

UNIT 2- NATURAL RESOURCES

Natural resources

Natural resources are resources that exist without any actions of humankind. This includes all valued characteristics such as commercial and industrial use, aesthetic value, scientific interest and cultural value.

There are various methods of categorizing natural resources. These include the source of origin, stage of development, and by their renewability.

On the basis of origin, natural resources may be divided into two types:

- Biotic — Biotic resources are obtained from the biosphere (living and organic material), such as forests and animals, and the materials that can be obtained from them. Fossil fuels such as coal and petroleum are also included in this category because they are formed from decayed organic matter.
- Abiotic – Abiotic resources are those that come from non-living, non-organic material. Examples of abiotic resources include land, fresh water, air, rare-earth elements, and heavy metals including ores, such as gold, iron, copper, silver, etc.

Considering their stage of development, natural resources may be referred to in the following ways:

- Potential resources — Potential resources are those that may be used in the future—for example, petroleum in sedimentary rocks that, until drilled out and put to use remains a potential resource
- Actual resources — Those resources that have been surveyed, quantified and qualified, and are currently used in development, such as wood processing, and are typically dependent on technology
- Reserve resources — The part of an actual resource that can be developed profitably in the future
- Stock resources — Those that have been surveyed, but cannot be used due to lack of technology—for example, hydrogen

On the basis of recovery rate, natural resources can be categorized as follows:

- Renewable resources — Renewable resources can be replenished naturally. Some of these resources, like sunlight, air, wind, water, etc. are continuously available and their quantities are not noticeably affected by human consumption. Though many renewable resources do not have such a rapid recovery rate, these resources are susceptible to depletion by over-use. Resources from a human use perspective are classified as renewable so long as the rate of replenishment/recovery exceeds that of the rate of consumption. They replenish easily compared to non-renewable resources.

- **Non-renewable resources** – Non-renewable resources either form slowly or do not naturally form in the environment. Minerals are the most common resource included in this category. From the human perspective, resources are non-renewable when their rate of consumption exceeds the rate of replenishment/recovery; a good example of this are fossil fuels, which are in this category because their rate of formation is extremely slow (potentially millions of years), meaning they are considered non-renewable. Some resources naturally deplete in amount without human interference, the most notable of these being radio-active elements such as uranium, which naturally decay into heavy metals. Of these, the metallic minerals can be re-used by recycling them, but coal and petroleum cannot be recycled. Once they are completely used they take millions of years to replenish.

Commercial values

- Forests are main source of many commercial products such as wood, timber, pulpwood etc. About 1.5 billion people depend upon fuel wood as an energy source.
- Timber obtained from the forest can be used to make plywood, board, doors and windows, furniture, and agriculture implements and sports goods. Timber is also a raw material for preparation of paper, rayon and film.
- Forest can provide food, fibre, edible oils and drugs.
- Forest lands are also used for agriculture and grazing.
- Forest is important source of development of dams, recreation and mining.

Life and economy of tribal

Forest provides food, medicine and other products needed for tribal people and plays a vital role in the life and economy of tribes living in the forest.

Ecological uses

Forests are habitat to all wild animals, plants and support millions of species. They help in reducing global warming caused by greenhouse gases and produce oxygen upon photosynthesis. Forest can act as pollution purifier by absorbing toxic gases. Forest not only helps in soil conservation but also helps to regulate the hydrological cycle.

Aesthetic values

All over the world people appreciate the beauty and tranquility of the forest because forests have a greatest aesthetic value. Forest provides opportunity for recreation and ecosystem research.

Over exploitation of forests

Forests contribute substantially to the national economy. With increasing population increased demand of fuel wood, expansion of area under urban development and industries has led to over exploitation of forest. At present international level we are losing forest at the rate of 1.7 crore hectares annually. Overexploitation also occurs due to overgrazing and conversion of forest to pastures for domestic use.

Deforestation

Deforestation refers to the decrease in forest areas across the world that are lost for other uses such as agricultural croplands, urbanization, or mining activities.

Deforestation can be defined as the large-scale removal of trees from forests (or other lands) for the facilitation of human activities.

1. Forest are burned or cut for clearing of land for agriculture ,harvesting for wood and timber , development and expansion of cities .These economic gains are short term where as long term effects of deforestation are irreversible
2. Deforestation rate is relatively low in temperate countries than in tropics If present rate of deforestation continues we may losses 90% tropical forest in coming six decades
3. For ecological balance 33% area should be under forest cover but our nation has only 20.6% forest cover.

