UNIT 4 NATURAL RESOURCES

Structure

4.1 INTRODUCTION

One of the most critical issues on the national and global agenda is the need to preserve natural resources for future generations while trying to meet the present day requirements. Today, the entire world has awakened to the need for sustainable development by maintaining judicious use of the natural resources and adopting developmental models and policies which assure proper environmental protection. It is well known that, the humans all across the globe are not only polluting nature but also destroying it thorough an aggressive expansion of urbanization vis-à-vis consumerism. Some 11 thousand years back, agriculture started in the lap of nature and at its beginning, it was a beautiful synergy between human technique and rhythmic nature. This went on with smiling, dancing and rippling notes of traditional wisdom and bounties of nature. As an aftermath of Second World War and till then, unabated mechanization as well as increasing use chemicals have been transforming our agriculture into a huge source of pollution of the environment and nature.

After studying this unit, you should be able to understand:

1. the role of natural resource in the life human being
2. impact of development activities on the natural resource base
3. impact of development on the natural resource management strategies
4. role of various government bodies in the management of natural resources
5. factors responsible for the depletion and over exploitation of natural resources
6. various threats in the management of natural resources

4.2 MEANING AND TYPES OF NATURAL RESOURCES

Nature has been defined as the 'Omnipresent' expanses, definite and indefinite, created and evolving having all the biotic, a biotic and social dimension, evolving within and around life forms and life process. Natural resources has been defined as "the sum total of all physical, chemical, biological and social factors which construct the surroundings of man is referred to as environment and each element of these surroundings constitutes a resource on which man thrives in order to develop a better life". Any part of our natural environment, such as land, water, air minerals, forest, rangeland, wild life, fish, micro organisms or even human population – that man can utilize to promote the welfare, may be regarded as a natural resource. There are two types of natural resources viz. Exhaustible and Inexhaustible natural resources. Exhaustible resources are limited in nature and liable to be degraded in quantity and quality by the human activities. Examples are forests, soil, water and fossil fuels etc. Inexhaustible natural resources are unlimited in nature, and they are not likely to be exhausted by human activities, like solar radiation, air and precipitation etc.

Environment: The Environment is everything which surrounds an organism and influences its life in many ways. It includes physical and biological components. The physical components of the environment are soil, water, air, light and temperature. These are termed as abiotic components. The plants and animals are collectively referred to as biotic components. All these components of the environment work together, interact and modify the effect of one another.

Water: About 70-73% of earth is covered by water. Water is available in the form of oceans, seas, rivers, lakes, ponds, pools, polar ice caps and water vapor and this forms the hydrosphere. The main component of hydrosphere is water. Water exists in all the three forms i.e., solid (snow), liquid (water) and gas (water vapor).

Air: It is an inexhaustible natural resource and very essential for the survival of all the living organisms on earth. In atmosphere, about 95% of the total air is present up to a height of 20 km above the earth's surface. The remaining 5% of air is present up to a height of about 280 km. Air is a mixture of different gases; nitrogen and oxygen are the major components. Thus, total volume of air present in atmosphere consists of 78% nitrogen 21% oxygen and remaining 1% is made up of other gases such as argon, neon, helium, krypton, xenon and radon.

Soil: The word soil is derived from a Latin word *'solum'* meaning ground. It is a stratified mixture of inorganic and organic materials, both of which are products of decomposition.

Minerals: Earth's crust is rich in inorganic materials which include ores that are used on a large-scale to yield metals such as iron, aluminum, copper, tin, nickel, silver, gold, platinum etc. These minerals are very useful in industrial and technological growth. Some of the metals are used as catalysts, for e.g., vanadium, tungsten and molybdenum. Some of the non-metallic materials (minerals) are vital to industrial growth such as sand, fluxes, clay, salt,

sulphur, phosphorus, diamonds, gems, coal and by-products of petroleum (petrol, kerosene, lubricants).

