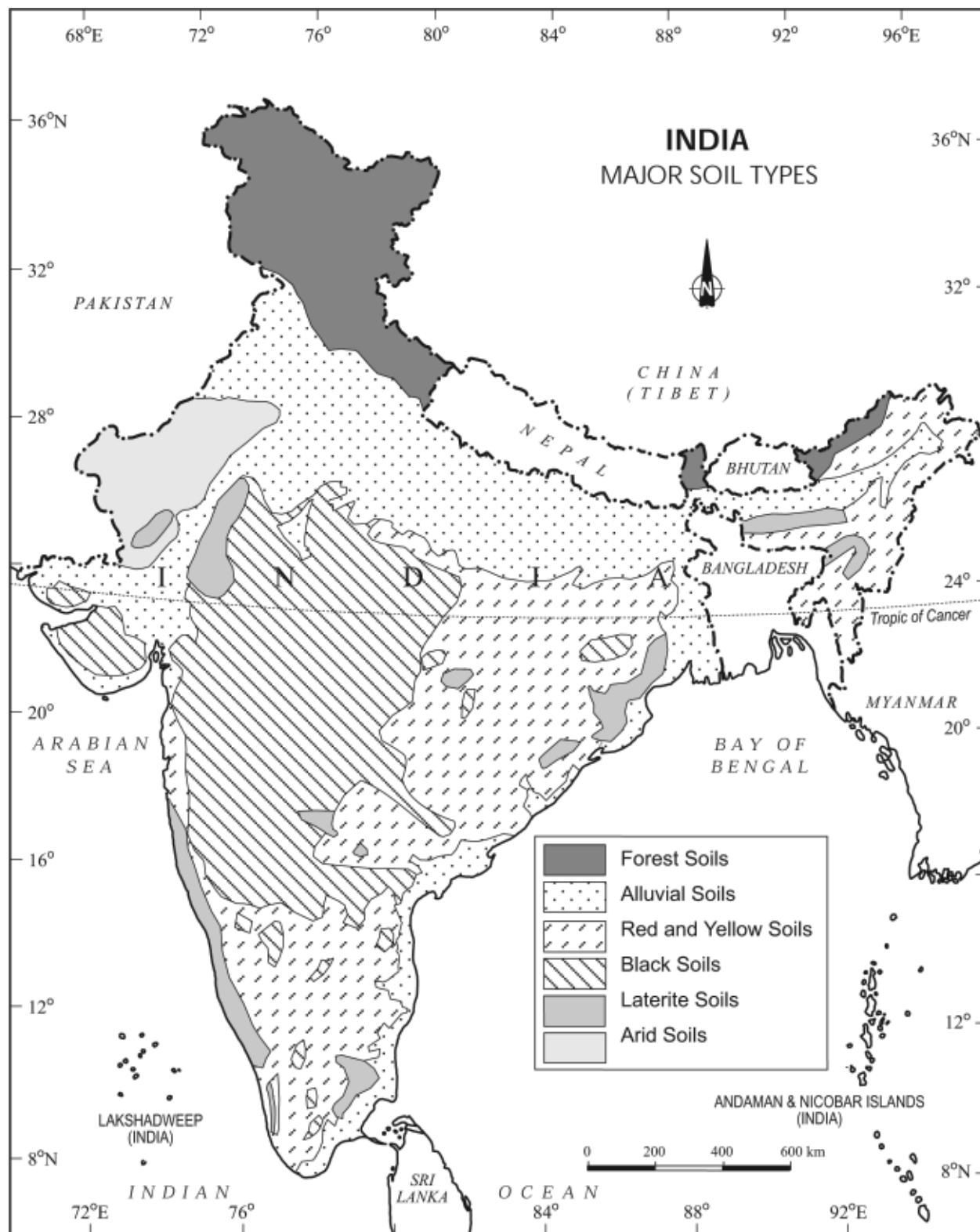
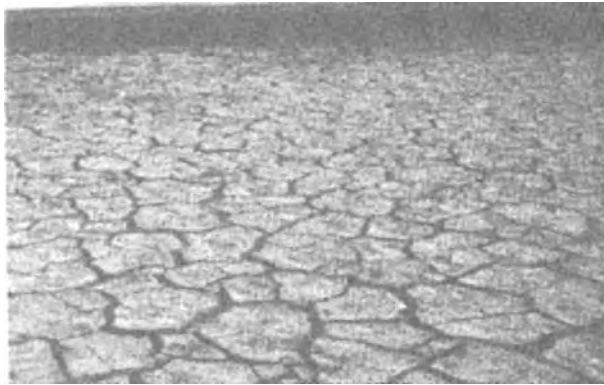


