4. Natural Resources

4.1 Water

4.2 Forest

4.3 Food

4.4 Land

4.5 Minerals

4.6 Sustainable use of natural resources

Man depends upon a large number of goods and services provided by nature. The water, air, soil, minerals, coal are abiotic resources. Forest resources , crops, wildlife and marine flora and fauna are all examples of biotic resources. Any material which is required or used to sustain life or livelihood is termed as a resource. Natural resources are defined as a form of energy and/or matter which is essential for the functioning of organisms, populations and ecosystems.

Natural resources can be classified into two categories: (i) Renewable resources (ii) Non-renewable resources.

i. **Renewable resources:** These are the resources that are replenished by the environment over relatively short period of time. These floral and faunal resources are able to increase through reproduction and utilization of simple substances. Example: Plants regenerate through biogeochemical cycles and photosynthesis.

ii. **Non-renewable resources:** These are the resources that are not easily replenished by the environment. These are available in limited amounts, which cannot be increased. Example: Coal, petroleum, minerals, natural gas.

- Solar energy, geothermal energy are considered perpetual resources.

Non-renewable resources can be further divided into two categories:

i. **Recyclable:** These are non-renewable resources, which can be collected after they are used and can be reused and recycled. These are mainly the mineral resources, which occur in the earth's crust and deposits. Eg. Iron metal items which can be recycled after use.

ii. **Non- recyclable:** These are non renewable resources, which cannot be recycled in any way. Example: Fossil fuels and uranium, which provide 90% of our energy requirement.

4.1 Water as a natural resource

Without water there would be no life on the earth. Fresh water is the main resource on earth without it there would be no plants or animals. Human beings require water not only to drink but also to grow crop, operate industries and to provide hydro electric energy. Water is an indispensable natural resource on this earth on which all life depends. About 97% of the earth's surface is covered by water and most of the animals and plants have 60-65% water in their bodies.

Distribution of water resources on Earth's water:

Sources of water	% of Total
Ocean	97.3
Ice	2.22
Ground water	0.5
Inland water	0.2
Soil moisture	0.005
Rivers	0.001
Atmospheric water vapour	0.001

Freshwater makes up a very small fraction of all water on the planet. Nearly 71% of the earth is covered by water only 2.5% of it is fresh water. The rest is saline water in the oceans. Only 1% of freshwater is available as much of it is trapped in glaciers and the Artic and Antartic circles.

Due to these unique properties water has of multiple use for all living organisms. Water is absolutely essential for life. Most of the life processes takes place in the tissue fluids in flora and fauna. Uptake of nutrients, their distribution in the body, regulation of temperature and removal of wastes are all maintained through water.

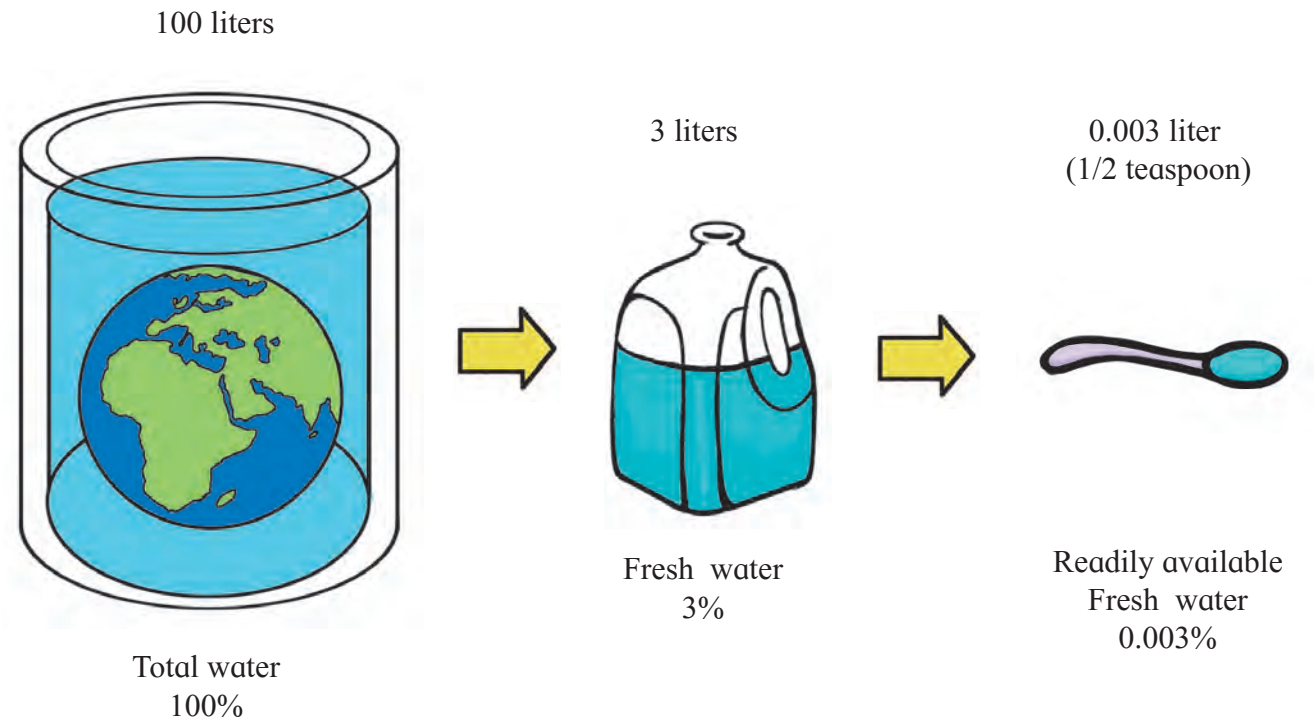


Figure 4.1 : Only a tiny fraction of the world's water supply is available as a fresh water for human use

