

UNIT-II NATURAL RESOURCES AND SUSTAINABLE DEVELOPMENT

CONCEPT OF RESOURCE

Resource is anything that is used to satisfy human needs. In the context of environmental studies, it can be extended to natural things, such as water, land, minerals, energy, animals, plants and man-made resources like money, institutions capacity etc. which help us to realize the goals and objectives of our social welfare.

DEFINITION OF RESOURCE

- “A natural stuff or manmade product which satisfies human needs or wants directly or indirectly.”
- **According Zimmerman**, “Resources does not refer to a thing or a substance but to a function which is a thing or substance may perform or to an operation in which it may take part, namely the function or operation of attaining a given end such as satisfying wants”

There is a need to understand the concepts of endowment, resource, potential resource and wealth.

Endowment- An endowment is any natural stuff or natural gift that exists in the environment, the use of which is not known to man.

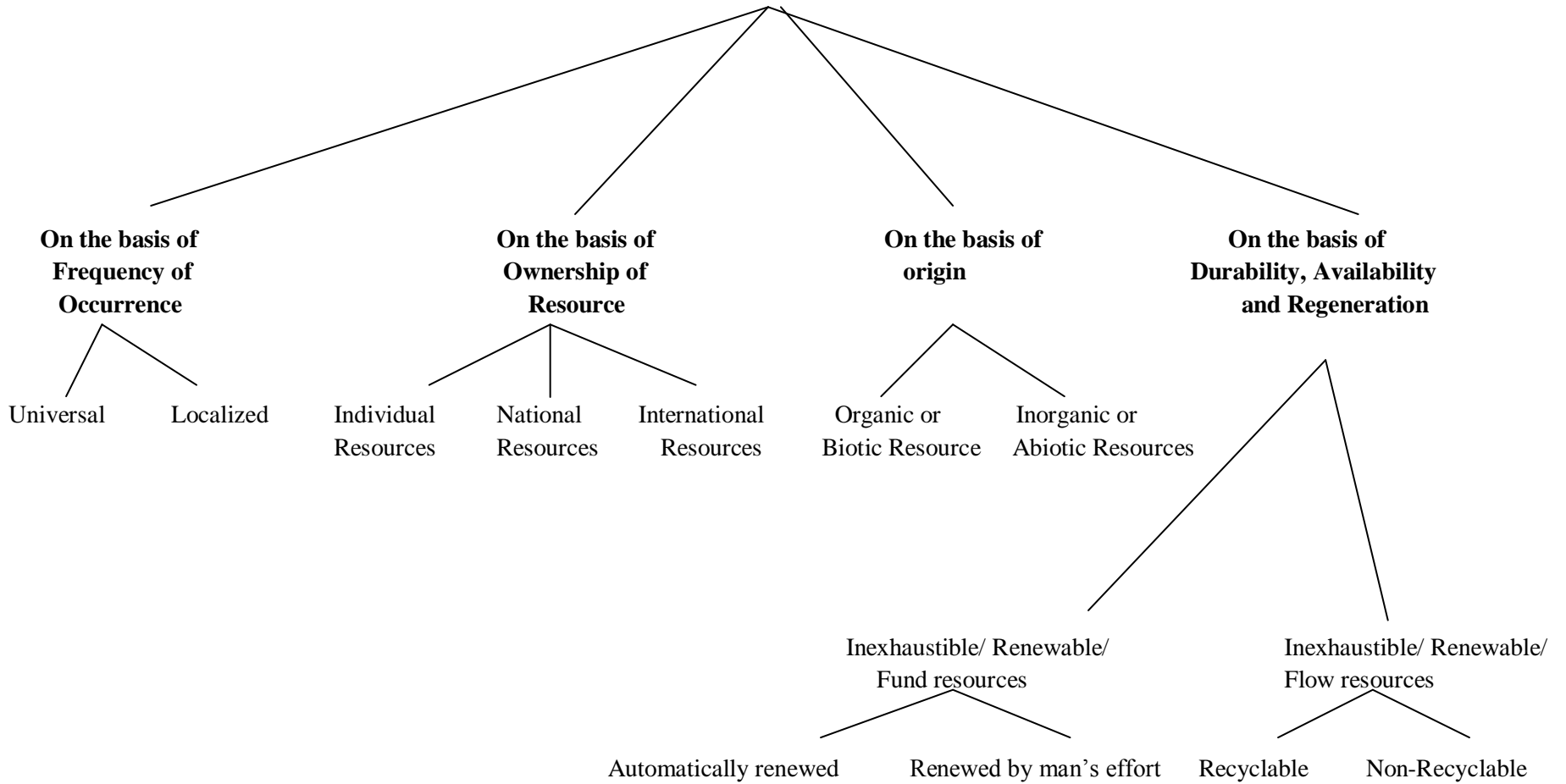
Resource- Resource is any natural stuff that exists in the environment and the use of which is known to man. When an endowment's utility is discovered by man, it becomes a resource.