Figure 6.2 : Major Soil Types of India

western part of the Deccan Plateau, the black soil is very deep. These soils are also known as the 'Regur Soil' or the 'Black Cotton Soil'. The black soils are generally clayey, deep and impermeable. They swell and become sticky when wet and shrink when dried. So, during the dry season, these soil develop wide cracks. Thus, there occurs a kind of 'self ploughing'. Because of this character of slow absorption and loss of moisture, the black soil retains the moisture for a very long time, which helps the crops, especially, the rain fed ones, to sustain even during the dry season.



**Figure 6.3 : Black Soil During Dry Season**

Chemically, the black soils are rich in lime, iron, magnesia and alumina. They also contain potash. But they lack in phosphorous, nitrogen and organic matter. The colour of the soil ranges from deep black to grey.

### **Red and Yellow Soil**

Red soil develops on crystalline igneous rocks in areas of low rainfall in the eastern and southern part of the Deccan Plateau. Along the piedmont zone of the Western Ghat, long stretch of area is occupied by red loamy soil. Yellow and red soils are also found in parts of Orissa and Chattisgarh and in the southern parts of the middle Ganga plain. The soil develops a reddish colour due to a wide diffusion of iron in crystalline and metamorphic rocks. It looks yellow when it occurs in a hydrated form. The fine-grained red and yellow soils are normally fertile, whereas coarse-grained soils found in dry upland areas are poor in fertility. They are generally poor in nitrogen, phosphorous and humus.

### **Laterite Soil**

Laterite has been derived from the Latin word 'Later' which means brick. The laterite soils develop in areas with high temperature and high rainfall. These are the result of intense leaching due to tropical rains. With rain, lime and silica are leached away, and soils rich in iron oxide and aluminium compound are left behind. Humus content of the soil is removed fast by bacteria that thrives well in high temperature. These soils are poor in organic matter, nitrogen, phosphate and calcium, while iron oxide and potash are in excess. Hence, laterites are not suitable for cultivation; however, application of manures and fertilisers are required for making the soils fertile for cultivation.

Red laterite soils in Tamil Nadu, Andhra Pradesh and Kerala are more suitable for tree crops like cashewnut.

Laterite soils are widely cut as bricks for use in house construction. These soils have mainly developed in the higher areas of the Peninsular plateau. The laterite soils are commonly found in Karnataka, Kerala, Tamil Nadu, Madhya Pradesh and the hilly areas of Orissa and Assam.

### **Arid Soils**

Arid soils range from red to brown in colour. They are generally sandy in structure and saline in nature. In some areas, the salt content is so high that common salt is obtained by evaporating the saline water. Due to the dry climate, high temperature and accelerated evaporation, they lack moisture and humus. Nitrogen is insufficient and the phosphate



**Figure 6.4 : Arid Soil**

content is normal. Lower horizons of the soil are occupied by '*kankar*' layers because of the increasing calcium content downwards. The '*Kankar*' layer formation in the bottom horizons restricts the infiltration of water, and as such when irrigation is made available, the soil moisture is readily available for a sustainable plant growth. Arid soils are characteristically developed in western Rajasthan, which exhibit characteristic arid topography. These soils are poor and contain little humus and organic matter.

### **Saline Soils**

They are also known as *Usara* soils. Saline soils contain a larger proportion of sodium, potassium and magnesium, and thus, they are infertile, and do not support any vegetative growth. They have more salts, largely because of dry climate and poor drainage. They occur in arid and semi-arid regions, and in waterlogged and swampy areas. Their structure ranges from sandy to loamy. They lack in nitrogen and calcium. Saline soils are more widespread in western Gujarat, deltas of the eastern coast and in Sunderban areas of West Bengal. In the Rann of Kuchchh, the Southwest Monsoon brings salt particles and deposits there as a crust. Seawater intrusions in the deltas promote the occurrence of saline soils. In the areas of intensive cultivation with excessive use of irrigation, especially in areas of green revolution, the fertile alluvial soils are becoming saline. Excessive irrigation with dry climatic conditions promotes capillary action, which results in the deposition of salt on the top layer of the soil. In such areas, especially in Punjab and Haryana, farmers are advised to add gypsum to solve the problem of salinity in the soil.