Classification of Water Resources

Surface water resources:

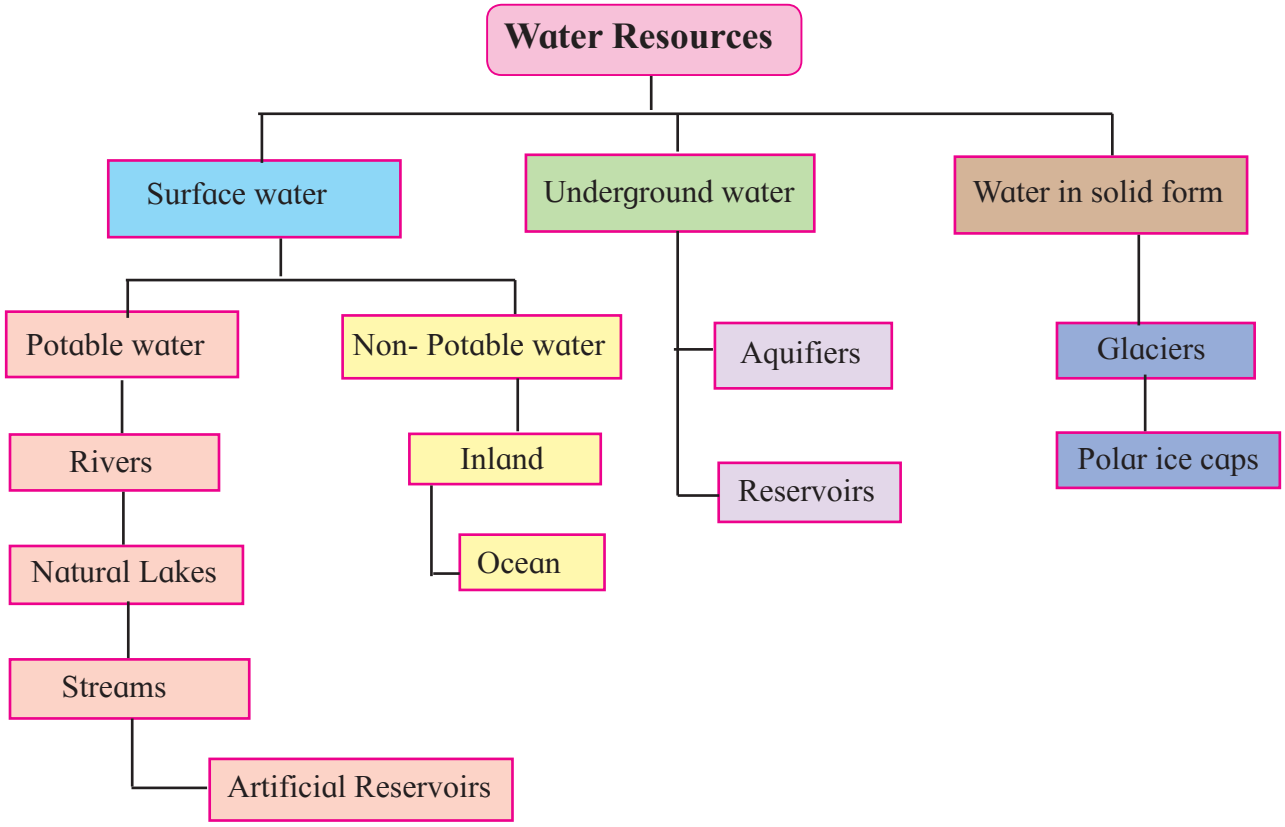
The surface water generally originates from the following:

- Precipitation in the form of snowfall and rainfall.

Underground water resources

It is the natural storage of water due to percolation of rain water through the soil. The quality of ground water is usually clean, clear and fresh as it gets filtered naturally. This water is mostly used for the agricultural purposes and domestic use.

About 9.86% of the total fresh water resources is in the form of groundwater. Overuse of groundwater for drinking, irrigation and domestic purposes has resulted in rapid depletion of groundwater levels in various regions leading to lowering of water table and drying of wells. Pollution of many groundwater aquifers has made the well water unfit for consumption. Rivers and streams are used for discharging urban , industrial and agriculture waste. Most of the civilizations have flourished on the banks of rivers, but, in turn they became sources of pollution for the rivers.