Potential resource- Potential resource is that natural stuff that exists in the environment, the use and value is known to man but it is not in use to satisfy human needs or wants.

Wealth- A resource becomes wealth when they are developed and sold. Like materials can be changed to something more valuable by proper application of knowledge, skill, labour and technology.

For example- The Bababudan hill near Bhadravati, Karnataka was a natural gift i.e. a natural **endowment**. When it was discovered that it is very rich in iron contents, it became a hidden natural **resource**. Its utility was recognized for mining operation. It was **potentially rich** due to high percentage of iron in the hill. Later on the large-scale surface mining has made it a **developed resource** resulting in accumulation of **wealth**, as it proved to be a major source of raw material (iron-ore) for the well-known Bhadravati Steel Plant in Karnataka.

CLASSIFICATION AND TYPES OF RESOURCES



CLASSIFICATION AND TYPES OF NATURAL RESOURCES

Resources can be classified into two ways: Natural Resource and Human Resource

A) Natural Resources: Materials or substances occurring in nature freely and which can be exploited for overall development of a region are known as natural resource. They can be classified as follows:

(I) On the basis of frequency of occurrence

1) Ubiquitous/ Universal: Resources which are occurring everywhere are known as Ubiquitous or universal resource. For eg- sunlight, soil, air etc. These resources are of low value and free from nature.

2) Localized: Resources occurring only at a few places are known as localized resources. For eg- coal, natural oil, iron ores etc. These resources are of high value and can help the economic development of the country.

(II) Ownership of Resource

1) Individual Resource: Individual resources are also known as personal resources. These resources are exploited or utilized for the benefit of an individual or family is called individual resources. For eg- plot of land, house, etc.

2) National Resources: The resources which are owned collectively by the people of a particular nation are called national resources. For eg- rivers, minerals, forest etc. They are used for the benefit of all the people of the nation.

3) International Resources: All material and non-material things in the world are called international resources. Eg. Atmosphere, sunlight, oceans etc.

(III) On the basis of nature of resource

1) Organic or biotic resource: These resources consist of living things. For eg- forests, wildlife, fish, micro-organisms etc.

2) Inorganic or abiotic resource: These resources consist of non-living things. These resources are exhausted by use while their rate of formation is very slow. For eg- minerals, rocks, climate etc.

(IV) On the basis of durability, availability and regeneration

1) Inexhaustible/ Renewable/ Flow resources: The resources that can be renewed by reproduction or by physical, mechanical or chemical processes are called inexhaustible or flow resources. These resources can be further divided into two types

(a) Automatically renewed: These resources are automatically renewed by various bio-geochemical processes and without man's efforts. For eg- sun, wind, etc. Role of man in production of automatically renewable resources is not important.

(b) Renewed by man's efforts: These resources require man's effort to be renewed. For eg- forests, crops, soil etc. as these might be used by man and will not be renewed if there is no efforts by man.

2) Exhaustible/ Non-renewable/ Fund resources: Many natural resources are limited. Once they are used reproduction is not possible, such resources are called Exhaustible resources. Eg. Coal, Natural oil, Iron ore etc. The natural replacement of minerals through geological process is very slow. These resources are of two types-

(a) Recyclable: The recyclable resources are those resources whose reproduction is not possible but the product can be recycled again and again. For eg- iron, copper, etc.

(b) Non-Recyclable: Some exhaustible resources are non-recyclable. They are of one single use. Once they are used in production process they get exhausted and produce energy, ash or smoke For eg- coal, oil, natural gas, uranium, sulphur etc.

FACTORS INFLUENCING RESOURCE UTILIZATION

The factors influencing resources depend upon level of cultural development. Resource identification and utilization depends upon the learned behavior of human kind. Some of the important factors influences the resource use are as follows:-

1) Cost benefit ratio: Exploitation of resources should be cost effective; that is cost of exploiting the resources should not exceed their value. Minerals that occur at great depths may not be exploited due to high cost of exploitation. For eg- Oil fields of Siberian region in Russia are not exploited because the cost is very high to extract oil as it is a snow capped area with thick forests.

2) Cheaper substitutes: Availability of cheaper substitutes put a limit on resource development. For example, scrap iron is used in the making of steel furniture so the industry does not depend upon steel sheets. Also, use of natural rubber is restricted as synthetic rubber is cheaper and more durable.

