

UNIT -1

NATURAL RESOURCES

- Life on this planet earth depends upon a variety of goods and services provided by the nature, these are known as natural resources.
- Any stock (or) reserve that can be drawn from nature is known as natural resources.
- Air, water, soil, minerals, coal, forests, crops and wild life are the examples of Natural resources.
- Natural resources are of two kinds –based on their existence. (i.e)
 - ❖ RENEWABLE RESOURCES –which are inexhaustible and can be regenerated with a specific time. E.g:- forests, wild life, wind energy, biomass energy etc.
 - ❖ NON RENEWABLE RESOURCES-which are exhaustible and may not be regenerated or it takes some million years to replenish. E.g:-fossil fuels, minerals.
- Even our renewable resources can become non-renewable, if we exploit them to such extent that their rate of consumption exceeds their rate of regeneration.

FOREST RESOURCES.

- Forests are one of the most important natural resources on this earth, covering the earth like a green blanket.
- About one third of the world's land area is forested.
- Total forest area of the world in 1900 was estimated to be 7,000 million ha, which was reduced to 2,890 million ha in 1975 and fall down to 2,300 million ha by 2000.
- Deforestation rate is relatively less in the temperate countries, but it is very alarming in the tropical countries.

Uses of forests

Commercial uses	Ecological uses
Forests provide us a large no. of commercial goods like –Timber, pulpwood, fuel wood fruits, honey, spices, fodder, rubber, gum, drugs, medicines, minerals, nuts, fiber, raw materials for industries etc.	Regulates water cycle, Produces oxygen, absorbs pollutants, reduce global warming, habitat for wild life, conservation of soil, protects wild life, prevents flash floods, provides shelter for tribal's.

Over exploitation of Forests:-

- Forests have been exploited since early times to meet the human demands like
- To get the raw materials like timber, pulpwood, and fuel wood etc.
- Deforestation to construct roads.
- clearing of forests to create more agricultural lands
- To construct hydro power projects.
- Live stocks grazing on a grass land or pasture areas.
- Mining activities etc.

Over grazing:-

- Over grazing removes the vegetal cover over the soil and soil gets compacted, causing erosion.
- Over grazing removes the humus content and leads to organically poor, dry, compacted soil (i.e) loose soil fertility.
- Loss of top soil reduce percolation of water into the soil
- The exposed soil gets eroded by strong wind, rain fall etc.
- Grass roots are very good binders of soil. Overgrazing in grass land leads to reduction in soil binding capacity.
- When live stock grazes upon the pastures heavily, the root stocks which carry the reserve food for regeneration get destroyed.
- Overgrazing converts the good quality pasture land to an ecosystem with poor quality thorny vegetation.
- Coastal Western Ghats and North-east India is facing the over-grazing problem.

Deforestation

- Clearing of the forests to create more agriculture land for building industries, for constructing roads, for constructing dams, for mining leads to desertification.

Causes of Deforestation:-

Shifting cultivation:-

- This is the method followed by the tribal communities, in which small forests area is cleared and burnt. Crops are successfully grown in this area for few years. After they left this area and go in search of new area.
- Due to this annually 5 lakh ha of forests area are in degradation.
- In India, this practice in north- east and to some extent in A.P, Bihar and M.P. clearing half of the forest area annually.

Overgrazing:-

- Overgrazing leads to loss of top soil and soil fertility.(refer the previous page)

Raw materials for industrial use:

- Wood for making boxes, furniture, railway sleepers, ply wood, match boxes, pulp for making paper etc have exerted tremendous pressure on forests.
- Ply wood is in great demand for packing tea for tea industry of Assam while fir wood is exploited greatly for packing apples in J & K.

Development projects:-

- Massive destruction of forests occurs for various development projects like hydro electric projects, big dams, road construction, mining etc.

Growing food needs:-

- To meet the demands of rapidly growing population, agricultural lands and settlements are created by clearing forests.

Mining:-

- Mining operations for extracting minerals and fossil fuels like coal often involves vast forest areas.
- More than 80,000ha of land is presently under the stress.
- Large scale de-forestation has reported in Mussorie and Dehradun valley (40km).
- Indiscriminate mining in forests of Goa has destroyed more than 50,000 ha forest land.
- Mining of magnesite and soap-stones has destroyed 14 ha in the hill slopes at Khirakot, Kosi valley, Almora.
- Mining of Radio-active minerals in Kerala, Tamil Nadu and Karnataka posing similar threats.

Consequences of Deforestation:-

- Threats the existence of many wild life species.
- Bio-diversity is lost.
- Hydrological cycle gets affected.
- Problems of soil erosion and loss of soil fertility increases.
- More carbon is added to atmosphere and global warming is disturbed.
- In hilly areas it often leads to landslides.
- Reduction in oxygen.

