- Landscape features that allow salts to become mobile(movement of water table).
- Climatic trends that favors accumulation.
- Human activities such as land clearing, aquaculture activities and the salting of icy roads.

CHANGES CAUSED BY OVER GRAZING

Overgrazing occurs when plants are exposed to intensive grazing for extended periods of time, or without sufficient recovery periods. It can be caused by either livestock in poorly managed agricultural applications, or by overpopulations of native or native wild. Overgrazing reduces the usefulness, productivity, and biodiversity of the land and is one cause of desertification and erosion. Overgrazing is also seen as a cause of the spread of invasive species of non-native plants and of weeds. Overgrazing typically increases soil erosion. Reduction in soil depth, soil organic matter and soil fertility impair the land's future natural and agricultural productivity. Soil fertility can sometimes be mitigated by applying the appropriate lime and organic fertilizers. However, the loss of soil depth and organic matter takes centuries to correct. Their loss is critical in determining the soil's water-holding capacity and how well pasture plants do during dry weather.

1.7 ENERGY RESOURCES

Energy is defined by physicists as the capacity to do work. Energy is found on ourplanet in a variety of forms, some of which are immediately useful to do work, while others require a process of transformation. Energy can neither be created nor destroyed but transformed from one form to other. Energy is closely related to force. When a force causes an object to move, energy is being transferred from the force to kinetic energy. Energy is present in a number of forms such as mechanical, thermal, chemical, biological energy etc.. Energy production and utilization have become essential to carry out many activities in modern life. Energy is one of the important requirements that a country needs for its economic growth. At the same time, energy production has its impact on environment due to pollution and finally affects the quality of life of people.

GROWING ENERGY NEEDS

Energy plays a key role in the process of economic growth of a nation. The industrial development of any country is dependent on the organized development of its power resources'.

Energy is also indispensable for agriculture, transport, business and domestic requirements. In fact, electricity has such a wide range of applications in modern economic development that its per capita consumption is, to a great extent, an index of the material advancement of the country.

Energy is the capacity for doing useful work. It is an essential input for economic growth. This energy is used in the form of electrical energy, thermal energy, light, mechanical energy and chemical energy etc.

Energy is measured in joules in Si units. The annual per capita energy consumption in developed countries ranges from 5 to 11 kW whereas in the developing countries it is between 1 to 1.5 KW Only

Uses of Energy

1. Energy is a primary input in any industrial operation.

2. It is also a major input in sectors such as commerce, transport, tele-communications etc.

3. The wide range of services required in the household and industrial sectors.

4. Owing to the far-reaching changes in the forms of energy and their respective roles in supporting human activities, research and training on various aspects of energy and environment have assumed great significance.

Types of energy: There are three main types of energy;
A. **Non-renewable B. Renewable C.Nuclear energy**

A. Non – renewable energy resources

Fossil fuels: Fossil means the remains of an animal or a plant which have become hard and turned into rock. All these found in earth's crusts which have been formed in the past by the geological processes. Fossil fuels are solid coal (lignite), liquid (crude oil / petroleum) and gases (natural gas).
a)Coal***:*** Huge quantity of plant materials buried under earths crust and altered by geological process and converted into carbon rich fuel. It is a non – renewable source because it takes a very long period (million of years) for its formation.
Coal is extracted by the process of mining and involves accidents due to mine collapse, ground water pollution, accumulation of poisonous material, explosive gases etc cause diseases. CO2 pollution leads to green house effect (global warming).

b) Crude oil***:*** It is obtained in the form of liquid . The crude oil is heated up to $600^{o}C$ in the oil refinery and condense the vapours of hydro – carbons. Petrol another petroleum products are refined fuels from crude oil. Petroleum products are used in large quantities in the manufacture of detergents, plastics, fertilizers, pharmaceuticals, synthetic rubber etc.. The transport sector consumes about 40% of diesel; 25% industries and 19%household and rest 16% agriculture and other sectors. .

c) Natural Gas: Gas deposits are trapped from the sedimentary formations by means drilling holes into the rock formations. While burning of natural gas, the emission of CO2 is less and thus reduces green house effect and global warming. A total of 734 billion cubic mts of gas is estimated as proven reserves.

B. Renewable energy resources: Renewable energy systems use resources that are constantly replaced and are usually less polluting.
Examples include hydropower, solar, wind, and geothermal (energy from the heat inside the earth).
1. Solar energy: The energy which is derived from the sun is known as solar energy. It can be used for direct heating or sun's heat is converted into electricity. Photo voltaic cells convert direct solar energy into electricity.

