

What is Environment?

Environment is the science which studies about the conditions and the vicinity of a particular organism.

Or

In other words we can say we call it as social, cultural conditions that affect an individual or community.

mental Studies. - 1) Systematic understanding of our environment or our existence in it.

2) It is a highly interdisciplinary field which combines natural sciences, social sciences and humanities in a broad holistic study of the world around us.

Objectives of Environmental Studies

1) Awareness - To acquire knowledge & awareness & sensitivity to the total environment.

E.g. of current awareness programs across the world

Uttar Pradesh ministry of Em - moss cleanups drive - 50 beaches
Swachh - Internal Tat Adhikyan (11-17 Nov. 2019)

In India.

2) knowledge - To gain experience and acquire basic understanding of the environment and its associated problems.

How to acquire? → Focus group, Tech Talks, Research articles, Observing Intelligent Systems, Research groups.

3) Attitude - 1) To acquire set of values and develop feelings of concern for environment

2) build motivation for active participation in environmental improvement and protection.

4) Skills → To develop skills in identifying and solving Environmental problems.

5) Participation → To provide an opportunity to be actively involved at all levels in working towards

Importance of Environmental Studies

1) Conservation of Energy - 1) by introducing alternate sources,
2) improved technologies and process
compatible with environment.

2) Economic boost or growth - better health of people leads to
improved economic productivity
of the nation.

e.g.

3) Conservation of Natural Resources - current state of natural resources

e.g. data

∴ Conservation of natural resources is critical step to maintain ecological balance.

4) Important Knowledge - about management of waste, treatment of disposal techniques to keep away hazards.

5) Social responsibility - to control environmental pollution and protection

6) Population control - awareness towards its effects on the depletion/distribution of resources.

7) Sustainable development - developing attitude and values towards understanding the interdependence of nature and man and work.

Role of Environment Scientists

- To establish general principle/law about how environment works.
- They use these principles to develop viable solutions to environmental problems based on scientific knowledge.

1) Scientific Assessment →

which involves collection of data
→ Define problem, collect data and perform experiment and do simulations are constructed a model.

2) Risk Analysis — performing data interpretation of data collected, the potential risk is analysed & one or more remediation options are calculated.

3) Public Education & involvement -

- 1) Awareness through media / endorsements
- 2) Explaining problem & its probable costs of each option.
e.g.

4) Political Action — The affected parties, through their elected officials, decide a course of action and implement it.

5.) Evaluation -

- 1) The results of any action should be carefully monitored

Solutions Toward Global issues

- ⇒ As a result of awareness; society has started finding solutions to the problems related to the environment.
- ⇒ Progress has been made to establish laws, policies and treaties in controlling air and water pollution and reducing wasteful use of resources.
- ⇒ Food production has improved the nutrition of millions in developing world, thus reducing the no. of undernourished from 35% to 20% over the past thirty years.
- ⇒ Population control is one of the measures to save environment.

Need for Public Awareness

- ⇒ Environmental studies/Education is a process of recognising problems, developing skills and add tools necessary to understand and appreciate the inter-relationship among man, ad culture.
- ⇒ The major goals of imparting/teaching materials Environment Education are
 - Development of educational/teaching materials and aids in the formal education sector.
 - To promote NGOs, mass media and other concerned organisations for promoting awareness among people at all levels.
 - To ensure training and manpower development in environment education
 - To mobilise people's awareness for the preservation and conservation of environment.

- Duties -
- 1) Deliver clean, non-polluting and renewable sources of energy
 - 2) Works towards food safety.
 - 3) Optimize use of natural resources and improve efficiency of resource use, specially of water and electricity.

Formal Environment Education

Introducing environmental studies in formal education system.

- (i) Environment Education in School System - • Initiated in 1999, where a survey was performed to study the curriculum.
 - Introduced in middle school since 2002.
- (ii) Environmental Education at college/ University level - There are diploma's B.Sc., M.Sc., Ph.D programmes & EVS. Autonomies Research lab. CSIR, IIT, IISER, IITM.
- (iii) Environmental Awareness course - • I & NOS with MOEF have developed non-credit awareness course of three month duration.
 - Provides a platform to create environmental consciousness & facilitate development of environmental leadership among individuals.
- (iv) Environmental Concepts in management & Business studies
 - Realising that the industry managers and leaders need to be sensitized towards environmental issues.
 - Environmental Concepts in business/management education is done by AICTE, MOEF & UGC.

