Environmental Engineering-1

Lecture 1 – Introduction to Environmental Engineering

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Course Content

Environmental Engineering -1

Introduction to Environmental Engineering:

Introduction to Environmental Engineering and environment related terms. Sources of environmental pollution- municipal, industrial and agricultural

Environmental pollution

-Water pollution

-Air Pollution

-Noise pollution

Solid waste Management:

Classification of solid wastes. Reduction, recycling and reuse. Solid waste collection, Solid waste disposal methods.

Water Quality:

Types of impurities in drinking water. Water quality and public health. Water borne diseases. Water quality parameters. Criteria and standards. Water quality regulations. Measurement of water quality. Water quality monitoring and surveillance. WHO drinking water quality guidelines. Water quality standards

Water supply systems, Design of water distribution system:

Components of water supply systems. Water consumption. Components of water consumption. Factors affecting water consumption. Fire demand. Design period. Population forecasting. Design flows.Sources of water and their general quality. Environmental and technical consideration in site selection of dams and intakes. Components and layout of water transmission and distribution systems.Hydraulics of water transmission and distribution. Hardy cross method of pipe network analysis. Hardy cross method of pipe network analysis.

Principles of process engineering: material balance relationships. Reaction kinetics. Rate laws. Analysis of kinetic data. Reactor theory. Types of reactors. Application to process design

Water Treatment Processes:

purpose of treatment. General flow diagrams of water treatment plants. Principles, theory and design of various treatment processes such as sedimentation, coagulation ,flocculation and disinfection.

Text & reference Books

- McGee, T.J. **Water Supply and Sewerage**, 6th Edition. McGraw Hill Inc. 1991

- Davis, M.L and Cornwell, D.A. **Introduction to Environmental Engineering**, 2nd Edition. McGraw Hill Inc. 1991

Introduction

- **Environment:**

In the simplest words:

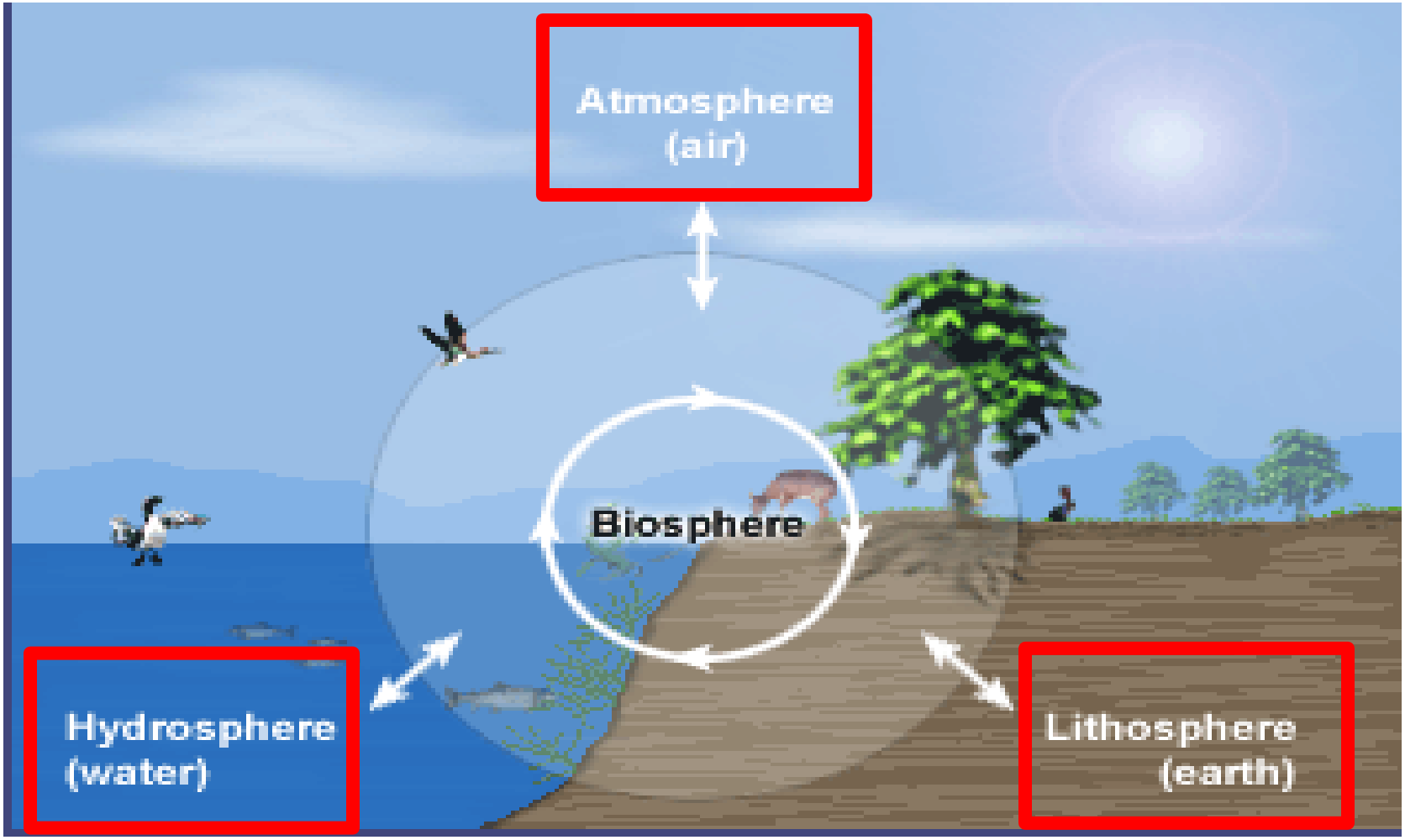
"Everything that surrounds and affect an organism during its lifetime is collectively known as Environment(e.g. Water , air, land, plant, and animal life)".