A number of solar equipments have been developed to utilize sun rays to heat water, to cook food, to pump water and to run certain machines and used for street lighting, railway signals etc. But the major problem with solar energy is that during cloudy weather it is available in less quantity than on sunny days.

How Solar Power Works

The sun's energy can be captured to generate electricity or heat through a system of panels or mirrors.

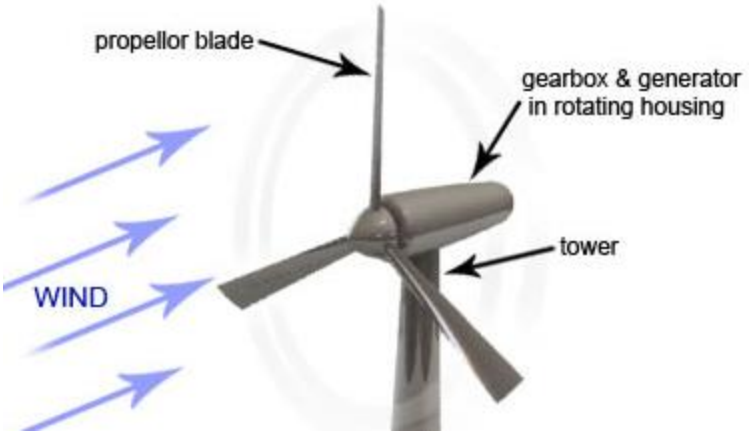
- Solar, or photovoltaic, cells convert sunlight directly into electricity. Most photovoltaic cells are made primarily of silicon, the material used in computer semiconductor chips, and arranged on rectangular panels. When sunlight hits a cell, the energy knocks electrons free of their atoms, allowing them to flow through the material. The resulting DC (direct current) electricity is then sent to a power inverter for conversion to AC (alternating current).
- Solar thermal collectors use heat-absorbing panels and a series of attached circulation tubes to heat water or buildings.
- Solar concentration systems use mirrors -- usually arranged in a series of long, parabolic troughs, a large round dish, or a circle surrounding a "power tower" -- to focus the sun's reflected rays on a heat-collecting element. The concentrated sunlight heats water or a heat-transferring fluid such as molten salt to generate steam, which is then used conventionally to spin turbines and generate electricity.
- Passive solar design is the creative use of windows, skylights and sunrooms, building site and orientation, and thermal construction materials to heat and light buildings, or to heat water, the natural way.

2. Hydro-Power energy: Electrical power is generated by hydro-electric projects in which dams are constructed across the river. The kinetic energy of water is converted into mechanical energy by means of turbines and in turn, the mechanical energy is transferred into electrical energy by generators. Hydro power projects lead to several environmental problems like destruction of animal habitats, deforestation, migration of people etc..

3. Geothermal energy: Geothermal energy found within rock formations. Inside the earth the temperature rises with depth .The temperature in earth’s crust is around 4000o C. Geysers (a natural spring that emits hot water) and hot springs are examples for geothermal energy where the steam and hot water come to the surface, in areas where the steam is tapped by drilling. The obtained steam is then used to generate power. Air pollution results in case of geothermal energy where the gases like H_2S, NH_3, CO_2 present in the steam coming out of the geothermal sources. The overall efficiency for power production is low (15%) as compared to fossil fuels (40%).

4. Wind energy: Wind energy is the kinetic energy associated with the movement of atmospheric air. Wind mills convert the wind energy into electrical energy. On an average wind mills can convert 30 – 40 % of available wind energy into electrical energy at a steady wind speed of 8.5mts / sec. The efficiency of wind mill is increased with the speed of wind and length of rotor blade.

The total wind energy potential in India’s estimate is 25,000 MW of this about6000 MW is located in Tamil Nadu; 5000 MW in Gujarat and contribute thestates of Andhra Pradesh, Maharashtra, Uttar Pradesh and Rajasthan forbalance quantity.



Merits & demerits of wind energy:

1. It is a non – polluting and environment friendly source of energy.
2. It is a renewable energy available at free of cost
3. Power generation is cheaper with nil recurring expenses.
4. Wind mills are suitable to erect at on shore, remote and rural areaswhere wind blows with required intensity.
5. Favorable in geographic locations which are away from cities.
6. Wind turbine design, manufacturing, installation is complex due tovarying atmospheric conditions.
7. Wind power doesn't suitable for large scale generation.