Causes of deforestation

Forest area in some developed area has expanded. However in developing countries area under forest is showing declining trend particularly in tropical region. Main causes of deforestation are

Causes of deforestation

a) Shifting cultivation or jhum cultivation

This practice is prevalent in tribal areas where forest lands are cleared to grow subsistence crops. It is estimated that principle cause of deforestation in tropics in Africa, Asia and tropical America is estimated to be 70, 50, and 35% respectively. Shifting cultivation which is a practice of slash and burn agriculture are possess to clear more than 5 lakh hectares of land annually. In India, shifting cultivation is prevalent in northeast and to limited extent in M.P, Bihar and Andhra Pradesh and is contributing significantly to deforestation.

b) Commercial logging

It is an important deforestation agent. It may not be the primary cause but definitely it acts as secondary cause, because new logging lots permits shifting cultivation and fuel wood gatherers access to new logged areas.

c) Need for fuel wood

Increased population has lead to increasing demand for fuel wood which is also acting as an important deforestation agent, particularly in dry forest.

d) Expansion for agribusiness

With the addition of cash crops such as oil palm, rubber, fruits and ornamental plants, there is stress to expand the area for agribusiness products which results in deforestation.

e) Development projects and growing need for food

The growing demand for electricity, irrigation, construction, mining, etc. has led to destruction of forest. Increased population needs more food which has compelled for increasing area under agriculture crops compelling for deforestation.

f) Raw materials for industrial use

Forest provides raw material for industry and it has exerted tremendous pressure on forest. Increasing demand for plywood for backing has exerted pressure on cutting of other species such as fir to be used as backing material for apple in J&K and tea in northeast states.

Major effects of deforestation

Deforestation adversely and directly affects and damages the environment and living beings. Major causes of deforestation are

- Soil erosion and loss of soil fertility
- Decrease of rain fall due to effect of hydrological cycle

Effects of deforestation

- Expansion of deserts
- Climate change and depletion of water table
- Loss of biodiversity, flora and fauna
- Environmental changes and disturbance in forest ecosystems

Preventive Measures of Deforestation

Educational campaigns

It is possible to combat deforestation through awareness. Educational campaigns can only be a good example of awareness about deforestation. Awareness helps to find out the solution to tackle deforestation.

Reforestation

Reforestation is a process of planting trees in a forest land where the trees have been cut for some reasons. We all need to understand the importance of reforestation and implement it to save the environment. Planting of trees can reduce various causes and effects of deforestation, global warming, greenhouse effect, pollution, etc.

Following the rules & regulations

There should be strict rules & regulations against those who are involved in the deforestation activities in anyways. The people also need to be dedicated to following these rules & regulations because it is everyone's responsibility to save the environment.

Use of renewable forest resources

We can grow trees as a source of wood from secondary growth forests. The use of sustainable local wood sources and charcoal for cooking or heating is an excellent alternative of fossil fuels (provided it comes from local sources).

Reduce the consumption of paper

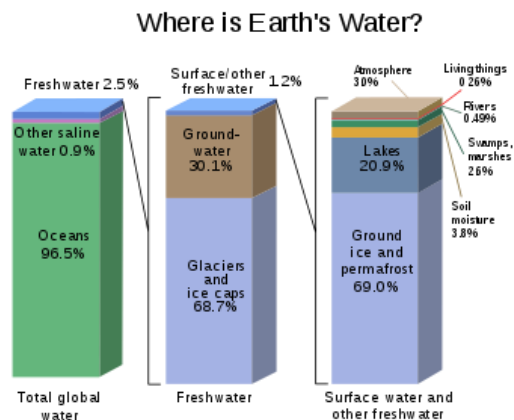
Choose recyclable paper products, such as printing paper, notebooks, napkins, toilet paper, etc. To reduce the wastage of paper we can make a habit of taking a print out on both the side of a paper and even write on both the side of your notebook. If we can limit the use of paper products, we can reduce the reasons of deforestation to some extent.

Other measures to stop deforestation are:

- Prefer to buy products from sustainable companies like Asian pulp & paper, Hershey, Wilmar international, L'Oreal, Unilever, Disney, etc. These companies are committed to minimizing deforestation.
- If we can minimize our consumption, we will be able to treat the deforestation problem to some extent. For example- reduce the use of products that contain palm oil, etc.
- Implement the process of recycling or prefer to buy recycled products.
- We should prefer to consume vegetarian food whenever possible.
- Prefer to purchase certified wood products. Make sure you check the labels & FSC (Forest Stewardship Council) mark before purchasing any wood product.
- Prefer to buy Eco-friendly products.

Water resources

- Water resources are natural resources of water that are potentially useful. Uses of water include agricultural, industrial, household, recreational and environmental activities. All living things require water to grow and reproduce.
- 97% of the water on the Earth is salt water and only three percent is fresh water; slightly over two thirds of this is frozen in glaciers and polar ice caps. The remaining unfrozen freshwater is found mainly as groundwater, with only a small fraction present above ground or in the air.



Global Distribution of Water resources

Fresh water:

96.5 per cent of the total volume of world's water is estimated to exist as oceans and only 2.5 per cent exists as fresh water. 70 per cent of the fresh water occurs as ice sheets and glaciers in Antarctica, Greenland and the mountainous regions of the world. Less than 30 per cent is stored as groundwater in the world's aquifers. Fresh water is mainly obtained from surface run off and ground water. This is continually being renewed and recharged through the hydrological cycle. All the water moves within the hydrological cycle making water a renewable resource.

Three fresh water sources are:

Precipitation—from rainfall; Surface water—in rivers, lakes, etc.; Ground water—water stored in underground aquifers which gets recharged by rainfall.

Dams

A dam is a barrier across flowing water that obstructs, directs or retards the flow, often creating a reservoir, lake or impoundment. “Dam” refers to the reservoir rather than the structure.

