

Unit – I

Multidisciplinary nature of Environmental studies

Environment derived from two **French words** Environ & Ment

Environ – Encircle / Surroundings

Ment - Actioning

Environment – Definition:

“The complex of physical, chemical and biological factors that act up on an individual organism or ecological community and ultimately determine its form and survival”.

(Or)

“The sum total of water, air and land and the inter-relationships that exist among them and with the human beings, other living organisms and materials”

Components of Environment:

Environmental components are divided in to two types

1. Biotic components (Living organisms)

Examples:

Plants

Animals

Human Beings

&

Microbial organisms

2. **A biotic components** (Non-living organisms)

Examples:

Air

Water

Soil

Temperature

Moisture

Minerals

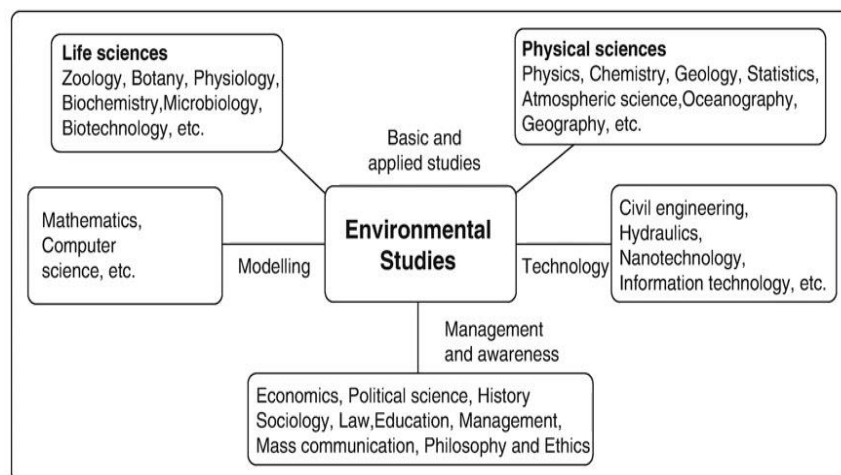
Fire

Altitude etc.

Multidisciplinary nature of environmental studies:

The multidisciplinary nature of environmental science:

- The science of Environment studies is a multi-disciplinary science because it comprises various branches of studies like chemistry, physics, medical science, life science, agriculture, public health, sanitary engineering etc.



- It studies of the sources, reactions, transport, effect and fate of physical a biological species in the air, water and soil and the effect of from human activity upon these.

1. Life sciences including Botany, Zoology, Bio-technology, Micro-Biology and Genetics subjects are more helpful in understanding the biotic components and their interactions.

Bio-technology, Micro-Biology and Genetics are emerging as useful tools for finding solutions to environmental problems.

2. Physical sciences and chemical sciences are useful for understanding the physical and chemical structure of a biotic component of environment.
3. Mathematics, statistics and computer science serve for environmental modeling; it is useful for research and developmental activities.
4. A synthesis of civil engineering, chemical engineering, hydraulics and nanotechnology provide the technical solutions to environmental pollution control and waste treatment that are extremely important for conservation of the environment.
5. Environmental laws provide the guidelines and legal measures for effective management and protection of the environment.
6. Environmental education and mass communication are two important subjects that are instrumental in disseminating environmental awareness.
7. Economics, management and sociology provide inputs for various developmental activities.

Scope and Importance of Environmental Studies

Environmental studies as a subject has a wide scope. It covers various topics and various themes.

1. Ecology

- a. Structure & Functions of an Ecosystem
- b. Terrestrial Ecosystem
- c. Aquatic Ecosystem
- d. Environmental Pollution
- e. Renewable & Non Renewable Energy Resources

2. Biodiversity & its Conservation

- a. Plant Diversity of India
- b. Animal Diversity of India
- c. IUCN Red list
- d. Protected Area Network
- e. Conservation Efforts

3. Climate change

- a. Global Warming
- b. Ozone Depletion
- c. Acid Rain
- d. Ocean Acidification

4. Environmental Legislation

- a. Environmental Acts & Policies
- b. Environmental Articles
- c. Environmental Organizations

In the recent years the scope of environmental studies has expanded dramatically the world over. Several career options have emerged in this field that is broadly categorized as:

- A. **Research and Development in Environment:** Skilled environmental scientists have an important role to play in examining various environmental problems in a scientific manner and carryout R&D activities for developing cleaner technologies and promoting sustainable development.
- B. **Green advocacy:** With increasing emphasis on implementing various acts and laws related to environment, need for environmental lawyers has emerged, who should be able to plead the cases related to water and air pollution, forest and wildlife.
- C. **Green Marketing:** While ensuring the quality of products with ISO mark, now there is an increasing emphasis on marketing goods that are environment friendly. Such products have eco-mark or ISO 14000 certification.
- D. **Green Media:** Environmental awareness can be spread amongst masses through mass media like television, radio, newspaper, magazines, hoardings, advertisements etc. for which environmentally educated persons are required.
- E. **Environmental Consultancy:** Many non-governmental organizations, industries and government bodies are engaging environmental consultants for systematically studying and tackling environment related problems.