Flora and fauna: Flora refers to plant species and fauna refers to animal species. The term biota includes both plant as well as the domesticated and wild species of animals. Our country has a rich diversity of flora and fauna. There are over 45,000 plant species and 81,251 animal species. It represents about 7% of world's flora and 6.5% of world's fauna.

4.3 BIODIVERSITY: OUR STRENGTH

Biodiversity is the variation of life forms within a given ecosystem, biome, or for the entire Earth. Biodiversity is often used as a measure of the health of biological systems. The biodiversity found on Earth today consists of many millions of distinct biological species, which is the product of nearly 3.5 billion years of evolution.

"Biological diversity" or "biodiversity" can have many interpretations and it is most commonly used to replace the more clearly defined and long established terms, species diversity and species richness. Biologists most often define biodiversity as the "totality of genes, species, and ecosystems of a region". An advantage of this definition is that it seems to describe most circumstances and present a unified view of the traditional three levels at which biological variety has been identified:

- genetic diversity
- species diversity
- ecosystem diversity

One of the most pressing issues on the national and global agenda is the need to conserve biodiversity for future generations while trying to understand and document the indigenous knowledge of resource management practices. So far, this challenge, has been partially addressed by the national and global agencies, who have restricted themselves to conservation of biodiversity as outlined by the World Commission on Environment and Development (1987), which led to calls for 'sustainable development'. As a result, the model of 'development' which was foisted upon the 'Third World' for the last fifty years, a strong argument has been made that development dictated from outside rather anchored in the knowledge base of the target population is in principle modernization disguised and not fully concerned with the local needs. Only recently it has been realized by the scholars and researchers that indigenous knowledge systems should constitute the core of development models in the third world. Because indigenous knowledge has permitted its holders to exist in 'harmony' with nature, allowing them to use it sustainable, it is seen as especially pivotal in discussions of sustainable resource use.

In agricultural systems, a diversity of crops and varieties is needed to combat the risks farmers face from pests, diseases and variations in climate. Crop biodiversity also underpins the breadth of dietary needs and services that consumers demand as societies become wealthier. For some time, scientific experts have been concerned about declining diversity of crop genetic resources on farms. Many argue that the very processes that engendered the

remarkable advances in agricultural productivity during the 20th century, such as the Green Revolution, also eroded the valuable stocks of genetic resources long maintained by farmers. The over all categories of floral and faunal biodiversity available to us is as under:

Flora

Item	No. of species
Bacteria	830
Algae	2500
Fungi	23000
Lichens	1600
Briophyta	2700
Pteridophyta	1022
Gymnosperms	64
Angiosperms	17000
Total	48736

Fauna

Item	No. of species
Fishes	2546
Amphibians	204
Reptiles	428
Birds	1228
Mammals	372
Total	1,26,188

Protozans-2577, Porifera-519, Enidaria-237, Ctenophora-10, Platyhelminthis-1622 Ctenophora-10, Platyheminthis-1622, Nematoda-2350, Rotifern-310, Mollusca-5042, Anthrapoda-57525, Protocordata-116, Echinodermata-705, Annelida-1093.

You have read about meaning and types of natural resources, diversity: our strength. Now, answer the questions in Check Your Progress 1.

Check Your Progress 1

Note: a) Write your answer in about 50 words.

b) Check your answer with possible answers given at the end of the unit.

1. What do you mean by Natural Resources Management (NRM)?

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2. What do you understand by biodiversity?

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4.4 EXPLOITATION ON NATURAL RESOURCES

A number of activities relating to development including construction activities of all kinds, forest based industries, hydel /irrigation projects, mining, oil drilling, pollution, resource extraction and road and transportation put enormous pressure on natural resource base. There are some human induced activities, which relating to agriculture, fishery, expansion of forest villages, grazing/increased domestic animals habitat, habitat depletion / exchange due to horticulture, monoculture forestry have led to different kinds of encroachment on natural resource.