3) Availability of Capital: Mining, transportation and resource processing requires huge capital. Exploitation of number of natural resources in the developing and underdeveloped countries is not possible due to lack of capital. For eg- in Africa there is huge potential of generation of hydroelectricity but due to lack of capital it is not exploited.

4) Market and its size: The resources are produced for consumption. The consumption is dependent on density of population and purchasing capacity of the people. For eg- In Australia resources are not exploited on a large scale due to low density of population. While in Asia the market size is small inspite of high density due to low standard of living.

5) Availability of Skilled labour: The development of resources requires knowledge and skilled labour. Thus if area are under populated as they are in Australia, resources will remain underexploited. On the other hand if the required skill for the exploitation of a resource is not available with the people, the resource will remain a potential resource unless it is so valuable that labour may be invited to exploit it.

6) Customs and traditions of people: Certain customs in some religious prevent the use of certain resources. For example, beef and pork are not consumed by Hindus. Thus areas dominated by such people like India, cannot develop their animal resources to produce these products. Also, wine industry will not develop in Islamic countries due to religious restrictions.

7) Political factors: Political differences generate problems in the development of certain resources; like for example, the sharing of river water or a boundary dispute can halt the development around such areas. Like Maharashtra and Andhra Pradesh have a water sharing dispute which leads to slow development and wastage of resources.

8) Resource Policy: Government policies and regulations can affect the development of resources. For example, the declaration of the coastal regulation zone, limits the tourist facilities that can be developed along the coast or aquaculture that be practiced for commercial prawn production.

CONVENTIONAL AND NON-CONVENTIONAL ENERGY RESOURCES

Conventional energy resources

Coal
Oil and
Natural gas
Electricity (Thermal energy,
Nuclear energy, Hydro-electricity)

Non-Conventional energy resources

Solar energy
Wind energy
Bio-energy
Geo-thermal energy
Tidal energy

(I) Conventional energy resources- Conventional energy resources are those which are used by the people right from the olden days. Firewood was first used by the people, then coal was invented followed by mineral oil and natural gas. About 95% of the world's commercial energy comes from coal, oil and natural gas.

1) Coal- (Thermal power): Coal is a major conventional source of energy which is formed from the remains of the trees and ferns (fossils) around 500 million years ago. Coal is largely used for heating of houses, as fuel for boilers and steam engines, and for generation of electricity by thermal plants. World's 3/4th reserve are located in USA, Russia, and Australia. China is the leading producer of coal followed by USA, Australia and India.

2) Oil: Like coal, petroleum (natural oil) is also derived from plants and also dead animals that lived in past. Petroleum occurs below the earth's crust.

Petroleum is a convenient fuel for automobile engines, industrial boilers, household purpose, vehicles, petro-chemical industries etc. Saudi Arabia alone possesses around 25% of the total global reserves followed by Iraq and Iran, USA, Mexico, Russia etc.

3) Natural Gas: The gas in contact with the petroleum layer which flows naturally from oil wells is termed as **natural gases**. Natural gas occurs either with natural oil or independently. World's largest gas field occurs in Russia. USA is the leading producer of the natural gas..

4) Electricity-

i) Thermal energy- In this energy the heat energy is used by burning coal or oil to heat the water and generate steam. When the steam is allowed to pass through narrow channel, it acquires great force which is used to rotate huge turbines with the magnetic field. This gives rise to electricity called **thermal electricity**. This type of energy however creates problems like air pollution, storage of coal and oil, risk in transportation etc. Major thermal power plants are located in China and Japan.

ii) Nuclear energy- Nuclear power is obtained by altering the structure of the atoms through the process of Nuclear Fission. The raw material required to generate nuclear power are uranium and thorium. These materials are rare and costly. France gets three-quarters of its power from nuclear energy while Finland, Switzerland, Sweden etc. get one-third. China and India are making a massive progress in the production of nuclear power.

iii) Hydro-electricity- The water flowing in a river is collected by constructing a big dam and allowed to fall from a height. The blades of the turbine located in the dam move with the fast moving water and rotate the generator and produces electricity. China, Canada, Brazil, USA, Norway are the leading countries in the production of hydropower.

(II) Non-Conventional energy resources- Most of the conventional sources of energy are exhaustible. The growing demand for energy and the increasing exploitation of the available energy resources are causing a rapid

depletion in their reserve. Efforts are therefore, being made to develop non-conventional energy resources which are non- exhaustible or renewable.

