

ENVIRONMENTAL SCIENCE

Class-5

Topic: MINERAL RESOURCES

1. A mineral is a naturally occurring substance of definite chemical composition and identifiable physical properties.
2. An ore is a mineral or combination of minerals from which a useful substance, such as a metal, can be extracted and used to manufacture a useful product.
3. The geological processes are caused for the formation of the minerals over millions of years ago in the earth's crust. Minerals are generally localized in occurrence and the deposits are very sporadic in distribution.
4. Mineral resources are non renewable and the mineral /ore is extracted by the process of mining. Iron, aluminum, zinc, manganese and copper are important raw materials for industrial use.
5. Important non-metal resources include coal, salt, clay, cement and silica. Stone used for building material, such as granite, marble, limestone, constitute another category of minerals.
6. Minerals with special properties that humans value for their aesthetic and ornamental value are gems such as diamonds, emeralds and rubies. The luster of gold, silver and platinum is used for ornaments.
7. Minerals in the form of oil, gas and coal were formed when ancient plants and animals were converted into underground fossil fuels.

USES OF MINERALS:

Minerals are used in a large number of ways for domestic, industrial, commercial Sectors etc...

1. Generation of energy by using coal (lignite / anthracite); uranium, gold, silver, platinum, diamond are used in jewellery. Copper, aluminum etc are used as cables for transmission of power.
2. Some of the minerals are used in ayurvedam as medicine. Gold is reputed to strengthen the heart muscle and increase energy and stamina.
3. Development of industrial plants and machinery
4. Construction, housing, settlements
5. Defense equipments- weapons, settlement
6. Transportation

MINING AND ITS PROCESS:

Minerals and their ores need to be extracted from the earth's interior so that they can be used. This process is known as mining. Mining is the extraction of valuable minerals or other geological materials from the earth, from an ore body, lode, vein, (coal) seam or reef, which forms the mineralized horizon and package of economic interest to the miner.

Mining operations generally progress through four stages:

- (1) Prospecting: Searching for minerals.
- (2) Exploration: Assessing the size, shape, location,
- (3) Development: Work of preparing access to the deposit so that the minerals can be extracted from it.
- (4) Exploitation: Extracting the minerals from the mines.

TYPES OF MINING:

The method of mining has to be determined depending on whether the ore or mineral deposit is nearer the surface or deep within the earth. The topography of the region and the Physical nature of the ore deposit is studied.

Mines are of two types

1. Surface (open cut or strip mines)
2. Deep or shaft mines. (Underground Mining)

a) Surface Mining: Surface mining is used to obtain mineral ores that are close to Earth's Surface. The soil and rocks over the ore are removed by blasting. Typically, the remaining ore is drilled or blasted so that large machines can fill trucks with the broken rocks. The trucks take the rocks to factories where the ore will be separated from the rest of the rock. Surface mining includes open-pit mining, quarrying, and strip mining.

- 1) Open-pit mining creates a big pit from which the ore is mined. The size of the pit grows until it is no longer profitable to mine the remaining ore.
- 2) Strip mines are similar to pit mines, but the ore is removed in large strips.
- 3) A quarry is a type of open-pit mine that produces rocks and minerals that are used to make buildings.

b) Underground Mining: Underground mining is used for ores that are deep in Earth's surface. For deep ore deposits, it can be too expensive to remove all of the rocks above the ore. Underground mines can be very deep. The deepest gold mine in South Africa is more than 3,700 meters deep (that is more than 2 miles)! There are various methods of underground mining. These methods are more expensive than surface mining because tunnels are made in the rock so that miners and equipment can get to the ore. Underground mining is dangerous work. Fresh air and lights must also be brought in to the tunnels for the miners. Miners breathe in lots of particles and dust while they are underground. The ore is drilled, blasted, or cut away from the surrounding rock and taken out of the tunnel. Environmental effects: Mineral extraction and processing in mines involves a negative impact on environment. Much risk is involved in mining process because of high temperature, pressure Variations, fire hazards and lack of ventilation in mines.