Collection made by scientific/ educational institution

- Exploitation by local authorities as revenue resource
- Fuel wood collection
- Food gathering
- Food hunting
- Smuggling of timber/ forest produce
- Trophies/ specimen collection of medicinal plants and orchids and
- Unregulated trade / market forces

Human induced disasters causing stress on Natural Resource

- Floods
- Major oil spills/ leakage
- Wildlife depredation
- Epidemic
- Forest fires due to humming and
- Intentional forest fire

Threats to NRM- Wrong and faculty Approaches

- Diseases
- Fire as management tool
- Genetic uniformity
- Hybridization
- Inadequate water and food for wildlife
- Increased competition
- Introduction of exotic species
- Lack of patronage of local / native species

Low population/ restricted range (protectionism)

Management of human resources

- Change in people's life style
- Conflicting / increasing demands
- Dilution of traditional values

- Erosion of indigenous knowledge
- Generation gap
- Human harassment
- Ignorance / lack of awareness
- Inadequate trained human resource
- Inappropriate land use
- Lack of effective management
- Negative attitude
- Tourism development

Political and policy issue

- Civil unrest / political movement
- Change in use/ tenure/ legal status
- Insurgency or armed conflict
- Intercommunity conflict
- Intervention failure
- Lack of clear policy implementation
- Lack of interdepartmental coordination
- Lack of intervention
- Military activities
- People's pressure

4.5 THREATS TO BIODIVERSITY

The following categories of threats have been recognized by International Union Council for Conservation Nature (IUCN):

Endangered

Under this category included taxa whose number have reduced to a critical level of whose habitats have been so drastically reduced that they are seemed to be in immediate danger of extinction e.g. : *Ncpenthes khasiana, Rhinanthera imschootiana, Vanda cerulean.*

Vulnerable

Taxa likely to move into endangered category in near future, if the casual factors continue, operating included taxa of which most or all the population are decreasing because of over exploitation, extensive destruction of habitats or other environmental disturbances. For e.g. *Discora deltoidea, taxus wallichiana.*

Rare

Taxa with small world population that are not at present endangered or vulnerable but are at risk. These taxa are usually localized within restricted geographical areas or habitats or are thinly scattered over more extensive range. e.g. *Farictia macrantha, Rauvolfia scrpentina.*

Threatened

The term threatened is used in the conservation context for species which are in one of the three categories: Endangered, Vulnerable and Rare. India's biodiversity is one of the most significant in the world. As many as 45,000 species of wild plants and over 77,000 if wild animals have recorded, which comprise about 6.5 percent of the world's known wildlife. In the last few decade India has lost at least half it's forests, polluted over 70 percent of it's water bodies, built on or cultivated much of it's grasslands and degraded most of it's coast.

4.6 CONSERVATION OF BIODIVERSITY

Why Conservation?

Indian region is a treasure house at wild genetic resources. Wild species and relatives of crop plants contain valuable genes that are of immense genetic values in crop improvement programmes. The important wild related species and types in various crop groups, prevailing under different phytogeographic zones at the country needs particular attention in the agro-biodiversity management system for a sustainable use to help maintain food, nutritional and agricultural economic security. The main objectives of biodiversity conservation are:

- The main objectives of the conservations are
- The conservation of biological diversity
- The sustainable use of component biodiversity

India's efforts for Biodiversity Conservation

Dr. M.S. Swaminathan (1983) suggested the following conservation measure

- Cultivated varieties in current use.
- Obsolete cultivars
- Primitive cultivars or land races
- Wild species and weedy species closely related to cultivated varieties
- Wild species of potential values to man
- Special genetic stock developed by man
- The fair and equitable sharing of benefits arising from the utilization of genetic resources.

In-situ Conservation

- It includes conservation of plant and animals in their native ecosystems or even in man made ecosystem, where they naturally occur.
- It applies only to wild fauna and flora.
- It aims at preservation of land races with wild relatives in which genetic exists.

Ex-situ Conservation

- It is done through establishment of gene banks.
- It is the chief mode for preservation of genetic resources

- Generally seeds or in-vitro maintained plants cells, tissue and organs are preserved under appropriate conditions.