Uses of Dam:

Dams are built:

- To impound rivers and rainwater that can be used later to irrigate agricultural fields.
- For electricity generation.
- Water supply for domestic and industrial uses.
- Flood control.
- Recreation, inland navigation and fish breeding.

Side effects of Creating Dams

- Regulating and damming of rivers affect their natural flow.
- Poorer the habitats for the rivers' aquatic life.
- Fragment Rivers make it difficult for aquatic fauna to migrate.
- Dams created on the floodplains submerge the existing vegetation and soil leading to its decomposition over a period of time.
- Creating of large dams has been the cause of many new environmental movements like the 'Narmada Bachao Andolan' and the 'Tehri Dam Andolan' etc.
- Many times local people had to give up their land, livelihood and their control over resources for the construction of the dam.

Mineral Resources

A mineral is a naturally occurring substance, representable by a chemical formula, that is usually solid and inorganic, and has a crystal structure.

Mineral resources are the key material basis for socio-economic development. Statistical results show that more than 95% of energy used by mankind, 80% industrial raw materials and 70% raw materials for agricultural production are from mineral resources.

A mineral is a pure inorganic substance that occurs naturally in the earth's crust. More than two-thousand minerals have been identified and most of these are inorganic, which are formed by the various combinations of elements. However, a small proportion of the earth's crust contains organic materials, consist of single elements such as gold, silver, diamond, and sulfur.

Exploitation of Minerals-Mining

Mining is the process used to extract valuable resources from the Earth. It is done to acquire any resource that cannot be grown or fabricated through artificial means. More specifically, mining is used to extract non-renewable resources like fossil fuels, minerals and even water.

There are four main methods of mining: underground, surface, placer and in-situ. The type of mining method used depends on the kind of resource that is being targeted for extraction, the deposit's location below or on the Earth's surface and the capacity of each method to profitably extract the resource. Each mining method also has varying degrees of safety and impacts on the surrounding environment, both of which are concerns for legitimate mining operations.

1. Underground Mining

Relatively costly and frequently used to get to deeper deposits, underground mining involves digging down into the earth and creating tunnels and shafts that reach the deposits of resources. Ore and other resources can then be brought up to the surface for processing, while waste rock can be removed for disposal. There are various types of underground mining that are categorized based on the kind of shafts used, the technique of extraction and the process used to get to a deposit. For instance, drift mining involves the use of horizontal tunnels, while slope mining uses diagonal shafts to access deposits.

The type of underground mining technique used is typically based on the geology of the area, especially the amount of ground support needed to make mining safe.

2. Surface Mining

Surface mining involves removal of plant life, soil and potentially bedrock to be able to access resource deposits. It is normally used for fairly shallow, non-precious deposits. The two foremost kinds of surface mining are open-pit mining and strip mining.

Open pit mining involves digging out rocks to form an open pit or borrow pit, from which resources are then extracted. An open pit mine generally has stepped sides to minimize the risks associated with collapse and a large ramp for mining equipment. Some kind of water management system is generally necessary to keep an active mine from turning into a lake. Open-pit mines are typically worked until either the mineral deposit is depleted, or various factors make the mine non-profitable. When this occurs, the open pit is often modified to become a landfill for solid wastes.

Strip mining is mostly used to extract shallow, "bedded" deposits, where a mineral layer is covered by a layer of soft topsoil and weathered rocks. The relatively soft top layer of earth is stripped by either a dragline or industrial shovel to uncover a deposit.

3. Placer Mining

Normally formed by weathering via water and/or wind action, placers are unconsolidated deposits of resources. Placer mining is generally done in riverbeds, sands or other sedimentary environments and involves sifting valuable materials from sediments. Famously, "panning for gold" can be part of the placer mining process. In placer operations, the extracted sedimentary material is rinsed and sluiced to pull out the desired minerals.

In addition to gold, gemstones, platinum, tin and other materials can be extracted via place mining. At least 50 percent the world's titanium comes from this type of mining operation.

4. In-Situ Mining

Also referred to as solution mining, in-situ mining does not involve removing intact ore from beneath the earth's surface. Instead, it involves pumping chemicals underground to dissolve resource-containing ore and then pumping what is known as the "pregnant solution" back up to the surface, where it can be processed to recover minerals. This technique is mainly used in uranium mining.

This technique causes very little disturbance to the surface and does not produce large amounts of waste rock. To use this technique, the ore body must be permeable to the extraction liquids, and it must be possible to complete the process without the significant risk of contaminating nearby groundwater.

Major effects of mining on the environment are as follows:

Minerals are the natural resources which play an important role in the economic development of the country. But the extraction and mining of these natural resources leads to some adverse effect on our environment as well.

1. It leads to the emission of dust, suspended particle and gases which cause air pollution.
2. Release of harmful trace element e.g. CO, Pb, Cd etc. leads to the contamination of surface water.
3. Underground water is also contaminated due to seepage and infiltration of leached drainage.
4. Mining leads to the degradation of soil quality, fertility and makes it toxic.
5. Natural vegetation gets adversely effected due to leached trace element.
6. The major consequences of mining are the deforestation which results in loss of flora and fauna.
7. It directly affects the ecosystem and its stability as many species are killed due to toxicity of water and soil and loss of habitat.
8. Mining results in wastage of land as it neither remain suitable for industrial use nor for agricultural purposes.
9. Mining directly results in the loss of landscape and beauty of surrounding.