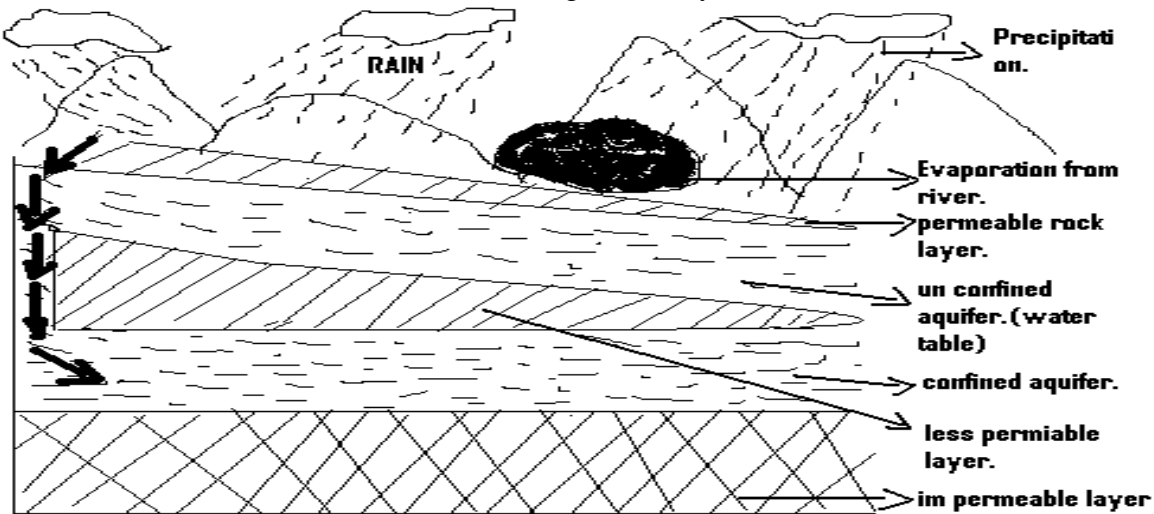
WATER RESOURCES

- Water is an indispensable natural resource on this earth on which life depends.
- Water covers 70% of the earth's surface, but only 35 of this are fresh water. Of which 25% is as polar ice caps and only 15 is usable water in rivers, lakes and sub soil aquifers. (Only 0.0035 is readily available to us in the form of ground water).
- On a global average 70% of water withdraws is used for agriculture. India uses 90% of its water for agriculture, 7% for industry and 3% for domestic use.
- Human beings depend on water for almost every developmental activity.

- Over use of ground water for drinking, irrigation and domestic purpose has resulted in rapid depletion of ground water in various regions leading to lowering of water table.
- Pollution of the ground aquifers has made many of the wells unfit for consumption.
- It is estimated that 2024, two-third of the world population would suffer from acute water shortage.

Ground water:-

- About 9.86% of total fresh water resources are in the form of ground water.
- A layer of sediment rock that is highly permeable and contains water is called aquifer.
- Aquifer may be of two types' i.e un-confined aquifer & un-confined aquifer.
- Un- confined aquifers which are sandwiched between two permeable layers of the rock and are recharged only in these areas where the aquifer intersects the land surface.
- Ground water is not static, it moves, though at a very slow rate.



Effects of ground water:-

- When ground water withdrawal is more than its recharge rate, the sediments in the aquifer get compacted, a phenomenon known as ground subsidence. This causes a huge damage to the sinking of overlying land surface.
- Mining of ground water is done extensively in the arid and semi arid areas. This causes a sharp decline in the future production due to water lowering of water table.
- When excessive irrigation is done with brackish water it raises the water table gradually leading to water logging and salinity problems.

Water rich vs. water poor countries.

Water rich countries are ice land, Guyana, New Guinea, Canada, Norway, Panama & Brazil.

Water poor countries are Kuwait, Egypt, United Arab Emirates, Jordan, Saudi Arabia, Singapore, Israel.

Floods:-

- In some countries like India & Bangladesh rainfall does not occur throughout the year, 90% of it is concentrated into a few months (June-sep).
- Heavy rain fall often causes floods in the low-lying coastal areas.
- Prolonged downpour can also causes the over-flowing of lakes and rivers resulting in to floods.
- Deforestation in the Himalayas causes floods that year after year, damaged crops and destroy homes in the Ganges and its tributaries.
- During floods tons of valuable soil is lost to the sea.
- Severe floods from excessive Himalayan runoff and storms in 1970, about one million people were drowned while 1, 40,000 people died in 1991.