Distribution of Water Resources

Degradation of water resources:

Degradation of water is decrease in quality and quantity of water on the earth surface with increase in population and industrial growth. Water is being degraded day by day.

Reasons for degradation:-

1. To fulfill the need of increasing population surface water and ground water are overused.
2. Sewage i.e. waste water generated from domestic and municipal use, when mixed with fresh water; becomes unfit for use by human beings and animals.
3. Untreated waste water from industries percolates into ground water which is polluted.
4. Agricultural wastes containing manures, fertilizers and pesticides enter water bodies and degrade the quality of water.
5. Continuous decrease in the level of ground water occurs due over use. The movement of saline sea water into fresh water wells, causes salinity of fresh water.

Activity 1 : Water budget
How much water does your family require per day?

Purpose	Approximate requirements Lit. per day
Drinking	
Cooking	
House cleaning	
Utensils washing	
Cloths washing	
Bathing	
Sanitation	
Miscellaneous (livestock, fire)	

Approximately calculate the yearly use of water.

Do You Know?

The data of ground water levels in Maharashtra shows that around 50% area of the state ground water level has fallen in the last ten years. In districts like Yavatmal, Chandrapur, Amravati, Akola, Beed and others the fall in ground water level has been more than 4 meters.

Conservation of water: -

Conservation and management of water are essential for the survival of biosphere.

This can be done by adopting following methods:-

1. Growing vegetation in the catchment area which holds water in the soil and allows it to percolate in deeper layers and contributes to the formation of ground water.
2. Constructing small dams and reservoir to regulate supply of water to the fields.
3. Sewage should be treated and only the clean water should be released into the rivers.
4. Industrial wastes should be treated to prevent chemical and thermal pollution of fresh water.
5. Judicious use of water in our day to day life.
6. Rainwater harvesting should be done by storing rain water and recharging ground water.
7. Use drip irrigation and sprinklers.

Think about it!

What you can do for water conservation?

Activity 2 : Study the water supply in your area under following headings

1. Drinking water supply.
2. Are there water purification plants?
3. Where the waste water goes from your houses?
4. Do you pay water tax?

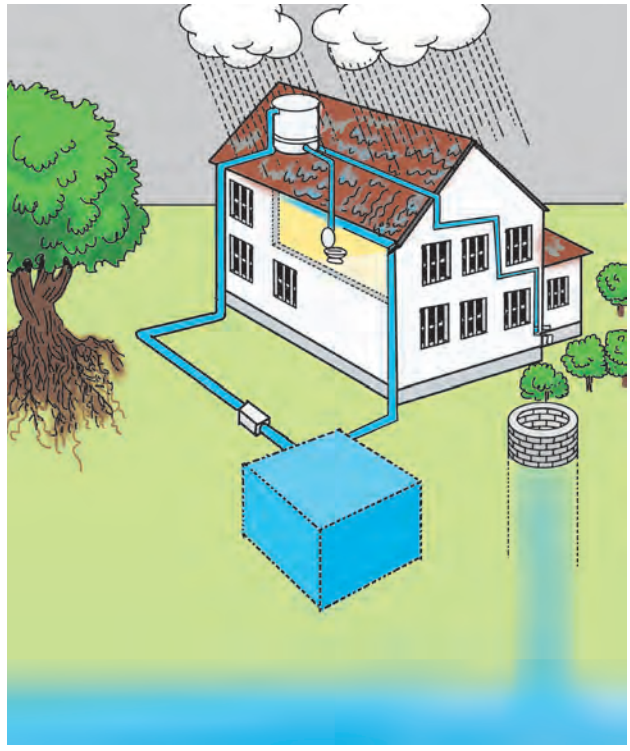


Figure 4.2 :Rain Water Harvesting

Activity 3 : Water management

Visit a watershed development programme/Rainwater harvesting unit and collect following information.

1. Process of watershed Management.
2. Economic benefits to the local people.
3. Perceptions of local people towards the project.

Case Study

Miracle of Water

Hiware Bazar a village located in the Ahmadnagar district, Maharashtra falls in rain shadow area with less than 400 mm of rainfall per annum created miracle with people's support and by using various government schemes.

In 1994, Maharashtra government brought Hiware Bazar under the Adarsh Gaon Yojana (AGY). The first work it took up was watershed management followed by planting trees on forest land; people were persuaded to stop grazing in forested areas.

The village invested all its funds on water conservation, recharging ground water and creating surface storage systems to collect rainwater. The 70-ha regenerated forest helped in recharging the wells. 414 ha of contour bunding stopped surface runoff; and around 660 water-harvesting structures collected the rainwater. The state government spent Rs. 42 lakh under Employment Guarantee Scheme (EGS) in the village to treat 1,000 ha of land.

Hiware Bazar is now reaping the benefits of its investments. "The little rainfall it receives is trapped and stored into the soil," says a villager, who worked on its watershed programme. The number of wells has increased from 97 to 217. Irrigated land has gone up from 120 ha in 1999 to 260 ha in 2006. Grass production went up from 100 tonnes in 2000 to 6,000 tonnes in 2004. Nearly 80 people go to the forest to collect grass. Residents of neighbouring village come here to collect grass. With more grass available, livestock numbers have gone up from 20 in 1998 to 340 in 2003 according to a government livestock census. Milk production rose from 150 litres per day in the mid-1990s to 4,000 litres in 2006. In 2005-06, income from agriculture was nearly Rs. 2.48 crore.