Non-formal Education & Awareness

- (i) NEACC (National Environment Awareness Campaign) - 1986
 - ⇒ nominal financial assistance as provided to NGOs, Schools, Colleges, Research Institutions, women & Youth organisation.
 - ⇒ Seminars, workshops, training programmes, camps, padayatra, exhibitions, essay/debate/ painting /Poster competitions, folk dances and songs.

iii) Eco Clubs (National Green Corps)

- Objective to educate children about their immediate Environment and impart knowledge about the eco-systems, their inter-dependence and their need to survival.
- Started in 1993 - large number of Eco-clubs have been provided grants in various parts of the country.
- National Green Corps - launched eco-clubs during 2001-2002. Under this program eco-clubs are being successfully setup in more than 100 schools in each District.
- Financial Assistance - QDF provides assistance for establishment of Eco-clubs, training of Master Trainers, Teacher training and distribution of resource materials.
- Globel Learning and Observations to Benefit the Environment (GLOBE) -
 - International Program started in August 2000.
 - hands-on- participatory approach.
 - Students of GLOBE school collect data about various environmental parameters under guidance of GLOBE trained teachers.
 - Further, this data is used by scientists, in their research work.
 - GLOBE Headquarters USA.

iv) Mass Awareness - Despite great efforts, there is not much "Mass Awareness" by the electronic media.

- Doordarshan and few other channels are extensively used for telecasting environment based programmes.

v) Other Awareness Programs:

- (i) Green Olympiad by TERI, 80,000 school students India, Russia & UAE.

- Awareness activities/events by NGOs, academic Institutions etc on the occasion of special environment days like Earth Day -
- Written Environmental Quiz - different regional languages is also being done.
- Organization of Annual Vacations - Environmental Resources for high school level students "Vacation program of natural resources - building a broader constituency of support for conservation" - by ATREE/NGO.

Introduction to the concept of Green Technology.

Technology in the 20th century was a boon to mankind. It brought prosperity and modernization in the society but threatened the ecological security of the earth.

- ⇒ over utilization and exhaustion of natural resources.
- ⇒ Pollution -
- ⇒ Green Technology - called as Clean Tech (Clean Technology) is the application of EVs to conserve the natural environment and resources and by curbing the negative impacts of human involvement.
- ⇒ A step to generate technology that would restrict generation of toxic by-products.

(4)

Expected goals from this tech

- 1) Sustainability - It will help to meet the present needs of the society without compromising the needs of future generations.
- 2) Cradle to Cradle design - The products thus obtained should not have any toxic effects on the environment.
- 3) Source Reduction - focuses on reduction of by products or the unreacted reactants.
- 4) Innovation - G.T. will focus on replacement of existing technologies into a cleaner one.
- 5) Viability - The technology developed should be economical.

Area Covered under Green Tech

1. Energy - emphasis on the opportunities for development
2. Green Building - substances used as building material and the location of the building.
e.g.
- 3) Environmentally friendly purchasing - avoid buying of toxic substances.

Green Nanotechnology - Nanotechnology means when the materials used are reduced to the nanoscale i.e. one billionth of a meter.

Green Chemistry

Chemists are addressing complicated E. issues for clean chemistry, which means judicious use of chemistry for prevention of pollution. It involves:-

1. Modified Engineering practices
2. Bioremediation - The use of either naturally occurring or deliberately introduced microorganisms to consume & break down environmental pollutants in order to clean a polluted site.
3. Ecofriendly reaction media - (E.g. - $\text{PEG}-400$)
4. Concepts of atom economy. - Conversion efficiency of a chemical process in terms of all atoms involved and desired products produced.

To be used effectively Green Technology should be.

= Min. usage of desired product
not weighing all reactants

- cost-effective
- economically viable
- ecologically sustainable
- Socially acceptable - happens when its cost effective, & long term.

⇒ Take measures like - control use of fossil fuels

- non-biodegradable plastic bags
- Cheaper than the alternatives available.

Some green technologies

- 1) CNG, LPG, biofuels and hybrid fuels or vehicles, rapidly chargeable electric batteries have reduced the emissions of CO, HC & NOx.
- 2) Genetically Engineered crops - reduced the use of chemical pesticides due to their high genetic resistance against pests and diseases.
- 3) Control on air pollution - equipments for electrostatic precipitation.
 - 1) flue gas desulphurization unit.
 - 2) solar energy, hydro energy, geothermal energy
 - 3) Ocean Energy.

