INTRODUCTION

The word environment is derived from the French word ‘environner’ which means to ‘encircle or surround’.

Thus our environment can be defined as “the Social, Cultural and Physical conditions that surround, affect and influence the survival, growth and development of people, animals and plants”

This broad definition includes the natural world and the technological environment as well as the cultural and social contexts that shape human lives.

It includes all factors (living and nonliving) that affect an individual organism or population at any point in the life cycle; set of circumstances surrounding a particular occurrence and all the things that surrounds us.

Scope of environmental studies

Environmental studies discipline has multiple and multilevel scopes. This study is important and necessary not only for children but also for everyone. The scopes are summarized as follows:

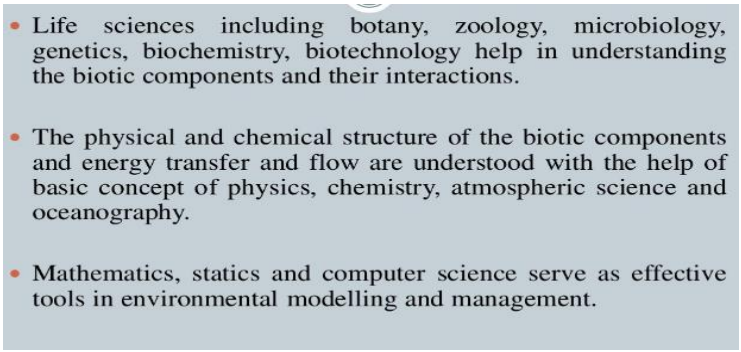
1. The study creates awareness among the people to know about various renewable and nonrenewable resources of the region. The endowment or potential, patterns of utilization and the balance of various resources available for future use in the state of a country are analysed in the study.
2. It provides the knowledge about ecological systems and cause and effect relationships.
3. It provides necessary information about biodiversity richness and the potential dangers to the species of plants, animals and microorganisms in the environment.
4. The study enables one to understand the causes and consequences due to natural and main induced disasters (flood, earthquake, landslide, cyclones etc.,) and pollutions and measures to minimize the effects.
5. It enables one to evaluate alternative responses to environmental issues before deciding an alternative course of action.
6. The study enables environmentally literate citizens (by knowing the environmental acts, rights, rules, legislations, etc.) to make appropriate judgments and decisions for the protection and improvement of the earth.
7. The study exposes the problems of over population, health, hygiene, etc. and the role of arts, science and technology in eliminating/ minimizing the evils from the society.
8. The study tries to identify and develop appropriate and indigenous eco-friendly skills and technologies to various environmental issues.
9. It teaches the citizens the need for sustainable utilization of resources as these resources are inherited from our ancestors to the younger generating without deteriorating their quality.
10. The study enables theoretical knowledge into practice and the multiple uses of environment.

Importance of Environmental studies

Environmental Issues are global: The environmental issues we talk about are not limited to a single city or a country but affect the whole global environment in a direct or indirect manner. Wind patterns, current ocean patterns, monsoon patterns, etc., are all a part of the global climate change. This requires detailed research and then finding possible solutions to these problems. These also require efforts and resources by multiple countries or the whole globe.

Reducing the gap between Rich and Poor: Wondering what the environment has to do with the rich and poor? This is because wealth depends on the resources possessed or accessible to a person. And here, we refer to the wealth of companies, countries, etc. The developed nations have more access and technology, while the underdeveloped and developing countries less so.

