

# **CL142 ENVIRONMENTAL SCIENCES**

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# CREDIT AND HOURS

Teaching Scheme/Week	Theory	Practical	Total	Credit
Hours/week	02	-	02	02
Practical	100	-	100	

# OUTLINE OF THE COURSE

Sr.No	Title of the Unit	No. of hours	Percentage Weightage	Marks (Out of 70)
1	Introduction	05	24 %	16
2	Environmental Pollution	12	33 %	23
3	Ecology and Ecosystems	10	33 %	23
4	Natural Resources	03	10 %	08

# TEXTBOOKS AND REFERENCES

## **Text Books:**

- Basics of Environmental Studies by B.R. Shah and Snehal Popli
- Varandani, N.S., Basics of Environmental Studies

## **Reference Books:**

- Shah Shefali & Goyal Rupali, Basics of Environmental Studies
- Agrawal, K.C., Environmental Pollution : Causes, Effects & Control
- Dameja, S. K., Environmental Engineering & Management

# DETAILED SYLLABUS

## **1 Introduction**

**05 Hours**

**24%**

- 1.1 Basic definitions
- 1.2 Objectives and guiding principles of environmental studies
- 1.3 Components of environment
- 1.4 Structures of atmosphere
- 1.5 Man-Environment relationship
- 1.6 Impact of technology on the environment

## **2 Environmental Pollution**

**12 Hours**

**33%**

- 2.1 Environmental degradation
- 2.2 Pollution, sources of pollution, types of environmental pollution
- 2.3 Air pollution: Definition, sources of air pollution, pollutants, classifications of air pollutants (common like SOX & NOX), sources & effects of common air pollutants
- 2.4 Water pollution: Definition, sources water pollution, pollutants & classification of water pollutants, effects of water pollution, eutrophication
- 2.5 Noise pollution: Sources of noise pollution, effects of noise pollution
- 2.6 Ill Effects of Fireworks: Severity of toxicity, effects and health hazards
- 2.7 Current environmental global issues, global warming & green houses, effects, acid rain, depletion of Ozone layer

# DETAILED SYLLABUS

## **3 Ecology & Ecosystems**

**10 Hours**

**33%**

- 3.1 Ecology: Objectives and classification
- 3.2 Concept of an ecosystem: Structure & function
- 3.3 Components of ecosystem: Producers, consumers, decomposers
- 3.4 Bio-Geo-Chemical cycles & its environmental significance
- 3.5 Energy flow in ecosystem
- 3.6 Food Chains: Types & food webs
- 3.7 Ecological pyramids
- 3.8 Major ecosystems

## **4 Population & Natural Resources**

**03 Hours**

**10%**

- 4.1 Natural resources: Renewable resources, nonrenewable resources, destruction versus conservation
- 4.2 Energy resources: Conventional energy sources & its problems, non-conventional energy sources-advantages & its limitations , problems due to overexploitation of energy resources

# LESSON PLANNING

MONTH	DAYS	TOPICS
July	24 - 29	Introduction, Objectives and guiding principles and Components of Environment
July - August	31 - 4	Components of Environment, Structure of Atmosphere, Man- environment relationship
August	7 -12	Environmental degradation, Introduction to pollution, Air pollution: Sources and Effects
	14 - 18	Air pollution: Sources and Effects
	21 - 26	Water Pollution : Classification, Sources and Effects, Eutrophication
August - September	28 - 1	Noise Pollution: Sources and Effects, Ill effects of fireworks, Global Environmental Problems
September	4 - 9	Ecology: Objectives and Classification, Structure of Ecosystem
September	11 - 15	Components of Ecosystem, Bio-geochemical cycles, Energy flow in ecosystem
September	18 - 23	<b>B Tech 1st Sem 1st Sessional Exam (18/09/2017)</b>
September	25 - 30	Types of food chain, Ecological pyramids, Types of ecosystem
October	2 - 6	Natural Resources : Renewable and Non-renewable resources, destruction v/s conservation
October	9 - 14	Energy resources: Conventional and Non-conventional with its advantages and disadvantages, problems due to over-exploitation of energy resources
October	16 - 20	Diwali Break
October	23 - 28	Diwali Break
October - November	30 - 3	Presentation by students

# UNIT 1 - INTRODUCTION

1.1 Basic definitions

1.2 Objectives and guiding principles of environmental studies

1.3 Components of environment

1.4 Structure of Atmosphere

1.5 Man-Environment relationship

1.6 Impact of technology on the environment



# BASIC DEFINITIONS

## Environment

- ✕ Derived from the French word “Environner” means to circle or surround

It can be basically defined as

- ✕ ‘External surroundings and conditions which directly or indirectly affects the living organism’

OR

- ✕ It is the sum total of water, air and land, interrelationship among themselves and also human beings, other living organisms and property