Importance of Environmental Studies

Environmental calendar

February 02 – World wet lands day

March 03 – World wildlife day

March 20 – World Sparrows day

March 21 – World forest day

March 22 – World day of water

March 23 – World meteorological day

April 22 – Earth day

May 22 – International Biodiversity day

June 5 – World Environmental day

June 8 – World Ocean day

September 16 – World ozone day

December 5 – World soil day

Environmental articles:

48(A): The state shall endeavor to protect and improve the environment and to safe guard the forests and wildlife of the country.

51A(g): Environmental Protection is the fundamental duty of the each and every citizen in our India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures.

Environmental acts:

Wildlife protection act – 1972

Water act – 1974

Forest Conservation act – 1980

Air act – 1981

Environmental Protection act – 1986

Motor vehicle act – 1988

The energy conservation act - 2001

Biodiversity conservation act – 2002

National green tribunal act – 2010

Natural Resources

Natural resources – definition: Which resources are drawn from nature and used without much modification that's called natural resources.

Examples: A. Forest resources
B. Water resources
C. Mineral resources
D. Energy resources

A. Forest Resources

1. Forests are an important natural resource on this Earth
2. Forests are immense value to us
3. According to National forest policy (NFP-1952) at least a total of 33% of the forest cover is mandatory.
4. As per Forest survey of India (FSI)

Forest cover in India 21.76%

Forest cover in Andhra Pradesh 23.59%

Uses of Forests/Forest Services

Forest provides a number of natural services for human beings

- 1. Biological Services (Direct Services)**
- 2. Ecological Services (Indirect Services)**
- 3. Social Services**

1. Biological Services (Direct Services)

Food & Shelter

Fuel wood

Ply wood

Alkaloids and Medicinal resources

Cloths

Oils

Diversity in genes, species and ecosystems

2. Ecological Services (In direct services):

Oxygen production

Biomass production

Decomposition

Soil formation

Nutrient cycling

Carbon sequestration

Water purification

Air purification

Soil fertility

Climate regulation

Pollution breakdown

Flood control

Soil erosion control

Ecological balance

3. Social Services:

Research, Education and Monitoring

Recreation

Eco-tourism

Eco-clubs

Cultural values

Deforestation:

“A wooden land transferring to clear land that’s called deforestation”

According to the Food & Agriculture organization (FAO), the rate of deforestation in India was 6, 68, 000 ha per year between 2015-20.

Causes of deforestation:

1. Agricultural expansion
2. Shifting cultivation
3. Urbanization
4. Industrialization
5. Mining
6. Dam-building
7. Transportation
8. Forest fires

9. Over grazing
10. Timber extraction
11. Other project developmental activities

Effects:

1. Loss of biodiversity
2. Oxygen deficiency
3. Green house effect
4. Climate change
5. Ground water shortage
6. Desertification
7. Environmental degradation
8. Soil erosion
9. Lack of nutrients
10. Effect on Hydrological cycle
11. Ecological imbalance

2. Water Resources

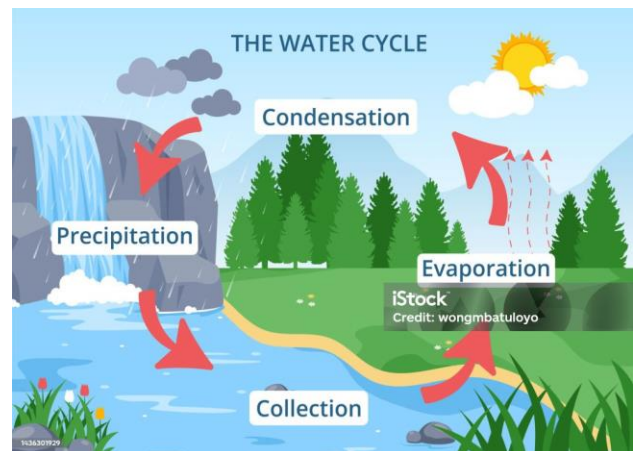
1. Water is an indispensable natural resource on this Earth
2. Water as an important ecological factor, it determines the structure and functions of an ecosystem.

