

3.4.2. Use and exploitation

Minerals find use in a large number of ways in everyday use in domestic, agricultural, industrial and commercial sector and thus form a very important part of any nation's economy. The main uses of minerals are as follows:

- Development of industrial plants and machinery
- Generation of energy e.g. coal, lignite, uranium
- Construction, housing, settlements
- Defence equipments-weapons, armaments
- Transportation means
- Communication-telephone wires, cables, electronic devices
- Medicinal system-particularly in Ayurvedic system
- Formation of alloys for various purposes (e.g. phosphorite)
- Agriculture-as fertilizers, seed dressings and fungicides
- Jewellery- gold, silver, platinum, diamond

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3.4.3. Conservation of Mineral Resources

As the mineral resources are limited in quantity and are being depleted very fast, the following steps are now being taken for the conservation of these resources:

- Minimizing waste and developing technologies to recover the resources from waste.
- Developing technologies to recycle metals.
- Research is being carried out to substitute some metals like gold, silver, mercury and platinum etc. by man-made products.
- Development of alloys which will reduce the demand of some pure metal, e.g. alloys of magnesium are replacing steel and reducing the demand of copper, lead and tin.
- Alternatives to fossil fuels need to be found.
- Mining areas need to be reclaimed
- A data bank on the availability and expenditure of mineral resources should be maintained so that their use is regulated.

DO YOU KNOW

Surface mining is less hazardous than underground mining and metal mining is less hazardous than coal mining.

3.4.4. Environmental Effect of Mineral Extraction and Use

The mining of mineral resources usually have a considerable effect on land, air, water and biological resources. Following are the some major environmental effect of mining operations:

- Land degradation

- Surface and groundwater water pollution due to the release of harmful trace elements such as cobalt, cadmium, lead, by leaching.
- Adverse effect on the growth of vegetation
- Defacing of landscape
- Subsidence of land
- Loss of fauna and flora, finally resulting in deforestation
- Air pollution due to emission of harmful gases
- Adverse effects on biological environment directly or indirectly by mining
- Physical changes in the land, water, soil and air associated with mining
- Rehabilitation problem of local inhabitant especially tribal people.
- Occupational Health Hazard

3.4.5. Dereliction (Closing or Abandoning Mines)

Dereliction is a tendency to be negligent and uncaring. It results from the ruthless exploitation of natural resources without consideration for the future. In most of the cases, dereliction is the result of thoughtless and uncontrolled extraction of mineral resources. Dereliction arises because mining operators are not interested in the rehabilitation of local inhabitant especially tribal people because investment in rehabilitation programme will give them no financial return. Some of the adverse effects of dereliction are:

- Waste of valuable agricultural and industrial land
- Health and accidental hazards
- Old quarries may also be dangerous
- Permanent damage to landscape
- Wastes of human resources
- Large number of litigation

3.5. FOREST RESOURCES

About 420 million years ago, during the Silurian Period, ancient plants and arthropods began to occupy the land. Over the millions of years that followed, these land colonizers developed and adapted to their new habitat. The first forests were dominated by giant horsetails, club mosses, and ferns that stood up to 40 feet tall.

DO YOU KNOW

Forest is derived from latin word 'foris' meaning out of door'.

The landscape changed again during the Pleistocene Ice Ages—the surface of the planet that had been dominated by tropical forests for millions of years changed, and temperate forests spread in the Northern Hemisphere.

Forests are one of the most important natural resources on this earth. Covering the earth like a green blanket these forests not only produce innumerable material goods, but also provide several environmental services which are essential for life. It is estimated that forests covered $1/4^{\text{th}}$ of the earth's entire land area in 1940 and $1/5^{\text{th}}$ in 1980. There are approximately 1.2 billion hectares of open wood lands and Savannah and nearly 2.5 billion hectares of closed forest.