The drawbacks of ex-situ conservation are:

- Loss of viability over passage of time and susceptibility to insect or pathogen attack.
- Inability to maintain distinct clones except for inbreed and apomicts species.
- Non-applicability to vegetative propagated crop.

4.7 MANAGEMENT OF NATURAL RESOURCES

There is an urgent need to think deeply about destruction of natural resources. With the exponential increase in human population and increased technological advancement, the natural resources get relentlessly exploited. There is a need for optimization of its usage. This is possible only when we adopt the concepts of management and conservation of natural resources. Management and conservation mean scientific utilization of resources while maintaining their sustained yield and quality. India produces only half of the national requirement of petroleum products and it imports the rest from other countries. Natural gas is the most popular petroleum product and its consumption during last two decades has increased tenfold. If we need to save fossil fuels from total exhaustion, we should encourage the usage of non-conventional resources of energy such as solar energy, wind energy, biomass energy etc. Biogas is a natural gas. It is produced from animal, water and weeds and other plants. India comes first in developing and using biogas technology. It is cheap, non-polluting and labor saving fuel. Biogas can be used for cooking, lighting and in vehicles.

According to world conservation strategy on natural resource management (NRM), it is the management of human use of the biosphere, lithosphere and hydrosphere so that it may yield the greatest sustainable benefit to the present generation, while maintaining its potential to meet the needs and aspiration, not the greed, of future generation. With the current rate of development, population growth and migration, communities are increasingly unable to meet their sustained needs, growing demand for fuel wood and other forest products, pollution due to industrialization and a market for rare animal species and medicinal plants have all threatened the biological diversity and thereby have hampered sustainable human development. Further the race for development and cultivation of improved varieties in larger area has threatened the biodiversity to a considerable extent. The complex dynamics of resource management system can be well understood by the flowchart (figure 1) and various issues/dimensions involved in resource management is represented in(figure 2).