### **Peaty Soils**

They are found in the areas of heavy rainfall and high humidity, where there is a good growth of vegetation. Thus, large quantity of dead organic matter accumulates in these areas, and this gives a rich humus and organic content to the soil. Organic matter in these soils may go even up to 40-50 per cent. These

soils are normally heavy and black in colour. At many places, they are alkaline also. It occurs widely in the northern part of Bihar, southern part of Uttaranchal and the coastal areas of West Bengal, Orissa and Tamil Nadu.

### **Forest Soils**

As the name suggests, forest soils are formed in the forest areas where sufficient rainfall is available. The soils vary in structure and texture depending on the mountain environment where they are formed. They are loamy and silty on valley sides and coarse-grained in the upper slopes. In the snow-bound areas of the Himalayas, they experience denudation, and are acidic with low humus content. The soils found in the lower valleys are fertile.

It is evident from the foregoing discussions that soils, their texture, quality and nature are vital for the germination and growth of plant and vegetation including crops. Soils are living systems. Like any other organism, they too develop and decay, get degraded, respond to proper treatment if administered in time. These have serious repercussions on other components of the system of which they themselves are important parts.

### **SOIL DEGRADATION**

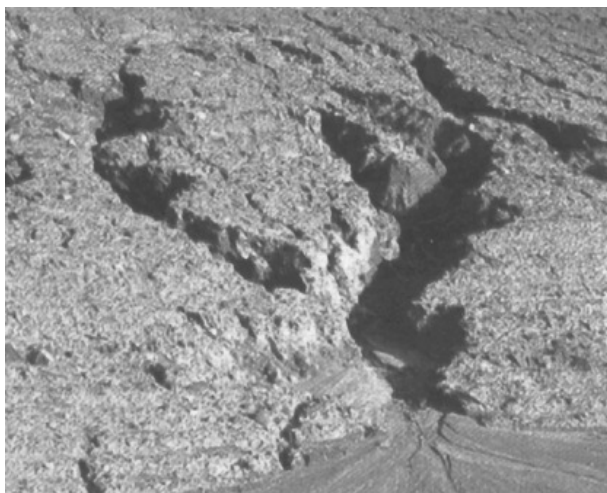
In a broad sense, soil degradation can be defined as the decline in soil fertility, when the nutritional status declines and depth of the soil goes down due to erosion and misuse. Soil degradation is the main factor leading to the depleting soil resource base in India. The degree of soil degradation varies from place to place according to the topography, wind velocity and amount of the rainfall.

### **SOIL EROSION**

The destruction of the soil cover is described as soil erosion. The soil forming processes and the erosional processes of running water and wind go on simultaneously. But generally, there is a balance between these two processes. The rate of removal of fine particles from the surface is the same as the rate of addition of particles to the soil layer.

Sometimes, such a balance is disturbed by natural or human factors, leading to a greater rate of removal of soil. Human activities too are responsible for soil erosion to a great extent. As the human population increases, the demand on the land also increases. Forest and other natural vegetation is removed for human settlement, for cultivation, for grazing animals and for various other needs.

Wind and water are powerful agents of soil erosion because of their ability to remove soil and transport it. Wind erosion is significant in arid and semi-arid regions. In regions with heavy rainfall and steep slopes, erosion by running water is more significant. Water erosion which is more serious and occurs extensively in different parts of India, takes place mainly in the form of sheet and gully erosion. Sheet erosion takes place on level lands after a heavy shower and the soil removal is not easily noticeable. But it is harmful since it removes the finer and more fertile top soil. Gully erosion is common on steep slopes. Gullies deepen with rainfall, cut the agricultural lands into small fragments and make them unfit for cultivation. A region with a large number of deep gullies or ravines is called a badland topography. Ravines are widespread, in the Chambal basin. Besides this, they are also found in Tamil Nadu and West Bengal. The country is losing about 8,000 hectares of land to ravines every year. What types are prone to gully erosion?



**Figure 6.5 : Soil Erosion**

Soil erosion is a serious problem for Indian agriculture and its negative effects are seen in other spheres also. Eroded materials are carried down to rivers and they lower down their carrying capacity, and cause frequent floods and damage to agricultural lands.

Deforestation is one of the major causes of soil erosion. Plants keep soils bound in locks of roots, and thus, prevent erosion. They also add humus to the soil by shedding leaves and twigs. Forests have been denuded practically in most parts of India but their effect on soil erosion are more in hilly parts of the country.