Drought:-

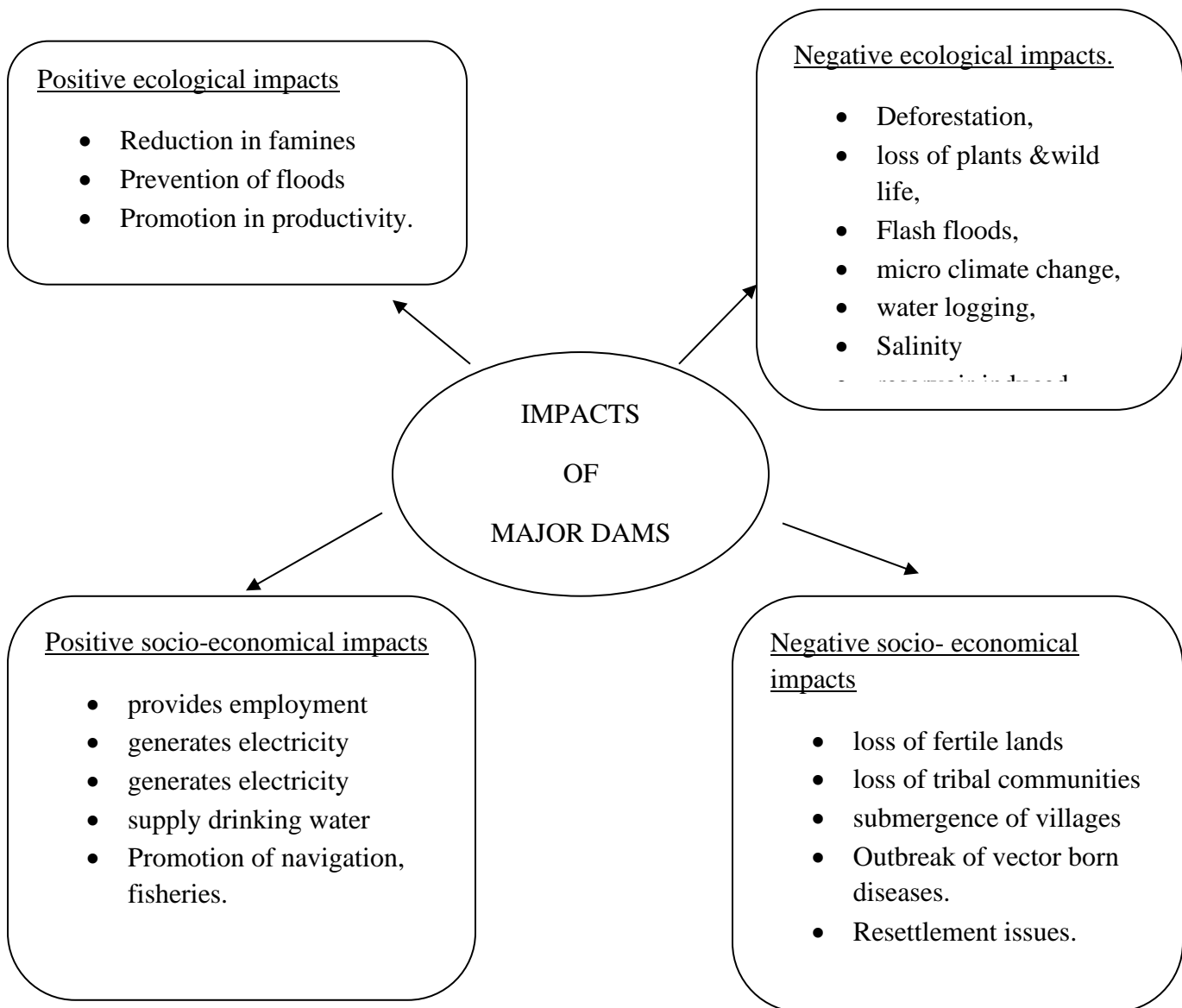
- There are about 80 countries in the world, lying in the arid and semi arid regions that experience frequent spells of drought.
- When annual rainfall is below normal and less than evaporation, drought conditions are created.
- Over grazing, deforestation, mining etc are causes for drought.
- Erroneous and intensive crop pattern and increased exploitation of water resources through wells or canals to get high productivity has converted drought-prone areas in to decertified ones.
- In Maharashtra there has been no recovery from drought for last 30 yrs.

Sustainable water Management:-

- “Save water” campaigns are essential to make people aware of dangers of water scarcity.
- Building several small reservoirs instead of mega projects.
- Treating and recycling municipal wastes water for irrigation.
- Preventing leakage from dams.
- Carefully selected mixed cropping.
- Pricing water at its real value makes people use it more responsibly and effective to fight against this drought problems (by making bunds)

BIG DAMS -BENEFITS AND PROBLEMS

Big dams are often regarded as a symbol of national development. However there are several issues and problems related to these.



- Big dams and river valley projects have multi-purpose uses and have been referred as "Temples of modern India". However those are responsible for the destruction of vast areas of forest.
- India has more than 1550 large dams. The highest one is Tehri dam. On river Bhagirathi in Uttarakhand and the largest in terms of capacity is Bhakra dam on the river Sutlej in Himachal Pradesh.
- The crusade against the ecological damage and deforestation caused due to Tehri dam was laid by Sh. Sunderlal Bahuguna, the leader of Chipko movement.
- Likewise the cause of Sardar Sarovar dam related issues has been taken up by environmental activists Medhapatkar, Arundhati Roy and Baba Amte.
- Sardar Sarovar dam is situated on river Narmada and is spread over three states of Gujarat, Maharashtra, and Madhya Pradesh.