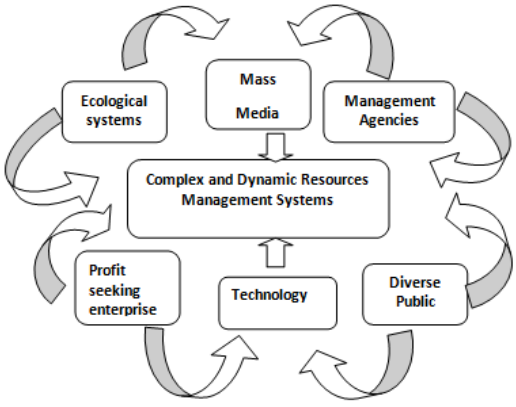

Figure 1: Complex and Dynamic Resources Management Systems

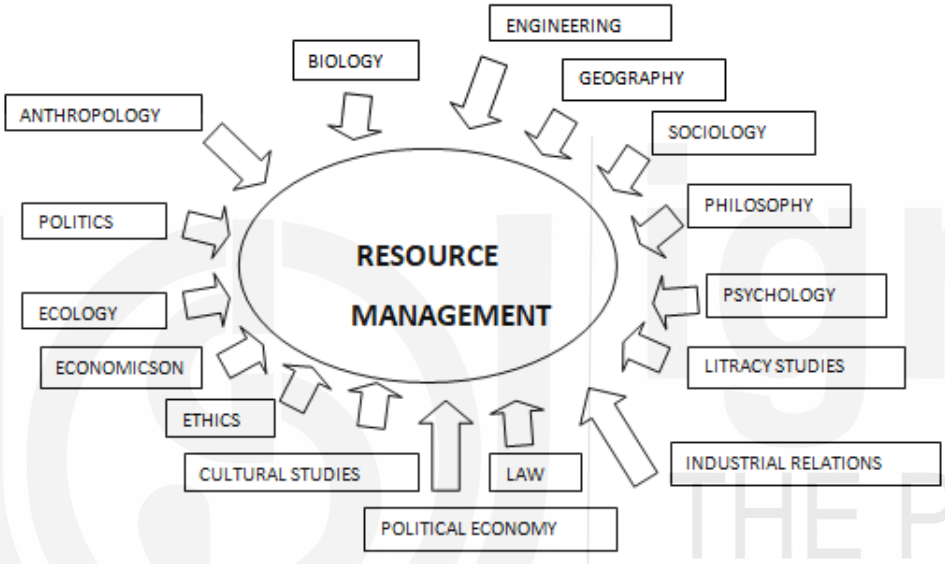

Figure 2: Various issues/dimensions involved in resource management

Meaning and Need for Resource Management

The main driving forces of resource consumption are population and economic growth, and the pattern of development, broadly defined to include technological level, economic structure, and the patterns of production and consumption. The projected 50 % growth in the global population over the next fifty years will put a significant pressure on the environment. If, over the next fifty years, the population of the developing countries achieves levels of material wealth similar to today's levels in industrialized countries, world consumption of resources would increase by a factor ranging from two to five. Without dramatic technological improvements or changes in the patterns of consumption, growth in resource use and environmental impacts due to increased population and economic growth in developing countries are likely to outweigh technological efficiency gains in industrialized countries.

Human wealth is based on the use and consumption of natural resources, including materials, energy and land. Continued increase in resource use and the related environmental impacts can have a multitude of negative effects leading to ecological crises and security threats. The sustainable use

and management of natural resources have therefore come into focus and has been the subject of many policy discussions over more than a decade, beginning with the summit in Rio de Janeiro in 1992.

Over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber and fuel. This has resulted in substantial gains in human well-being and economic development, but these gains have been achieved at growing costs in the form of the degradation of many ecosystems (Millennium Ecosystem Assessment, 2005). What is driving our material and energy use to the extent that it is becoming a global environmental problem and a threat to future generations? There is no simple answer to this question, because a number of interdependent socio-economic and environmental factors are at play. Nevertheless, there are three basic factors which determine the growth of resource consumption, and the resulting environmental impacts of human production and consumption patterns.

Management of Forests

The world forest is derived from the Latin word 'foris' meaning outside, the reference being to a village boundary or fence, and it must have included all uncultivated and uninhabited land. Today a forest is any land managed for the diverse purpose of forestry, whether covered with trees, shrubs, climbers, etc., or not. The Indian work 'jungle' has been adopted in the English language to describe a collection of trees, shrubs, climbers, etc., that are not grown in a regular manner, as contrasted with 'forest', which is any vegetation under a systematic management. Technically forest has been defined as:

a. In general point of view a forest is an area set aside for the production of timber and other forest produce, or maintained under woody vegetation for certain indirect benefits which it provides, e.g. climatic or protective;

b. In ecological point of view forest is a plant community predominantly of trees and other woody vegetation, usually with a closed canopy; and

c. In logical point of view an area of land proclaimed to be a forest under a forest law.

Forestry is the theory and practice of all that constitutes the creation, conservation, and scientific management of forests and the utilization of their resources to provide for the continued production of the required goods and services. Forests are a very striking feature of the land surface. They vary greatly in composition and density, and stand in marked contrast with meadows and pastures. The scenic effect of forests changes with the seasons like the patterns in a kaleidoscope. Certain forests are evergreen, like the Deodar forests of Kashmir, while others are deciduous, becoming leafless either before the advent of winter when vegetative activity almost ceases, such as the oak forests of the Himalayas, or else just before the onset of intense dry summer, to reduce transpiration to the minimum, like the Teak forests of Central India. The falling leaves in some species become bright orange or golden yellow. In others the young foliage is pink. Such autumnal

and verbal tinges are in vivid contrast with the general green or straw-colored background, and are extremely pleasing. Unlike animals, plants do not have the power of locomotion. They also cannot construct shelters or generate heat to which stand the adverse effects of the environment of which they are captives. Therefore, to survive they wear the evidence of this fact in the form of structural adaptations, such as leaflessness in summer to minimize transpiration, thorns to ward off browsers, poisonous sap, etc.