In technical words :

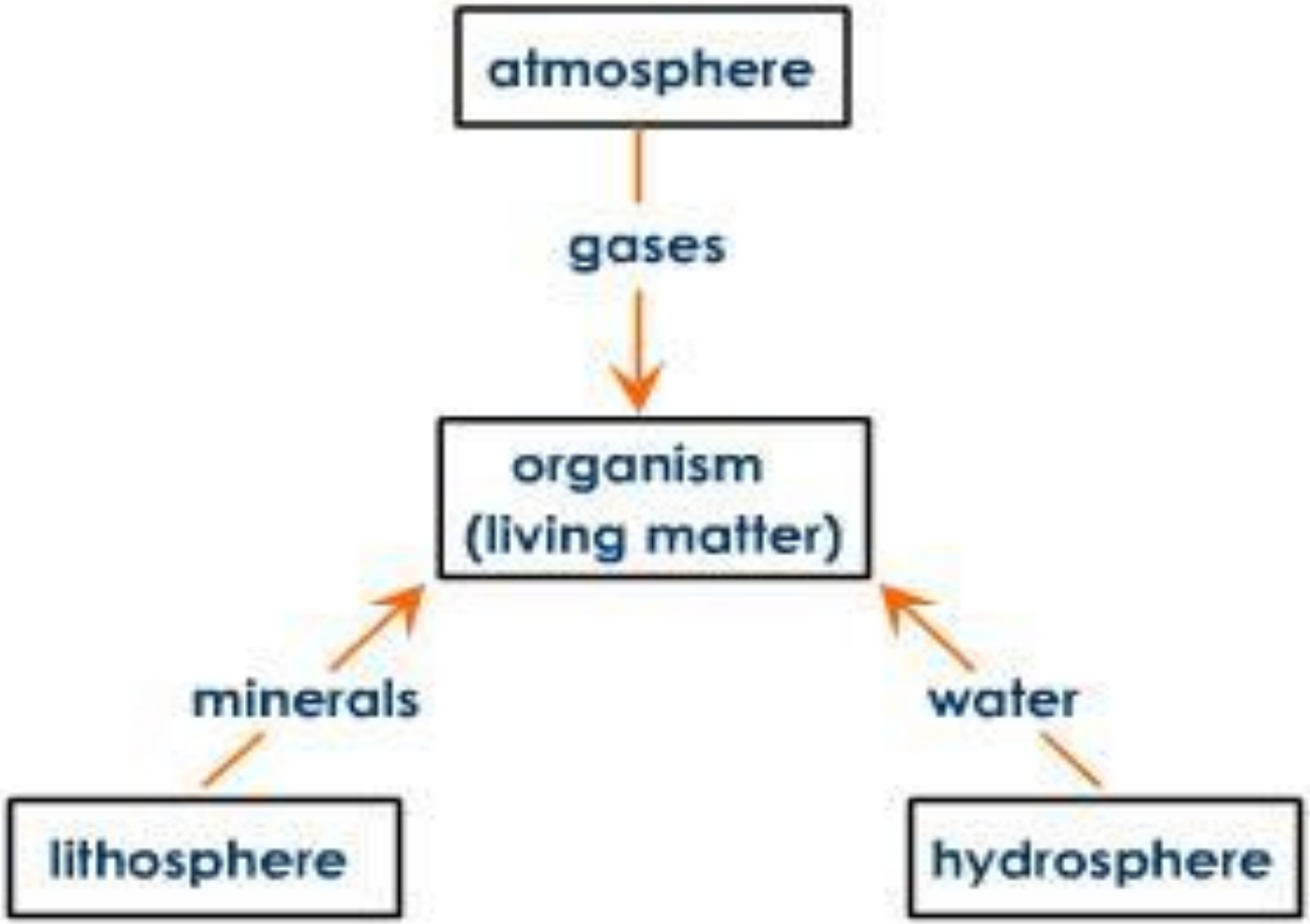
"Environment includes water, air , land & interrelationship among themselves & also with human being, other living things& property".

Introduction

- On global dimensions:



introduction



Introduction

- On global dimensions:

The environment consists of :

- Atmosphere(consists of mixture of gases extending outwards from the surface of the earth)
- Hydrosphere(consists of oceans, the lakes, rivers and streams, and the shallow groundwater)
- Lithosphere(consists of soil mental that wraps the core of the earth)
- Biosphere(part of atmosphere, hydrosphere, & lithosphere in which the life can exist)

- **Environmental Engineering:**

"It is the branch of engineering which is concerned with the application of scientific & engineering principles for the management of environment to protect human health from the adverse effects of environmental factors; to protect the environment, both local & global, from the potentially deleterious effects of human activities; & enhance the quality of human life and welfare by improving the environment quality."

- **Role of Environmental Engineer**

Environmental Engineers study:

- ✓ Water, soil and air pollution problems, and develop technical solutions needed to solve, attenuate or control these problems in a manner that is compatible with legislative, economic, social and political concerns.
- ✓ Also involved in such activities as water supply and sewerage, management of surface water and groundwater quality, remediation of contaminated sites and solid waste management in order to enhance & protect environment and quality of human health.

Introduction

- Role of Civil Engineer:

✓ Civil engineers are particularly involved in such activities as water supply and sewerage, management of surface water and groundwater quality, remediation of contaminated sites and solid waste management. Also design such structures, equipment and systems to protect & enhance the quality of environment and human health.