# PARTS OF ENVIRONMENT

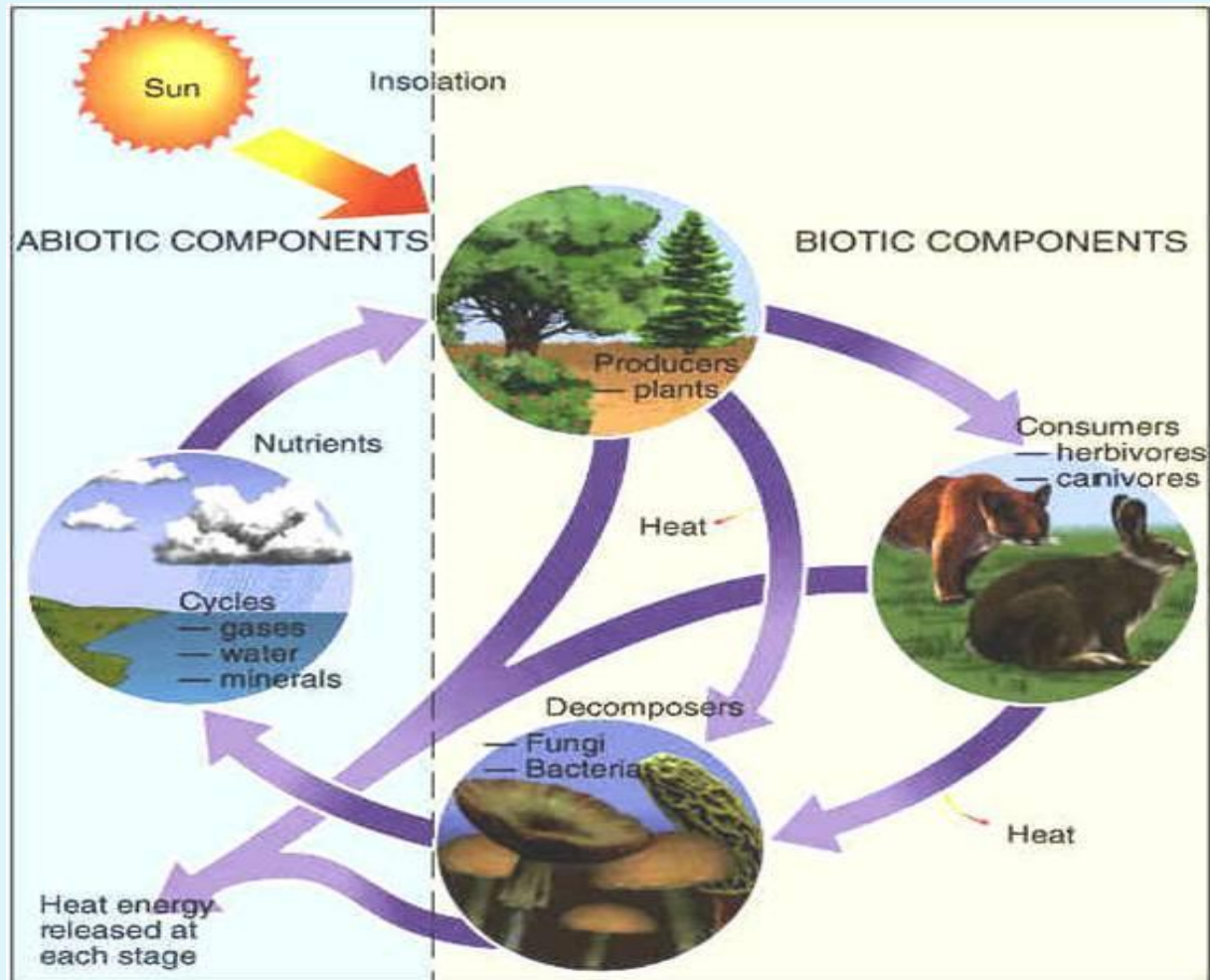
## **Biotic Components**

- Made up of all living organisms (Plant, animals and microorganisms) including their reactions, interactions and interrelated actions.

## **Abiotic Components**

- Composed of all external physical factors like, temperature, humidity, water, soil, mineral, gases etc.
- Provides both habitation and raw material for the synthesis of organic food.

# PARTS OF ENVIRONMENT



# ENVIRONMENTAL SCIENCE

- ✖ It can be defined as “The study of earth, air water, living organisms and the man with his impact on environment”.
- ✖ It is the scientific study of environment and our place in it



# SCOPE OF ENVIRONMENTAL SCIENCE

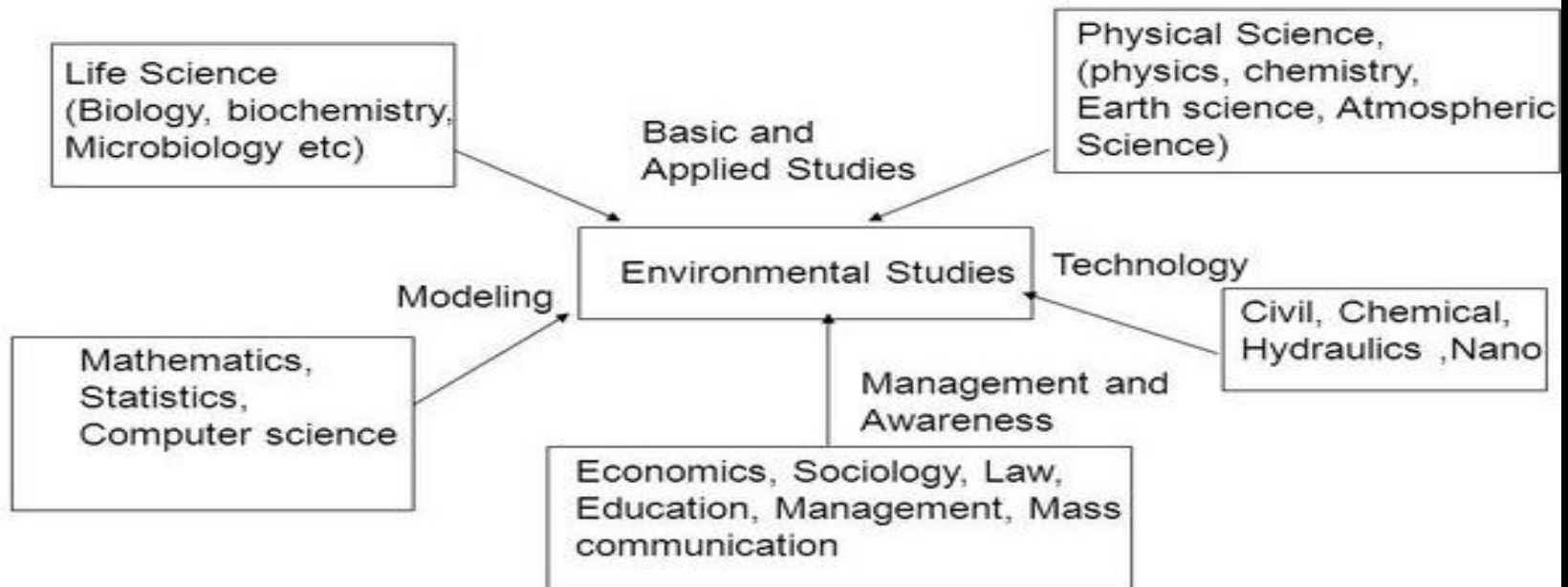
- × Natural resource- their conservation and management
- × Ecology and biodiversity
- × Environmental pollution and control
- × Social issues in relation to development and environment
- × Human population and environment