"There has been a 73 per cent reduction in poverty, due to profits from dairy and cash crops," says Sarpanch Popatrao Pawar. According to Pawar, those who earn Rs. 10,000 a year are considered below the poverty line in Hiware Bazar. This is around 3 times higher than the official poverty line of country.

Discuss and act:

Collect the information about contribution of people or orgnisation for water conservation in Maharashtra and discuss it in class.

4.2 Forest resources:

Forest is a dense growth of trees, together with other plants, covering a large area of land. Forests are important natural resources on earth. Covering the earth like a green blanket the forests not only produce innumerable material goods, but also provide several environmental services which are essential for life.

Uses of forest

1. Commercial use:

Forest provide a large number of commercial goods which include timber, firewood, pulpwood, food items, gums, resins, non-edible oils, rubber, fibers, lac, bamboo, cane, fodder, medicines, drugs and many more items. Half of the timber cut each year is used as fuel for heating and cooking. Wood is used for building material for , plywood and hardwood, particle board and chipboard and some portions are converted into pulp and used for paper industry. Many forest lands are used for mining, agriculture, grazing, tourism and recreation and for development of dams.

2. Ecological uses:

a. Production of oxygen: Trees produce oxygen by photosynthesis which is vital for life on this earth. They are called lungs of the earth.

b. Reducing global warming: The main greenhouse gas, carbon dioxide (CO_2) is absorbed by the forest as a raw material for photosynthesis. Thus, forest can act as a sink for CO_2 thereby reducing the problem of global warming caused by the greenhouse gas.

c. Wildlife habitat: Forests are the homes of millions of wild animals and plants. About 7 million species are found in the tropical forests alone.

d. Regulation of hydrological cycle: Forested watershed act like giant sponges, absorbing the rainfall, slowing down surface runoff, percolation into ground water and slowly releasing the water for recharge of springs. About 50-80% of the moisture in the air above tropical forests come from their transpiration.

e. Soil conservation: Forests bind the soil particles tightly in their roots and prevent soil erosion. They also act as windbreakers.

f. Pollution control: Forest can absorb carbon dioxide and release oxygen. This helps in keeping the air pure and clean. They have also been reported to absorb noise and thus help in preventing air and noise pollution.

Threats to forest

• Over exploitation of forests:

Humans depend on forest for food, medicine, shelter, wood and fuel. With growing civilization, the demands of raw material like timber, pulp, minerals, fuel wood etc. has increased. Large scale logging, mining, road-building and clearing of forests are major threats. Our forests contribute substantially to the local economy. Excessive use of fuel wood and charcoal has lead to forest degradation. The expansion of urban, agricultural, industrial areas leads to severe landuse and landcover changes. Overgrazing and repeated fires has lead to over exploitation of our forests.

• Deforestation:

The total forest area of the world in 1990 was estimated to be 7000 million hectares which was reduced to 2890 million hectors in 1995 and reduced to only 2300 million hectares by 2000. Deforestation rate is relatively less in temperate countries, but is alarming in tropical countries. In developing countries it can be as high as 40-50% and at the present rate it is

estimated that in the next 60 years we would lose more than 90% of our tropical forest. The forested area in India seems to have stabilized since 1982 with about 0.04% decline annually between 1982-90. The current Forest report of Govt. of India has shown that the forest and tree cover has increased by 1 % from 2017 to 2018. The total forest and tree cover is now 24.39% of the geographical area of the country.

Major causes of deforestation are:

i. **Shifting cultivation:** It is estimated that there are 300 million people living as shifting cultivators who practice slash and burn agriculture and clear more than 5 lakh hectares of forest for shifting cultivation annually. In India this practice is found in the North-East regions and to some extent in Andhra Pradesh, Bihar , Madhya Pradesh and Western Ghats which contribute to nearly half of the forest clearing annually.

ii. **Fuelwood requirements:** There is an increase in the fuel wood demand by our growing poverty stricken population.

iii. **Raw material for industrial use:** Wood for making boxes, furniture, plywood, match boxes, pulp for paper industry, etc. add tremendous pressure on forests.

iv. **Development projects:** The forests are destroyed for various developmental projects like hydroelectric projects, dams, road construction, mining, urbanization industry etc.

v. **Growing food needs:** To meet the demands of rapidly growing population, agricultural lands and settlements are created by clearing forests, irrigated and highly intensive agriculture.

vi. **Overgrazing:** Loss of tree cover and the cleared lands are turned into grazing lands. Overgrazing by the cattle lead to further degradation of these forests.

Major consequences of deforestation:

1. It threatens the existence of many wildlife species due to destruction of their natural habitat.
2. Biodiversity is lost and genetic diversity is eroded.
3. Hydrological cycle gets affected, thereby influencing rainfall.
4. Problems of soil erosion and loss of soil fertility increases.
5. In hilly areas it often leads to landslides.
6. It contributes to global warming as concentration of CO_2 increases.