Introduction

- **Scope of Environmental Engineering**

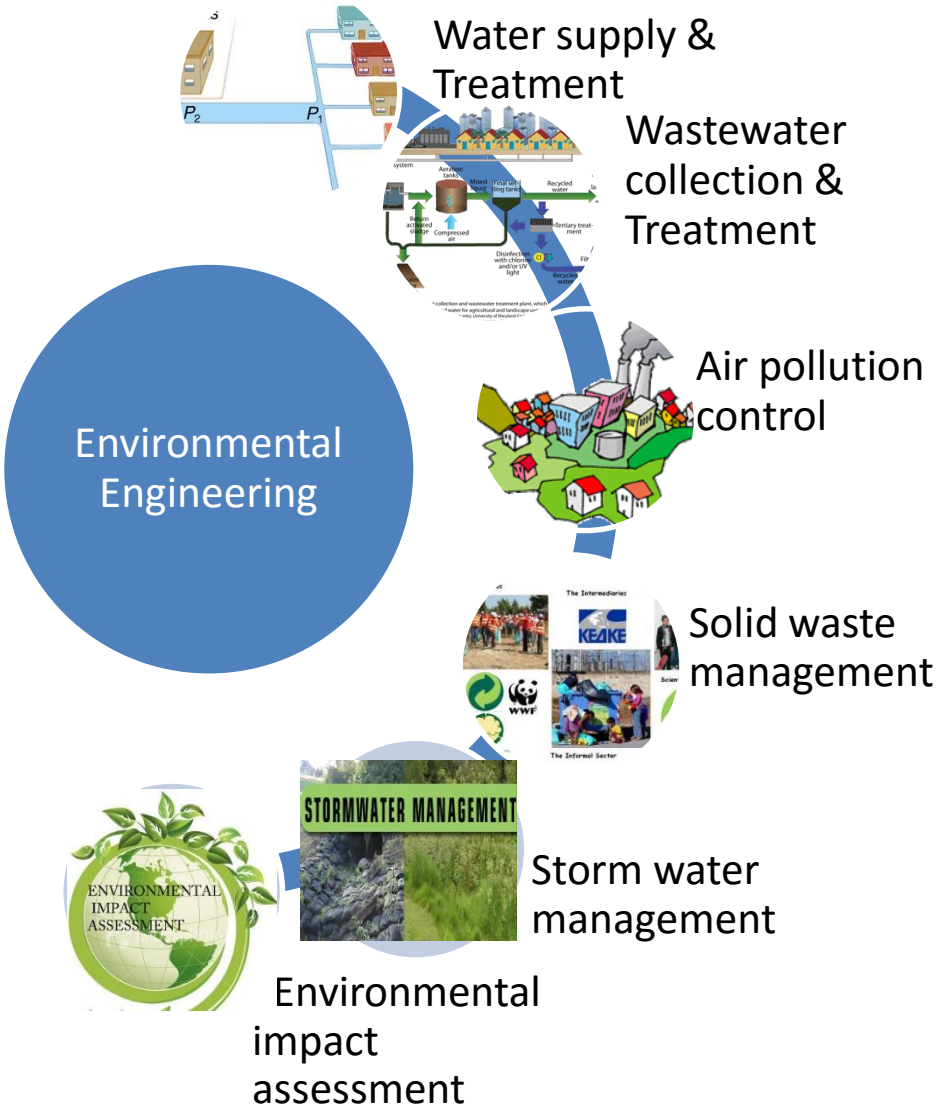
✓ Every development projects has an environmental impacts

✓ Environmental impact Assessment Reports are mandatory

✓ Construction of sewer collection & water supply system

Introduction

Areas of Specialty in Environmental Engineering



Terminology

Ecosystem

- It is a ecological system consisting of all the living organisms (biotic) living in a particular area, as well as all the non living physical components(abiotic) of the environment with which they interact, such as air, soil, water , and sunlight.