# OBJECTIVES AND GUIDING PRINCIPLES OF ENVIRONMENTAL SCIENCE

- ✕ *Creating awareness about environmental problems*
- ✕ *Imparting basic knowledge about environment and its allied problems*
- ✕ *Developing an attitude of concern for environment*
- ✕ *Motivating public to participate in environment protection and environment improvement*
- ✕ *Acquiring skills to help the concerned individuals in identifying and solving environmental problems*
- ✕ *Striving to attain harmony with nature*



# MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL SCIENCE



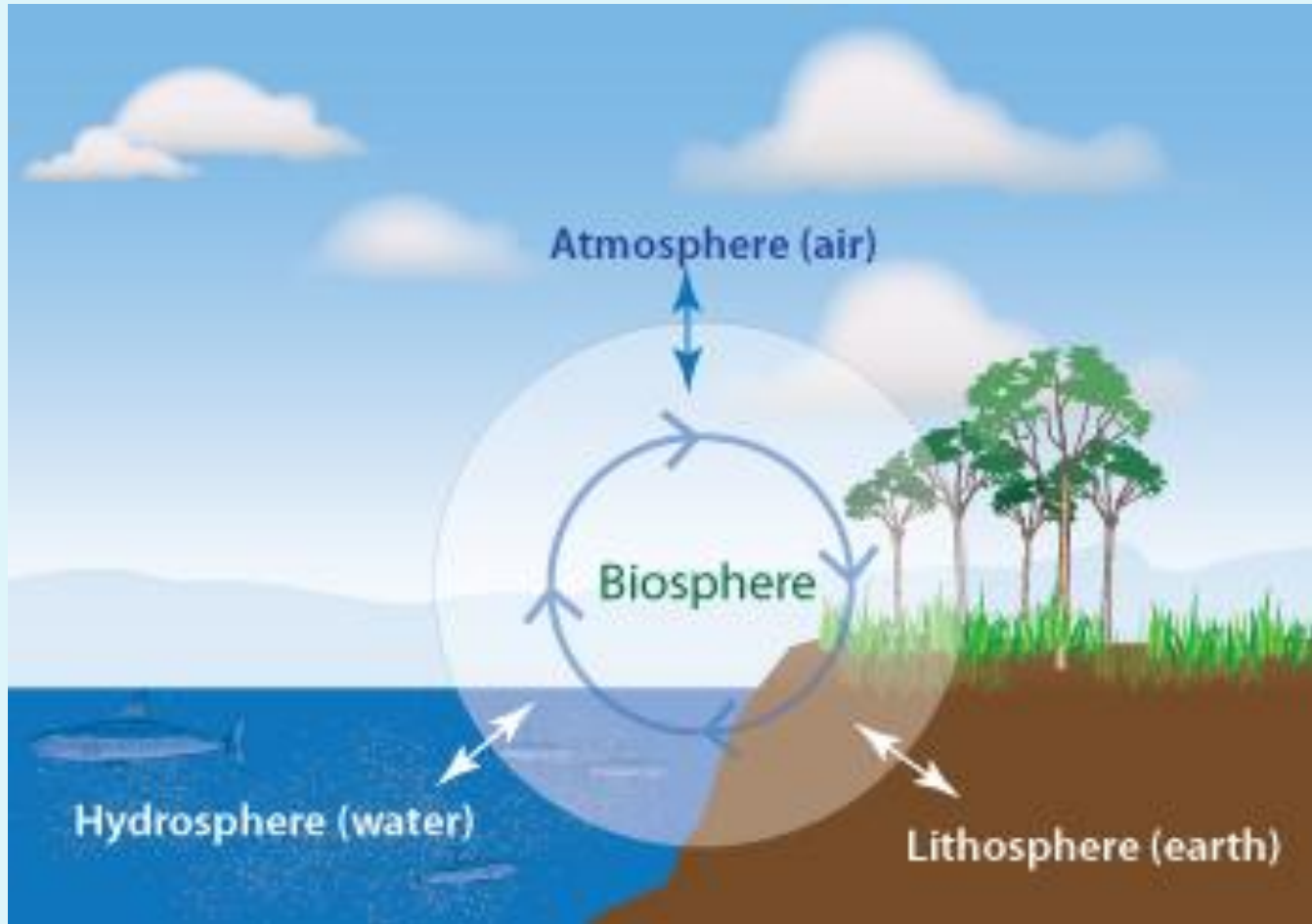
# COMPONENTS OF ENVIRONMENT

✕ Components of environment are mainly divided into

- 1) Atmosphere
- 2) Hydrosphere
- 3) Lithosphere
- 4) Biosphere



# COMPONENTS OF ENVIRONMENT

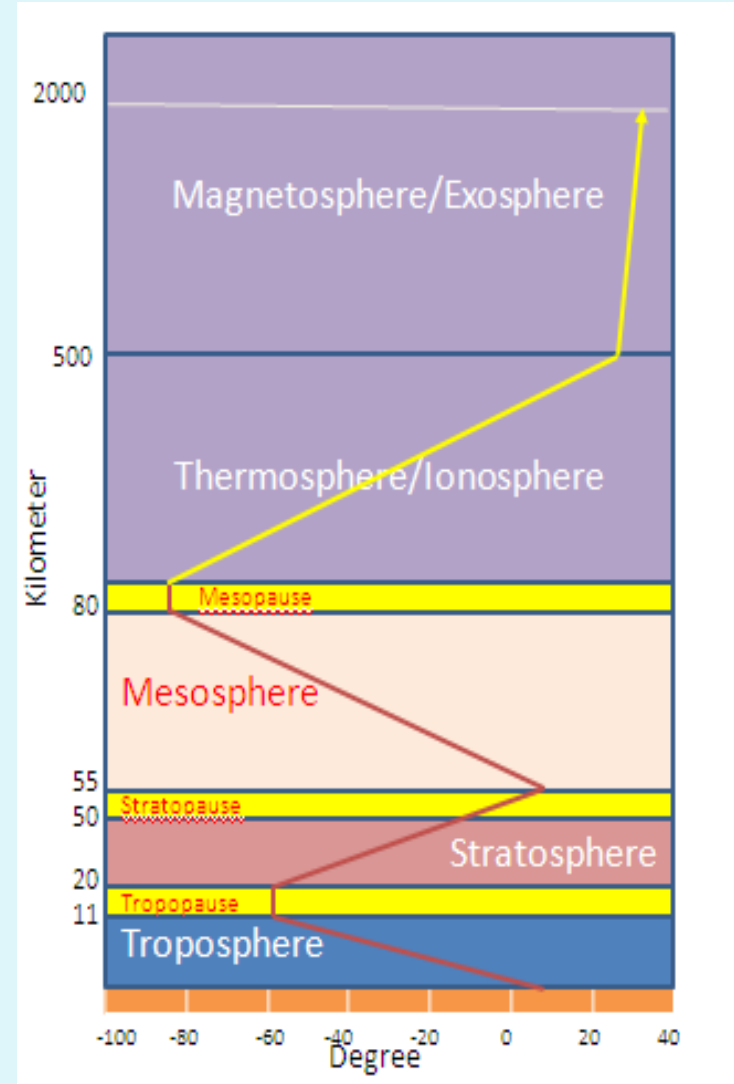