Conservation of Mineral Resources

The total volume of consumable mineral resources is just 1% of all the minerals present in the earth's crust. However, the consumption rate is so high that these mineral resources which are non-renewable will get exhausted very soon. Here are some measures to conserve minerals:

- Use of minerals in a planned and sustainable manner.
- Recycling of metals
- Use of alternative renewable substitutes.
- Technology should be improved to use the low-grade ores profitably.

Food Resources

Food is any substance consumed to provide nutritional support for an organism.

Food is usually of plant, animal or fungal origin, and contains essential nutrients, such as carbohydrates, fats, proteins, vitamins, or minerals. The substance is ingested by an organism and assimilated by the organism's cells to provide energy, maintain life, or stimulate growth.

Functions of Food

- (1) The Physiological functions
 - a) To provide energy
 - b) To repair body tissues
 - c) To build new cells and tissues

- d) To regulate body processes
- e) To protect against diseases.
- (2) The social functions of food
- (3) The psychological functions of food.

1.The Physiological functions

To provide energy

- ☐ Body needs fuel for voluntary and involuntary activities.
- ☐ Carbohydrate and fat rich foods are main sources
- ☐ Carbohydrate are starch, sugars and cellulose. Fat sources are vanaspati, butter, ghee, nuts and oil seeds. 1 gram of carbohydrate yields 4 kilocalories, 1 gram of fat yields 9 kilocalories, 1 gram of protein yields 4 kilocalories.

To build cells and tissues

Proteins, water and minerals build cells muscles and blood. Protein sources are cereals and Pulses. Animal protein comes from milk products, eggs, fish and meat. Minerals are found in egg, Meat, fish, green leafy vegetables etc.

To repair cells and tissues

Body tissues are continually broken down and replaced by new ones. Proteins, minerals and water is required to replace them.

To regulate body processes

Essential fatty acids present in certain fats, proteins, minerals, vitamins and water all perform certain regulatory functions – coagulation of blood, maintenance of body temperature, activation of enzymes etc.

To protect the body from diseases.

Vitamins and minerals protect body from injury and diseases. They help in regulating growth, muscular co-ordination, eye sight, digestion and other body processes. These are present in green leafy vegetables, other vegetables, milk, meat, liver and eggs etc.

2.Social functions of food

Man is a social being food helps him to be social. During special occasion like marriages, birthday's etc. food is an important ingredient.

3. Psychological Functions of Food

- ☐ Food satisfies certain emotional needs.
- ☐ Food is used to express feelings of special attention, friendship, recognition or punishment.

Components of Food and their Functions

Element/ component	Daily requirement	Function	Sources
1. Carbohydrates	500 gms.	Energy and Temperature of the body is maintained	Grains, potatoes, sugar, banana, carrot, honey, etc
2. Fats	50 gms.	Important for the development of cells and building tissues.	Clarified butter, edible oil, milk, butter, eggs, etc
3. Proteins	100 gms.	Necessary for the growth and development of body tissues.	Cereals, milk, curd, cheese, meat, fishes, and eggs.
4. Water	2.5 liters	Essential for the bio-chemical process in the body.	Water
5. Salt (minerals)	0.7 gm.	Security against damage and strengthens bones.	Grains, cereals, salt
6. Vitamins	0.6 gm	Useful for bio chemical processes, health, growth	Milk, butter, vegetables, eggs and meat
7. Roughage	Rarely taken	It is useful for proper digestion and bowel's movement.	Chaff of grains.

Modern agriculture

Modern agriculture is an evolving approach to agricultural innovations and farming practices that help farmers increase efficiency and reduce the number of natural resources like water, land, and energy necessary to meet the world's food, fuel, and fiber needs. The agribusiness, intensive farming, organic farming, and sustainable agriculture are other names of modern agriculture.

Impact of Modern Agriculture on the Environment

As we know that modern agriculture improved our affordability of food, increases the food supply, ensured the food safety, increases sustainability, and also produces more biofuels. But at the same time, it also leads to environmental problems because it is based on high input–high output technique using hybrid seeds of high-yielding variety and abundant irrigation water, fertilizers, and pesticides. The impacts of modern agriculture on the Environment are discussed below:

Soil Erosion

The top fertile soil of the farmland is removed due to the excessive water supply. This leads to the loss of nutrient-rich soil that hampered productivity. It also causes global warming because the silt of water bodies induces the release of soil carbon from the particulate organic material.

Contamination of groundwater

The groundwater is one of the important sources of water for irrigation. From agricultural fields, nitrogenous fertilizers leach into the soil and finally contaminate groundwater. When the nitrate level of groundwater exceeds 25 mg/l, they can cause a serious health hazard known as “Blue Baby Syndrome”, which affects mostly infants even leading to their death.

Water-logging and salinity

The salinity of the soil is one of the reasons of low productivity just because of the improper management of farm drainage. In this situation, the roots of plants do not get enough air to respiration then it leads to low crop yield as well as low mechanical strength.

Eutrophication

It refers to the addition of artificial or non-artificial substances such as nitrates and phosphate, through fertilizers or sewage, to a freshwater system. It leads to an increase in the primary productivity of the water body or the 'bloom' of phytoplankton.