With the help of environmental education, there would be equal access to the technology and know-how of the environment and resources, hence helping everyone to achieve the common goal.
Sustainable Development: As we all know, sustainable development is basically about the development achieved without compromising on the needs of the future generation. It starts and goes hand in hand with environmental conservation.
Environment and ecological conservation: It is preserving the quality of nature, environment, and its components and maintaining its integrity throughout. Anthropogenic activities have caused incalculable damage to the environment. A basic environmental education gives us the knowledge of what is needed to conserve the earth and the various resources we obtain.
A Search for Alternatives: Many industries—from agriculture to the IT industry, are looking for natural or eco–friendly alternatives as products or resources. This has helped in spreading awareness and in reducing the pollution caused by hazardous substances. Severe pollution and the eco–friendly nature of the alternatives will help cutting pollution at the individual level as well.
Waste management: The rising waste in every country and the problem of its safe treatment and disposal is one of the integral parts of environment conservation and reducing pollution.
Energy efficiency: Saving energy ultimately reduces the carbon footprint, saves money, and has a positive impact on the environment.
Improvement of Communities: Local communities of people are directly dependent on the environment—forests, oceans or deserts—for their livelihood. Their habitation is of mutual benefit for the respective ecosystems as the people have traditional knowledge of the environment.
Research & Development: It is the most important component of environmental education as it forms the groundwork on which products, services, plans, for use and environment conservation will be based. It serves the dual purpose of getting a deeper knowledge of the environment, and of inventing applications thereof.



Concept of ECOSYSTEM

The term ecosystem was coined in 1935 by the Oxford ecologist Arthur Tansley to encompass the interactions among biotic and abiotic components of the environment at a given site. The living and non-living components of an ecosystem are known as biotic and abiotic components, respectively.

It is an unit that includes all the organisms, i.e., the community in a given area interacting with the physical environment so that a flow of energy leads to clearly defined trophic structure, biotic diversity and material cycles, i.e., exchange of materials between living and non-living, within the system".

We can classify ecosystems as follows:

Natural Ecosystems:

These ecosystems are capable of operating and maintaining themselves without any major interference by man.

A classification based on their habitat can further be made:

1. Terrestrial ecosystems: forest, grassland and desert.
2. Aquatic ecosystems: fresh water ecosystem, viz. pond, lake, river and marine ecosystems, viz. ocean, sea or estuary.

(b) Artificial Ecosystem:

These are maintained by man. These are manipulated by man for different purposes, e.g., croplands, artificial lakes and reservoirs, townships and cities.

Abiotic Components

Basic inorganic compounds of an organism, habitat or an area like carbon dioxide, water, nitrogen, calcium, phosphorus, etc. that are involved in the material cycles are collectively called as abiotic component. The amount of these inorganic substances present at any given time, in an ecosystem is called as the standing state or standing quality of an ecosystem.

Whereas, organic components e.g., proteins, amino acids, carbohydrates and lipids that are synthesized by the biotic counterpart of an ecosystem make the biochemical structure of the ecosystem. The physical environment, viz. climatic and weather conditions are also included in the abiotic structure of the ecosystem.

Biotic Components:

From the trophic (nutritional) point of view, an ecosystem has autotrophic (self-nourishing) and a heterotrophic (other nourishing) components:

Autotrophic component (Producers):

This component is mainly constituted by the green plants, algae and all photosynthetic organisms. Chemosynthetic bacteria, photosynthetic bacteria, algae, grasses, mosses, shrubs, herbs and trees manufacture food from simple inorganic substances by fixing energy and are therefore called as producers.

(b) Heterotrophic component (Consumers):

The members of this component cannot make their own food. They consume the matter built by the producers and are therefore called as consumers. They may be herbivores, carnivores or

omnivores. Herbivores are called as primary consumers whereas carnivores and omnivores are called as secondary consumers. Collectively we can call them as macro-consumers.

(c) Decomposers:

Heterotrophic organisms chiefly bacteria and fungi that breakdown the complex compounds of dead protoplasm, absorb some of the products and release simple substances usable by the producers are called as decomposers or reducers. Collectively we call them as micro consumers.