# ATMOSPHERE

- ✖ Mixture of various gases, water vapors and subatomic particles that entirely cover the earth extending several thousand kilometers
- ✖ Major gases Nitrogen (78%), Oxygen (21%), Argon (0.9-1.0%), and carbon dioxide(0.032%)
- ✖ Minor Gases Neon, Helium, Methane, Hydrogen, Carbon monoxide, ozone etc.

# STRUCTURE OF ATMOSPHERE

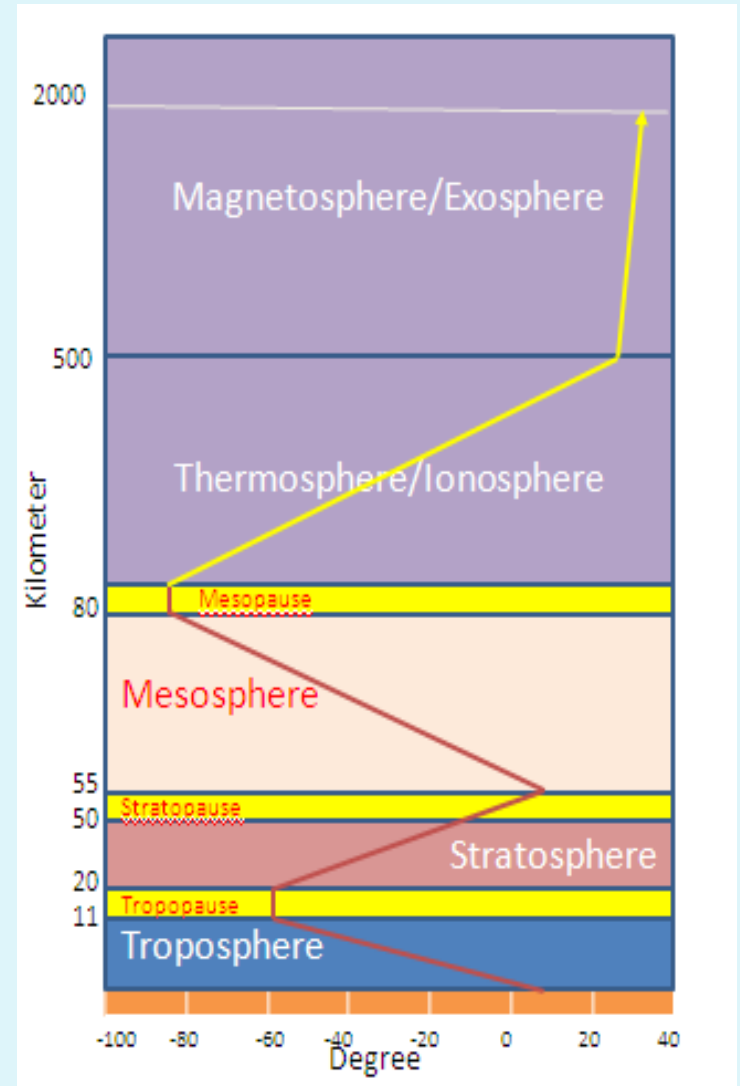
- ✖ Troposphere
- ✖ Stratosphere
- ✖ Mesosphere
- ✖ Thermosphere/Ionosphere
- ✖ Magnetosphere/Exosphere



# STRUCTURE OF ATMOSPHERE

## × Troposphere

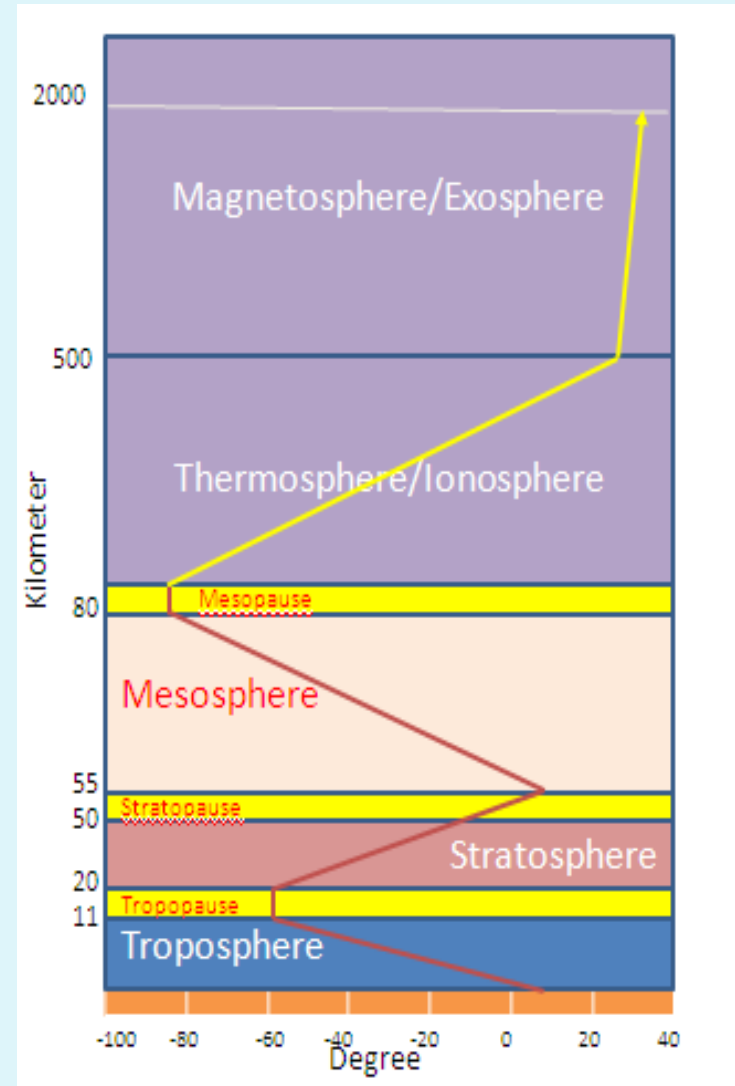
- + Lowest portion of the atmosphere
- + Thickness
  - × 8 Km (pole)
  - × 16 km(equator)
  - × Average 10-11 km
- + Temperature
  - × Air near the ground is heated by radiation from earth
  - × But decreases with altitude
  - × decrease at a rate of  $5-7^{\circ}\text{C}/\text{Km}$  (lapse rate)