Present-day forest biomes, biological communities that are dominated by trees and other woody vegetation (Spurr and Barnes), can be classified according to numerous characteristics, with seasonality being the most widely used. Distinct forest types also occur within each of these broad groups. There are three major types of forests, classed according to latitude:

3.5.1. Tropical forests

Tropical forests are characterized by the greatest diversity of species. They occur near the equator, within the area bounded by latitudes 23.5 degrees N and 23.5 degrees S. One of the major characteristics of tropical forests is their distinct seasonality: winter is absent, and only two seasons are present (rainy and dry). The length of daylight is 12 hours and varies little.

Temperature is on average $20-25^{\circ}\text{C}$ and varies little throughout the year: the average temperatures of the three warmest and three coldest months do not differ by more than 5 degrees.

Precipitation is evenly distributed throughout the year, with annual rainfall exceeding 2000 mm

Soil is nutrient-poor and acidic. Decomposition is rapid and soils are subject to heavy leaching.

Canopy in tropical forests is multilayered and continuous, allowing little light penetration.

Flora is highly diverse: one square kilometer may contain as many as 100 different tree species. Trees are 25-35 m tall, with buttressed trunks and shallow roots, mostly evergreen, with large dark green leaves. Plants such as orchids, bromeliads, vines (lianas), ferns, mosses, and palms are present in tropical forests.

Fauna include numerous birds, bats, small mammals, and insects. More than $1/2$ of tropical forests have already been destroyed.

3.5.2. Temperate Forests

Temperate forests occur in eastern North America, northeastern Asia, and western and central Europe. Well-defined seasons with a distinct winter characterize this forest biome. Moderate climate and a growing season of 140-200 days during 4-6 frost-free months distinguish temperate forests.

Temperature varies from -30°C to 30°C .

Precipitation (75-150 cm) is distributed evenly throughout the year.

Soil is fertile, enriched with decaying litter.

Canopy is moderately dense and allows light to penetrate, resulting in well-developed and richly diversified understory vegetation and stratification of animals.

Flora is characterized by 3-4 tree species per square kilometer. Trees are distinguished by broad leaves that are lost annually and include such species as oak, hickory, beech, hemlock, maple, basswood, cottonwood, elm, willow, and spring-flowering herbs.

Fauna is represented by squirrels, rabbits, skunks, birds, deer, mountain lion, bobcat, timber wolf, fox, and black bear.

Only scattered remnants of original temperate forests remain.

3.5.3. Boreal Forests

Boreal forests, or taiga, represent the largest terrestrial biome. Occurring between 50 and 60 degrees north latitudes, boreal forests can be found in the broad belt of Eurasia and North America: two-thirds in Siberia with the rest in Scandinavia, Alaska, and Canada. Seasons are divided into short, moist, and moderately warm summers and long, cold, and dry winters. The length of the growing season in boreal forests is 130 days.

Temperatures are very low.

Precipitation is primarily in the form of snow, 40-100 cm annually.

Soil is thin, nutrient-poor, and acidic.

Canopy permits low light penetration, and as a result, understory is limited.

Flora consists mostly of cold-tolerant evergreen conifers with needle-like leaves, such as pine, fir, and spruce.

Fauna include woodpeckers, hawks, moose, bear, weasel, lynx, fox, wolf, deer, hares, chipmunks, shrews, and bats.

3.5.4. Uses of Forest

Forests are vital to the ecological functioning of the planet, producing 60% of the net productivity of all terrestrial ecosystems. They also form the habitat for a large portion of the earth's plant and animal species, providing the basis for the biodiversity which is essential for the biosphere's future.

The diverse functions of forests can be stated as follows:

3.5.4.1. Productive Function

From time immemorial the forest has supplied man with useful goods; fuel for warmth and cooking, and materials for shelter, tools and transport. Though wood products have now changed in both degree and kind, and modern chemistry enables wood to be plasticized, moulded, laminated, impregnated and turned into a bewildering number of products, still roughly

half our wood is used for fuel. And much of the remainder still goes, as in primitive times, into relatively crude materials for shelter and transport.