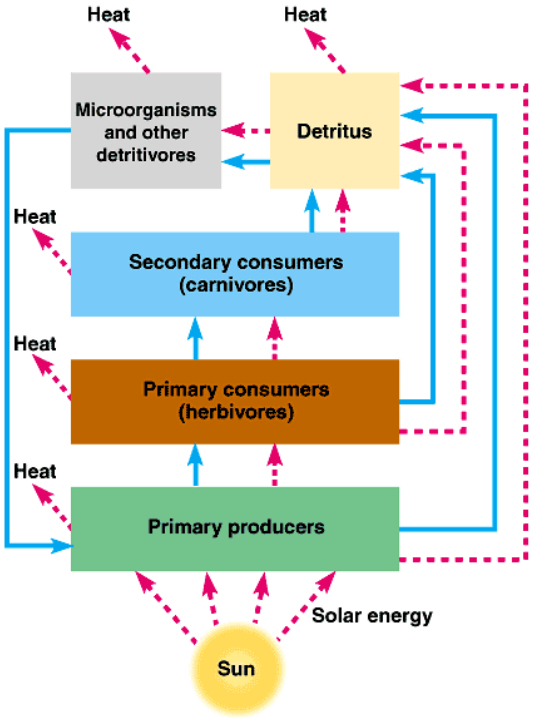
Food Chain

A food chain also represents a series of events and consumption in which food and energy are consumed from one organism in an ecosystem to another. Food chains show how energy is passed from the sun to producers, from producers to consumers, and from consumers to decomposes such as fungi. They also show how animals depend on other organisms for food

Food web

A food web is a detailed interconnecting diagram that shows the overall food relationships between organisms in a particular environment. It can be described as a "who eats whom" diagram that shows the complex feeding relationships for a particular ecosystem.

Energy flow and nutrient cycling



Living organisms can use energy in two forms radiant and fixed energy. Radiant energy is in the form of electromagnetic waves, such as light. Fixed energy is potential chemical energy bound in various organic substances which can be broken down in order to release their energy content.

Organisms that can fix radiant energy utilizing inorganic substances to produce organic molecules are called autotrophs. Organisms that cannot obtain energy from abiotic source but depend on energy-rich organic molecules synthesized by autotrophs are called heterotrophs. Those which obtain energy from living organisms are called consumers and those which obtain energy from dead organisms are called decomposers

When the light energy falls on the green surfaces of plants, a part of it is transformed into chemical energy which is stored in various organic products in the plants. When the herbivores consume plants as food and convert chemical energy accumulated in plant products into kinetic energy, degradation of energy will occur through its conversion into heat. When herbivores are consumed by carnivores of the first order (secondary consumers) further degradation will occur. Similarly, when primary carnivores are consumed by top carnivores, again energy will be degraded.

Balanced Ecosystem

It is a term used to describe the equilibrium between living organisms such as human being, plants, and animals as well as their environment. Photosynthesis that takes place in ecosystem contributes to building a good environment that stabilizes the coexistence of all organisms. Harmonious relationships reflect healthy and desirable ecological balance. Human being plays a key role to maintain ecological balance because they have the highest thinking capacity as compared to other living organisms. Sufficient food availability to all living organisms and their stability reflect the existence of ecological balance. Therefore, this balance is very important because it ensures survival, existence and stability of the environment.

Ecological balance is also important because it leads to the continuous existence of the organisms. It ensures that no particular species is exploited or overused.

For example, human activities such as farming and resources exploitation are checked to prevent excessive destruction of the forests. Deforestation leads to drought. Drought reduces food production resulting to insufficient food. Insufficient food leads to starvation and later death occurs, hence reducing the existence of some species.

Species diversity

Species diversity refers to the variety of different types of species found in a particular area. It is the biodiversity at the most basic level. It includes all the species ranging from plants to different microorganism.

No two individuals of the same species are exactly similar. For example, humans show a lot of diversity among themselves.

Genetic diversity

It refers to the variations among the genetic resources of the organisms. Every individual of a particular species differs from each other in their genetic constitution. That is why every human looks different from each other. Similarly, there are different varieties in the same species of rice, wheat, maize, barley, etc.

Ecological diversity

An ecosystem is a collection of living and non-living organisms and their interaction with each other. Ecological biodiversity refers to the variations in the plant and animal species living together and connected by food chains and food webs.

It is the diversity observed among the different ecosystems in a region. Diversity in different ecosystems like deserts, rainforests, mangroves, etc., include ecological diversity.

Ecological values of biodiversity

- Balance in ecosystem
- Biological productivity
- Regulation of climate
- Waste management
- Minimizing environmental pollution
- Nutrient cycling
- Land stabilization against erosion
- Maintaining of soil fertility

Threats to biodiversity

Habitat destruction:

- Habitat destruction has played a key role in extinctions ,especially related to tropical forest destruction.
- Deforestation and increased road-building in the Amazon Rainforest are a significant concern because of increased human encroachment upon wild areas, increased resource extraction and further threats to biodiversity.

Applications of Sustainable Development

1. Wind Energy

People have utilized the power of the wind for millennia, dating back to the first recorded windmill in Persia between 500 and 900 AD. Fast forward to the 21st century and, in many localities, energy generated by wind power has become either competitive with or less expensive than coal-generated electricity.

Wind turbines are a great solution for power generation due to their cost and the fact that they require a very small land footprint. Other land uses such as farming, conservation and recreation can happen simultaneously with wind power generation. As the price of wind power technology continues to drop and energy storage and transmission infrastructure improves, wind energy could significantly supplement or replace entire grid systems.

2. Solar Energy

From roof-top solar panels to massive solar farms that can attain the same generating capacity as a conventional power plant, it is clear that there is a renewable energy revolution happening in the world — and it is powered by the sun.

A solar farm can reduce 94% of the emissions that a coal power plant emits. It also eliminates noxious pollutants like sulphur nitrous oxides and mercury which are major contributors to the air pollution responsible for millions of premature deaths every year. Solar technology is getting cheaper and is now cost competitive or less costly than conventional power generation in many parts of the world.

According to the International Renewable Energy Agency, currently 220 million to 330 million tons of annual carbon dioxide are saved due to solar photovoltaics. With solar still making up less than 2% of the global energy mix, this shows the great potential for the growth of solar in the future.

3. Crop Rotation

Currently we produce the bulk of our food through industrial agriculture. A system which relies on large farms that monocrop and use enormous amounts of fertilizer and chemical pesticides. Industrial agriculture is immensely damaging to soils, water, air and the climate.

Crop rotation, in contrast, is defined as “the successive planting of different crops on the same land to improve soil fertility and help control insects and diseases.” This way of farming is not a new practice, but rather a more ancient way of farming chemical-free, whilst maximizing the long-term growth potential of land.

An ongoing study at Iowa State University’s Marsden Farm research centre has shown that complex crop rotation systems can outperform conventional monoculture in both yield and profitability. It is also a practice that produces a diverse range of foods, can be adapted to different local conditions, causes less erosion and stores more carbon in soils assisting with carbon sequestration.

4. Water efficient fixtures

Many countries in the world are becoming water stressed and we are beginning to understand that water is not as unlimited as we once believed. In most buildings around the world, essential water usage such as showering, washing hands and sewage conveyance is unavoidable.

However, the amount of water used for these essential services can be drastically reduced by more than 50% with the use of water-saving fittings and fixtures. Some examples of water-efficient fixtures include: low-flow taps and shower heads, dual flush toilets and toilet stops. These fixtures can be retrofitted easily and affordably into existing buildings or specified for new building projects.

5. Green Spaces

Green spaces such as parks, wetlands, lakes, forests or other eco systems are fundamental to sustainably developed urban areas. These areas are essential for cooling cities while trees produce oxygen and filter out air pollution. Well-designed green spaces also play a critical role in providing safer routes for those commuting by foot or bicycle and providing safer spaces for physical activity and recreation.According to the World Health Organisation, "recent estimates show that physical inactivity, linked to poor walkability and lack of access to recreational areas, accounts for 3.3% of global deaths." Thus having access to green spaces can improve health and well-being and even aid in the treatment of mental illness.

These examples are only a few of the many types of sustainable development that have the potential to perpetuate positive global change. The world is faced with a crossroad whereby we have the power now (and only now) to shift global development to be more sustainable before it is too late. As such, changes to regulations and incentives that govern development need to happen. This will make sustainable development, not only the best and most affordable option, but also the most obvious one to choose.

Unit 2: Natural Resources

Natural Resources

Life on this planet earth depends upon a large number of things and services provided by the nature, which are known as Natural resources. Thus water, air, soil, minerals, coal, forests, crops and wild life are all examples of natural resources.

The natural resources are of two kinds:

● Renewable resources which are in exhaustive and can be regenerated within a given span of time

E.g. forests, wildlife, wind energy, biomass energy, tidal energy, hydro power 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 e.g. Fossil fuels like coal, petroleum, minerals

Etc.Once we exhaust these reserves, the same cannot be replenished.

The major natural resources:

(1) Forest resources (2) Water resources (3) Mineral resources (4) Food resources

(5) Energy resources (6) Land resources.

FOREST RESOURCES

Forests are one of the most important natural resources on this earth. Covering the earth like a green blanket these forests not only produce innumerable material goods, but also provide several environmental services which are essential for life.

About 1/3rd of the world3s land area is forested which includes closed as well as open forests.

Significance of Forest resources

Commercial values

- Forests are main source of many commercial products such as wood, timber, pulpwood etc. About 1.5 billion people depend upon fuel wood as an energy source. Timber obtained from the forest can used to make plywood, board, doors and windows, furniture, and agriculture implements and sports goods. Timber is also a raw material for preparation of paper, rayon and film.
- Forest can provide food , fibre, edible oils and drugs.
- Forest lands are also used for agriculture and grazing.
- Forest is important source of development of dams, recreation and mining.
    - ***Timber***
      More than 1500 species of trees are commercially exploited for timber in different parts of India. It is used in timber-based industries such as plywood, saw milling, paper and pulp, and particle boards.
    - **Bamboo**
      These are common in the north-eastern and the south-western parts of India, growing along with deciduous or evergreen forest. The main commercial uses of bamboo are as timber substitutes, fodder, and raw material for basket, paper and pulp, and other small-scale industries.

- **Cane**
  Cane or rattan are the stems of a climber plant and are used for a large number of household items. It is used to make walking sticks, polo sticks, baskets, picture frames, screens, and mats.
- **Grasses**
  There are hundreds of varieties of grasses in the country that are used for a number of purposes. Lemon grass, palmrose grass, bhabbhar, and khus grass are some of them.
- **Fruit**
  Fruit trees are an important source of income and food for the rural household. In some areas fruit trees are commonly planted along the field borders and around the wells. Mango, coconut, orange, pear, jackfruit and many others grow wild in the forest.
- **Medicinal use**
  Since time immemorial humans have been depending on the forest to cure them of various ailments. Even today man is dependent on the forest for herbs and plants to fight against disease. Of all the medicinal trees found in India, the neem is the most important. Leaves, bark, and other parts of many other trees also have medicinal value and are used to make various ayurvedic medicines.
- **Fibre**
  Plant fibre has many different uses. Soft fibres such as jute are derived from the stems of the plant. Hard fibre from the leaves of hemp and sisal are used to make fabrics for various applications. Coir, another form of fibre from the fruit of the coconut, is used to make ropes.
- **Floss**
  The fruits of many species of Indian trees produce a silky floss. The most common of these is simal. It is used to made cotton wool, mattresses, and pillows.
- **Essential oils**
  Tropical grasses such as lemon grass, citronella, and khus are the source of essential oils. Oil is distilled from the wood of various species such as sandalwood, agar, and pine. Oil is also derived from the leaves of certain plants and trees such as eucalyptus, camphor, wintergreen, and pine. These oils are used for making soaps, cosmetics, incense, pharmaceuticals, and confectionery.