Excessive use of fertilizers that consists of nitrogen and phosphorus leads to over nourishment of the lakes/water bodies and gives rise to the phenomenon of eutrophication (EU = more, trophication= nutrition).

Excessive use of Pesticide

There are many pesticides that are used for destroying pests and boosting crop production. Earlier arsenic, sulfur, lead, and mercury was used to kill pests. For Example- Dichloro Diphenyl Trichloroethane (DDT) content pesticides were used, but unfortunately, it also targeted the beneficial pests. Most importantly, many pesticides are non-biodegradable, which also linked to the food chains which are harmful to the human being.

Fertilizers and Pesticides

Fertilizers are chemical substances supplied to the crops to increase their productivity. These are used by the farmers daily to increase the crop yield. The fertilizers contain the essential nutrients required by the plants, including nitrogen, potassium, and phosphorus. They enhance the water retention capacity of the soil and also increase its fertility.

Fertilizers are used to supply crops with essential nutrients for growth and to help replenish the soil of key elements once a crop has extracted them during the growth process.

Types of Fertilizers

There are six different types of fertilizers that are mentioned below:

Inorganic Fertilizers

Inorganic fertilizers are chemical fertilizers that contain nutrient elements for the growth of crops made by chemical means. The inorganic fertilizers are of the following types:

Nitrogen Fertilizers

Nitrogen fertilizers contain nitrogen necessary for the development of crops. Nitrogen is the main constituent of chlorophyll that maintains a balance in the process of photosynthesis. It is also a part of amino acids in plants and constitutes protein. Nitrogen fertilizers improve the production and quality of agricultural products.

Phosphorus Fertilizer

The main nutrient in a phosphorus fertilizer is phosphorus. The efficiency of fertilizer depends upon effective phosphorus content, methods of fertilizing, properties of soil and crop strains. Phosphorus found in the protoplasm of the cell plays an important role in cell growth and proliferation. The phosphorus fertilizer is beneficial for the growth of roots of the plants.

Organic Fertilizers

Organic fertilizers are natural fertilizers obtained from plants and animals. It enriches the soil with carbonic compounds essential for plant growth. Organic fertilizers increase the organic matter content of the soil, promotes the reproduction of microorganisms, and changes the physical and chemical properties of the soil. It is considered to be one of the main nutrients for green food.

Organic fertilizers can be obtained from the following products:

- Agricultural Waste
- Livestock Manure
- Industrial Waste
- Municipal Sludge

Advantages of Fertilizers

The advantages of fertilizers are mentioned below:

- They are easy to transport, store, and apply.
- For supplying a specific nutrient we can select a specific fertilizer due to its nutrient specific nature.
- They are water-soluble and can easily dissolve in the soil. Hence, they are easily absorbed by the plants.
- They have a rapid effect on the crops.
- They increase the crop yield and provide enough food to feed the large population.

- They are predictable and reliable.

Disadvantages of Fertilizers

Fertilizers have the following disadvantages:

- They are expensive.
- The ingredients in the fertilizers are toxic to the skin and respiratory system.
- Excessive use of fertilizers damages the plants and reduces soil fertility.
- Leaching occurs and the fertilizers reach the rivers causing eutrophication.
- Long term use reduces the microbial activity and disturbs the pH of the soil.

Uses of Fertilizers

Fertilizers are used for various purposes. The uses of fertilizers are mentioned below:

- They are used to providing additional nutrients to the plants.
- They are added to improve the yield of the crops.
- Nitrogen-rich fertilizers are used for the greening of lawns.
- Organic fertilizers improve the texture and fertility of the soil.
- Gardeners use fertilizers to address certain needs of the plants such as nutritional needs.
- Fertilizers are added to potted plants to replace the lost nutrients.

Pesticides

Pesticides are chemical substances that are meant to kill pests. In general, a pesticide is a chemical or a biological agent such as a virus, bacterium, antimicrobial, or disinfectant that deters, incapacitates, kills, pests.

This use of pesticides is so common that the term pesticide is often treated as synonymous with plant protection product. It is commonly used to eliminate or control a variety of agricultural pests that can damage crops and livestock and reduce farm productivity.

Types of Pesticides

These are grouped according to the types of pests which they kill:

Grouped by Types of Pests They Kill

1. Insecticides – insects
2. Herbicides – plants
3. Rodenticides – rodents (rats & mice)

4. Bactericides – bacteria
5. Fungicides – fungi
6. Larvicides – larvae

Based on how biodegradable they are:

Pesticides can also be considered as:

- **Biodegradable:**

The biodegradable kind is those which can be broken down by microbes and other living beings into harmless compounds.

- **Persistent:**

While the persistent ones are those which may take months or years to break down.

Another way to classify these is to consider those that are chemical forms or are derived from a common source or production method.

Examples of pesticides

Examples of pesticides are fungicides, herbicides, and insecticides. Examples of specific synthetic chemical pesticides are glyphosate, Acephate, Deet, Propoxur, Metaldehyde, Boric Acid, Diazinon, Dursban, DDT, Malathion, etc.

Benefits of Pesticides

The major advantage of pesticides is that they can save farmers. By protecting crops from insects and other pests. However, below are some other primary benefits of it.