4.3 Food Resources

There are thousands of edible plants and animals over the world out of which only few constitute major food for humans. The main food resources include wheat, rice, maize, potato, barley, oats, etc. About twenty common fruits and vegetables, milk, meat, fish and seafood.

Since 1950 food production from agricultural lands has increased drastically. The growth occurred because of technological advances such as use of tractors, farm machinery, inorganic chemical fertilizers, irrigation, pesticides, high yielding varieties of wheat, rice, etc. Animal products increased due to increasing poultry and dairy industry besides piggery. Fisheries and aquaculture ponds increased quantity of fish. This increase in food resource has happened because of green revolution by Dr. M.S. Swaminathan.

Today our food comes entirely from agriculture, animal husbandry and fishing activities. India is self-sufficient in food production. This is only because of modern methods of agriculture which however pollutes our environment with excessive use of fertilizers and pesticides.

Impact of modern agriculture includes

- The changes due to high yielding varieties of crops leads to loss of traditional cultivable diversity.
- Fertilizers related problems include micronutrient imbalance, nitrate pollution, eutrophication.
- Pesticide related problems include creating resistance in pests and producing new pests. It also leads to death of non-target useful organisms in nature. Biomagnification leads to loss of species at the apex of food pyramid.
- Water logging affects a number of biological and chemical processes in plants and soil and can affect crop growth in the long and short term.
- Salinity problems reduce productivity in both irrigated and non-irrigated agricultural lands throughout the world. As the water evaporates, salt accumulates at the soil surface making the land unproductive.

Food Scarcity: -

In many developing countries the production of food is unable to keep pace with rapidly expanding population. A developing country does not produce enough food or does not have the financial ability to import it. The technologies we have used to achieve high yield cause major problems such as:

1) Decrease in fertility of the soil
2) Conversion of forest, grass land, wetland into agricultural use which has led to degradation of ecosystems.
3) Reduction of fish catch.
4) Some communities such as tribals still face serious food problem leading to malnutrition.

In India, there is a shortage of cultivable productive land. Farm sizes are too small to support the family. Farmlands are being sub-divided. Poor environmental condition and agricultural practices reduce food production. Due to the over use of agricultural chemicals land degradation occurs along with decrease in nutrients. Water scarcity, salinization and water logging affects large amount of agricultural land. The loss of genetic diversity in crop plants is another issue that is reducing agricultural produce.

In India, some traditional communities in urban and semi urban areas used to grow their own vegetables in backyard using waste water from their own homes. This is not commanly done now.

Food Security:

It is estimated that 18 million people worldwide die each year due to starvation or malnutrition and many others suffer a variety of dietary deficiency. To overcome this problem we have to conserve and supply nutritious food.

Food security is only possible if food is equally distributed to all. It is important not to waste food. Another major concern is the support needed for different farmers, so that they do not migrate to urban centers as unskilled industrial workers.

Alternate food resources should be used and food production can also be increased by following intercropping patterns. Using unfamiliar crops such as **Nagali** which are grown on poor soil on hill slopes of Western Ghat. Several crops can be grown in urban settings including vegetables which can be grown on house hold waste water and fertilizers from vermicomposting.

Do you Know?

Israel's drip irrigation system: The small and arid state of Israel began using drip irrigation system, as they sufer from acute shortage of water. With this technique farmers have been able to improve the efficiency of irrigation by 95 % over a 20 year period. Israel's food production has doubled without increase in the use of water for agriculture. Israel is one of the major suppliers of food and vegetables in the world.

Case Study:

Using the purification capacity of wetlands, the Indian city Kolkata has pioneered a system of sewage disposal. 8000 hectar of East Kolkata wetlands are declared as Ramsar Site. A patchwork of tree fringed canals, vegetable plots, rice paddies and fish ponds is used by the 20 thousand people that work there daily and transform 1/3rd of the city's sewage and most of its domestic refuse in to a rich harvest of fish and fresh vegetables.

4.4 Land as a Resource:

Land is a very valuable resource that provides food, fiber, medicine, wood and other biological materials needed for mankind. Land is a resource generating area on which people depend. If land is utilized carefully, it can be considered a renewable resource.

Land is a finite and valuable resource upon which we depend for our food, fiber and fuel wood.

Land degradation:-

Because of increasing of population growth the demands for arable land for producing food and fuel wood is increasing. Hence there is more and more pressure on the limited land resources which are getting degraded due to over-exploitation. Soil erosion, water logging, salinization and contamination of the soil with industrial waste like fly-ash, press mud or heavy metals which cause degradation of land.

Main causes of land degradation Deforestation, excessive use of fertilizers and pesticides , overgrazing, salinization, water logging, desertification, soil erosion, wastelands and landslides.

1. **Soil erosion -** The removal of top fertile layer of soil by wind and water is called soil erosion. Characteristics of different natural ecosystems depend on the type of the soil. The misuse of various ecosystem leads to the loss of valuable soil.
2. **Causes of Soil Erosion -** Poor farming methods, over grazing and deforestation, are responsible for soil erosion.