A fairly large area of arable land in the irrigated zones of India is becoming saline because of over-irrigation. The salt lodged in the lower profiles of the soil comes up to the surface and destroys its fertility. Chemical fertilisers in the absence of organic manures are also harmful to the soil. Unless the soil gets enough humus, chemicals harden it and reduce its fertility in the long run. This problem is common in all the command areas of the river valley projects, which were the first beneficiaries of the Green Revolution. According to estimates, about half of the total land of India is under some degree of degradation.

Every year, India loses millions of tonnes of soil and its nutrients to the agents of its degradation, which adversely affects our national productivity. So, it is imperative to initiate immediate steps to reclaim and conserve soils.

### **Soil Conservation**

If soil erosion and exhaustion are caused by humans; by corollary, they can also be prevented by humans. Nature has its own laws of maintaining balance. Nature offers enough opportunities for humans to develop their economy without disturbing the ecological balance. Soil conservation is a methodology to maintain soil fertility, prevent soil erosion and exhaustion, and improve the degraded condition of the soil.

Soil erosion is essentially aggravated by faulty practices. The first step in any rational solution is to check open cultivable lands on slopes from farming. Lands with a slope gradient of 15 - 25 per cent should not be used

for cultivation. If at all the land is to be used for agriculture, terraces should carefully be made. Over-grazing and shifting cultivation in many parts of India have affected the natural cover of land and given rise to extensive erosion. It should be regulated and controlled by educating villagers about the consequences. Contour bunding, Contour terracing, regulated forestry, controlled grazing, cover cropping, mixed farming and crop rotation are some of the remedial measures which are often adopted to reduce soil erosion.



**Figure 6.6 : Terrace Farming**

Efforts should be made to prevent gully erosion and control their formation. Finger gullies can be eliminated by terracing. In bigger gullies, the erosive velocity of water may

be reduced by constructing a series of check dams. Special attention should be made to control headward extension of gullies. This can be done by gully plugging, terracing or by planting cover vegetation.

In arid and semi-arid areas, efforts should be made to protect cultivable lands from encroachment by sand dunes through developing shelter belts of trees and agro-forestry. Lands not suitable for cultivation should be converted into pastures for grazing. Experiments have been made to stabilise sand dunes in western Rajasthan by the Central Arid Zone Research Institute (CAZRI).

The Central Soil Conservation Board, set up by the Government of India, has prepared a number of plans for soil conservation in different parts of the country. These plans are based on the climatic conditions, configuration of land and the social behaviour of people. Even these plans are fragmental in nature. Integrated land use planning, therefore, seems to be the best technique for proper soil conservation. Lands should be classified according to their capability; land use maps should be prepared and lands should be put to right uses. The final responsibility for achieving the conservation of land will rest on the people who operate on it and receive the benefits.

### EXERCISES

1. Choose the right answer from the four alternatives given below.
  - (i) Which one of the following is the most widespread and most productive category of soil?
 

(a) Alluvial Soil	(c) Black Soil
(b) Laterite Soil	(d) Forest Soil
  - (ii) 'Regur Soil' is another name for the.
 

(a) Saline Soil	(c) Black Soil
(b) Arid Soil	(d) Laterite Soil
  - (iii) Which one of the following is the main reason for the loss of the top soil in India?
 

(a) Wind erosion	(c) Excessive leaching
(b) Water erosion	(d) None of these

- (iv) Arable land in the irrigated zones of India is turning saline due to which of the following reasons?
- (a) Addition of gypsum      (c) Over irrigation  
(b) Over grazing              (d) Use of fertilisers
2. Answer the following questions in about 30 words.
- (i) What is soil?  
(ii) What are the main factors responsible for the formation of soil?  
(iii) Mention the three horizons of a soil profile.  
(iv) What is soil degradation?  
(v) What is the difference between *Khadar* and *Bhangar*?
3. Answer the following questions in not more than 125 words.
- (i) What are black soils? Describe their formation and characteristics.  
(ii) What is soil conservation? Suggest some measures to conserve soil.  
(iii) How do you know that a particular type of soil is fertile or not? Differentiate between naturally determined fertility and culturally induced fertility.

**Project/Activity**

1. Collect various samples of soil and prepare a report on the type(s) of soils found in your region.
2. On an outline map of India, mark the areas covered by the following soil categories.
- (i) Red soil  
(ii) Laterite soil  
(iii) Alluvial soil.