- Controlling pests and plant disease vectors.
- Controlling human/livestock disease vectors and nuisance organisms.
- Controlling organisms that harm other human activities and structures.

Effects of Pesticides

- The toxic chemicals in these are designed to deliberately released into the environment. Though each pesticide is meant to kill a certain pest, a very large percentage of pesticides reach a destination other than their target. Instead, they enter the air, water, sediments, and even end up in our food.
- Pesticides have been linked with human health hazards, from short-term impacts such as headaches and nausea to chronic impacts like cancer, reproductive harm.

- The use of these also decreases the general biodiversity in the soil. If there are no chemicals in the soil there is higher soil quality, and this allows for higher water retention, which is necessary for plants to grow.

Water logging

Waterlogging is the presence of an excess of water in the soil. The water table of the groundwater becomes too high to facilitate any agricultural activity in the soil. Improper irrigation practices coupled with an inadequate drainage system is the major cause of waterlogging. This, in turn, affects the salt content by drawing the salt up to the surface of the soil. The increased salt content has detrimental effects on agriculture. It severely affects plant growth and yields as the soil becomes vulnerable.

Salinity

It refers to accumulation of soluble salts in the soil. Concentration of soluble salts increases due to poor drainage facilities. In dry land areas, salt concentration increases where poor drainage is accompanied by high temperature. High concentration of salts affects the process of water absorption hence affects the productivity.

Soil salinity is the salt content in the soil; the process of increasing the salt content is known as salinization. Salts occur naturally within soils and water. Salination can be caused by natural processes such as mineral weathering or by the gradual withdrawal of an ocean.

Soil salinity and waterlogging are caused by huge irrigation without suitable drainage of water. The constant presence of water trails salt to the soil surface, which accumulates as a thin crust on the surface of the land or begins to collect at the plant roots.

Over long periods of time, as soil minerals weather and release salts, these salts are flushed or leached out of the soil by drainage water in areas with sufficient precipitation. In addition to mineral weathering, salts are also deposited via dust and precipitation. Salts may accumulate in dry regions, leading to naturally saline soils. This is the case, for example, in large parts of Australia.

Human practices can increase the salinity of soils by the addition of salts in irrigation water. Proper irrigation management can prevent salt accumulation by providing adequate drainage water to leach added salts from the soil. Disrupting drainage patterns that provide leaching can also result in salt accumulations.

Severe effects:

- High salt content exploits the growth of crop plants
- Cells of the roots get damaged with saline water saturation
- Plants tend to die
- The yield of crops is affected
- Farmers procure financial loss

Land Resources

Land is a naturally occurring finite resource. It provides the base for survival of living beings. It holds everything that constitutes terrestrial ecosystems. Increased demand on land in modern times due to the rise in human population and resultant activities has resulted in degradation of land quality and quantity, decline in crop production, and competition for land.

Land and Land Resources refer to a delineable area of the earth's terrestrial surface, encompassing all attributes of the biosphere immediately above or below this surface, including those of the near-surface climate, the soil and terrain forms, the surface hydrology (including shallow lakes, rivers, marshes and swamps), the near-surface sedimentary layers and associated groundwater and geo-hydrological reserve, the plant and animal populations, the human settlement pattern and physical results of past and present human activity (terracing, water storage or drainage structures, roads, buildings, etc.)

Land area constitutes about 1/5 of the earth surface. To meet out the challenging demand of food, fibre and fuel for human population, fodder for animals and industrial raw material for agro based industries, efficient management of land resources will play critical role. Soil, water, vegetation and climate are basic natural resources for agricultural growth and development.

Importance of land

Land is considered as an important resource as it provides habitation to a wide variety of flora and fauna. It is used by human beings for various purposes such as agriculture, forestry, mining, building houses and roads, and setting up industries.

The use of land is determined by physical factors such as topography, soil, climate, minerals and availability of water. Human factors such as population and technology are also important determinants of land use pattern.

Land Degradation

Land degradation is a process in which the value of the biophysical environment is affected by a combination of human-induced processes acting upon the land.

Due to increasing population, the demands for arable land for producing food, fibre and fuel wood is also

increasing. Hence there is more and more pressure on the limited land resources which are getting degraded due to over-exploitation. Nearly 56% of total geographical area of the country is suffering due to land resource degradation. Out of 17 million hectare canal irrigated area, 3.4 million hectare is suffering from water logging and salinity. Soil erosion, water logging, salinization and contamination of the soil with industrial wastes like fly-ash, press mud or heavy metals all cause degradation of land.

Soil Erosion

“Soil erosion is the natural process in which the topsoil of a field is carried away by physical sources such as wind and water.”

In this process, the soil particles are loosened or washed away in the valleys, oceans, rivers, streams or faraway lands. This has been worsening due to human activities such as agriculture and deforestation.

Soil erosion is a continuous process that occurs either slowly or at an alarming rate. It results in a continuous loss of topsoil, ecological degradation, soil collapse, etc.

The raindrops disperse the soil, which is then washed away into the nearby streams and rivers. Regions with very heavy and frequent rainfall face a large amount of soil loss. The flowing water during floods also erodes a lot of soil by creating potholes, rock-cut basins, etc.