# STRUCTURE OF ATMOSPHERE

## × Stratosphere

- + Stable layer above stratosphere
- + Thickness
  - × 50 to 55 km above the surface
- + Temperature
  - × Up to 20 km remains constant
  - × Then increases with increase in height
- + Known for the presence of Ozone (around 20 Km from ground)
  - × Protect from harmful ultraviolet radiations
- + Layer separating stratosphere from mesosphere called **Stratopause**



# STRUCTURE OF ATMOSPHERE

## ✖ Mesosphere

### + Thickness

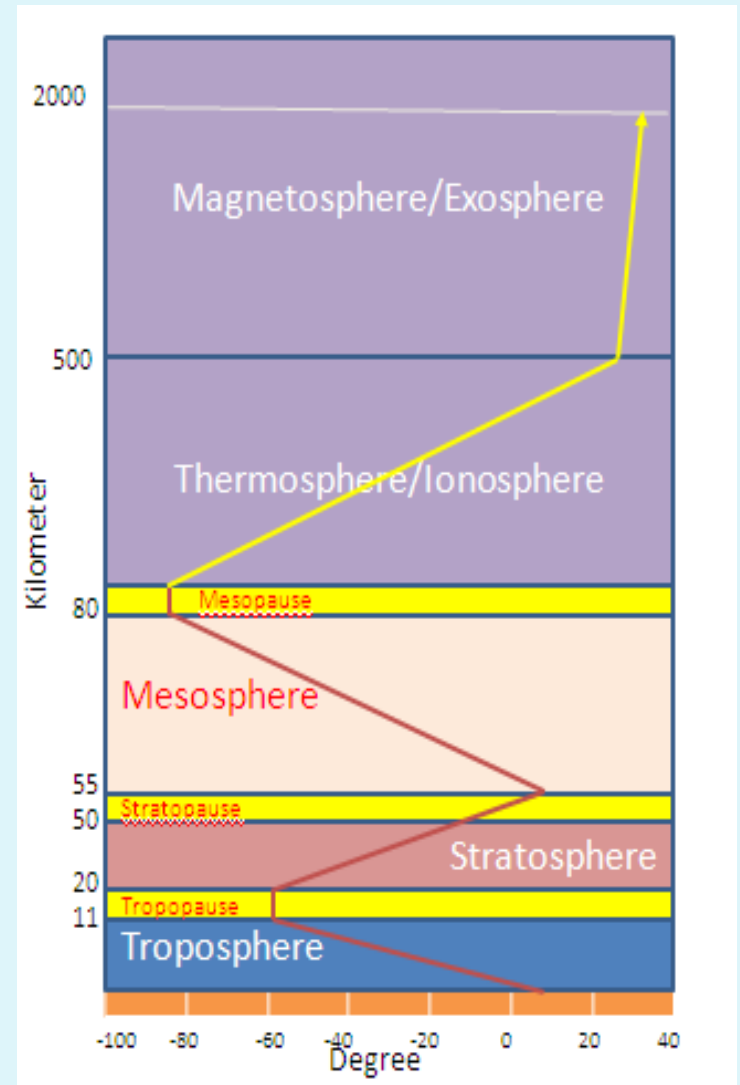
- ✖ Above stratosphere and extends up to 80 km

### + Temperature

- ✖ Decreases with altitude

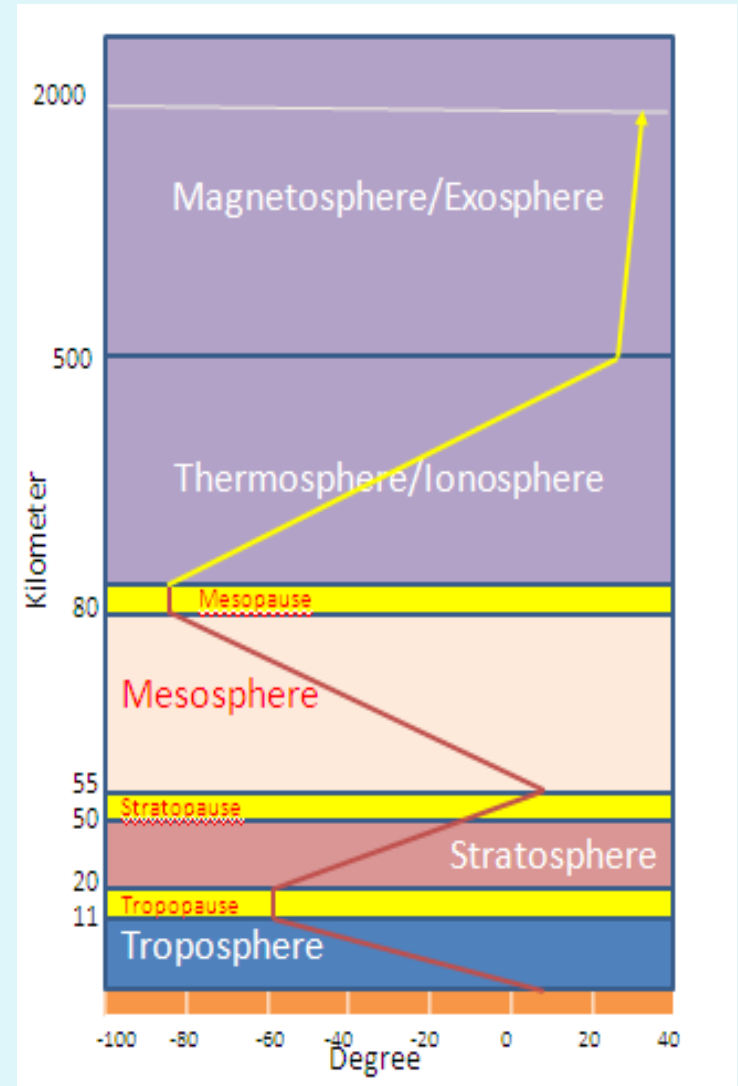
### + Importance

- ✖ Sound waves and short radio waves coming from earth are reflected back from this layer