The forests of a country are a natural asset of immense value. Unlike its minerals resources, including fossil fuels, which in course of time either get exhausted or their utilization will become uneconomic due to increased costs for obtaining and processing them, the forests, if of adequate extent, ideally dispersed, scientifically managed and judiciously utilized can be kept perpetually productive and useful, conferring many benefits, direct and indirect, on the people. Thus forests are a renewable resource. Directly, forests meet the needs of small timber, fuel, bamboos and a variety of other products, including fodder which is indispensable requirements of the people living in close proximity of the forests. They also provide facility for the grazing of their livestock, and yield a variety of products of commercial and industrial value such as structural timber, charcoal, and raw materials for making paper, newsprint, rayon, panel products, bidi leaves, gums, resin, dyes, tans and a number of other economic products including medicinal drugs. Forests also provide employment to a large population engaged in their protection, tending, harvesting and regeneration as also in ancillary occupations processing forest raw material and marketing them. These are productive functions of the forests.

Management of Soil Resources

Rapid deterioration of soil health and degradation of soil environment as a consequence of persistent nutrient depletion and operating process of erosion, salinisation, acidification and desertification have been at concern to a soil scientists in recent years as these are posing a threat to the potentiality of our soil resources to support the increasing food demands in future.

Soil Degradation

- Physical- Soil Erosion, Water Logging, Desertification, Compaction, Crusting, Overgrazing
- Chemical-Nutrient runoff, Acidification, Salinisation, Alkalinisation, loss of organic matter, Nutrient imbalance, Nutrient Depletion, Accumulation of toxicants.
- Biological-monoculture, pesticides and herbicides, Disposal of industrial waste, toxic containing sewage water, Genetic Manipulation
- Approaches towards soil conservation
- The primary purpose of soil conservation is to prevent soil erosion and heal the damage where it has not advanced too far to respond to curative methods.
- The land should wear a vegetative cover throughout the year.
- Engineering and agronomic practices should be applied conjointly.

Reclamation of eroded lands

- Ravines should be provided with sufficient and suitable vegetative cover.
- Instead of agriculture, these lands should be reclaimed for forestry, pasture or horticulture.
- Their deficiency in nutrients and moisture for plants growth should be improved.
- Further misuse of such land should be prevented. Over transplanting by man and cattle trails fenced etc.
- Vegetative cover provided, should be protected against reckless destruction by local population.

Measures for controlling soil erosion deposition hazard-

- Plantation at wind breaks and shelterbelts
- Sand dune stabilization
- Stubble mulching
- Wind string cropping
- Primary and secondary tillage
- Conserving soil moisture.

Management of Water Resources

Groundwater has been exploited in India quite substantially in the past few decades for irrigation. However, unlike surface water resources, there has been a conspicuous lack of scientific assessment of groundwater resources. Availability of this important natural resource has been taken for granted; utilization of ground water has not been commensurate with the available potential in a state e.g. about 86% in Gujarat and 3% in Assam indicating considerable regional imbalance. India has 4% of the world's water resources. The present water demand of India's agriculture is nearly 83 percent of the total water use in the country and shall not change appreciable by the end of the country. Use of most of the available water is for agriculture, and is confined to 33 percent irrigated area and the remaining 67 percent is still dependent on monsoon rains. The disproportionate use of water in certain pockets results in wastage as discernible from water in certain pockets result in wastage as discernible from water logging of vast cultivable areas caused by the seepage and evaporation between dam gate and the field and only 15 percent of the wasteful flood irrigation method.

Excessive use of water makes the field more vulnerable to soil erosion. Irrigation, thus, can be identifies as the most important single activity responsible for agriculture induced environmental stress although other activities such as deforestation for expanding agriculture, production oriented agronomic practices, use of fertilizers and plants protection chemicals have their individual contribution.

Approaches towards water conservation

Management at surface water resources such as

- Canal water

- Run-off water
- Khadins
- Nadis, Tanks
- Gully
- Plugging
- Water harvesting dams
- Water spreading
- Percolation tank

Management of ground water resources

The ground water resources in arid region have four major problems:

- Sixty five (65) percent area has saline ground water with total soluble salt content over 3200 ppm.
- Deep static water level
- Poor yield from wells
- Due to over exploitation, static water level started declining, soluble salt content have increased and yield reduced.