- A total of 1, 44,731 ha of land is submerged by this dam, out of which 56,547 ha is forest land.
- A total of 573 villages are submerged by the Narmada Dam.
- This dam has displaced thousands of tribal folk, whose lives and livelihoods were linked to the river, the forest and agricultural lands.

MINERAL RESOURCES

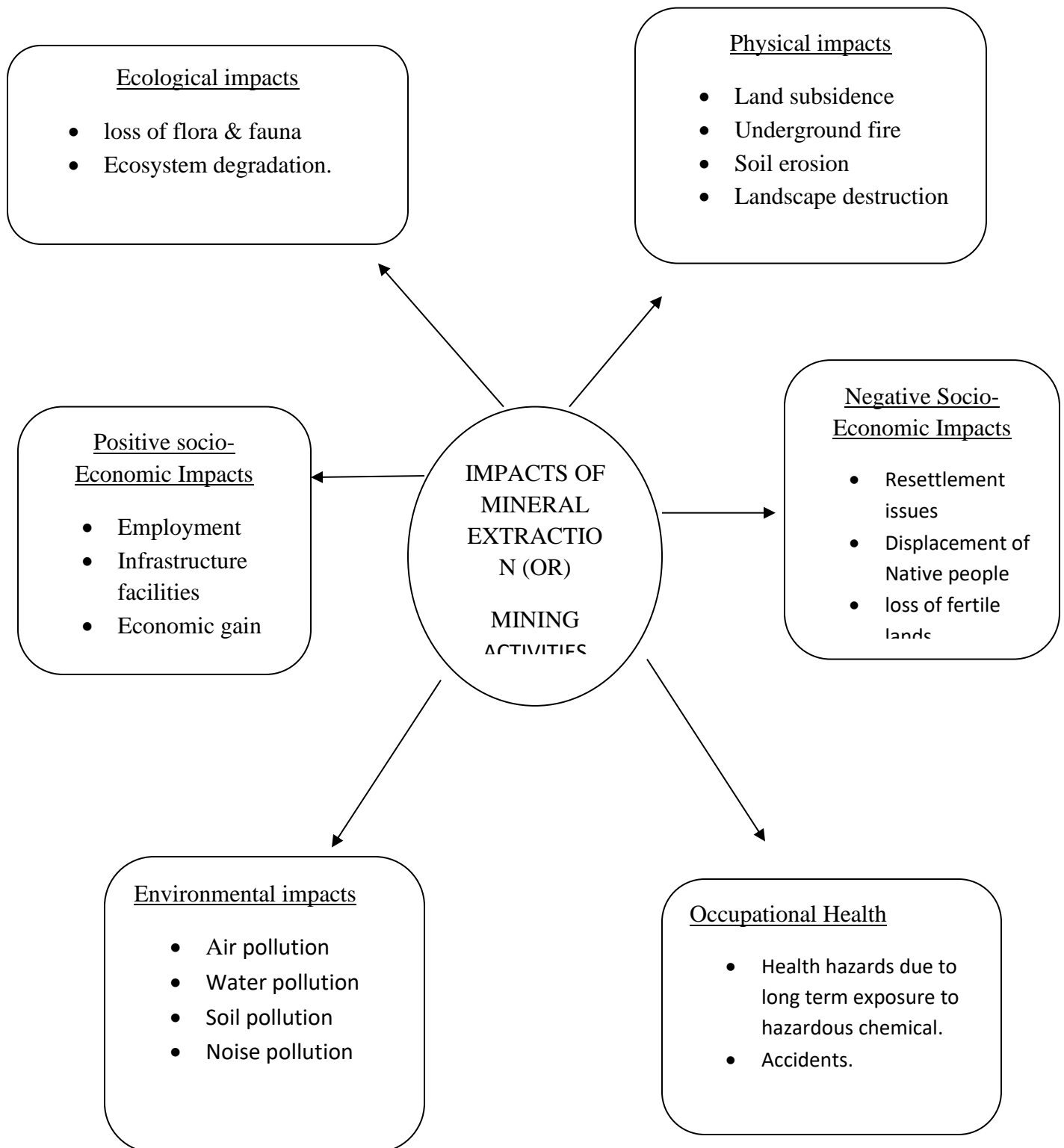
- Minerals are naturally occurring, inorganic, crystalline solids having definite chemical composition and characteristic properties.
- Minerals are formed over a period of millions of years in Earth's crust.
- Aluminum, zinc, Manganese, copper – Raw materials for industries.
- Coal, clay, cement, silica - non-metallic minerals.
- Granite, marble, lime stone, quartz, feldspar-stone minerals.
- Diamond, Emeralds and rubies – special property minerals.

Uses of Minerals:-

- Development of industrial plants
- Generation of energy
- Construction, housing, settlements
- Defense equipments
- Transportation means
- Communication – wires, cables, electronic devices
- Medicinal system
- As fertilizers in agriculture
- Ornamental use

Some Major Minerals of India:-

- Coal and lignite:- west Bengal, Jharkhand, Orissa, M.P, A.P
- Uranium:- Jharkhand, A.P(Nellore, Nalgonda), Rajasthan
- Aluminum: - Jharkhand, W.B., Maharashtra, M.P., T.N.
- Iron: - Jharkhand, Orissa, M.P., A.P, T.N, Karnataka, Goa, Maharashtra.
- Copper:- Rajasthan, Bihar, Jharkhand, M.P., W.B., A.P.,



Conflicts:-

- India is the producer of 84 minerals, the annual value of which is about 50000 crore. Six major mines which are causing several problems are :
- Jaduguda uranium mine-Jharkhand
- Jharia coal mine – Jharkhand
- Sukinda chromite mine – Orissa
- Kudremukh iron mine – Karnataka
- East coast bauxite mine – Orissa
- North –East coal fields – Assam
- Mining operations in Sariska Tiger Reserve in Aravalli ranges has left many areas permanently infertile & barren.
- The precious wildlife is under serious threat.
- This reserve is very rich in wildlife and has enormous mineral reserves.
- Supreme court on December 31st 1991 has given a Judgment that all mining activity within the park be stopped (Tarun Bharat Sangh NGO litigation).
- More than 400 mines were shut immediately. But, still illegal mining is in progress,. (May6, 2002 Supreme Court ordered to ban the illegal mining).
- About 200 open cast mining and quarrying centers in Udaipur. About half of which are illegal are involved in stone mining have caused many adverse impacts on environment.
- Uranium mining in Nalgonda –AP, with the pathetic condition of Jaduguda Uranium mines in Jharkhand where there is black history of massive deaths and devastation has outraged the public, who do not want it to be repeated in Nalgonda. The fate of the proposed mining is yet to be decided. (It is 10 km from Nagarjun Sagar and 4km from Akkampalli reservoir a new source of drinking water to Hyderabad.)

Remedial Measures:-

- In order to minimize the adverse impacts of mining it is desirable to adopt eco-friendly mining technology.
- The low-grade ores can be better utilized by using Microbial leaching technique.
- The bacterium Thiobacillus ferrooxidans has been successfully and economically used for extracting gold embedded in iron sulphide etc.

FOOD-RESOURCES

- We have thousands of edible plants and animals, of which only three dozen types constitute the major food of humans.
- The main food resources include wheat, rice, maize, potato, barley, oats sweet potato, sugarcane, pulses, sorghum, millets etc.

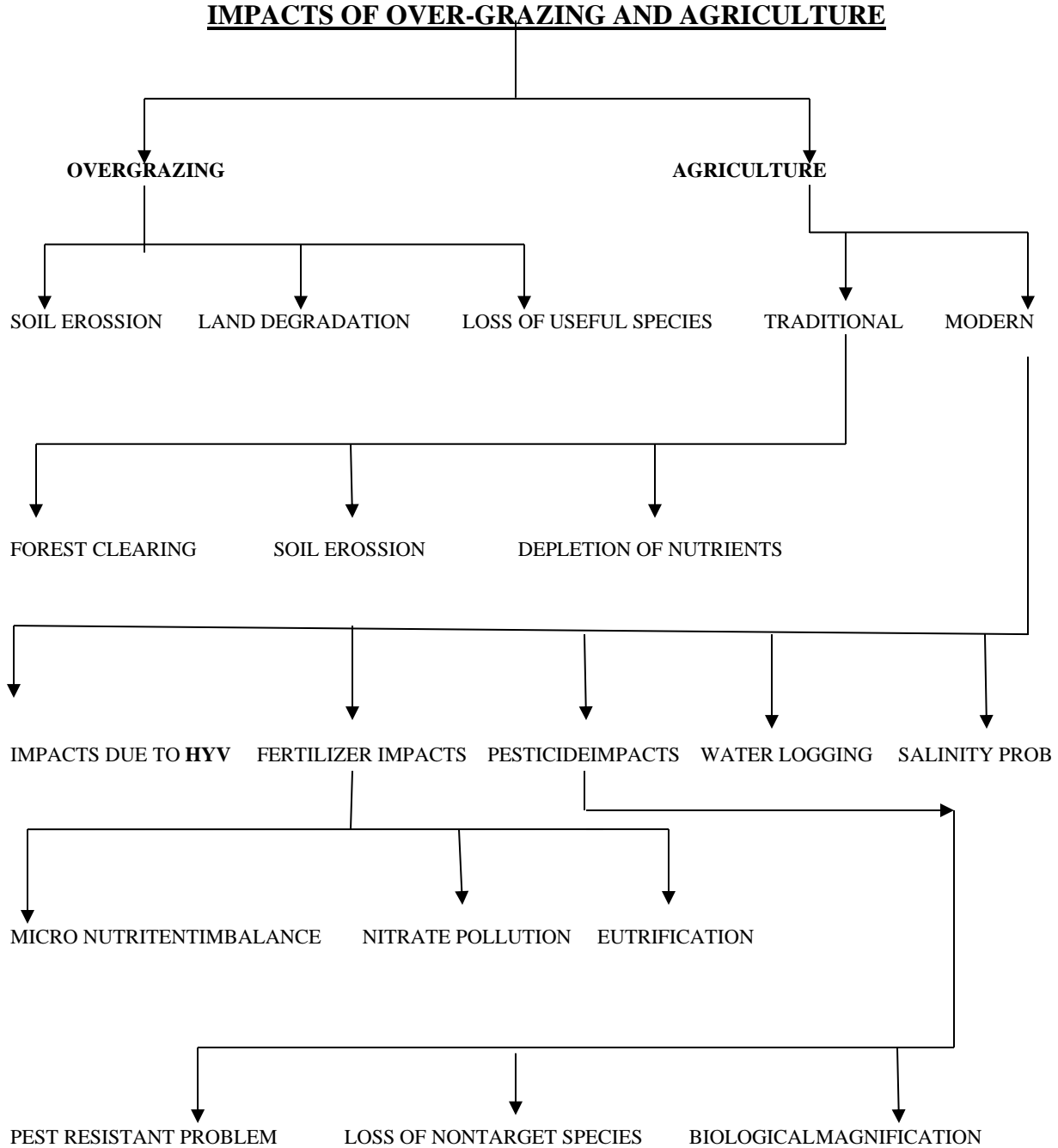
- The Food and Agriculture Organization (FAO) of United Nations estimated that average caloric intake on a global scale is 2500 calories per day.
- Besides the minimum caloric intake are also need, proteins minerals etc. Deficiency or lack of nutrition often leads to malnutrition resulting in several diseases.

IMPACTS OF MALNUTRITION

DEFICIENCY	HEALTH EFFECTS	NO.OFCASES	DEATH PER YEAR(in million)
Proteins & calories	Kwashiorkor & marasmus	750-1million	15-20
Iron	Anemia	350	0.75-1
Iodine	Goitre, cretinism	150million,6million	-
Vitamin A	Blindness	6million	-

World food problems:-

- During the last 50 years world grain production has increased almost three times.
- But at the same time population growth increased at such a rate in less developed countries (LDC's) that outstripped food production.
- Every year 40 million people (50% of which are young children) die of under nourishment and malnutrition.
- Although India is the third largest producer of staple food, an estimated 300 million Indians are still under nourished.



Overgrazing Impacts:-

- Land degradation-Due to overgrazing the humus content of the soil decreases and overgrazing leads to organically poor, dry, compacted soils.
- Soil erosion – Overgrazing removes the vegetal cover of the soil. The soil becomes exposed and gets eroded by the action of wind and water currents.

- Loss of useful species - Overgrazing adversely effects the composition of plant population and their regeneration capacity. Some livestock keep on overgrazing on the same species also. –
- As a result of overgrazing vast areas in AP. And Meghalaya are getting invaded by thorny bushes, weeds etc.
- Traditional Agriculture impacts:-Deforestation – the slash and burn of trees in forests for shifting cultivation results in loss of forests.
- Soil erosion – cleaning of forest cover exposes the soil to wind and rain, there by resulting in loss of top fertile soil.
- Depletion of nutrients – During slash and burn the organic matter in the soil gets destroyed and most of the nutrients are taken up by the crops within a short period of time, thus making the soil nutrients poor.

Modern Agriculture impacts:-

- HYV: – The uses of high yielding varieties encourage monoculture. In case of an attack by some pathogen, there is total devastation of the crop by the disease.
- Fertilizer related impact:-
 - Most of the chemical fertilizers used in modern agriculture are N,P,K. Excess use of these fertilizers to boost up the crop causes micronutrient imbalance.
 - Nitrogenous fertilizers applied in the field leach deep in to the soil and contaminate ground water. Excess concentration of nitrogen i.e. >25 mg per liter causes serious health hazards like ‘Blue Baby Syndrome” or “Methaemoglobinemia”.
 - A large portion of N& P used fields is washed off and reach the water bodies causing over nourishment of lakes, a process known as “Eutrophication”. due to these lakes get invaded by algal blooms. These are often toxic and badly affect the food chain. Very soon the water gets depleted of dissolved oxygen. Thus affects aquatic fauna. Thus due to excessive use of fertilizers the lake ecosystem gets degraded.
- Pesticide related problem:-
 - Pest resistance problem – some individuals of pest survive usually even after pesticide spray. The survivors give rise to highly resistant generations called “Super pests,”
 - Loss of non-target organisms:- Many of the insecticides not only kill the target organisms, but also the non/targeted species.
 - Many pesticides are non-degradable and accumulate in food chain, a process called biological – magnification, which is very harmful.
 - Water logging: – over irrigation of crops for good growth leads to water – logging. Excess accumulation of water forms a continuous column with water

table. This depletes soil-air. Due to this the roots of plants do not get adequate air for respiration, which results in fall of yielding.

- Salinity problem:-
 - Canal water or ground water contains dissolved salts. Excessive irrigation with these waters causes salinity problem. Under dry conditions the water evaporated leaving behind salts in upper soil profile. This causes stunted plant growth and lowers crop yield. Thousands of ha of land area in Haryana and Punjab are affected by soil salinity and alkalinity.