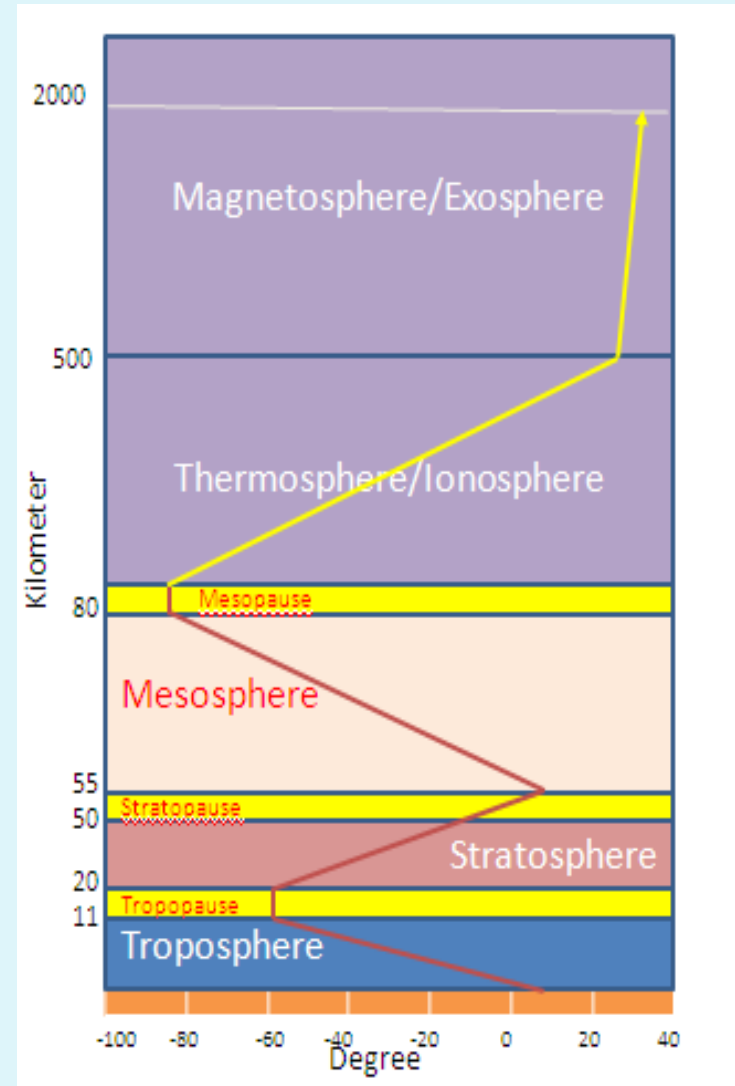
# STRUCTURE OF ATMOSPHERE

- × **Thermosphere**
  - + Thickness
    - × Extends up to 500 km
  - + Temperature
    - × Increases with altitude
  - + Also known as ionosphere
    - × Ionization of elements like oxygen and nitric oxide take place in the uppermost portion



# STRUCTURE OF ATMOSPHERE

- × **Exosphere**
  - + Thickness
    - × Extends up to 2000 km
  - + Temperature
    - × Increases with altitude
    - × Very high temperate ( $>1200^{\circ}\text{C}$ )
- + Almost airless and empty
- + Probably contains Hydrogen gas in ionized stage





# HYDROSPHERE

- ✖ All type of water resources, namely-ocean, sea, rivers, lakes, ponds, reservoirs, polar ice cap, glaciers, ground water and water vapor are collectively known as hydrosphere.
- ✖ About 70% of earth surface is covered with water (1.4 billion km<sup>3</sup>)