1) Solar energy- Solar energy is the energy derived from the sun through the form of solar radiation. Solar energy is non-exhaustible, perennial, non-polluting and cheap source of energy. Solar energy is used for cooking, drying, power generation, steam sterilization, etc. This energy can be extracted from:

i) Solar cooker ii) Solar Photovoltaic (PV) cells iii) Solar water pumps. China and India are well known for Solar energy.

2) Wind energy- Wind energy can be harnessed in the area where strong wind blows. The energy can be harnessed by using turbines and is called as a wind mill. The minimum speed required to generate wind energy is 15km/hr. China is the leading installed wind power capacity in the world. Even, U.S.A. and India are known for wind energy.

3) Bio-energy- Biomass is a renewable energy derived by waste of various human and natural activities.

i) Biogas- Organic waste can be converted into gaseous fuel known as biogas. India produces biogas fuel also known as gobar gas.

ii) Biomass briquetting- The process of densifying loose agricultural waste into a solidified biomass, which can be used as a fuel, is called biomass briquetting. Briquette is also termed as Bio-coal. Commonly used materials are jute stick, coffee husk, almond shell, tobacco dust, rice, husk, barley straw etc.

iii) Bio-fuels- Biomass can also be converted directly into liquid fuels- bio-fuels- for transportation needs. The two most common types of bio-fuels are ethanol and biodiesel. Ethanol is made by fermenting any biomass high in carbohydrates. Biodiesel, produced by plants such as sunflower, soyabean, corn etc. extracted and refined into fuel which can be burnt in diesel engine and buses.

4) Geo-thermal energy- In some places naturally hot water comes out from the underground as a form of natural geysers. On the other side artificially we can drill a hole up to the hot rocks and by putting pipes hot water can be made to gush out, which can help to run the turbine of a generator and can produce electricity. Geothermal energy is generated in USA, Italy, New Zealand, Mexico etc.

In India the potential geothermal provinces can produce 10,600 MW of power. The prospective sites in India are (i) Puga valley (Jammu & Kashmir) (ii) Tatapani (Chhattisgarh) (iii) Manikaran (Himachal Pradesh) (iv) Bakreshwar (West Bengal) (v) Tuwa (Gujarat) (vi) Unai and Jalgaon (Maharashtra)

5) Tidal energy- Ocean tides and waves contain enormous amount of energy that can be harnessed to produce electricity. High tide and low tide refers to rise and fall of water in the oceans. The difference of certain meters between high and low tide is required to spin the turbine. The world's largest tidal energy centre is located at France. Tidal energy is also developed in USA, Russia, Japan, UK etc.

PROBLEMS ASSOCIATED WITH AND MANAGEMENT OF WATER, FOREST & ENERGY RESOURCES

I) WATER RESOURCES

Water acts as a life-line for all the ecosystem of the bio-sphere. Water has immense importance to mankind since ages. Human civilization developed in the flood plain where water was in abundance.

Importance of water as resources:

- a) **Fundamental importance:** The entire living organism from plains to mountainous regions depends on fresh water.
- b) **Transparent Body:** Water has a transparent body that makes the sun rays to enter into the deep sea. It helps to grow the planktons which are the source of food for marine organism.
- c) **A source of energy:** Hydroelectricity project is developed where there is abundance supply of water resources.
- d) **Navigation:** The water ways are considered as cheapest mode of transportation. Most of the international trade is carried through waterways throughout the world.
- e) **Salt Production:** Extraction of salt from saline water of the sea is an important activity of man.

Global distribution of water: The total water on the surface of the earth is unevenly distributed in the air, land and in the ocean. Around 97.6% of the water on the earth's surface is in the ocean. Remaining 2.4% is available in the form of fresh water. Out of those 2.4%, around 2.07% is in the form of ice and snow, ground water accounts for 0.28%, river and lakes accounts for 0.02% and atmosphere contains 0.0001%.

Problems associated with water resources:-

- 1) **Supply and usage of water:** The global supply is not distributed evenly around the planet, nor is water equally available at all times throughout the year. Many areas of the world have seriously inadequate access to water, and many places with high annual averages experience alternating seasons of drought and monsoons. Some areas have good volumes of water but due to remoteness or run-off cannot supply water to agricultural land and population centers where water is needed.
- 2) **Increasing demand and scarcity:** Agricultural sector, is the largest consumer of freshwater resources that accounts for 70% of the global consumption, whereas, industrial sector accounts for 22% of global water consumption and the residential sector uses the remaining 8% of the total water supply. The increasing demand of water in all these sectors has resulted into scarcity of water.
- 3) **Water pollution:** There are different sources of water pollution such as factories, power plants, sewage treatment, coal mines oil wells etc. Due to these sources, water pollution is reaching epic proportions. In the U.S. 40% of rivers and lakes are considered too polluted to support normal activities. In China 80% of the rivers are so polluted that fish cannot survive in them. In Japan 30% of groundwater has been contaminated by industrial pollution. The Ganga River, which supports around 500 million people, is considered one of the most polluted rivers in the world.
- 4) **Growing demand for water in urban areas:** The global water demand has increased mainly due to growing demand from industrial, residential and commercial sector. All of this mainly results from growing urbanization, industrialization and increase in standard of living. As the population in urban areas rise, the demand for water is also increasing.