Following methods are available for artificially recharging the aquifers-

- Water spreading
- Recharging through pits
- Wells ands shafts
- Pumping to induce recharge from surface water bodies

Extension approaches for NRM

- Creation of natural resources like forests, water bodies etc.
- Conservation of resources in an ecology niche.
- Regeneration of natural resources by organizing self-propelling processes.
- Preservation through social fencing.
- Recycling of waste water by products.
- Rejuvenation of degraded or age old resource base.
- Protection of target species.
- Pollution control through policy formulation.
- Elimination of negative factors operating in the eco-systems.
- Social fencing for protection, preservation.
- Integration of biotic, abiotic and social factors.
- Rationalization in the use of dwindling resources.
- ITK and ITW: appropriate use and application.
- Watershed management to generate livelihood and conserve natural resources.
- Monitoring : Benefit monitoring evaluation (BME)

- Auditing is required to get account of depletion and to suggest interventions
- People's participation: this is the most important and critical to accomplish any objective in NRM.

You have read about exploitation of natural resources, threats to biodiversity, conservation of biodiversity and management of natural resources. Now, answer the question in Check Your Progress 2.

Check your progress 2

Note: a) Write your answer in about 50 words.

b) Check your answer with possible answers given at the end of the unit.

1. What are the important roles of forest in our society?

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2. What are the right approaches of soil conservation?

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4.8 LET US SUM UP

Natural resources has been defined as "the sum total of all physical, chemical, biological and social factors which construct the surroundings of man is referred to as environment and each element of these surroundings constitutes a resource on which man thrives in order to develop a better life". Any part of our natural environment, such as land, water, air minerals, forest, rangeland, wild life, fish, micro organisms or even human population that man can utilize to promote the welfare, may be regarded as a natural resource. Over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber and fuel. This has resulted in substantial gains in human well-being and economic development, but these gains have been achieved at growing costs in the form of the degradation of many ecosystems Over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber and fuel. This has resulted in substantial gains in human well-being and economic development, but these gains have been achieved at growing costs in the form of the degradation of many ecosystems. There is an urgent need to conserve our natural resources for our survival and future generations.

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4.10 CHECK YOUR PROGRESS – POSSIBLE ANSWERS

Check Your Progress 1

1. What do you mean by Natural Resources Management (NRM)?

Answer: Natural resources has been defined as "the sum total of all physical, chemical, biological and social factors which construct the surroundings of man is referred to as environment and each element of these surroundings constitutes a resource on which man thrives in order to develop a better life". Any part of our natural environment, such as land, water, air minerals, forest, rangeland, wild life, fish, micro organisms or even human population – that man can utilize to promote the welfare, may be regarded as a natural resource.

2. What do you understand about biodiversity?

Answer: Biodiversity is the variation of life forms within a given ecosystem, biome, or for the entire Earth. Biodiversity is often used as a measure of the health of biological systems. "Biological diversity" or "biodiversity" can have many interpretations and it is most commonly used to replace the more clearly defined and long established terms, species diversity and species richness. Biologists most often define biodiversity as the "totality of genes, species, and ecosystems of a region".

Check Your Progress 2

1. What are the important roles of forest in our society?

Answer: Forests are solely responsible for maintaining the water cycle, which includes the rain and ground water table. They also act as sink which absorbs the carbon dioxide and converts them into oxygen. They also maintain the balance between the floral and faunal biodiversity, while supplying a number of minor forest based products for our use.

2. What are the right approaches of soil conservation?

Answer: The good approaches towards soil conservation are:

1. The primary purpose of soil conservation is to prevent soil erosion and heal the damage where it has not advanced too far to respond to curative methods.
2. The land should wear a vegetative cover throughout the year.
3. Engineering and agronomic practices should be applied conjointly.

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