Causes of Soil Erosion

Following are the important causes of soil erosion:

- **Rainfall and Flooding**

The raindrops disperse the soil, which is then washed away into the nearby streams and rivers. Regions with very heavy and frequent rainfall face a large amount of soil loss. The flowing water during floods also erodes a lot of soil by creating potholes, rock-cut basins, etc.

- **Agriculture**

The farming practices are the major cause of soil erosion. The agricultural activities disturb the ground. The trees are cleared and the land is ploughed to sow new seeds. Since most of the crops are grown during the spring season, the land lies fallow during winters. Most of the soil is eroded during winters.

Also, the tyres of tractors make grooves on the land, making a natural pathway for water. Fine soil particles are eroded by wind.

- **Grazing**

The grazing animals feed on the grasses and remove the vegetation from the land. Their hooves churn up the soil. They also pull out plants by their roots. This loosens the soil and makes it more prone to erosion.

- **Logging and Mining**

A large number of trees are cut down to carry out the logging process. Trees hold the soil firmly. The canopy of the trees protects the soil from heavy rainfall. The leaf litter that protects the soil from erosion, is also lost during logging.

Mining activities also disturb the land and leave the soil more prone to erosion.

- **Construction**

The construction of roads and buildings exposes the soil to erosion. The forests and grasslands are cleared for construction purposes, which exposes the soil making it vulnerable to erosion.

- **Rivers and Streams**

The flowing rivers and streams carry away the soil particles leading to a V-shaped erosion activity.

- **Heavy Winds**

During dry weather or in the semi-arid regions, the minute soil particles are carried away by the wind to faraway lands. This degrades the soil and results in desertification.

Effects of Soil Erosion

The major effects of soil erosion include:

- **Loss of Arable Land**

Soil erosion removes the top fertile layer of the soil. This layer is rich in the essential nutrients required by the plants and the soil. The degraded soil does not support crop production and leads to low crop productivity.

- **Clogging of Waterways**

The agricultural soil contains pesticides, insecticides, fertilizers, and several other chemicals. This pollutes the water bodies where the soil flows.

The sediments accumulate in the water and raise the water levels resulting in flooding.

Soil Erosion Prevention

Soil erosion is a serious environmental issue. Steps should be taken to curb this problem. Following are some of the methods of soil erosion prevention:

1. Plant trees on barren lands to limit erosion of soil.
2. Add mulch and rocks to prevent the plants and grass underneath to prevent soil erosion.
3. Mulch matting can be used to reduce erosion on the slopes.
4. Put a series of fibre logs to prevent any water or soil from washing away.

5. A wall at the base of the slope can help in preventing the soil from eroding.
6. Every household should have a proper drainage system so that water flows down into proper water collecting systems.

Desertification

Desertification is defined as a process of land degradation in arid, semi-arid and sub-humid areas due to various factors including climatic variations and human activities. Or,

Desertification results in persistent degradation of dry land and fragile ecosystems due to man-made activities and variations in climate

Desertification affects topsoil, groundwater reserves, surface runoff, human, animal, and plant populations. Water scarcity in dry lands limits the production of wood, crops, forage, and other services that ecosystems provide to our community.

Various Causes of Desertification

1. Overgrazing

Animal grazing is a huge problem for many areas that are starting to become desert biomes. If there are too many animals that are overgrazing in certain spots, it makes it difficult for the plants to grow back, which hurts the biome and makes it lose its former green glory.

2. Deforestation

When people are looking to move into an area, or they need trees in order to make houses and do other tasks, then they are contributing to the problems related to desertification. Without the plants (especially the trees) around, the rest of the biome cannot thrive.

3. Farming Practices

Some farmers do not know how to use the land effectively. They may essentially strip the land of everything that it has before moving on to another plot of land. By stripping the soil of its nutrients, desertification becomes more of a reality for the area that is being used for farming.

4. Excessive Use of Fertilizers and Pesticides

The use of excessive amounts of fertilizers and pesticides to maximize their crop yields in the short term often leads to significant damages for the soil. In the long run, this may turn from arable into arid land over time, and it will no longer be suitable for farming purposes after a few years of excessive farming since the soil has been damaged too much over time.

5. Over drafting of groundwater

Groundwater is the freshwater found underground and also one of the largest water sources. Over drafting is the process in which groundwater is extracted in excess of the equilibrium yield of the aquifer that is pumping or the excessive pulling up of groundwater from underground aquifers. Its depletion causes desertification.

6. Urbanization and Other Types of Land Development

As mentioned above, development can cause people to go through and kill plant life. It can also cause issues with the soil due to chemicals and other things that may harm the ground. As areas become more urbanized, there are fewer places for plants to grow, thus causing desertification.

7. Climate Change

Climate change plays a huge role in desertification. As the days get warmer and periods of drought become more frequent, desertification becomes more and more eminent. Unless climate change is slowed down, huge areas of land will become desert; some of those areas may even become uninhabitable as time goes on.

8. Stripping the Land of Resources

If an area of land has natural resources like natural gas, oil, or minerals, people will come and mine it or take it out. This usually strips the soil of nutrients, which in turn kills the plant life, and eventually leads to the process of becoming a desert biome as time goes on.