(6)

2 Ecosystem

⇒ Ecosystem is a community of living organisms (plants, animals and microbes) that occurs in some locale, in conjunction with physical and chemical factors (air, water & soil, climate etc.).

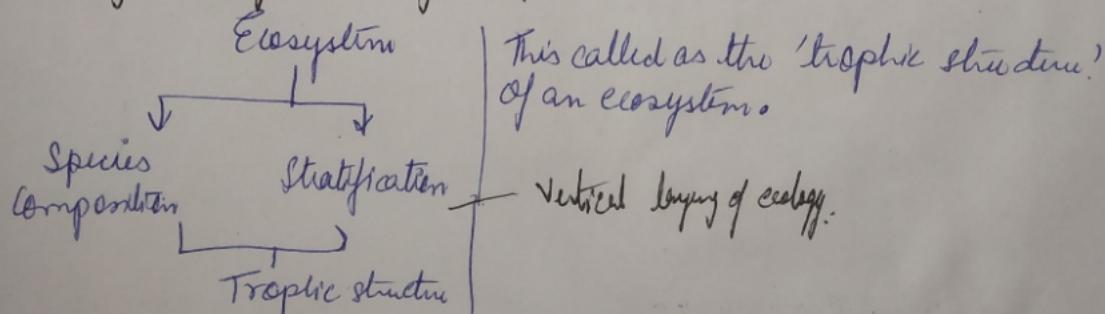
Abiotic & biotic are linked together through nutrient cycles and flows.

Abiotic - physical rather than biological; not derived from living organisms. e.g. Sunlight, oxygen, nitrogen, climate, temperature, pH, water

Biotic - living component that affects another organism or shapes the ecosystem. e.g. animal, fungi, bacteria

Ecosystem :- generally fragile
- forests - deserts - rivers } natural
- grasslands - ponds - lakes - sea. }
⇒ agricultural land - man made system

Structure & function of an Ecosystem

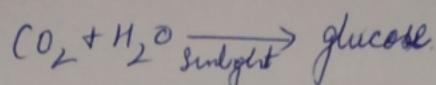


* functional group → a biological category composed of organisms that perform mostly the same kind of function in the system.
e.g. Plants (all perform photosynthesis)

Producers, Consumers & Decomposers

The biotic system is divided into three main categories:-

Producers - algae, plants.



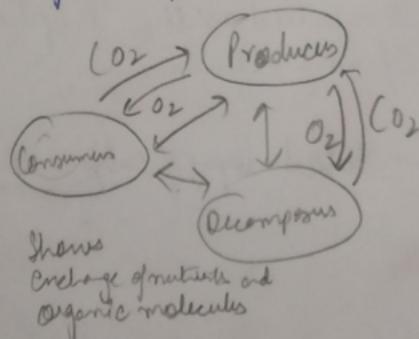
The glucose produced can be used as a primary or secondary source of energy where it can combine with other molecules to produce biomass.

Consumers - heterotrophs are organisms that obtain organic molecules by eating or digesting other organisms.

Plants → Herbivores - Carnivores (Consumer of energy)

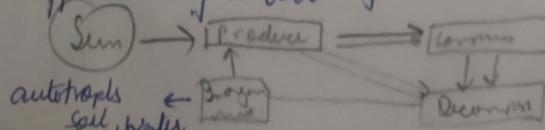
Decomposers - final link in a food web breaking down dead organic matter (DOM) from producers and consumers to produce energy which is returned to the atmosphere.

e.g. Shelf fungus



Energy flow through the Ecosystem

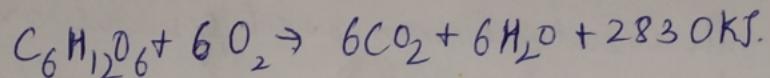
- Energy flows from one organism to the other when one organism eats another.
- Any energy remaining in dead organism is consumed by decomposers.



⑧

Respiration — carbon-carbon bonds are broken, to produce carbon oxygen bonds $\rightarrow \text{CO}_2$

Plant respiration — a carbohydrate combines with oxygen and is reduced to CO_2 , H_2O & heat.



The energy thus produced is used up for performing various tasks like

- movement of muscles
- digest food
- excrete waste
- think.

\Rightarrow Energy produced is transferred/consumed by one organism or the other and eventually lost into atmosphere after being used by decomposers.