Mining and soil erosion

Mining exploration is detrimental to the environment and causes soil erosion. The main types of soil erosion in the mining areas is due to water erosion and wind erosion. Water causes soil erosion in the rainy season which extends from June to September. Most soil loss in these areas is associated with water erosion. Wind erosion, accompanied by sand storms takes place in the dry season that normally extends from January to April.

Topography and soil cover change is due to digging of open cast mines and dumping of rock mass in the form of large heaps. Due to mass deforestation in mining areas soil gets exposed to further erosion.

Even the soil which is removed and dumped elsewhere is exposed to further erosion and weathering.

In order to prevent soil erosion and conserve the soil the following conservation practices are carried out:

1. Contour farming
2. Terracing
3. Strip cropping
4. Wind breaks or shear belts

The causes of land degradation are as follows

1) If forests are depleted, the land becomes unproductive.
2) Intensive irrigation leads to water logged and salinized soil, on which crops cannot grow.
3) Land can be converted into a non-renewable resource when highly toxic industrial and nuclear wastes are dumped on it.
4) Farm land is under threat due to more and more intense utilization.
5) When soil is used more intensively for farming it gets eroded which is accelerated by wind and rain.
6) The use of more chemical fertilizers, poisons the soil and eventually the land becomes unproductive.
7) Due to urbanization and industrialization degradation of agricultural land and forest land takes place. This is a serious loss and will have unfavorable long term effects on human civilization.
8) Various anthropogenic activities like large dams, construction of roads and railway lines, unplanned urbanization, mining, etc. are responsible for landslides.
9) Desertification is a process by which the productive potential of arid or semi-arid lands fall by ten percent or more. Desertification is characterized by loss of vegetal over, depletion of groundwater, and severe soil erosion.

Case Study

Landslides and disaster

On 26 October 2013, in the state of Uttarakhand and adjoining areas received heavy rainfall, which was about 375% more than the benchmark rainfall during a normal monsoon. This caused the melting of Chorabari Glacier at the height of 3800 metres, and eruption of the Mandakini River which led to heavy floods near Kedarnath temple, Uttarakhand.

The upper Himalayan region of Himachal Pradesh and Uttarakhand are full of forests and snow-covered mountains and thus remain relatively inaccessible. Heavy rainfall for four consecutive days as well as melting snow aggravated the floods and land slides causing thousands of people to be caught unaware, resulting in huge loss of life and property.

The heavy rains resulted in large flashfloods and massive landslides. Landslides, due to the floods, damaged several houses and structures, killing those who were trapped. Entire villages and settlements such as Gaurikund were affected. The market town of Sonprayag suffered heavy damage and loss of lives. Pilgrimage centres in the region, are usually visited by thousands of devotees, who were affected by land slides. Over 70,000 people were stuck in various regions because of damaged or blocked roads .

Conservation of land resources:

Conservation of land is the process of protecting natural ecosystems and converting developed land to its natural state. As some land has only suffered minor disturbances and other area have been completely destroyed, a variety of techniques are needed to carry out eco restoration. Some of the most common techniques include preservation, restoration, remediation, and mitigation.

1. **Preservation –** Preservation of land as a natural resource by humans can be maintained in its pristine form. Under this form of land conservation, humans would no longer be able to use certain land for human use, but would be able to enjoy it for its natural beauty, which would help protect the land for many years to come.
2. **Restoration -** Another technique used in land conservation is restoration, which is the process of returning ecosystems and communities to their original natural conditions. In order to restore an ecosystem, scientists must first examine the current environmental status and do research to determine the historical background of the ecosystem. Restoration often includes planting native plants, introducing native animals, restoring streams to their natural flow and removing human infrastructure.
3. **Remediation** is the cleaning of a contaminated area using relatively mild or nondestructive methods. We can use a variety of methods for remediation, including chemical, physical, and biological methods to remove contamination. Bioremediation is a more effective method than chemical, physical remediation. Bioremediation is the use of naturally occurring or purposefully introduced organisms to break down pollutants.

Activity 4 :

Visit an agricultural farm in your area and try to find out following information.

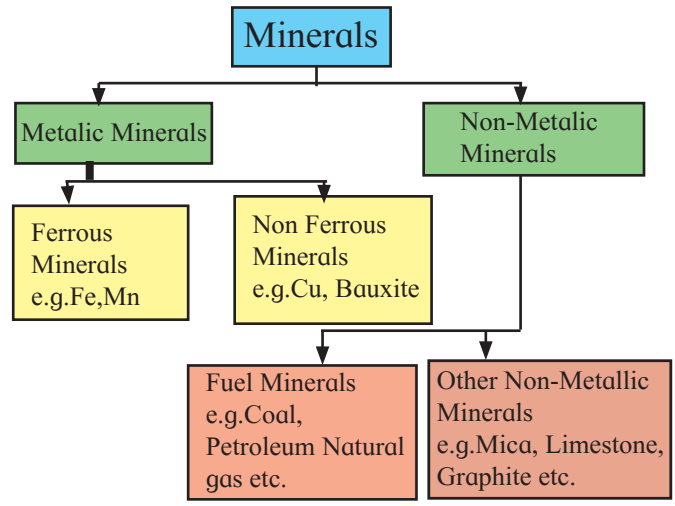
1. What are types of crops grown?
2. Which were the crops grown ten years back?
3. Has the production increased or decreased?
4. What are the problems related to agriculture in last five years?