Without the forests we would have much less oxygen. One acre of forest provides over 6 tons of oxygen per year! This is because trees (and all green plants) use a process called photosynthesis, during which they take in carbon dioxide and, as a by-product, produce oxygen. Plants "breathe" carbon dioxide, like we breathe oxygen. There has been a balance between species that breathe out carbon dioxide and take in oxygen, and species that take in carbon dioxide and exhale oxygen. Since the 1800's this balance has been upset. Fossil fuels, when burned, create carbon dioxide, so carbon dioxide levels have risen dramatically. Unfortunately, this gas, in large amounts, acts like an insulator and keeps heat near the surface of the Earth. This is called the "greenhouse effect." In addition to the other important aspects of the ancient forests, some individual species, such as the yew tree (*Taxus brevifolia*), have shown great importance in the medical field. The bark of the yew tree provides taxol, an anti-cancer agent. It helps treat ovarian, lung and breast cancer. This property of the yew tree was only discovered in recent years, and if the forests that are home to the yew trees are lost, other medical treatments may also be lost as well.

3.5.4.2. *Protective functions*

Forests protect our waters and manage our climate. When it rains in the forests, the leaves allow the water to slowly drip to the ground. When a forest has been clear-cut, the rain pours down hard on the unprotected soil. The dirt then washes into streams, muddying the waters. This is unhealthy for the fish, and can cause flooding. Also, without trees, the moisture in the air evaporates quickly, changing the climate of nearby forests. This process prevents trees from receiving the water they need. Vegetation, plant roots, and soil quality also mitigate the impact of floods and erosion. Biomass production is vitally important for human beings. Moreover, when used for construction or as a source of energy, wood is a raw material. Its production can meet sustainability criteria (including those referring to climate change: balanced CO₂ cycle).

Plant cover, root systems, and the quality of topsoil enable good infiltration and water retention. Forests also play a role as landscape and recreation areas. They often have cultural and spiritual value

3.5.4.3. *Regulative function*

Forest regulates temperature (reducing global warming), humidity, precipitation, shape soil environment and different hydrological cycles.

3.5.5. **Overexploitation of Forests**

Since time immemorial, humans have depended heavily on forests for food, medicine, shelter, wood and fuel. With growing civilization the demands for raw material like timber, pulp, minerals, fuel wood etc shoot up resulting

3.5.6. Deforestation

Deforestation is the permanent destruction of indigenous (original) forests and woodlands. Deforestation is defined as the complete cleaning of tree formation and their replacement by using land for other purpose. The term does not include the removal of industrial forests such as plantations of gums or pines. Deforestation has resulted in the reduction of indigenous forests to four-fifths of their pre-agricultural area. Indigenous forests now cover 21% of the earth's land surface. The main factors that cause deforestation are natural factors (fire, soil erosion and drought), economical factors (agriculture, commercial logging and establishment of heavy industries) and traditional factors (shifting cultivation, grazing, and fuel). Deforestation rate is relatively less in temperate countries but it is very alarming in tropical countries where it is as high as 40-50 percent and at the present rate it is estimated that in the next 60 years we would lose more than 90 percent of our tropical forests.

DO YOU KNOW

Scientist estimates the India should ideally have 33% of its land under forest. Today we only have about 12%.

Major Causes of Deforestation

- Population growth
- Shifting cultivation
- Fuel requirements - felling of trees for firewood and building material;
- Raw materials for industrial use
- Development projects
- Growing food need- conversion of forests and woodlands to agricultural land to feed growing numbers of people;
- Overgrazing
- Fires
- Acid rain

Consequences of Deforestation

Effects of deforestation are numerous. Rise in temperature, low rain fall, accelerated soil erosion, loss of habitat and species and range of secondary effects. The concomitant effects are: