

## UNIT – 3

# NATURAL RESOURCES

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### **3.0 Objective:**

The basic objective of this unit is to provide comprehensive information to students about the natural resources, its type and importance, significance of natural resources.

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### **3.1 Introduction :**

Natural resources are generally defined as all those things given by nature on, above and under the surface of the earth. In a broad sense natural resources include land, water , forests, food, energy like coal, Petroleum, gas and uranium etc.

There is no direct link between the availability of natural resources and the level of economic development. There are many countries which are rich in natural resources but still they are underdeveloped.

Infact for the economic development of a country, optimum exploitation of natural resources is more important than their availability. Never the less, importance of natural resources can not be undermined. Natural resources of a country influence not only economic growth but also its economic structure.

The type of resources available, their quantities, their distribution within the different regions of a country determine, to a considerable extent, the type and scale of industries that can be developed.

#### **3.1.1 Forest Resources**

India's forest cover in 2007 was 69,09 million hectare which is 21.02 percent of the geographical area. Of this 8.35 million hectare is moderately dense forest and the rest 28.84 million hectare is open forest.

The per capita forest in India (0.5 hectare) is much less than that in the world (1.9 hectares). According to the national policy on forests (1988), one third (33%) of the country's area should be covered by forests in order to maintain ecological balance.

### **USE and Over Exploitation**

A forest is a biotic community predominantly of trees, shrubs and other woody vegetation, usually with a closed canopy. This invaluable renewable natural resource is beneficial to man in many ways.

The direct use from forests are :

- (a) **Fuel Wood**–Wood is used as a source of energy for cooking purpose and for keeping warm.
- (b) **Timber**– Wood is used for making furniture, tools-handles, railway sleepers, matches, ploughs, bridges, boats etc.
- (c) **Bamboos**–These are used for matting, flooring, baskets, ropes, rafts, cots etc.
- (d) **Food**–Fruits, leaves, roots and tubers of plants and meat of forest animals form the food of forest tribes.
- (e) **Shelter**–Mosses, ferns, insects, birds, reptiles, mammals and micro-organisms are provided shelter by forests.
- (f) **Paper**–Wood and Bamboo pulp are used for manufacturing paper (Newsprint, stationery, packing paper, sanitary paper)
- (g) **Rayon**–Bamboo and wood are used in the manufacture of Rayon (yarns, artificial silk-fibres)
- (h) **Forest Products**–Tannins, gums, drugs, spices, insecticides, waxes, honey, horns, musk, ivory, hides etc. are all provided by the flora and fauna of forests.

### **The direct use and benefits from forests are :**

- (a) **Conservation of Soil**–Forests prevent soil erosion by binding the soil with the network of roots of the different plants and reduce the velocity of wind and rain-which are the chief agents causing erosion.
- (b) **Soil–Improvement**–The fertility of the soil increases due to the humus which is formed by the decay of forest litter.
- (c) **Reduction of Atmospheric Pollution**–By using up Carbon dioxide and giving off oxygen during the process of photosynthesis, forests reduce pollution and purify the environment.
- (d) **Control of Climate**–Transpiration of plants increases the atmospheric humidity which affects rainfall and cools the atmosphere.
- (e) **Control of water flow**–In the forests, the thick layer of humus acts like a big sponge and soaks rain water preventing run-off, thereby preventing flash floods. Humus prevents quick evaporation of water, thereby ensuring a perennial supply of water to streams, springs and wells.

### **Deforestation and its Effect on Climate and People**

Deforestation by definition refers to the activity of clearing the forest cover or trees on a larger extent without replacements. The result of this exercise often leads to the destruction of the quality of land, weather and even climate. The primary culprits in the deforestation exercise are loggers who are

acting on legal and illegal instructions. Research studies indicate that the world has had approximately half of the tropical forests cleared through logging where no new trees been planted.

That can be translated into 18 million acres of land and it represents such a great loss to the environment. However, tree harvesting is not a criminal act, but the policy of environmental sustenance necessitates that when trees are cut down, they ought to be replaced with the new planted ones. There are several consequences of deforestation. Here is a detailed discussion of how deforestation affects climate change, animals and humans.

### **Effects of Deforestation on Climate**

There are 3 major effects of deforestation on climate–

#### **1. It reduces soil moisture and leads to desertification–**

In normal circumstances, the soil contains moisture. The moisture needs to be conserved and this can only be done successfully if there is forest cover. The crucial role that the trees play is that they cover the soil and prevent the soil from losing the water vapour. When the soil is heated, vapour is lost but when the tree canopies are present; no excess vapour is lost.

But with the continued acts of deforestation, water vapour is lost and the water cycle is broken. In return, no rainfall will take place because of the absence of trees. The whole process may end up in the emergence of a desert. Some of the worst desert conversion rates in sub-saharan Africa have been associated with deforestation in west and central African forests.

**2. Increase of the Green house effect–**In the normal circumstances trees are always significant in the absorption of the green house gases such as CO<sub>2</sub>, nitrogen and many others. A research by the global forest research assessment revealed that deforestation resulted in the release of approximately a billion ton of carbon-dioxide (CO<sub>2</sub>). In 2010 with the cutting of trees which results in the depletion of the forest cover, the concentration of the green house gases increase the rate of global warming.

This leads to the inevitable climate change and adverse green house effects causing the increased incidences of La Nina and El nino. Increase of the green house effects also raises the levels of evaporation and evapotranspiration and the higher temperatures cause extended dry spell periods and the exacerbation of drought conditions.

**3. Melting of the Icebergs–**Deforestation in the cold polar regions also lead to the disturbance of the icecaps. Eventually, there is increased melting which further leads to the rise in the ocean or sea-level. Climate change is also a consequence of this activity. When such trees are cut and the ice begin to melt, there is that alteration in the weather pattern which also extend to the change in the climate conditions in the polar regions with the melting of the icebergs, there is the rise of sea levels which might give rise to intense flooding.

### **Effects of Deforestation on People and Animals**

**1. Vanishing of species (Biodiversity loss)–**There are numerous species that depend on the forest habitats for survival breeding and development. It is estimated that about 80% of the world's species live in the tropical rain forests. These species are specifically supported by the rich forest environments that provide them with food and shelter. In most cases, when there is deforestation, many animals that depend on trees for livelihood are disadvantaged.

To be precise birds, reptiles, amphibians among many other classes of animals depend on trees for food and shelter. Whenever there is deforestation, these species that are lost either through death, migration, or the general degradation of their habitat. As an instance, in this case, many animal species that were found in the west African equatorial rainforest have vanished without a trace. Furthermore,

Some animal species such as the Northern spotted owl in the western United States can not survive in secondary forest habitat.

**2. Low Agriculture Produce**—Humans may not be affected directly but as a result of the climate changes they have to suffer from the consequences of their actions. Deforestation leads to the change in climate. This even further leads to the altered weather pattern. It can be characterized by the extreme heat or too much rainfall.

Deforestation also degrades soil quality and is a major cause of the world's rapid desertification. Such weather patterns and environmental changes contribute to the plummeting of the agriculture production. Humans are hit by food shortage due to the low agriculture produce.

**3. Extreme Climate and low life quality**—Many people decry the extreme weather conditions such as the intense heat in the US, India and many other parts in Middle East or extreme rainfalls in South America. But few people have thought about deforestation as the main contributor. This ramification is so severe it lowers the quality of living conditions and leads to the emergence of various problem that may lead to death.

Extreme changes in climate pattern can alter creature's habitats and decrease water and food availability. This may lead to loss of biodiversity, death and even extinction for the creatures without the necessary adaptive mechanism.

**4. Natural Disasters**—Though this may not come directly as a result of deforestation but it is a consequence of climate change. Natural disasters such as flooding may be caused by the climate and they mostly result in deaths or displacement of people. Without trees there is also increased soil erosion which depletes soil fertility and the final outcome is the loss of arable land. In the long-term, it results in famine, hunger, and flood insecurity. Deforestation also heightens the possibility of complete desertification which can worsen the effects of drought and aridity.

**5. Disrupted Livelihoods**—Thousands and thousands of people all over the world are contingent upon forests for hunting, gathering and medicine, small scale agriculture and forest resources such as rubber and palm oil. However, deforestation interferes with the lives of such people, at times with wrecking consequences.

In Some areas deforestation has contributed to migration and social conflicts. Accordingly, thousands of people lose their source of livelihood on the account of deforestation.

**6. Disruption of the water cycle**—Trees play a critical role in facilitating the continuity of the water in the atmosphere and water on land. But when deforestation takes place, the water balance goes away resulting in changes in water cycle.

The direct outcome is alteration of habitats that depend on particular precipitation pattern, river flow or water availability from adjacent water resources. Species losses may occur whenever the water cycle is disrupted.

### **3.1.2. Food Resources**

Today our food comes almost entirely from agriculture, animal husbandry and fishing. Although India is self-sufficient in food production, It is only because of modern pattern of agriculture that are unsustainable and which pollute our environment with excessive use of fertilizers and pesticides.

The FAO defines sustainable agriculture as that which conserves land, water and plant and animal genetic resources, does not degrade the environment and is economically viable and socially acceptable. Most of our large farms grow single crops (mono culture). If this crop is hit by a pest, the

entire crop can be devastated, leaving the farmer with no income during the year. On the other hand, if the farmer uses traditional varieties and grows several different crops, the chance of complete failure is lowered considerably. Many studies have shown that one can use alternatives to inorganic fertilizers and pesticides. This is known as integrated crop management.

### **Fisheries**

Fish is an important protein food in many parts of the world. This includes marine and fresh water fish. While the supply of food from fisheries increased phenomenally between 1950 and 1990, in several parts of the world fish catch has since dropped due to overfishing. In 1975 FAO reported that 44% the world's fisheries are fully or heavily exploited, 16% are already overexploited, 6% are depleted, and only 30% are gradually recovering. Canada had to virtually close down cod fishing in the 1990s due to depletion of fish reserves.

Modern fishing technologies using mechanized trawlers and small meshed net lead directly to over exploitation, which is not sustainable. It is evident that fish have to breed successfully and need to have time to grow if the yield has to be used sustainably. The worst hit are the small traditional fishermen who are no match for organized trawlers.

### **Alternate food sources–**

Food can be innovatively produced if we break out of the current agricultural patterns. This includes working on new avenues to produce food, such as using forests for their multiple non-wood forest products, which can be used, for food is harvested sustainably. This includes fruit, mushrooms, sap, gum etc. This takes time, as people must develop a taste for these new foods.

**World food Problems**–In many developing countries where populations are expanding rapidly, the production of food is unable to keep pace with the growing demand. Food production in 64 of the 105 developing countries is lagging behind their population growth levels.

These countries are unable to produce more food or do not have the financial means to import it. India is one of the countries that have been able to produce enough food by cultivating a large proportion of its arable land through irrigation. The green revolution of the 60's reduced starvation in the country. However, many of the technologies we have used to achieve this are now being questioned.

- 1 Our fertile soils are being exploited faster than they can recuperate.
- 1 Forests, grasslands and wet lands have been converted to agricultural use, which has led to serious ecological questions.
- 1 Our fish resources both marine and inland, show evidence of exhaustion.
- 1 There are great disparities in the availability of nutritious food. Some communities such as tribal people still face serious food problems leading to malnutrition especially among women and children.

These issues bring in new questions as to how demands will be met in future even with slowing of population growth, In India there is a shortage of cultivable productive land. Thus farm sizes are too small to support a family on farm produce alone with each generation, farms are being subdivided further. Poor environmental agricultural practices such as slash and burn, shifting cultivation, or 'rab' (woodash) cultivation degrade forests.

Globally 5 to 7 million hectares of farmland is degraded each year. Loss of nutrients and overuse of agricultural chemicals are major factors in land degradation. Salinization and water logging has affected a large amount of agricultural land world wide.

Loss of genetic diversity in crop plants is another issue that is leading to a fall in agricultural produce. Rice, wheat and corn are the staple foods of two thirds of the world's people. As wild relatives of crop plants in the world's grasslands, wetlands and other natural habitats are being lost, the ability to enhance traits that are resistant to diseases, salinity etc. is lost. Genetic engineering is an untried and risky alternative to traditional cross breeding.

**Food Security**—It is estimated that a million people worldwide, most of whom are children, die each year due to starvation or malnutrition, and many others suffer a variety of dietary deficiencies.

The earth can only supply a limited amount of food. If the world's carrying capacity to produce food can not meet the needs of growing population, anarchy and conflict will follow. Thus food security is closely linked with population control through the family welfare program. It is also linked to the availability of water for farming. Food security is only possible if food is equitably distributed to all. Many of us waste a large amount of food carelessly. This eventually places great stress on our environmental resources.

A major concern is the support needed for small farmers so that they remain farmers rather than shifting to urban centres as unskilled industrial workers. International trade policies in regard to an improved flow of food across national borders from those who have surplus to those who have a deficit in the developing world is another issue that is a concern for planners who deal with international trade concerns. 'Dumping' of under priced food stuffs produced in the developed world, onto markets in undeveloped countries undermines prices and forces farmers there to adopt unsustainable practices to compete.

### **3.1.3. Water Resources**

All aquatic ecosystems are used by a large number of people for their daily needs such as drinking water, washing, cooking, watering animals and irrigating fields. The world depends on a limited quantity of fresh water. Water covers 70% of the earth's surface but only 3% of this is fresh water. Of this, 2% is in polar icecaps and 1% is usable water in rivers, lakes and sub soil reserves. At a global level 70% of water is used for agriculture about 25% for industry and only 5% for domestic use, while India uses 90% for agriculture, 7% for industry and 3% for domestic use.

#### **Use and Overutilization of Surface and Ground Water**

With the growth of human population there is an increasing need for large amounts of water to fulfill a variety of basic needs. Today in many areas this requirement cannot be met. Overutilization of water occurs at various levels. Most people use more water than they really need. Most of us waste water during a bath by using a shower or during washing of clothes. Many agriculturists use more water than necessary to grow crops. There are many ways in which farmers can use water without reducing yields such as the use of drip irrigation systems.

Agriculture also pollutes surface water and underground water stores by the excessive use of chemical fertilizers and pesticides. Methods such as the use of biomass as fertilizer and non toxic pesticides such as neem products and using integrated pest management system reduces the agricultural pollution of surface and ground water.

Industries tend to maximize short term economic gains by not bothering about its liquid waste and releasing it into streams, rivers and the sea. In the longer term, as people become more conscious of using 'green products' made by ecosensitive industries, the polluter's products may not be used. The polluting industry that does not care for the environment and pays off bribes to get away from the cost needed to use effluent treatment plants may eventually be caught, punished and even closed down. Public awareness may increasingly put pressures on industry to produce only eco-friendly products which are already gaining in popularity.

As people begin to learn about the serious health hazards caused by pesticides in their food, Public awareness can begin putting pressures on farmers to reduce the use of chemicals that are injurious to health.

### **Flood**

Floods have been a serious environmental hazard for centuries. However, the havoc raised by rivers overflowing their banks has become progressively more damaging, as people have deforested catchment and intensified use of river flood plains that once acted as safety valves. Wetlands in flood plains are nature's flood control systems into which overflowed rivers could spill and act like a temporary sponge holding the water, and preventing fast flowing water from damaging surrounding land.

Deforestation in the Himalayas causes floods that year after year kill people, damage crops and destroy homes in the Ganges and its tributaries and the Brahmaputra. Rivers change their course during floods and tons of valuable soil is lost to the sea. As the forests are degraded, rain-water no longer percolates slowly into the sub-soil but runs off down the mountain side bearing large amounts of top soil. This blocks rivers temporarily but gives way as the pressure mounts allowing enormous quantities of water to wash suddenly down into the plains below. There, rivers burst their banks and flood waters spread to engulf people, farms and homes.

### **Drought**

In most arid regions of the world the rains are unpredictable. This leads to periods when there is a scarcity of water to drink, use in farms or provide for urban and industrial use. Drought prone areas are thus faced with irregular periods of famine. Agriculturists have no income in their bad years and as they have no steady income, they have a constant fear of droughts. India has 'Drought prone Area Development programmes' which are used in such areas to buffer the effects of droughts. Under these schemes, people are given wages in bad years to build roads, minor irrigation works and plantation programmes.

Drought has been a major problem in our country especially in arid regions. It is an unpredictable climate condition and occurs due to the failure of one or more monsoons. It varies in frequency in different parts of our country.

While it is not feasible to prevent the failure of the monsoon, good environmental management can reduce its ill effects. The scarcity of water during drought years affects homes, agriculture and industry. It also leads to food shortage and malnutrition which especially affects children.

One of the factors that worsens the effect of drought is deforestation. Once hill slopes are denuded of forest cover the rain water rushes down the rivers and is lost. Forest cover permits water to be held in the area permitting it to seep into the ground. This charges the underground stores of water in natural aquifers. This can be used in drought years if the stores have been filled during a good monsoon. If water from the underground stores is overused, the water table drops and vegetation

suffers. This soil and water management and afforestation are long term measures that reduce the impact of droughts.

### **Water Conservation**

‘Save water’ campaigns are essential to make people everywhere aware of the dangers of waterscarcity. A number of measures need to be taken for the better management of the world’s water resources. These include measures such as :

- 1 Building several small reservoirs instead of few mega projects.
- 1 Develop small catchment dams and protect wet lands.
- 1 Soil management, micro catchment, development and afforestation permits recharging of underground aquifers thus reducing the need for large dams
- 1 Treating and recycling municipal waste water for agriculture use.
- 1 Preventing leakages from dams and canals.
- 1 Preventing loss in municipal pipes.
- 1 Effective rain water harvesting in urban environments.
- 1 Water conservation measures in agriculture such as using drip irrigation.
- 1 Pricing water at its real value makes people use it more responsibly and efficiently and reduces water wasting.
- 1 In deforested areas where land has been degraded soil management by bunding along the hill slopes and making ‘nala’ plugs, can help retain moisture and make it possible to revegetate degraded areas.

Managing a river system is best done by leaving its course as undisturbed as possible. Dams and canals lead to major floods in the monsoon and the drainage of wet lands seriously affects areas that get flooded when there is high rainfall.

### **3.1.4. Energy Resources**

Energy is defined by physicists as the capacity to do work. Energy is found on our planet in a variety of forms, some of which are immediately useful to do work, while others require a process of transformation.

The sun is the primary energy source in our lives. We use it directly for its warmth and through various natural processes that provide us with food, water fuel and shelter. The sun’s rays power the growth of plants, which form our food material, give off oxygen which we breathe in and take up carbon-dioxide that we breathe out. Energy from the sun evaporates water from oceans, rivers and lakes, to form clouds that turn into rain. Today’s fossil fuels were once the forests that grew in prehistoric times due to the energy of the sun.

We use energy for household use, agriculture, production of industrial goods and for running transport. Modern agriculture uses chemical fertilizers, which require large amounts of energy during their manufacture.

### **Types of Energy**

There are two main types of energy, those are classified as–

- 1 Non-renewable
- 1 Renewable

### **Non-Renewable Energy**

These consist of the mineral based hydrocarbon fuels coal, oil and natural gas, that were formed from ancient prehistoric forests. These are called 'fossil fuels' because they are formed after plant life is fossilized. At the present rate of extraction there is enough coal for a long time to come. Oil and gas resources however are likely to be used up within next 50 years. When these fuels are burnt, they produce waste products that are released into the atmosphere as gases such as carbon dioxide, oxides of sulphur, nitrogen, and carbon monoxide all causes of air pollution. These have led to lung problems in an enormous number of people all over the world, and have also affected buildings like the Tajmahal and killed many forests and lakes. Due to acid rain. many of these gases also act like a green house letting sunlight in and trapping the heat inside. This is leading to global warming, a rise in global temperature, increased drought in some areas, floods in other regions, the melting of ice caps, and a rise in sea levels, which is slowly submerging coastal belts all over the world.

### **Renewable Energy**

Renewable energy systems use resources that are constantly replaced and are usually less polluting. Examples include hydropower, solar, wind and geothermal. We also get renewable energy from burning trees and even garbage as fuel and processing other plants into bio fuels.

**Hydroelectric Power**—This uses water flowing down a natural gradient to turn turbines to generate electricity known as 'hydroelectric power' by constructing dams across rivers. Between 1950 and 1970, Hydropower generation world wide increased seven times. The long life of hydropower plants, the renewable nature of the energy source, very low operating and maintenance costs and absence of inflationary pressures as in fossil fuels.

**Solar Energy**—In one hour, the sun pours as much energy on to the earth as we use in a whole year. If it were possible to harness this colossal quantum of energy, humanity would need no other source of energy. Today we have developed several methods of collecting this energy for heating water and generating electricity.

**Photovoltaic Energy**—The solar technology which has the greatest potential for use throughout the world is that of solar photovoltaic cells which directly produce electricity from sunlight using photovoltaic cells.

### **Solar thermal electric power**

Solar radiation can produce high temperatures, which can generate electricity. Areas with low cloud levels of cover with little scattered radiation as in the desert are considered most suitable sites. According to a UNDP assessment, STE is about 20 years behind the wind energy market exploitation, but is expected to grow rapidly in the near future.

### **Biomass Energy**

When a log is burned we are using biomass energy. Because plants and trees depend on sunlight to grow, biomass energy is a form of stored solar energy. Although wood is largest source of biomass energy, we also use agricultural waste, sugar cane wastes. and other farm by-products to make energy.

**Biogas Energy**—Biogas is produced from plant material and animal waste, garbage, waste from households and some types of industrial wastes, such as fish processing, dairies and sewage treatment plants. It is a mixture of gases which includes methane, carbon-dioxide, hydrogen sulphide and water vapour, In this mixture methane burns easily. With a ton of food waste, one can produce 85 cu.M of Biogas. Once used, the residue is used as an agriculture fertilizer.

### **Wind Power Energy–**

Wind was the earliest energy source used for transportation by sailing ships. Most of the early work on generating electricity from wind. At present, India is the third largest wind energy producer in the world.

Other renewable energy produced as Tidal wave power, geothermal and nuclear energy.

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### **3.2 Summary:**

All means of satisfying human needs, at a given time and place are ‘resources’. Thus “Resources” are means for attaining individual and social welfare. Natural components like land, water, minerals, forests, wildlife, energy-or even man himself–are considered as resources as well as resource creating factors.

Among the global resources the major components are water, forest, energy. Global survival depends on the availability of such resources. It is well-known that the requirement for early man was very limited, but with the advancement of industrialisation, man’s requirement changed significantly with times.

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### **3.3 Questions for Exercise:**

1. What is natural resources and its type ?
2. What is forest resource and discuss use and over exploitation, deforestation and its effect on climate and people ?
3. What is food resource and discuss world food problem ?
4. What is water resource and describe the use and overutilization of surface and ground water and its conservation ?
5. Explain the Renewable and Non-Renewable Energy Resources.

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### **3.4 Suggested Reading :**

- 1 Owne, S. Oliver : Natural Resource conservation : An Ecological Approach
- 1 Santra, S.C. : Environmental Science
- 1 Saxena, H.M. : Environmental Geogrraphy

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