4.5 Minerals as a natural resource

A mineral is a natural substance of organic and inorganic origin with definite chemical and physical properties. The mineral resources provide the country with necessary base for industrial development. India is endowed with a rich variety of mineral resources due to its varied geological structure.

Types of mineral Resources

On the basis of chemical and physical properties, minerals are grouped into two main categories such as metallic and non – metallic which may be further classified as follows:



A) **Metallic minerals:** Metallic minerals are the sources of metals such as iron ore, copper, gold. These are ferrous and non-

ferrous metallic minerals. All these minerals which have iron content are ferrous and which do not have iron content are non-ferrous.

B) Non-metallic minerals: Non-metallic minerals are organic in origin such as fossil fuel which are derived from buried animals and plant life such as coal and petroleum. Other types of Non-metallic minerals are inorganic in origin like mica, limestone, graphite, etc.

Minerals are exhaustible over time. Minerals take a longer period to develop geologically and they can not be replenished. There is a need to conserve and not to misuse minerals.

Both metals and non-metals mineral are used in number of industries.

Do you know:

India is a rich country of mineral resources. Reserve of some minerals are inadequate, while some minerals are available in excess amount e.g. as mica and bauxite is present in excess amount those are exported while Titanium and petroleum are in scarcity, are imported.

Availability of Minerals:

Most of the metallic minerals in India occur in Peninsular plateau region in the old crystalline rocks.

1. **Coal -** Coal is one of the important minerals used in generation of thermal power and smelting of iron ore. The deposits of coal are found in Jharkhand and Bengal belt. 97% coal is found in the valley of Damodar, Shone, Mahanadi and Godavari.
2. **Petroleum -** Crude petroleum consists of hydrocarbon in liquid and gaseous states varying in chemical composition, color, and specific gravity. It is used in internal combustion engines in automobiles. It's reserves located in sedimentary basins of Assam, Gujarat and Mumbai high and Krishna-Cauveri basins.

Degradation of Minerals:

Environmental impacts of mining activity: -

As mineral resources are essential for industrialization and the development the rate of consumption is increased and according to correct rate it will deplete in next 50 – 100 years.

Mining and processing minerals are among the most environmentally damaging of all human activities, the mineral industry accounts for 5-10% of world energy use making it a major contribute to air and water pollution also increases greenhouse effect. Mining wastes often contain hazardous substances. The overall impacts of mining observed are summarized as follows.

1) Forest are destroyed.
2) Mined land becomes unproductive.
3) Local people loose their lands.
4) Peoples are forced to migrates and are economically impoverished.
5) Rivers are polluted.
6) Air and water pollution occurs after mining.

Energy Resource:-

Mineral fuels are essential for generation of power required by urban areas, agriculture industry, transport and other sectors of the economy. Mineral fuels like coal, petroleum, natural gas and nuclear energy minerals are the conventional energy sources of energy and are non renewable resources. They will completely used up in the future.

Energy consumption of a nation is usually considered as an index of its development. This is because almost all development activities are

directly or indirectly dependent upon available energy. There are wide disparities in per capita energy use between developed and the developing nation. The very original form of energy technology was fire, which produced heat and the early man used it for cooking and heating purposes. Wind and hydropower have also been used. Invention of steam engineers replaced the burning of wood by coal was further replaced by oil. The oil producing countries put the terms for developed as well as developing countries by dictating the prices of oil and other petroleum products.

Energy resources are primarily divided into two categories namely, renewable and non-renewable sources. Renewable energy resources must be preferred over the non-renewable resources. This will seek to end energy crisis which the world is facing. It is inevitable truth that now there is an urgent need of thinking in terms of alternative source of energy, which are also termed as non-conventional energy sources which include:

1. **Solar energy:** Using solar cells, solar cooker, water heater, furnace, power plants are must.
2. **Wind energy:** It is the use of air flow through wind turbines to provide the mechanical power to turn electric generators. Wind power is an alternative to burning fossil fuels.
3. **Hydropower:** It refers to the conversion of energy from flowing water into electricity.
4. **Tidal energy:** Tidal stream generators are same as wind turbines except they are below water. The turbine and generator convert the movement of water coming from change in tide into the kinetic energy to electricity.
5. **Ocean thermal energy:** It is a process that can produce electricity by using the temperature difference between deep cold ocean water and warm tropical surface waters.
6. **Geothermal energy:** It works by tapping into steam or hot water reservoirs underground, then heat is used to drive an electrical generator.
7. **Biomass:** It can either be used directly via combustion to produce heat or indirectly after converting it to various forms of biofuel like burning .
8. **Biogas:** It is a type of biofuel that is naturally produced form the decomposition of organic waste.