Termiology

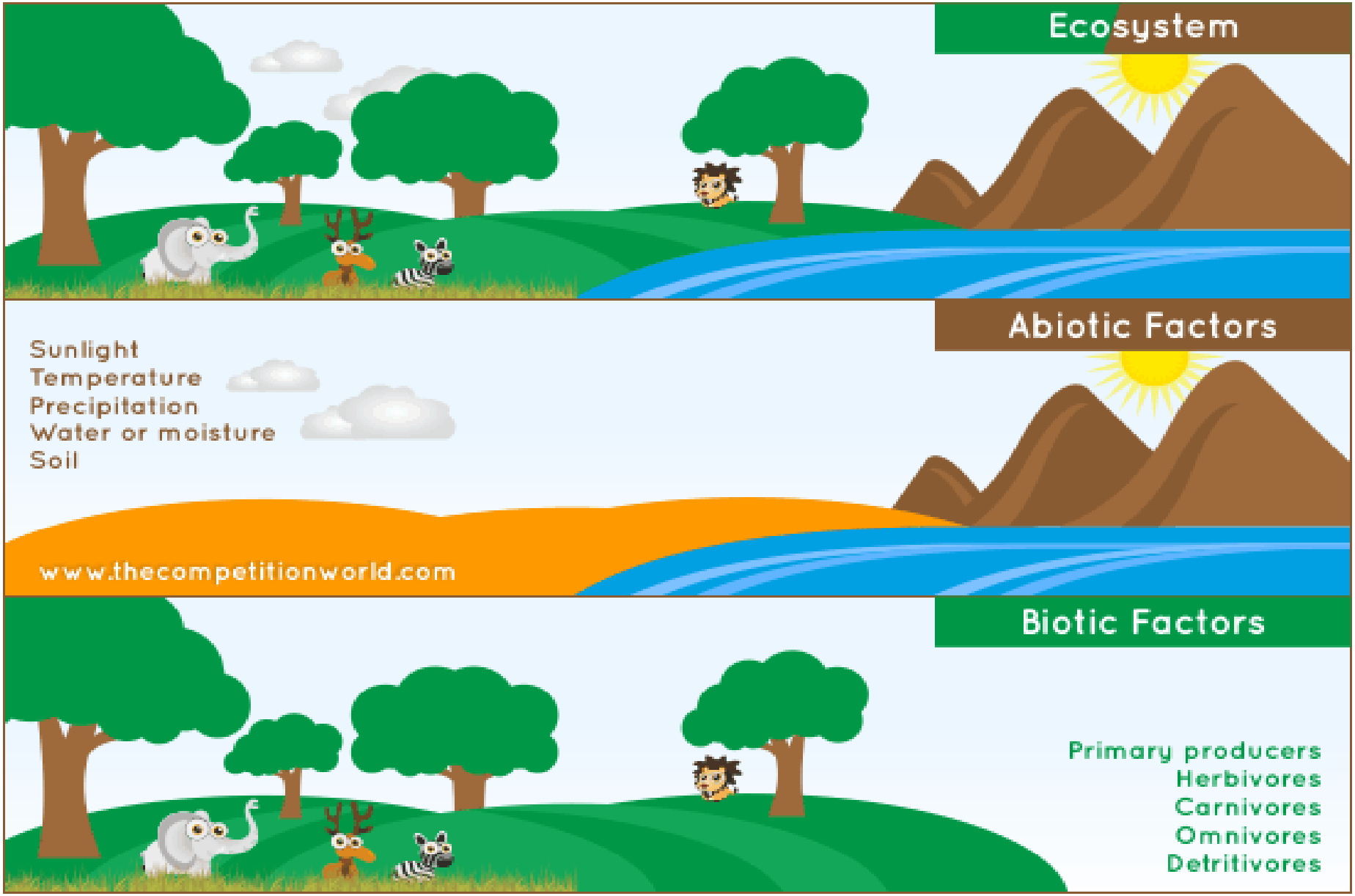
- Biotic factors

✓ Plants
✓ Animals
✓ Fungi
✓ Decomposers

- Abiotic factors

✓ Sunlight
✓ Water
✓ Wind
✓ Soil conditions
✓ Temperature

introduction

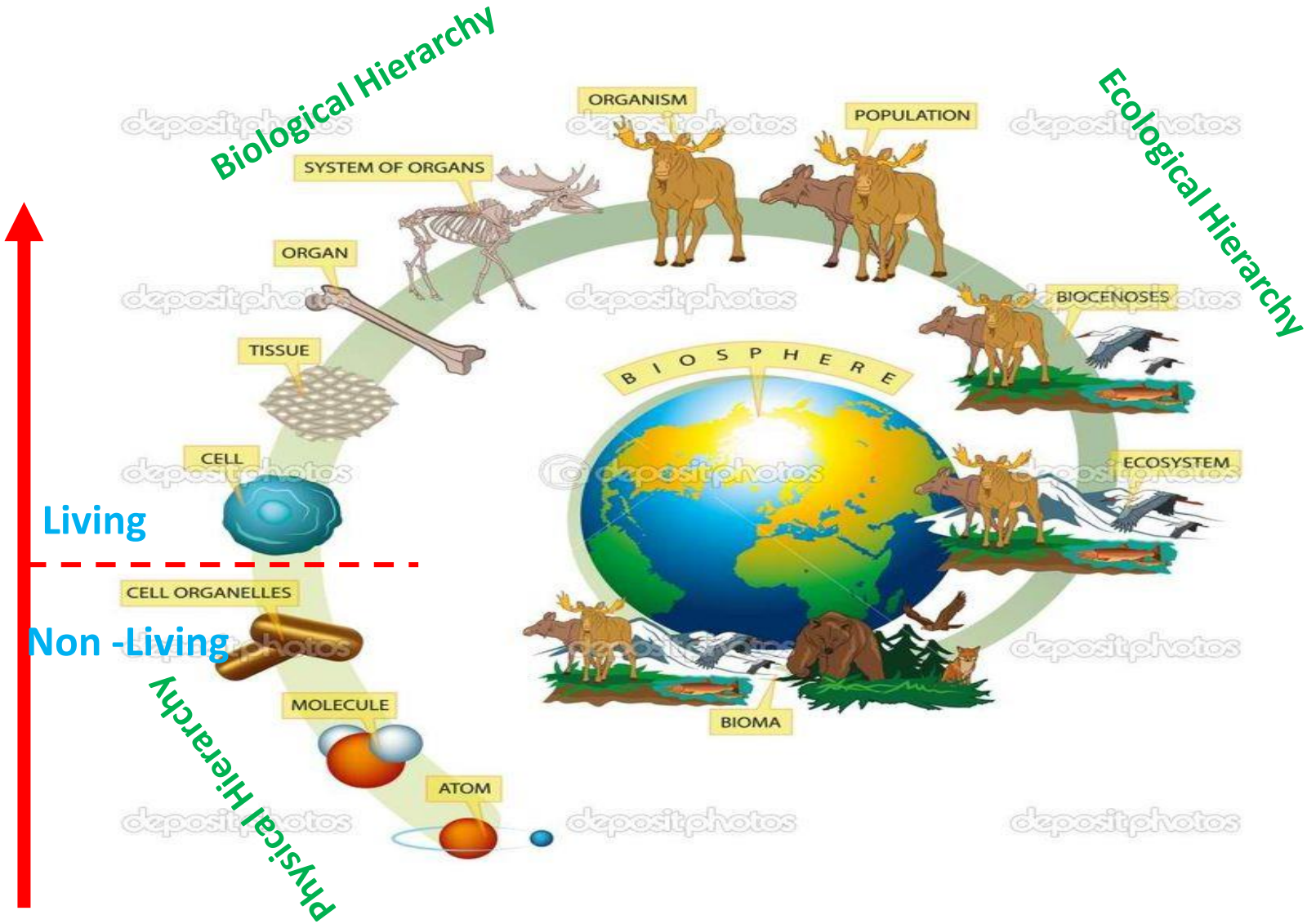


Terminology

Ecology

- The study of the interactions of organisms with one another and with their environment.