9. Natural Disasters

There are some cases where the land gets damaged because of natural disasters, including drought. In those cases, there isn't a lot that people can do except work to try and help rehabilitate the land after it has already been damaged by nature.

10. Soil Pollution

Soil pollution is a significant cause of desertification. Most plants are quite sensitive to their natural living conditions. When soil becomes polluted due to various human activities, the respective area of land may suffer from desertification in the long run. Higher the level of pollution more will be the degradation of soil over time

11. Overpopulation and excessive consumption

Since our world population is continuously growing, the demand for food and material goods is also increasing at an alarming rate. Our overall level of consumption is also increasing at a steady rate. Thus to fulfill our demand, we have to optimize our farming processes to harvest even higher crop yields.

However, this excessive optimization of farming will hurt the soil and will eventually turn into the desertification of land in the long run.

12. Mining

Mining is another big reason for desertification. Large amounts of resources have to be extracted by industries to meet our demand for material goods. For mining, large areas of land have to be used, which causes deforestation as well as pollution of the nearby areas. By the time most of the natural resources have been extracted, and mining practices are no more profitable, the soil gets damaged significantly, and the land becomes arid, which may not be recoverable, and desertification occurs.

Solutions to Desertification

1. Policy Changes Related to How People can Farm
2. Policy Changes to Other Types of Land Use
3. Education
4. Technology Advances
5. Restricting Mining Practices
6. Putting Together Rehabilitation Efforts
7. Reforestation
8. Sustainable Practices to Prevent Desertification From Happening

Land Slides

Landslide, also called landslip, the movement downslope of a mass of rock, debris, earth, or soil (soil being a mixture of earth and debris).

Natural Causes of Landslides

1. Climate

Long-term climatic changes can significantly impact soil stability. A general reduction in precipitation leads to lowering of water table and reduction in overall weight of soil mass, reduced solution of materials and less powerful freeze-thaw activity. A significant upsurge in precipitation or ground saturation would dramatically increase the level of ground water. When sloped areas are completely saturated with water, landslides can occur. If there is absence of mechanical root support, the soils start to run off.

2. Earthquakes

Seismic activities have, for a long time, contributed to landslides across the globe. Any moment tectonic plates move, the soil covering them also moves along. When earthquakes strike areas with steep slopes, on numerous occasion, the soil slips leading to landslides. In addition, ashen debris flows instigated by earthquakes could also cause mass soil movement.

3. Weathering

Weathering is the natural procedure of rock deterioration that leads to weak, landslide-susceptive materials. Weathering is brought about by the chemical action of water, air, plants and bacteria. When the rocks are weak enough, they slip away causing landslides.

4. Erosion

Erosion caused by sporadic running water such as streams, rivers, wind, currents, ice and waves wipes out latent and lateral slope support enabling landslides to occur easily.

5. Volcanoes

Volcanic eruptions can trigger landslides. If an eruption occurs in a wet condition, the soil will start to move downhill instigating a landslide. Stratovolcano is a typical example of volcano responsible for most landslides across the globe.

6. Forest fires

Forest fires instigate soil erosion and bring about floods, which might lead to landslides

7. Gravity

Steeper slopes coupled with gravitational force can trigger a massive landslide.

Human causes of landslides

1. Mining

Mining activities that utilize blasting techniques contribute mightily to landslides. Vibrations emanating from the blasts can weaken soils in other areas susceptible to landslides. The weakening of soil means a landslide can occur anytime.

2. Clear cutting

Clear cutting is a technique of timber harvesting that eliminates all old trees from the area. This technique is dangerous since it decimates the existing mechanical root structure of the area.

Effects of Landslides

1. Lead to economic decline

Landslides have been verified to result in destruction of property. If the landslide is significant, it could drain the economy of the region or country. After a landslide, the area affected normally undergoes rehabilitation. This rehabilitation involves massive capital outlay. For example, the 1983 landslide at Utah in the United States resulted in rehabilitation cost of about \$500 million. The annual loss as a result of landslides in U.S. stands at an estimated \$1.5 billion.

2. Decimation of infrastructure

The force flow of mud, debris, and rocks as a result of a landslide can cause serious damage to property. Infrastructure such as roads, railways, leisure destinations, buildings and communication systems can be decimated by a single landslide.

3. Loss of life

Communities living at the foot of hills and mountains are at a greater risk of death by landslides. A substantial landslide carries along huge rocks, heavy debris and heavy soil with it. This kind of landslide has the capacity to kills lots of people on impact. For instance, Landslides in the UK that happened a few years ago caused rotation of debris that destroyed a school and killed over 144 people including 116 school children aged between 7 and 10 years. In a separate event, NBC News reported a death toll of 21 people in the March 22, 2014, landslide in Oso, Washington.

4. Affects beauty of landscapes

The erosion left behind by landslides leaves behind rugged landscapes that are unsightly. The pile of soil, rock and debris downhill can cover land utilized by the community for agricultural or social purposes.

5. Impacts river ecosystems

The soil, debris, and rock sliding downhill can find way into rivers and block their natural flow. Many river habitats like fish can die due to interference of natural flow of water. Communities depending on the river water for household activities and irrigation will suffer if flow of water is blocked.

*******END*******