5) Excess use of water due to changing lifestyles: Industrial development has led to economic development which has increased the purchasing power and standard of living of people. Large number of appliances, electronic gadgets and fittings of bathrooms are available in market and generally tempt people to buy them. For example, taps and showers are designed in such a way that large amount of water comes out when they are turned on. Washing machines and dishwashers use large amounts of water but are convenient and suit the present day life style.

6) Inadequate sewage treatment plant: In the less developed countries of South America, Africa and Asia sewage treatment plants either totally are lacking or are not properly working. In Urban areas 95% of all sewage is discharged untreated into rivers, lakes and oceans.

7) Wastage of water: During evaporation, leaks and other losses 65% to 70% water is lost as per the World Resource Institute. Irregular maintenance of water supply pipelines results into water leakage problem. Lot of fresh water is wasted during the leakage. Leakage in water tank, in urban and rural areas, also wastes water.

8) Negative impact of big dam construction: Construction of large dams often leads to flooding of towns and agricultural land. This usually happens in the monsoon season when there is high rainfall. Large dams waste tremendous amount of water from evaporation. Also, in some areas large dams can cause major damage when there are natural calamities like earthquakes and floods.

9) Problems of water pricing policy: Water is wasted due to government subsidies of water supply projects that create artificially low water prices. In India, the price for water in different sectors is fixed by the state governments and varies from state to state. Water rates for agriculture and domestic consumption do not cover even the working expenses of providing service.

Conservation methods / management/ or solutions of water resource:

1) Construction of small dams: Construction of small dams and creation of water reservoirs at suitable location helps to save water. Small dams are ecologically and economically viable to meet the water needs of rural and urban people. Small dams will have less environmental impact during natural calamities.

2) Water conservation in agricultural sector: Agriculture is considered as the largest consumer of water. In order to save water, the water subsidy for agriculture should be reduced. Crops which consume less water should be grown. Micro-irrigation techniques like 'drip' & 'sprinkle' irrigation should be introduced.

3) Water conservation in urban areas: Urban areas can adopt the following methods to conserve water:-

- High charges should be levied for drinking water
- Underground pipes should be maintained properly
- In households, industries, hotels, etc waste water must be recycled
- Water meters should be installed
- Quota system should be adopted so that individual gets minimum water required.

4) Watershed management: A watershed is defined as "any surface area from which rain water is collected and drained through a common point. "Watershed management should be practiced as it helps to conserve soil and water, recharges ground water, manages cropping system etc.

5) Rainwater harvesting: This is one of the most simple and affordable techniques to solve the problem of scarcity of water. In this method rainwater that falls on land surface is captured, stored and then used for different purposes. This method can be practiced in both rural and urban areas. The Municipal Corporation of greater

Mumbai has made it mandatory to practice rain water harvesting technique for the upcoming developmental plots having area, more than 1000 Sq.km.

6) Forest belt: Plant trees at certain regular intervals and especially in the erosion prone areas. This increase in the forest belt area will help prevent pollution, reducing heat and increase water percolation. Forest can solve both the problems of floods as well as droughts.

7) Controlling water pollution: Since fresh water supply is limited and scarce resource, its pollution by human activity is not desirable. Pollution of water has to be controlled and prevented by implementing strict rules and regulations. Industries can reduce pollution by recycling water. Also, sewage treatment plant should be set up to avoid large amount of pollution

8) Water Conservation awareness programmes: Reduction of wastage of water can be best achieved by launching awareness campaigns to involve all sections of society for water conservation. Such awareness is possible through different media such as newspapers, radio and television. Other ways would be organize short plays, street plays and lectures.

9) Water conservation at household level: The following methods can be used to conserve water at household level:

- Do not leave the tap running while brushing, washing hands, shaving etc.
- Avoid flushing the toilet unnecessarily
- Make sure your home is leak-free
- When washing car use bucket and not hosepipe
- Lawns and gardens should be watered in the early morning or late evening so that water evaporation losses are minimised

II) FOREST RESOURCES-

Forest is a key environmental resource. They are commonly called as the “lungs of the planet”. Forest has economic, ecological, environmental, commercial, social, scenic and cultural values.