5. Ocean energy: Seas and oceans are large water bodies . Seas absorb solar radiation and large amounts of solar energy are stored in the tides and waves of the ocean. Ocean energy is non – polluting in nature and suitable at a few places only. Energy from seas or oceans is obtained from the following:

(1) **Ocean Thermal Energy Conversion**: The oceans collect and store huge quantities of solar on the surface of the water while the temperature of deepwater is very low. Using this temperature difference it is possible to convert heat into electricity.
(2) **Tidal energy:** Tidal waves of the sea can be used to turn turbine and generate electricity. Asia's first tidal power plant of 800 - 1000 MW capacity is proposed to be set up at Kandla in Gulf of Kutch.

6. Bio mass energy: Bio-mass is an organic material from living beings or its residues. It is a renewable source of energy derived from the waste of various human and natural activities. The bio-mass energy sources include Wood, animal manure, sugarcane waste, agriculture crops, house hold waste, roots of plants, garbage etc. The simplest way of using bio-mass energy sources is to allow them to dry out in the sun and burn them.

7. Bio-gas: Bio-gas is a sustainable source of energy by virtue of its production from available natural organic wastes of cattle dung, human excreta, poultry waste, plant leaves, paddy husk etc…. Bio-gas is amixture of methane (68%), CO_2 (31%) and N_2 (1%). Methane gas (CH_4) is produced by bio-gas plants and this gas is utilized as cooking gas whose calorific value varies from 4400 – 6200 Kilo Calories / cum. Heat value of biogas can be improved by reducing its

CO_2 content.Bio-gas production is carried out in an enclosed bio-gas plant made of bricks or steel. Aslurry of waste organic matter is fed into the plant through an inlet and gas formed is tapped by an inverted drum. As gas is produced the drum rises and the gas may be drawn through an outlet.Bio-gas is commonly produced from cattle dung in a bio gas plant known as Gobar Gas plant. Bio-gas is a clean, cheap fuel that can be used for lighting purpose, lifting water through small pumps.

C.Nuclear Energy or Atomic power: It is the energy which is trapped inside the atom. It is non–renewable source of energy which is released during fission or fusion of certain radioactive elements. The most important advantage of atomic power is the production of an enormous amount of energy from a small quantity of radioactive element. For eg: 1 kg of Uranium liberates energy equivalent to 30000 kgs of coal.
Energy released during nuclear reaction (mass – energy equation as per Albert Einstein's formula E = mc2).
Nuclear Energy is produced by two processes namely (1) Nuclear Fission and (2) Nuclear Fusion.
Nuclear Fission: The nucleus in atoms is split by fast moving neutrons and in turn a tremendous amount of energy in the form of heat, light etc is released by a chain of reactions. Uranium is used as fuel. The energy released slowly in this process is utilized to generate electricity or else released suddenly all at once, results a tremendous explosion as in the case of Atom bomb.
Nuclear Fusion*:* Nuclear energy can be generated by fusion process which involves two hydrogen atoms combine to produce one helium atom.
Eg: hydrogen bomb. The disposal of nuclear wastes during mining, fuel production and reactor operation for a long time period resulting in adverse effects on environment. Disposable of nuclear waste is a national and global problem.

USE OF ALTERNATIVE ENERGY SOURCES

Alternative energy is any energy source that is an alternative to fossil fuel. These alternatives are intended to address concerns about such fossil fuels.

The nature of what constitutes an alternative energy source has changed considerably over time, as have controversies regarding energy use. Today, because of the variety of energy choices and differing goals of their advocates, defining some energy types as "alternative" is highly controversial.

In a general sense, alternative energy as it is currently conceived, is that which is produced or recovered without the undesirable consequences inherent in fossil fuel use, particularly high carbon dioxide emissions, an important factor in global warming. Sometimes, this less comprehensive meaning of "alternative energy" excludes nuclear energy

- Solar energy is the generation of electricity from the sun. It is split up into two types, thermal and electric energy. These two subgroups mean that they heat up homes and generate electricity respectively.
- Wind energy is the generation of electricity from the wind.
- Geothermal energy is using hot water or steam from the Earth's interior for heating buildings or electricity generation.

- Biofuel and Ethanol are plant-derived substitutes of gasoline for powering vehicles.
- Nuclear binding energy uses nuclear fission to create energy.
- Hydrogen is used as clean fuel for spaceships, and some cars

CASE STUDIES

• In 1981, a plane called 'The Solar Challenger 'flew from Paris to England in 5hours, 20minutes. It had 16,000 solar cells glued to the wings and tail of the plane and they produced enough power to drive a small electric motor and propeller. Since 1987, every three years there is a World Solar challenge for solar operated vehicles in Australia where the vehicles cover 3000 kms.