Ecological uses: While a typical tree produces commercial goods worth about $ 790 it provides environmental services worth nearly
$ 196, 270.
The ecological services provided by our forests may be summed up as follows:
● **Production of oxygen:** The trees produce oxygen by photo- synthesis which is so vital for life on this earth. They are rightly called as earth3s lungs.
● Reducing global warming: The main greenhouse gas car- bon dioxide (CO_2) is absorbed by the forests as a raw material for photosynthesis. Thus forest canopy acts as a sink for CO_2 thereby reducing the problem of global warming caused by greenhouse gas CO_2
● wild life habitat: Forests are the homes of millions of wild animals and plants. About 7 million species are found in the tropical forests alone.
● Regulation of hydrological cycle : Forested watersheds act like giant sponges, absorbing the rainfall, slowing down the runoff and slowly releasing the water for recharge of springs. About 70-80 %of the moisture in the air above tropical forests comes from their transpiration which helps in bringing rains.
● Soi1 Conservation: Forests bind the soil particles tightly in their roots and prevent soil erosion. They also act as wind- breaks.
● Pollution moderators: Forests can absorb many toxic gases and can help in keeping the air pure. They have also been reported to absorb noise and thus help in preventing air and noise pollution.

Deforestation

- **Deforestation**, **clearance**, **clearcutting** or **clearing** is the removal of a forest or stand of trees from land which is then converted to a non-forest use.

Major Causes of Deforestation

(¿) Shifting cn1tiration: There are an estimated 300 million people living as shifting cultivators who practice slash and burn agriculture and are supposed to clear more than 7 lakh ha of forests for shifting cultivation annually. En India, we have this practice in North- East and to some extent in Andhra Pradesh, Bihar and M.P which contribute to nearly half of the forest clearing annually.

(¿¿) Fne1 requirements: Increasing demands for fuel wood by the growing population in India alone has shooted up to 300-700 million tons in 2001 as compared to just 67 million tons during independence, thereby increasing the pressure on forests.

(¿¿¿) Raw materia1s for indnstria1 use: Wood for making boxes, furniture, railway-sleepers, plywood, match-boxes, pulp for paper in- dustryetc. have exerted tremendous pressure on forests. Plywood is in great demand for packing tea for Tea industry of Assam while fir tree wood is exploited greatly for packing apples in J&K.

(¿v) Dere1opment projects: Massive destruction of forests occur for various development projects like hydroelectric projects, big dams, road construction, mining etc.

(v) Growing food needs: En developing countries this is the main reason for deforestation. To meet the demands of rapidly growing population, agricultural lands and settlements are created permanently by clearing forests.

(v¿) Overgrazing: The poor in the tropics mainly rely on wood as a source of fuel leading to loss of tree cover and the cleared lands are turned into the grazing lands. Overgrazing by the cattle leads to further degradation of these lands.

Preventive Measures of Deforestation

Let's not lose hope; we can still protect our earth by applying possible preventive measures or solutions to deforestation –

- **Educational campaigns**

It is possible to combat deforestation through awareness. Educational campaigns can only be a good example of awareness about deforestation. Awareness helps to find out the solution to tackle deforestation.

- **Reforestation**

Reforestation is a process of planting trees in a forest land where the trees have been cut for some reasons. We all need to understand the importance of reforestation and implement it to save the environment.
Planting of trees can reduce various causes and effects of deforestation, global warming, greenhouse effect, pollution, etc.

- **Following the rules & regulations**

There should be strict rules & regulations against those who are involved in the deforestation activities in anyways. The people also need to be dedicated to following these rules & regulations because it is everyone's responsibility to save the environment.

- **Use of renewable forest resources**

We can grow trees as a source of wood from secondary growth forests. The use of sustainable local wood sources and charcoal for cooking or heating is an excellent alternative of fossil fuels (provided it comes from local sources).

- **Reduce the consumption of paper**

Choose recyclable paper products, such as printing paper, notebooks, napkins, toilet paper, etc. To reduce the wastage of paper we can make a habit of taking a print out on both the side of a paper and even write on both the side of your notebook.

If we can limit the use of paper products, we can reduce the reasons of deforestation to some extent.