Conservation of Minerals

The Mineral resources are being rapidly consumed. Recycling of metals scrap like iron, copper, aluminum, zinc, lead etc. should be encouraged and facilitated.

4.6 Sustainable use of Natural Resources:-

We should rethink our energy strategies to satisfy our needs with minimum use of energy with a environmental impacts.

There are a number of practical steps that all of us can take to help protect and improve the sustainable use of resources. Some are very small steps like putting off the lights when you go out of the room. Implementing energy audit for households or in your college/school.

We can contribute in conservation by not throwing unncessary household articles. Instead they can be reused or recycled. Walking, cycling or using public transportation, avoiding environment damaging goods or wasteful packaging are activities which are environment friendly.

Good business practice-

Businesses and large retailers are now instructed to develop environment friendly practices due to consumer pressure. We should

all become wise consumers. Lifestyle change, consumer pressure and acceptance of personal responsibility will bring out transformation of our industrial society. But without this pressure there cannot be sustainable solutions. Each one of us is responsible to bring about the change in society.

Role of an individual in conservation of Natural Resources

Different natural resources like forest, water, soil, food, mineral and energy resources play an important role in the development of a nation. With small individual efforts we can help in conserving our natural resources to a large extent. The following ways can be adopted in order to conserve resources:

Conserve water:

i. Do not keep the water taps running while brushing, shaving, washing or bathing.
ii. In washing machines, fill the machine only to the level required for your clothes.
iii. Install water saving toilets, that use no more than 6 liters per flush.
iv. Check for water leaks in pipes and toilets and repair them properly.
v. Reuse the soap water from washing of clothes for gardening, etc.
vi. Water the plants and the lawns in the morning or evening when the evaporation losses are minimum.
vii. Install a system to capture rain water.

Conserve energy:

i. Turn off the lights, fans and other appliances when not in use.
ii. Use light as much as possible from natural sources like sunlight.
iii. Dry clothes in sun instead of drier.
iv. Use solar cooker for cooking which will be more nutritious and will save the LPG expenses.
v. Build houses with provision for sun light which will keep the house warmer and will provide more light.
vi. Use bicycle or walk down instead if using vehicles
vii. Use public transportation whenever possible.
viii. Control the use of air conditioners.
ix. Recycle and reuse glass, metal and papers.

Protect the soil:

i. Grow different types of ornamental plants, herbs and trees in your garden.
ii. Grow grass in the open areas which will bind the soil and prevent erosion.
iii. Make compost from kitchen waste and use it for the garden.
iv. Do not irrigate plants using a strong flow of water as it would wash off the soil.
v. Use drip irrigation, if possible.

Promote good practices:

i. Do not waste food.
ii. Reduce the use of pesticides.
iii. Use organic fertilizers.
iv. Use drip irrigation.
v. Eat local and seasonal vegetables.
vi. Control pests by using biopesticides.

Equitable use of resources for sustainable life style:

The division in the world with more developed countries and less developed countries should be reduced. It is observed that more developed countries have only 22% of the world's population but they use 88% of the natural resources, 73% of the energy and command 85% of income, in turn they contribute to pollution. On the other hand, low developed countries have very low or moderate industrial growth and have 78% of the world's population. They use only 12% of the natural resources,

27% of energy and have only 15% of global income. The rich become more rich and the poor become poorer. The gap between these two worlds should be reduced as this is not sustainable growth. The solution to this problem is to have more equitable distribution of resources and wealth. A global consensus has to be reached for balanced distribution. There are two major causes of unsustainability:

1. Over population in poor countries.
2. Over consumption of resources by rich countries.

The rich countries will have to lower down their consumption levels. Need of the hour is fair sharing of resources between rich and poor which will bring out sustainable development for all.

Think on it!

What is your individual role in conservation of natural resource.

Exercise

Q. 1. Fill in the blank with the help of correct option.

1. Total forest cover is …….. % of the geographical area of India.

   a) 24.39% b) 27%

   c) 50% d) 75%

2. ……..is a naturally occurring substance of organic and inorganic origin with definite physical and chemical properties.

   a) Mineral b) Matter

   c) Material d) None of this.

3. The removal of top soil by wind and water is ……..

   a) Soil fertility b) Soil salinity

   c) Soil erosion d) Soil alkalinity.

4. Renewable resources are known as ……..

   a) Inexhaustible b) Both a and b

   c) Exhaustible d) None of this

Q.2. Write answer in short for the following question.

1. What are the ecological uses of forest?
2. What are the causes behind less food production and increase in food production?
3. What do you mean by ferrous and nonferrous mineral?
4. Discuss the industrial uses of minerals
5. Write a short note on food resources.
6. Explain in brief soil salinity.

Q.3. Write the answer in Long for the following questions.

1. Explain Renewable and Nonrenewable resources in detail.
2. Explain the causes of water degradation and suggest the control measures to overcome water scarcity problem
3. Explain the land degradation and suggest conservation practices for mineral resources.
4. What are the environmental impacts of mining activity? Suggest the conservation practices for mineral resources.