• The world's first solar-powered hospitals in Mali in Africa. Being situated at the edge of the Sahara desert, Mali receives a large amount of sunlight. Panel's of solar cells supply the power needed to run vital equipment and keep medical supplies cool in refrigerators.

• In recent years, the popularity of building integrated photovoltaic's (BIPV's) has grown considerably. In this application, PV devices are designed as part of building materials (i.e. roofs and siding) both to produce electricity and reduce costs by replacing the costs of normal construction materials. There are more than 3, 000 BIPV systems in Germany and Japan has a program that will build 70,000BIPV buildings.

1.8 LAND RESOURCES

Land as a resource: Landforms such as hills, valleys, plains, river basins and wetlands include different resource generating areas that the people living in them depend on. Many traditional farming societies had ways of preserving areas from which they used resources. If land is utilized carefully it can be considered a renewable resource. The roots of trees and grasses bind the soil. If forests are depleted, or grasslands overgrazed, the land becomes unproductive and wasteland is formed. Intensive irrigation leads to water logging and salinization, on which crops cannot grow. Land is also converted into a non-renewable resource when highly toxic industrial and nuclear wastes are dumped on it. Land on earth is as finite as any of our other natural resources. While mankind has learnt to adapt his lifestyle to various ecosystems world over, he cannot live comfortably for instance on polar ice caps, on under the sea, or in space in the foreseeable future.

LAND DEGRADATION AND CONTROL OF LAND DEGRADATION

Land degradation can be defined as any change in the land that alter its conditions or reduces its quality. Land degradation occurs due to both natural disasters like volcanic eruptions, earthquakes, heavy rains, fire etc or human induced activities. The other causes of land degradation consist of wind blow, salinity of water, water logging, soil acidity, loss of flora and fauna.

Desertification is land degradation occurring in the arid, semi-arid regions of the world. These dry lands cover about 40% of the earth's surface and puts at risk more than 1 billion people who are dependent on these lands for survival.

Land clearing and deforestation; Mining activity in forest areas; urban conversion; bringing more land under cultivation; soil pollution ; loss of organic matter in the soils; alkalinization of soils; salinity of water etc leads to land degradation. Severe land degradation affects in decreasing the mineral wealth and economic development of nations.

The methods that are followed for the prevention of land degradation are called soil conservation methods. Some of the popular methods are;

(a) **Contour farming**: The land is prepared with alternate furrows (a long narrow cut in the Ground) and ridges at the same level. The water is caught and held in furrows and stores which reduces run off and erosion.

(b) **Mulching**: Stems of maize, cotton, tobacco etc are used as a mulch (decay of leaves) to reduce soil moisture, evaporation.

(c) **Crop rotation**: Growing same crop year after year depletes the nutrients and land becomes Unproductive. This is overcome by changing the crops and cultivating legumes (plants like peas, beans) after a regular crop.

(d) **Strip cropping**: It consists of planting crops in rows or strips along contours to check flow of water.

LANDSLIDES AND MAN INDUCED LAND SLIDES

Landslides always exist on this planet and the term land slide is used to describe a wide variety of process that result a downward movement of rocks under gravitational forces. In other words, mass movement of rocks, debris and soil down a slope of land.

Landslides are primarily associated with steep slopes. Surface run-off and changes in drainage also cause for landslides. Landslides can also be initiated by rainfall; earthquakes; volcanic activity, changes in groundwater movement or any combination these factors.

Debris-flows can travel down a hillside of speeds up to 200 miles per hour (more commonly, 30 – 50 miles per hour) depending on the slope angle, water content, and type of earth and debris in the flow.

While landslides are a naturally occurring environmental hazard they have recently increased in frequency in certain areas due to human activities.

Building excavations collapses in mining (e.g.: coal mine) causes landslides. However, landslides can be triggered by the human beings by induced changes in the environment.

Simply landslides can be explained in three ways:

(a) Inherent of rocks (weakness in the structure of a rock)

(b) Due to heavy seismic or volcanic activity and

(c) Due to various environmental conditions.