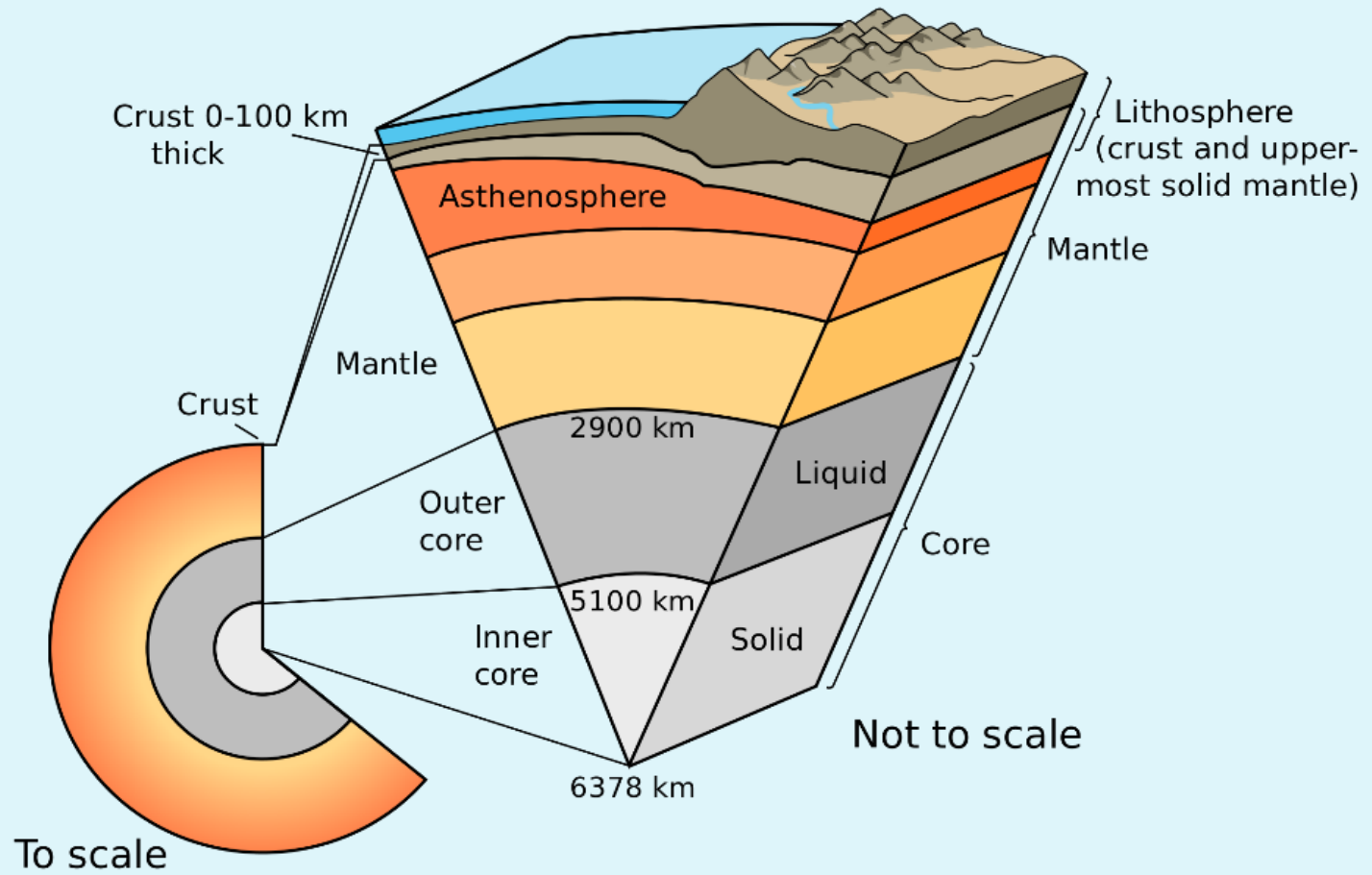


Water distribution	Percentage
Ocean and Sea	97%
Ice at polar regions	2.3%
Ground water	0.67%
Lake, pond, river, stream	0.03%

# LITHOSPHERE

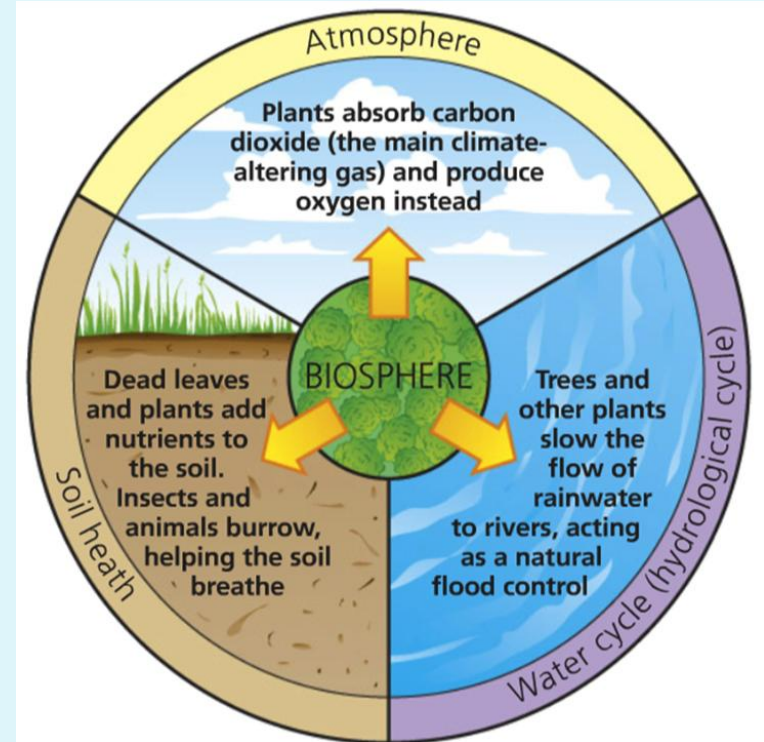
- ✖ The upper layer of the earth's crust is called lithosphere. It is made up of soil, minerals, rocks and organic as well as inorganic matter (64 to 96Km).
- ✖ Have a major role in producing food for human and animal and also in decomposing wastes.
- ✖ Soil :
  - Mixture of air, water, mineral and organic matter
  - Obtained from weathering of rocks
  - Organic matter in the soil is decomposed by micro-organism thus forming biomass
- ✖ Rocks
  - Igneous-eg. granite
  - Sedimentary- eg sandstone
  - Metamorphic- eg. Marble

# LITHOSPHERE



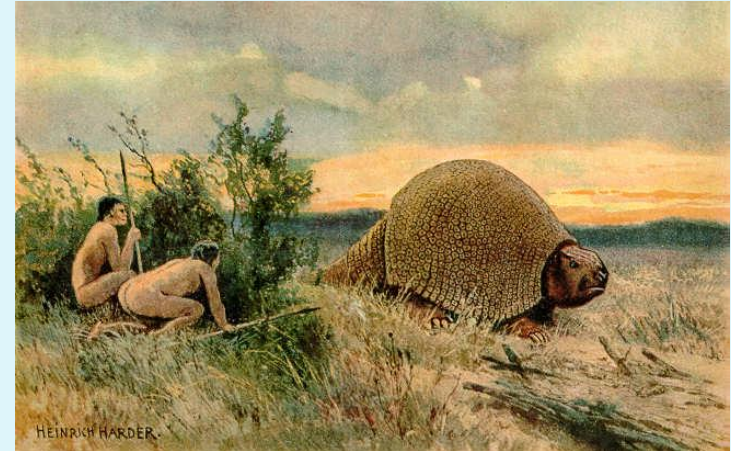
# BIOSPHERE

- ✖ *It is the portion of earth surface, hydrosphere and atmosphere where life exist.*
- ✖ Extends from lowest sea bed level to about 24 km of atmosphere
- ✖ Living organism interact with one another in biosphere and sustain their life
- ✖ Use basic resources form biosphere (air, water, food, and sunlight)
- ✖ The waste products in the form of gaseous, solid and liquid are discharge in to biosphere
- ✖ System is operating for millions of years but show stress now due to impact of human