Mining process involves removal of over burden of soil, ore extraction & transportation, crushing & grinding of ore, water treatment of ore, storage of waste material. As a result of

these activities cause air pollution, noise pollution, water pollution, loss of habitat of wildlife, concentration of toxic substances in tailing ponds and spreading of dust.

- People working in mines often suffer from serious respiratory system and skin diseases.
- Mining often causes ground subsidence which results in tilting of buildings, cracks in houses, buckling of roads, bending of rail tracks etc.
- Exploration process before a mining involves, geochemical, geophysical surveys Drilling activities which causes for air pollution, noise pollution etc...
- In addition, disturbance of all vegetation (flora) and fauna (animals) from that a region.
- Acid mine drainage (AMD), or acid rock drainage (ARD): The outflow of acidic water from (usually abandoned) metal mines or coal mines. However, other areas where the earth has been disturbed (e.g. construction sites, subdivisions, transportation corridors, etc.) may also contribute acid rock drainage to the environment

ENVIRONMENTAL IMPACTS OF MINERAL EXTRACTION

Environmental impacts of over extraction of mineral resources:

Depending on the conditions of terrain and depth of ore deposits. 2 types of mining operations are carried out.

1. Open cast mining

2. Underground mining.

- In both types each steps in mining processing produce several environmental effects such as, Deforestation takes place due to removal of vegetal covers.
- Great volume of debris has been generated which disrupt the surface and ground water circulation. It also reduces the water carrying capacity of streams very close to mining area.
- The stacking of over burden and building of soil banks creates problems of landslides.
- Under ground fire in coalmines is a hazard that is difficult to control.
- Mining and ore processing normally causes air pollution and water pollution.
- The acid water generated in coalmines can pose a serious problem of water pollution, which adversely affects the flora and fauna.
- Deeper excavation of ground causes lowering of water table, which leads to drying of wells or sea water intrusion.
- In stone quarries, blasting of rocks not only annoying the people nearby, but also cause hazard from fly rocks and dusts and damage to buildings due to vibrations.
- The disposal of waste material produced after concentrations of ore create increase concentration of heavy metals and toxic elements in the environment.

IMPACTS OF MINING:

Mining is done to extract minerals from deep deposits in soil. Environmental damages caused by mining activities are as follows:

Devegetation and defacing of lands: Mining requires removal of vegetation along with underlying soil mantle and overlying rock masses. This results in destruction of landscape in the area.

Subsidence of land: Subsidence of mining areas results in tilting of buildings, cracks in houses, buckling of roads, bending of rail tracks and leaking of gas from cracked pipe lines leading to serious disasters.

Groundwater contamination: Mining pollutes the groundwater. Sulphur, usually present as an impurity in many ores is known to get converted into sulphuric acid through microbial action, thereby making the water acidic.

Surface water pollution: The acid mine drainage often contaminates the nearby streams and lakes. The acidic water, radioactive substances like uranium, heavy metals also contaminate the water bodies and kill aquatic animals.

Air pollution: In order to separate and purify the metal from other impurities in the ore, smelting is done which emits enormous quantities of air pollutants. Oxides of sulphur, arsenic, cadmium and lead etc. shoot up in the atmosphere near the smelters and the public suffers from several health problems.

Occupational Health Hazards: Miners working in different type of mines suffer from asbestosis, silicosis, black lung disease.

Remedial measures

- Adopting eco-friendly mining technology • Utilization of low grade ores by using microbial – leaching technique. In this method, the ores are inoculated with the desired strains of bacteria like *Thiobacillus ferrooxidans*, which remove the impurities and leave the pure mineral.
- Re-vegetating mined areas with appropriate plants
- Gradual restoration of flora
- Prevention of toxic drainage discharge

MCQ

1. Explain the mining process
2. Write the over exploitation of mining resources
3. What are the types of mining process