Energy resources

Growing energy needs:-

- Development in different sectors relies largely upon energy.
- Agriculture, industry, mining, transportation, lighting, cooling and heating in buildings all need energy.
- With the demands of growing population the world is facing further energy deficit.
- In developed countries like U.S.A and Canada an average person consumes 300 GJ per year.
- By contrast, an average man in a poor country like Bhutan, Nepal or Ethiopia consumes less than 1 GJ per year.
- This clearly shows that our life-style and standard of living are closely related to energy needs.

Renewable and Non-Renewable energy sources:-

- Life on earth depends upon a large number of things and services provided by nature, which are known as energy resources.
- Energy Resources are of two kinds.
 - ❖ **Renewable resources:** which are inexhaustible and can be regenerated within a given span of time eg. Forests, wildlife, wind energy, biomass energy etc. Solar energy is also a renewable form of energy as it is an inexhaustible source of energy.
 - ❖ **Non-renewable resources** which cannot be regenerated eg. Fossil fuels like coal, petroleum etc. Once we exhaust these reserves, the same cannot be replenished.

Renewable energy resources:-

Solar energy:

- Sun releases enormous quantity of energy in the form of heat and light.
- The solar energy received by the near earth space is approximately 1.4 kJ/s/m^2 known as solar constant.
- Now we have several techniques for harnessing solar energy.
- Solar heat collectors, solar cells, solar cooker, solar water heater, solar furnace and solar power plant are some important solar energy harvesting devices.

Wind Energy:

- The high speed winds have a lot of energy in them as kinetic energy due to their motion.
- Wind energy is very useful as it does not cause any air pollution.
- After the installation cost, the wind energy is very cheap.

Hydro power:

- The water flowing in a river is collected by constructing a big dam where the water is stored and allowed to fall from a height.
- The blades of turbine located at the bottom of the dam move with the fast moving water which in turn rotates the generator and produces electricity.
- Hydro power does not cause any pollution.
- Hydro power projects help in controlling floods, used for irrigation, navigation etc.

Tidal energy:

- Ocean tides produced by gravitational forces of sun and moon contain enormous amounts of energy.
- The tidal energy is harnessed by constructing a tidal barrage.
- During high tide, the water flows into the reservoir of the barrage and turns the turbine, which in turn produces electricity by rotating the generators.
- During low tide, when the sea-level is low, the sea water stored in the barrage reservoir flows out into the sea and again turns the turbines.

Ocean thermal energy (OTE):

- The energy available due to the difference in the temperature of water at the surface of the tropical oceans and at deeper levels is called OTE.
- This energy is used to boil liquid like ammonia.
- The high pressure vapours of the liquid formed by boiling are then used to turn the turbine of a generator and produce electricity.

Geothermal energy:

- The energy harnessed from hot rocks present inside the earth is called geothermal energy.
- Sometimes the steam or boiling water underneath the earth does not find any place to come out.
- We can drill a hole up to the hot rocks and by putting a pipe in it make the steam or hot water gush out through the pipe at high pressure which turns the turbine of a generator to produce electricity.

Biomass energy:

- Biomass is the organic matter produced by the plants or animals which include wood, crop, residues, cattle dung agricultural wastes etc.
- The burning of biogas cause air pollution and produce a lot of ash.
- It is therefore more useful to convert biomass into biogas or bio fuels.

Biogas:

- Biogas is a mixture of methane, carbon dioxide, hydrogen and hydrogen sulphide.
- Biogas is produced by anaerobic degradation of animal wastes in the presence of water.
- Anaerobic degradation means break down of organic matter by bacteria in the absence of oxygen.
- Biogas has many advantages. It is clean, non-polluting and cheap.
- There is direct supply of gas from the plant and there is no storage problem

Bio fuels:

- Biomass can be fermented to alcohols like ethanol and methanol which can be used as fuels.
- Gasohol is common fuel in Brazil and Zimbabwe for running cars and buses.

- Methanol is very useful since it burns at a lower temperature than gasoline or diesel.
- Due to its high calorific value, hydrogen can serve as an excellent fuel.
- Moreover it is non-polluting and can be easily produced.
- Presently H₂ is used in the form of liquid hydrogen as a fuel in spaceships

Non -Renewable energy resources:

Coal:

- Coal was formed 255-250 million years ago in the hot, damp regions of the earth during the carboniferous age.
- The ancient plants along the banks of rivers were buried after death into the soil and due to the heat and pressures gradually got converted into peat and coal over million years of time.
- When coal burnt it produces carbon dioxide, which is a green house gas responsible for causing enhanced global warming.

Petroleum:

- It is the life line of global economy.
- Petroleum is a cleaner fuel as compared to coal as it burns completely and leaves no residue.
- It is also easy to transport and use.
- Crude petroleum is a complex mixture of alkane hydrocarbons.
- Hence it has to be refined by the process of fractional distillation, during which we get large variety of products namely, petroleum gas, kerosene, petrol, diesel, fuel oil, lubricating oil, paraffin wax etc.
- The petroleum gas is easily converted to liquid form under pressure as LPG.