Hydrological cycle (Water cycle):

Definition: “The continuous circulation of water in the Earth-Atmosphere system, which is driven by the solar energy”

Stages of Water cycle:

1. Evaporation
2. Sublimation
3. Condensation
4. Precipitation
5. Infiltration
6. Run-off



1. Evaporation:

The sun is the ultimate source of energy

In this process water converted in to water vapor

2. Sublimation:

Snow/Ice changes in to water vapor

3. Condensation:

Water vapor converted in to tiny droplets of water

4. Precipitation:

Water droplets converted into snow/hail

5. Infiltration:

Rain water gets absorbed in to the ground through the process of infiltration; it might be forming as aquifers. Ground storage with help of infiltration process. Continous little rainfall is suitable for ground water storage.

6. Run-off:

Based on gravity, rain water is always flow from high altitude to low altitude, eventually forming as water bodies.

Ground water

Ground water is an important resource for water supply in rural and urban areas

Ground water is more convenient and less exposed to pollution

Ground water subsidence- definition:

“When ground water withdrawal is more than its recharge rate that phenomenon known as ground water subsidence”.

Water logging – definition:

“The presence of excess water in the roots of the plants”

(Or)

“Water logging refers to the saturation of soil with water”

Floods – definition:

“A flood is an over flow of water”

Flash flood – definition:

“A flood caused by excess amount of the rainfall presence in particular geographical area, within short period of time that’s called flash flood”

Drought:

“A long period without rains leading to a severe shortage of water in particular geographical area that’s called drought”

Conflicts over water:

1. Kaveri river water dispute is a serious conflict between Tamil Nadu & Karnataka
2. Krishna water dispute also presence in between Maharashtra, Karnataka, Telangana and Andhra Pradesh.
3. The satlej-Yamuna link canal dispute between Punjab & Haryana
4. Vamshadhara water disputes tribunal between Odisha & Andhra Pradesh

Big Dams

Generally big dams are regarded as a symbol of national development. It is a fundamental vehicle for developmental activities. The dams have tremendous potential for economic upliftment and growth.

Impacts of Big dams:

1. Positive ecological impacts:

Drought/famine reduction

Prevention of floods

Promotion of agricultural productivity

2. Negative ecological impacts:

Deforestation

Loss of Biodiversity

Water logging

Flash floods

3. Positive Socio-Economic impacts:

Employment

Electricity generation

Water supply for irrigation

Water supply for drinking

Promotion of navigation

Promotion of fisheries

4. Negative Socio-Economic impacts :

Submerging of villages and fertile lands

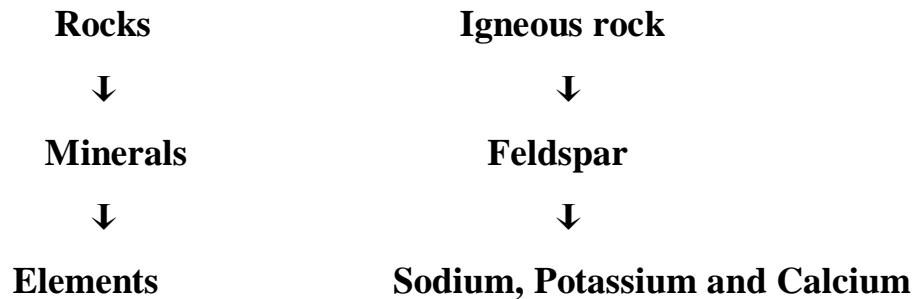
Displacement of tribal's (RS&RH)

Resettlement and Rehabilitation issues

3. Mineral Resources

Minerals – Definition:

1. An arrangement of elements in particular format that's called minerals.
2. Minerals are naturally occurring chemical compounds
3. Most of the rocks are including a few minerals; these minerals are composed of some elements like (Na, k, Ca, Mg, Mn, Fe, Co, Ni, Cu, Zn).



4. A total of 48 minerals are identified in our Andhra Pradesh
5. A total of 95 minerals are identified in our India
6. Jharkhand has large deposits of minerals – **Store House of Minerals**
(A total of 40% of the minerals are exclusively presence in Jharkhand)

Based on their chemical composition minerals are divided in to four types

A. Metallic minerals: Ex: Iron, Gold, Silver, Platinum and Diamond

B. Non- Metallic minerals: Asbestos, Limestone and Mica

C. Fuel based minerals: Coal, Petrol, Diesel and Kerosene

D. Nuclear – fuel based minerals: Thorium, Uranium and Zirconium.

Major minerals in our India

Coal – Jharkhand

Copper – Madhya Pradesh

Uranium – Andhra Pradesh

Aluminum – Odisha

Iron – Odisha

Gold – Karnataka

(KGF-Kolar Gold Fields - Land of Gold)

Uses of Minerals:

1. Development of industrial plants and machinery
2. Generation of Electricity Ex: Coal
3. Defense of equipments Ex: Weapons
4. Transportation & Technology Ex: For making vehicles
5. Communication Ex: Electronic devices
6. Medicinal field Ex: Ayurvedic
7. Agriculture Ex: As a fertilizer
8. Jewellery