➤ **Importance of Forest resources:**

Economic Importance

- It provides very valuable timber.
- Forest is the main source of food for primitive societies.
- Forest is the main source of fuel for domestic use in many underdeveloped and developing countries.
- It also provides different products like quinine, gum, resin, camphor etc.
- It is the source of different types of medicines like Ayurvedic, Unani medicines etc.
- It supplies raw materials to many industries like paper, building materials, furniture and other industries.

Environmental importance

- They play an important role in maintaining the quality of the environment.
- Forest also controls flood by reducing the siltation
- It prevents the soil erosion and help in the process of soil conservation by holding the soil particles firmly
- It helps in conserving water and regulating the water cycle

- It is the habitat for many wild animals
- They play a vital role in maintaining ecological balance

Problems associated with Forest resources:

1) Expansion of agriculture: Most of the clearing of forest is done for the purpose of agriculture. Intensive or modern agriculture occur on a much large scale, deforesting several kilometer. Also large forest lands are cleared for commercial farming. In the world 40% and in South America 68% of deforestation is due to commercial agriculture. For example, for soyabean cultivation in western Brazil part of Amazon basin is deforested in large scale.

2) Deforestation for cattle and fuel production: Growing demand for meat at local and global scale result into deforestation for grazing. Stripping trees to provide fodder for grazing animals can also be a problem in some of the regions. Overgrazing is more common in drier areas of the tropics like in Central America nearly two third of the forest land is cleared within 30 years. Also rapid population growth has caused increased demand for fuel wood in many areas. For example- in many African countries deforestation is done for charcoal production.

3) Commercial Logging: Commercial logging uses heavy machinery such as bull dozer, road graders etc. to remove tree cover and build roads which damages the forest areas to a greater extent.

4) Violation of laws related to forest resources: Laws related to forest resources can be violated in any number of ways, such as taking wood from protected areas, harvesting more than is permitted and harvesting protected species. This destruction threatens some of the world's most famous and valuable forest like the rainforests of Amazon, Congo Basin and Indonesia.

5) Developmental Activities: Some of the developmental activities like construction of roads, railways, bridges, canals, dams, etc. lead to massive deforestation of the forest areas. Overpopulation directly affects forest covers, as with the expansion of cities more land is needed to establish housing and settlements. Therefore, forest land is reclaimed on large scale for example mangrove areas in Mumbai and Thane region have been reclaimed for real estate development and for different human activities.

6) Forest fires: Forest fires start as a consequence of downed power lines, sparks from trains, tools and machinery doing work in the forest. Natural forest fires are due to lightning strikes. Forest fire changes the structure and composition of forest, threatens biodiversity and also destroys the livelihoods of the people who live in and around forest.

7) Unplanned Mining: Many forest areas are rich in minerals and therefore vulnerable to deforestation. The waste that comes out from mining pollutes the environment and affects the nearby species. For example the Amazon basin is rich in precious metals like copper, iron and even gold and suffering from deforestation. With technology and monetary incentives from government increase the rate of deforestation.

8) Wildlife extinction: Due to massive felling down of trees, various species of animals are lost. They lose their habitat and are forced to move to new location. Some of them are even pushed to extinction. Our world has lost many species of plants and animals in last couple of decades.

9) Natural Calamities: Natural calamities like earthquakes, floods, tsunamis etc. also leads to a lot of forest destruction. When it rains, trees absorb and store large amount of water with the help of their roots. When they are cut down, the flow of water is disrupted and leads to floods in some areas and droughts in other.

Measure for conservation/ solution/ methods of forest resources:

1) Afforestation: Afforestation means development of forest where they did not exist in past. It includes different plantation practices like intensive plantation, captive plantation etc. Intensive plantation refers to raising the plants on all available land from farm-fields to roads, rails sides to every available space. Afforestation along slopes ensures timber supplies and also protects soil erosion.

2) Reforestation: Reforestation refers to growing trees where deforestation has taken place. Efforts are made to replace lost trees. Also, the practice of shifting cultivation should be discouraged and overgrazing of animal must be restricted. There is a need for reforestation in ecologically sensitive areas like national parks, mountain slopes etc.

2) Improved cutting practice: Selective cutting of trees should be encouraged i.e. only mature trees or weak or disease affected trees which are wasting the space must be cut. This ensures enough trees are left to prevent soil erosion. Clear cutting if not organized will lead to soil erosion especially on steep slopes.