Natural gas:

- It is mainly composed of methane with small amounts of propane and ethane.
- It is used as a domestic and industrial fuel in thermal power plants for generating electricity.
- It is used as a source of hydrogen gas in fertilizer industry and as a source of carbon in tier in

Nuclear energy:

- Nuclear energy is known for its high destructive power.
- Nuclear energy can be generated by two types of reactions:
 - ❖ *Nuclear fission:* It is the nuclear reaction in which heavy isotopes are split into lighter nuclei on bombardment by neutrons. Fission reaction of U²³⁵ is given below.
$${}^{92}\text{U}^{235} + {}^0_1\text{n} \rightarrow {}^{36}\text{Kr}^{92} + {}^{56}\text{Ba}^{141} + 3 {}^0_1\text{n} + \text{energy}$$
 - ❖ *Nuclear fusion:* Here two isotopes of a light element are forced together at extremely high temperatures (1 billion °C) until they fuse to form a heavier nucleus releasing enormous amount of energy in the process.
$$1\text{H}^2 + 1\text{H}^2 \rightarrow 3\text{He}^2 + {}^0_1\text{n} + \text{energy}$$
- Nuclear energy has tremendous potential but any leakage from the reactor may cause devastating nuclear pollution. Disposal of the nuclear waste is also a big problem.

Land Resources

- We depend upon land for our food, fibre, and fuel wood.
- About 200-1000 years are needed for the formation of one inch or 2.5 cm soil, depending upon the climate and the soil type.
- But, when rate of erosion is faster than rate of renewal, then the soil becomes a non-renewable resource

Land degradation:

- With increasing population growth the demands for land for producing food, fibre and fuel wood is also increasing.
- Hence there is more and more pressure on limited land resources which are getting degraded due to over-exploitation.
- 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.

Man induced landslides

- Various anthropogenic activities like hydroelectric projects, large dams, reservoirs, construction of roads and railway lines, construction of buildings, mining etc are responsible for clearing of large forested areas.
- Earlier there were few reports of landslides between Rishikesh and Byasi on Badrinath Highway area. But, after the highway was constructed, 15 landslides occurred in a single year.
- During the construction of roads, mining activities etc. huge portions of fragile mountainous areas are cut or destroyed by dynamite and thrown into adjacent valleys and streams.
- These land masses weaken the already fragile mountain slopes and lead to landslides.
- They also increase the turbidity of various nearby streams, thereby reducing their productivity.

Soil erosion:

- Soil erosion is defined as the movement of soil components, especially surface litter and top soil from one place to another.
- Soil erosion results in the loss of fertility because it is the top soil layer which is fertile.
- There are two types of agents which cause soil erosion. They are climatic agents and biotic agents
- **Climatic Agents – Water and Wind:** Water affects soil erosion in the form of rain. Water induced soil erosion is of following types:

- Sheet erosion
- Rill erosion
- Gully erosion
- Slip erosion
- Stream bank erosion

Wind erosion is responsible for the following three types of soil movements:

- Saltation
- Suspension
- Surface creep

Biotic Agents:

- Excessive grazing, mining, and deforestation are the major biotic agents responsible for soil erosion.
- Deforestation without reforestation, overgrazing by cattle, surface mining without land reclamation, irrigation techniques that lead to salt build-up, water logged soil, make the top soil vulnerable to erosion

Soil conservation practices:

- In order to prevent soil erosion and conserve the soil the following practices are employed.

Conventional till farming:

- In traditional method the soil is broken up and smoothed to make a planting surface.
- Conservational till farming, popularly known as no-till-farming causes minimum disturbance to the top soil.
- Here special tillers break up and loosen the subsurface soil without turning over the top soil.
- The tilting machines make slits in the soil and inject seeds, fertilizers, and little water in the slit, so that crop grows successfully.

Contour farming:

- On gentle slopes, crops are grown in rows across, rather up and down also known as contour farming.
- It helps to hold soil and slow down loss of soil through run-off water.

Terracing:

- Still steeper slopes are converted into a series of broad terraces which run across the contour.
- Terracing retains water for crops at all levels and cuts down soil erosion.

Strip cropping:

- Here strips of crops are alternated with strips of soil saving crops like grasses or grass-legume mixture.
- Whatever run-off comes from the cropped soil is retained by the strip of cover-crop and this reduces soil erosion.

Alley cropping:

- It is a form of inter-cropping in which crops are planted between rows of trees or shrubs. This is also called Agro forestry.
- Even when the crop is harvested, the soil is not fallow because trees and shrubs still remain on the soil holding the soil particles and prevent soil erosion.

Desertification:

- Desertification is characterized by loss of vegetal cover,
- Desertification leads to the conversion of irrigated croplands to desert like conditions in which agricultural productivity falls..

Causes of Desertification:

- The major man made activities responsible for desertification are as follows.
 - Deforestation
 - Overgrazing
 - Mining and quarrying