Environmental impacts of mining activities:

1. Ecological impacts
2. Physical impacts
3. Positive socio-economic impacts
4. Negative socio-economic impacts
5. Environmental pollution
6. Occupational health impacts

Ecological impacts:

Deforestation

Loss of Biodiversity

Ecosystem degradation

Man&Wildlife conflicts

Physical impacts:

Land subsidence

Underground fires

Soil erosion

Landscape destruction

Positive – Socio economic impacts:

Employment

Infrastructure facilities

Economic gains

Negative – Socio economic impacts:

Encroachment & Evacuation

Resettlement & Rehabilitation

Environmental pollution:

Air pollution

Water pollution

Soil pollution

Noise pollution

Occupational health impacts:

Health hazards due to long term exposure to hazardous chemicals

Accidents

Energy Resources

Energy definition: Ability to do work that's called energy

Energy transfer from one form to another form

Energy resources are divided in to two types

1. Renewable energy resources
2. Non-Renewable energy resources

Renewable energy resources:

a). which resources are generated within a span of time that's called

Renewable energy resources

b). Pollution free energy resources

c). Unlimited resources

Examples: Solar energy

Wind energy

Hydropower

Biomass

Geo-thermal

Tidal power

I. Solar Energy:

1. It is abundant renewable energy resources
2. Generation of electricity from sunlight under the principle of "photovoltaic effect".

(When certain materials are exposed to light they absorb photons and release free electrons, this phenomenon is called Photovoltaic effect).

3 A solar cell is made up of semiconductors like silicon, indium, gallium,

Selenium, cadmium and tellurium

4 Bhadla solar park is the biggest solar park in India

Established in Rajasthan (Jodhpur)

Extent: 14000 acres or 5700 ha

Capacity: 2245 MW

Aim: 450 GW of power by 2030

Advantages:

Renewable resource

Unlimited

Disinfection

Disadvantages:

Lot of space

II. Wind Energy:

1. Wind energy obtained from wind turbine

2. Based on location wind farms are two types

3. On-shore wind farms: wind turbines located on land

4. Off – shore wind farms: Wind turbines located shallow open water

Note: Off-shore wind farms are more efficient than on shore

Reason: Higher speed of winds

Greater consistency

Lack of physical interference

5. Largest wind power plant in India – Muppandal wind farm – 1500 MW - TN

Advantages:

A. Large scale electricity generation

B. Wind energy creates alternative revenues for farmers who lease their land

C. Cleanest form of renewable energy

Disadvantages:

A. Expensive

B. Harmful to Birds

III). Hydro power:

1. The energy obtained from water flow that's called hydropower

2. Hilly areas and high altitude areas are suitable for hydropower

3. Hydropower is one of the oldest and largest source of renewable energy

4. The power generation depends up on two major factors

Height of the water
&
Flow rate of the water

The main dams in India:

1. Tehri dam – 2400 MW – Uttarakhad

2. Srisaillam dam – 1670 MW – Andhra Pradesh

3. Nagarjuna Sagar dam – 1965 MW – Telangana

4. Sardar sarovar dam – 1450 MW – Gujarat

5. Bhakra namgal dam – 1325 MW – Himachal Pradesh

Advantages:

Sustainable renewable energy resource

Recreation use / Eco-tourism

It is a fundamental vehicle for development

Disadvantages:

High initial cost

Deforestation

Loss of Biodiversity

Aquatic imbalance

Non-Renewable Energy Resources

a) Which cannot be regenerated that's called non-renewable energy resources

b). These are created pollution

c). Limited resources

Examples: Coal

Petrol

Diesel

Kerosene

Natural Gas

I. Coal

1. Coal is an important non-renewable energy resource for the generation of electricity

2. Thermal power plants produce electricity by burning coal in a boiler to produce steam. The steam produced under tremendous pressure, flows in to a turbine, which spins a generator to create electricity.

3. Bituminous coal is suitable for industrial sector and electricity generation.
4. Largest thermal power station in our India -
Vindhyachal thermal power station – 4760 MW – Madhya Pradesh
5. At present in our India a total of 75% electricity generated from thermal power

II. Petroleum

1. It is the lifeline of global economy. About $\frac{1}{4}$ of the petroleum reserves in Saudi-Arabia.
2. Petroleum is a cleaner fuel as compared to coal (No residues)
3. Major components of petroleum Butane, Propane and Ethane
4. Petroleum is a liquid form; LPG is a gaseous form (Under Pressure)
5. The main oil fields in our India Digbai (Assam)

III. Natural Gas

1. It is mainly composed of methane with small amounts of propane and ethane
2. It is also one of the fossil fuel
3. CNG (Compressed natural gas used as an alternative to petrol & diesel for transport of vehicles
4. CNG use has greatly reduced vehicular pollution