Other measures to stop deforestation are:

- Prefer to buy products from sustainable companies like Asian pulp & paper, Hershey, Wilmar international, Loreal, Unilever, Disney, etc. These companies are committed to minimizing deforestation.
- If we can minimize our consumption, we will be able to treat the deforestation problem to some extent. For example- reduce the use of products that contain palm oil, etc.
- Implement the process of recycling or prefer to buy recycled products.
- We should Prefer to consume vegetarian food whenever possible.
- Prefer to buy certified wood products. Make sure you check the labels & FSC (Forest Stewardship Council) mark before purchasing any wood product.
- Prefer to buy Eco-friendly products.

Mineral resources

Minerals provide the material used to make most of the things of industrial- based society; roads, cars, computers, fertilizers, etc. Demand for minerals is increasing world wide as the population increases and the consumption demands of individual people increase. The mining of earth's natural resources is, therefore accelerating, and it has accompanying environmental consequences.

Acid Mine Drainage

- Outflow of acidic water from metal mines or coal mines.
- This toxic water leaks out of abandoned mines to contaminate groundwater, streams, soil, plants, animals and humans.
- As a result an orange color can blanket the river, estuary or sea and kill aquatic life and making surface water unusable as drinking water.

- Airborne emissions occur during each stage of the mine cycle, but especially during exploration, development, construction, and operational activities.
- Coal mine methane, less prevalent in the atmosphere than CO2, but 20 times as powerful as a greenhouse gas, and is released during the coal mining process. Most coal mine methane come from underground mines.
- Carbon-monoxide (CO), carbon-dioxide (CO2), methane (CH4), sulphur dioxide (SO2), nitrous oxides (NOx) and other greenhouse or toxic gases – as well as fly ash from vents and fissures.

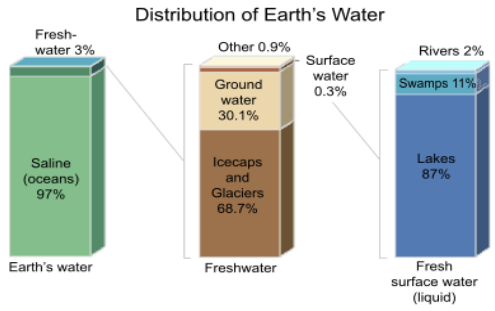
Heavy Metal Contamination

- Release of harmful trace element e.g., Cu, Pb, Cd etc. leads to the contamination of surface water.
- Underground water is also contaminated due to seepage and infiltration of leached drainage.
- Elevated levels of cyanide and nitrogen compounds (ammonia, nitrate, nitrite) can also be found in waters at mine sites, from heap leaching and blasting.

Erosion and sedimentation

- Mineral development disturbs soil and rock in the course of constructing and maintaining roads, open pits, and waste impoundments.
- Loss of landscape and beauty of surrounding.
- Excessive sediment can clog riverbeds and smother watershed vegetation, wildlife habitat and aquatic organisms.

Global water distribution



The distribution of water on the Earth's surface is extremely uneven. Only 3% of water on the surface is fresh; the remaining 97% resides in the ocean. Of freshwater, 69% resides in glaciers, 30% underground, and less than 1% is located in lakes, rivers, and swamps. Looked at another way, only one percent of the water on the Earth's surface is usable by humans, and 99% of the usable quantity is situated underground.

All one needs to do is study rainfall maps to appreciate how uneven the distribution of water really is. The white areas on the map below had annual rainfall under 400 mm for the last year, which makes them semi-arid or arid. And, remember, projections are for significant aridification to occur in many dry regions and for more severe rainfall events to characterize wet regions.

Environmental impacts of mining

1. Air pollution by the emission of Sulphur Dioxide and Nitrogen Monoxide (SO2 and NO) during the mining process.
2. Various types of diseases arises due to air pollution.
3. Possibility of Acid Rain due to Toxic substances in the air.
4. Increase in Noise pollution due to the use of Heavy machineries in mining process.
5. Emission of Radon and Thorone in the Uranium Mines.
6. When water flows from mines, there will be Water

Pollution.

7. Polluted water obtained from the Natural oil wells may create Land pollution.