Level of Organization in the Environment



Termiology

Biosphere	The part of Earth that contains all ecosystems	
Ecosystem	Community and its nonliving surroundings	
Community	Populations that live together in a defined area	
Population	Group of organisms of one type that live in the same area	
Organism	Individual living thing	
Groups of Cells	Tissues, organs, and organ systems	
Cells	Smallest functional unit of life	
Molecules	Groups of atoms; smallest unit of most chemical compounds	

Habitat

"It is an ecological or environmental area that is inhabited by a particular species of animal, plant, or other type of organism".

Or

"It is the natural environment in which an organism lives, or the physical environment that surrounds (influences and is utilized by a species population)".

Termiology

Resource

"Any thing (living or non living) which humans obtain to meet their needs and wants (solar energy, air, water, minerals, petroleum)".

Types of Resources:

1. Renewable(perpetual /continuous resource)

A resource that is virtually inexhaustible on a human time scale (e.g. Solar energy, tides, wind)

2. Non renewable(exhaustible resource)

A resource that is available in a fixed amount (e.g., oil, coal, metallic minerals)

Yield

Sustainable Yield

- Highest rate at which a renewable resource can be used without reducing its available supply locally, regionally, or globally.

Carrying capacity

- It is the maximum number of individuals of a given species that a particular habitat can support.

- Exceeding the sustainable yield can cause a resource to become non renewable. This generally called Environmental Degradation

Development

- Application of various resources to improve the quality of human life.

Sustainable Development

- It is the development through which we can meet our present needs without compromising the ability of future generation to meet their own needs.

Conservation

- Management of human use of natural resources in a manner that such use can continue.

Terminology

Environmental Degradation

"Exhaustion or destruction of a potentially renewable resource such as water, forest, or wildlife by consuming it at higher rate that it is naturally renewed".

- The processing and use of resources results in the generation of different type of wastes(e.g, Liquid Wastes(municipal, industrial wastewaters), Solid Wastes(discarded materials of household), Gaseous Wastes(emissions from industries and motor vehicles such as $CO, CO_2, SO_2, O_3, No_x$)
- The wastes are released back to the environment that may cause environmental pollution

Environmental Pollution

Environmental Pollution

"Any thing added to water, air ,soil or food that threatens health survival or activities of humans or other organisms is called Environmental Pollution".

Or

"Any condition or substance resulting from human or natural activity that adversely affect the quality of environment is called Environmental Pollution"

Pollutant

"Any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystem."

Environmental Pollution

- Sources of Pollution

Natural:

- Volcanoes
- Lightning
- Dust storm
- Strom water runoff
- Termites, Cows
- Soil microbes
- Oceans

Anthropogenic:

- Municipal
- Industrial
- Agricultural

Environmental Pollution

Different forms of Pollution

Key Environmental Issues of Pakistan

- ✓ Poor Drinking Water Quality (as if does not meet WHO guidelines)
- ✓ Limited Water Supply and Sanitation Coverage (as 63% of population has access to water supply)
- ✓ Pollution of Water Sources (In Pakistan 1% of wastewater is treated before discharge)
- ✓ Air Pollution
- ✓ Noise Pollution in big cities
- ✓ Poor Waste collection and disposal

Environmental pollution control Strategies

- ✓ Pakistan Environmental Protection Act
  - ✓ (PEPC, EPAs, NEQS)
- ✓ Industries required to provide: Wastewater treatment plant, Air Pollution control
- ✓ Public awareness programme
- ✓ Pollution charges
- ✓ Incentives for pollution control
- ✓ Promote clean technology, recycling, by products
- ✓ Improve water quality (WHO guidelines)
- ✓ Prohibit raw sewage irrigation
- ✓ Ban on solid waste burning
- ✓ Tune vehicles , ban pressure horns
- ✓ Provide appropriate sanitation facilities