3) Control forest fire: To check the forest fire; a close system of lookout towers, and air patrols to give earliest possible warnings of fire outbreaks, should be developed in the areas frequently affected by fire. Some fire preventing techniques would include water spray from helicopters, three-meter wide fires lanes etc.

4) Protection of forest from diseases: Insects and diseases must also be fought by regular inspection of forests, spraying insecticides and some protective measures to prevent the spread of pests.

5) Use of substitutes: As far as possible make use of substitutes for the forest products and adopt methods like Reduce, reuse and recycle. For eg- replace wooden furniture with steel or plastic furniture. Rubber or good quality plastic can be substituted for wood product wherever possible.

6) Increase logging tax: Logging tax should be raised by the government, which will reduce the growing demand of the timber. The government should set license fees high enough to discourage logging.

7) Promoting agro-forestry and social forestry: Agro-forestry means planting of trees along the fencing of farms or in-between crops in the farm i.e. growing tree along with agriculture. This will lead to prevent in soil erosion. Agro-forestry is quite successful in states of Haryana, Punjab and Uttar Pradesh. Social forestry means involving farmers and public in forestry.

8) Public awareness: People should be made aware of the importance of forest resources in human life and ill effects of deforestation. With the help of seminars, workshops, advertisements etc. awareness needs to be created. This can further lead to management of valuable forest resources.

III) Energy resources:

Energy is a vital component of economic development. The scale of production and utilization of energy has undergone radical changes with the development of civilization. Energy is the capacity to do work. Energy occurs in various forms and can be converted from one form to another, but the total energy in any energy conversion on process always remain constant that is energy can be neither created nor destroyed.

Problems associated with energy resources

1) Energy crisis- The term energy crisis generally refers to shortage of energy supply. Depleting stock of energy resources however is not the only reason for the shortage. The concept of energy crisis is concerned with politics of energy supply especially the increase in oil prices leading to shortage of energy. The industrialized countries recover quickly from this problem, but the under developed countries are still facing problem.

2) High rate of consumption of energy resources- Rising standard of living, huge growth of secondary and tertiary activities and enlargement of transport sector has resulted into high rate of consumption of energy resources in developed and developing countries of the world. Excess demand for energy results into rising prices of oil, coal and natural gas.

3) More use of non-renewable energy resources- Almost 90% of the world's current energy supply is based on fossils or mineral resources, oil, gas and uranium. Only 10% comes from renewable sources especially hydropower and biomass while the share of solar and wind energy is less than 1%. This is due to lack of financial investment in the development of renewable energy sources.

4) Unfavorable government policies- Energy crisis occurs due to government actions like tax hikes, nationalization of energy companies and regulation of energy sector. The crisis can develop due to industrial actions like union organized strikes.

5) Shortage due to accidents and wars- Pipeline failures and other accidents may cause minor interruptions to energy supplies. A crisis could possibly happen after infrastructure damage from severe weather or attacks by terrorists.

6) Wastage of energy- During the process of transmission of energy resources loss of energy takes place due to inefficient technology, improper plant location and poor maintenance of pipelines. In day to day life carelessness attitude of human beings about switching off fan, tube and electronic appliances after use also waste energy resources.

7) Other problems- The cause may be over-consumption, aging infrastructure etc. that restrict fuel supply. An emergency may emerge during very cold winters due to increased consumption of energy.

Measure for conservation/ Management/ Solution/ of energy resources:

1) Energy Audit- Energy audit is an official scientific study of energy consumption at regional, organization or plant level with aim of reduction in energy cost and consumption without affecting productivity and comforts and suggesting the methods for energy conservation and reduction in energy costs. Energy audit should be done in every sector of economy.

2) More use of renewable energy: The non-renewable resources are irretrievable, so it is necessary to substitute their use by renewable resources as far as possible. For eg- use of hydro-electricity, wherever possible must be given preference to thermal electricity because the source of energy is running water and not coal or oil

3) Formulate energy strategy- In each country, national level energy strategies should be adopted to ensure adequate and uninterrupted supply of usable energy to various consumers on both short term and long term basis. This strategy can be as follows-

- Reduce dependency on imported fuels
- Growth of renewable energy
- Conservation of fuels by substituting non-conventional energy
- Rational policies in energy pricing
- Encouraging energy conservation

4) Energy simulation- It is a software that can be used by big corporate and corporations to redesign building unit and reduce running business energy cost. Engineers, architects and designers could design to come with most energy efficient building and reduce carbon footprint.