SOIL EROSION AND CAUSES FOR SOIL EROSION

The top layer of the earth is called as soil. Soil erosion occurs due to deforestation, overgrazing, industrialization; desertification etc.

a. Deforestation: Mining, industrial, urban development etc causes deforestation and leads to exposure of the land to wind and rains causing soil erosion. Cutting trees leads to deforestation which in turn loss of organic matter in the soils.

b. Overgrazing: When sufficient amount of grass is available for the organisms usually the entire land /area may be subjected to exhaust and the land is exposed without grass and ultimately the land expose to wind/rain causing soil erosion. .

c. Industrialization: Different processes carried out by industries and mining operations cause soil pollution which leads to degradation of land

DESERTIFICATION:

Desertification is the process which turns productive into non- productive desert as a result of poor land-management. Desertification occurs mainly in semi-arid areas (average annual rainfall less than 600 mm) bordering on deserts. In the Sahel, (the semi-arid area south of the Sahara Desert), for example, the desert moved 100 km southwards between 1950 and 1975.

CAUSES OF DESERTIFICATION

* Overgrazing is the major cause of desertification worldwide. Plants of semi-arid areas are adapted to being eaten by sparsely scattered, large, grazing mammals which move in response to the patchy rainfall common to these regions. Early human pastoralists living in semi-arid areas copied this natural system. They moved their small groups of domestic animals in response to food and water availability. Such regular stock movement prevented overgrazing of the fragile plant cover.

* Cultivation of marginal lands, i.e lands on which there is a high risk of crop failure and a very low economic return, for example, some parts of South Africa where maize is grown.

* Destruction of vegetation in arid regions, often for fuelwood.

* Poor grazing management after accidental burning of semi-arid vegetation.

* Incorrect irrigation practices in arid areas can cause salinization, (the buildup of salts in the soil) which can prevent plant growth.

When the practices described above coincide with drought, the rate of desertification increases dramatically.

Increasing human population and poverty contribute to desertification as poor people may be forced to overuse their environment in the short term, without the ability to plan for the long term effects of their actions. Where livestock has a social importance beyond food, people might be reluctant to reduce their stock numbers.

EFFECTS OF DESERTIFICATION

Desertification reduces the ability of land to support life, affecting wild species, domestic animals, agricultural crops and people. The reduction in plant cover that accompanies desertification leads to accelerated soil erosion by wind and water. South Africa losing approximately 300-400 million tonnes of topsoil every year. As vegetation cover and soil layer are reduced, rain drop impact and run-off increases.

Water is lost off the land instead of soaking into the soil to provide moisture for plants. Even long-lived plants that would normally survive droughts die. A reduction in plant cover also results in a reduction in the quantity of humus and plant nutrients in the soil, and plant production drops further. As protective plant cover disappears, floods become more frequent and more severe. Desertification is self-reinforcing, i.e. once the process has started, and conditions are set for continual deterioration.

1.8.1 ROLE OF AN INDIVIDUALCONSERVATION OF NATURAL RESOURCES

Different natural resources like forests, water, soil, food, mineral and energy resources play a vital role in the development of a nation. With our small individual efforts we can together help in conserving our natural resources to a large extent. Following are the ways:

a) Conserve Water:

1. Don't keep water taps running while brushing, shaving, washing or bathing.
2. In washing machines fill the machine only to the level required for your clothes.
3. Install water saving toilets that use not more than 6 liters per flush.
4. Check for water leaks in pipes and toilets and repair them promptly.
5. Reuse the soapy water of washing from clothes for gardening, driveways etc.
6. Water the plants and the lawns in the evening when evaporation losses are minimum. Never water the plants in mid-day.
7. Install a system to capture rain water.

b) Conserve energy:

1. Turn off lights fans and other appliances when not in use.
2. Obtain as much heat as possible from natural sources. Dry the clothes in sun instead of direr if possible.
3. Use solar cooker for cooking which will be more nutritious and will save your LPG Expenses.
4. Build your house with provision for sunspace which will keep your house warmer and will provide more light.
5. Drive less, make fewer trips and use public transportations whenever possible.Share a car-pool if possible.
6. Control the use of A.C.
7. Recycle and reuse glass, metals and papers.
8. Use bicycle or just walk down small distances instead of using vehicle.

Protect the Soil:

1. Grow different types of ornamental plants, herbs and trees in your garden. Grow grass in the open areas which will bind the soil and prevent its erosion.
2. Make compost from your kitchen waste and use it for your kitchen-garden.
3. Do not irrigate the plants using a strong flow of water as it would wash off the soil.
4. Better use sprinkling irrigation.

Promote Sustainable Agriculture:

1. Do not waste food; Take as much as you can eat.
2. Reduce the use of pesticides.
3. Fertilize your crop with organic fertilizers.
4. Use drip irrigation.
5. Eat local and seasonal vegetables.
6. Control pest