# MAN ENVIRONMENT RELATIONSHIP

- ✕ Man is the only living organism capable to modify the surrounding to its need
  - + Hunting animals and cut trees for basic need
  - + Started cultivation and for that started cutting trees and forest
  - + To increase comfort started disturbing each and every component





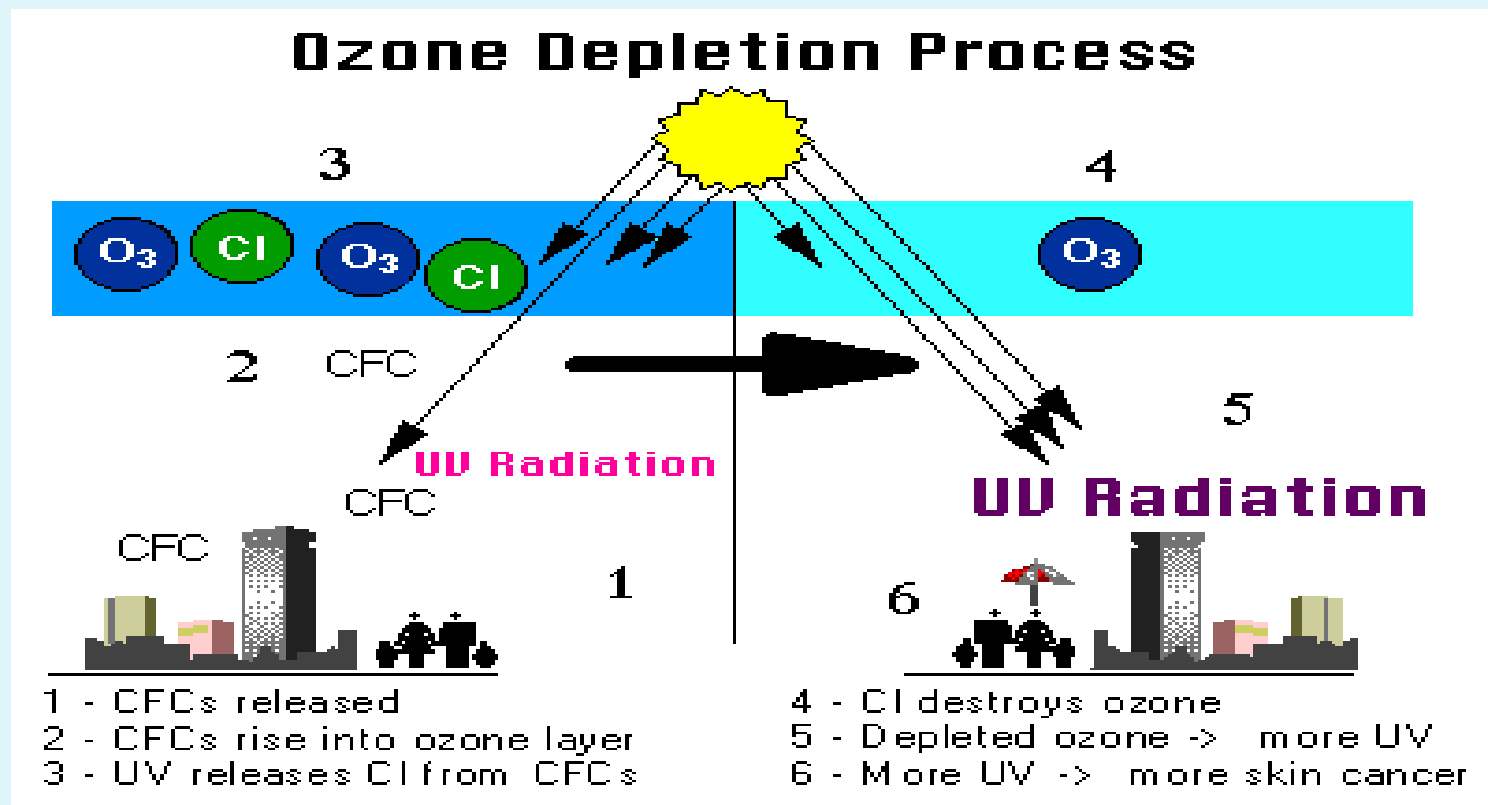
# IMPACT OF TECHNOLOGY ON ENVIRONMENT

- ✖ Emissions of Carbon Dioxide increased



# IMPACT OF TECHNOLOGY ON ENVIRONMENT

## ✦ Excessive formation of CFCs and Halogens



# IMPACT OF TECHNOLOGY ON ENVIRONMENT

## ✦ Extinction of species





# IMPACT OF TECHNOLOGY ON ENVIRONMENT

## ✕ Desertification



# IMPACT OF TECHNOLOGY ON ENVIRONMENT

✕ Ocean Pollution due to oil spills, plastics etc.





# IMPACT OF TECHNOLOGY ON ENVIRONMENT

- ✖ Lack of safe drinking waters



# ENVIRONMENTAL DEGRADATION

- ✖ The overall lowering of environmental quality due to the damage caused by both natural and human activities in the basic structure of the environment at local, regional and global level, adversely affecting all living organism including man

# ENVIRONMENTAL DEGRADATION

- ✖ Natural factors include droughts, floods, earthquake etc.





# ENVIRONMENTAL DEGRADATION

- ✖ Man made factors include deforestation, urbanization and industrialization



# ENVIRONMENTAL DEGRADATION

- ✖ To explain the impact of environmental degradation a three factor model was proposed by John and Paul for developed countries as

$$I = P \times A \times T$$

- ✖ I = Environmental impact
- ✖ P = Size of human population
- ✖ A = Affluence (Level of consumption of resources by population)
- ✖ T = Technology (Degradation pollution caused per unit or resource used)
- ✖ Affluence – Key governing factor

# ENVIRONMENTAL DEGRADATION

- ✖ For developing countries a model was given as

$$I = P \times P \times P$$

- ✖  $P$  = Population, Poverty and Pollution
- ✖ Poverty is key governing factor



# SUSTAINABLE DEVELOPMENT

- ✖ It is the development that meets the needs of present generation without jeopardizing the needs of future generation
- ✖ Steps to be taken for sustainable development:
  - 1) Control of Population
  - 2) Reduction in excessive use of resources
  - 3) Recycling and Reuse of materials
  - 4) Using cleaner technologies
  - 5) Development of more public transport facilities