5) Awareness on energy efficient products- Replace traditional bulbs with CFL's and LED's. They use less watts of electricity and lasts longer. If millions of people use CFL's and LED's for residential and commercial purposes, the demand for energy can go down and energy crisis can be prevented. Also, buying five star rating electronic items which consumes less amount of electricity.

6) Awareness on climate change- Both developed and developing countries should adopt a common stand on climate change. They should focus on reducing greenhouse gas emissions through effective mechanism. With current population growth and over consumption of resources, the consequences of global warming and climate change cannot be ruled out. Both developed and developing countries must focus on emissions cuts by half by 2050.

7) Conservation at Individual level:

- Use public transport as much as possible instead of personal vehicles
- Car speed should be 50 to 60 km/hr
- Promote use of renewable energy at homes like solar cookers, solar heaters, solar cells etc.
- Replace incandescent bulbs with CFL's and LED bulbs.

RESOURCE UTILIZATION AND SUSTAINABLE DEVELOPMENT

The name sustainability is derived from the Latin word '*sustinere*' which means to hold. Sustain can also mean "maintain", "support" or "endure". The term sustainable development was first introduced in 1972 in United Nations, Stockholm Conference on Human Environment. There are many different definitions of the term sustainable development but the most widely recognized definition is:

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The following are sustainable development practices:-

1) Use of renewable energy- Energy from renewable sources is limitless, meaning we have the stability to eliminate dependence on non-renewable sources by harnessing power from renewable resources. Like using solar energy, wind energy etc. will reduce the dependency on coal, oil, natural gas etc.

2) Soil Conservation- Many farmers and gardeners are using this method as a chemical free way to reduce diseases in the soil and increase growth potential of their crops.

3) Water conservation- Water conservation is critical to sustainable development, and more and more products are available that uses less water in the home, such as showers, toilets, dishwashers and laundry systems.

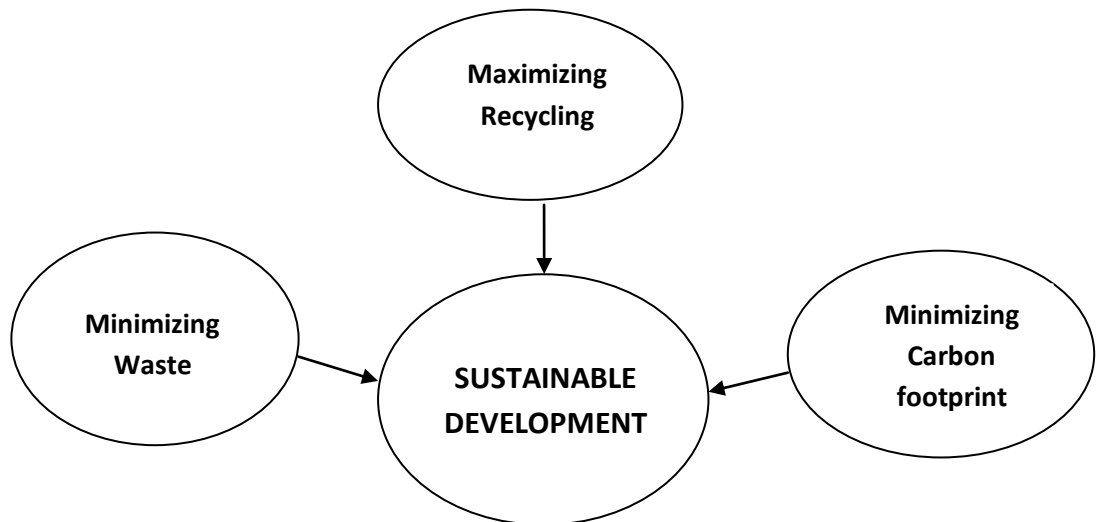
4) Substitution: Use of substitute of certain resources which are limited in nature. Dependency of limited resources should be reduced very systematically and efficiently.

The main aspects of sustainable development include:

1) Minimizing waste- The most important thing is to reduce the generation of waste. Like, unnecessary packing of products can use a lot of plastic, paper and cardboard and end up as waste in trash, instead less packing will lead to less amount of waste. Also to avoid using disposable items like cups, napkins, plates etc. which generates more waste and use metal plates, glasses etc.

2) Maximizing Recycling- Recycling is the reprocessing of unwanted materials into new, useful products. For eg- paper, plastic, glass, metals can be recycled. It is important to segregate the recyclables waste at source.

3) Minimizing Carbon footprint- This means that there is a need to minimize the carbon emissions mainly coming from man-made sources like industries, vehicles etc. Carbon dioxide emissions can be minimized by growing more number of trees, reduced deforestation, use of renewable sources of energy etc.



Act Responsible, Think Sustainable
