Unit I

Humans and the Environment

Environment

French word 'environ', ***which means encircle or surrounds***

- **Environment is the sum total of living, non living components; influences and events, surroundings**

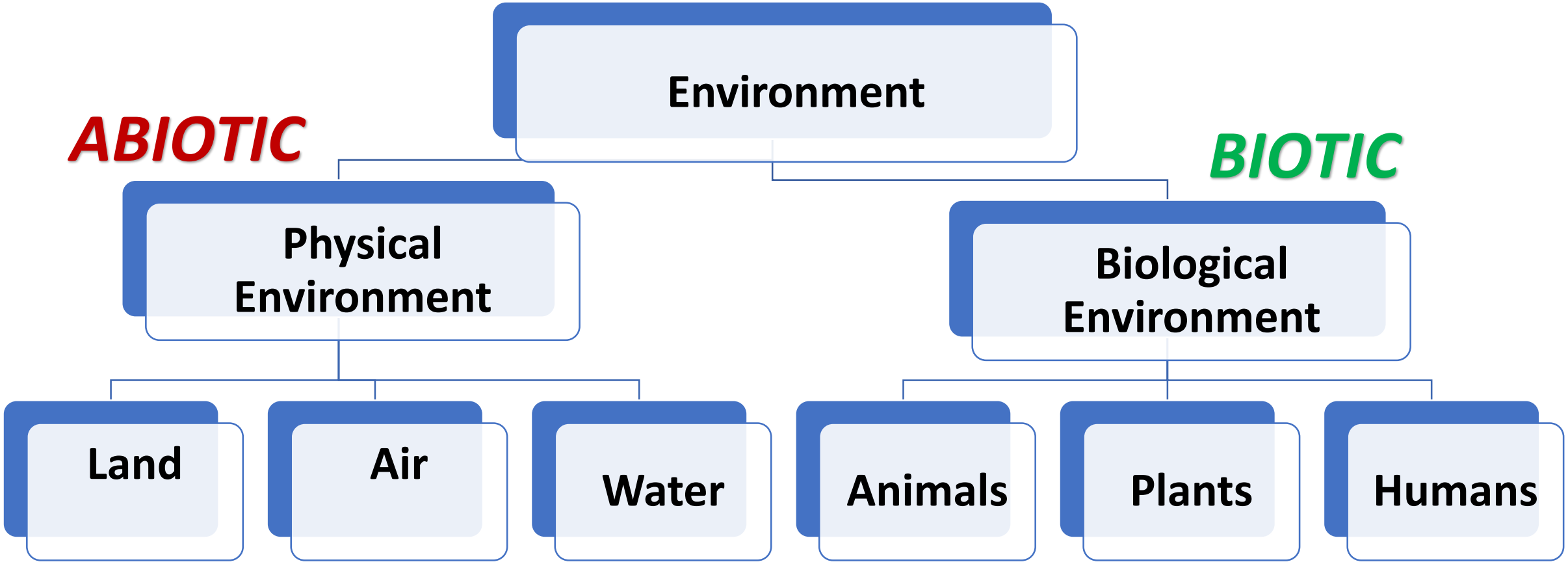
External Conditions + Influences That affect the Living organisms

Ecology : Scientific Study of the relationship of the living organisms with each other and with their environment.

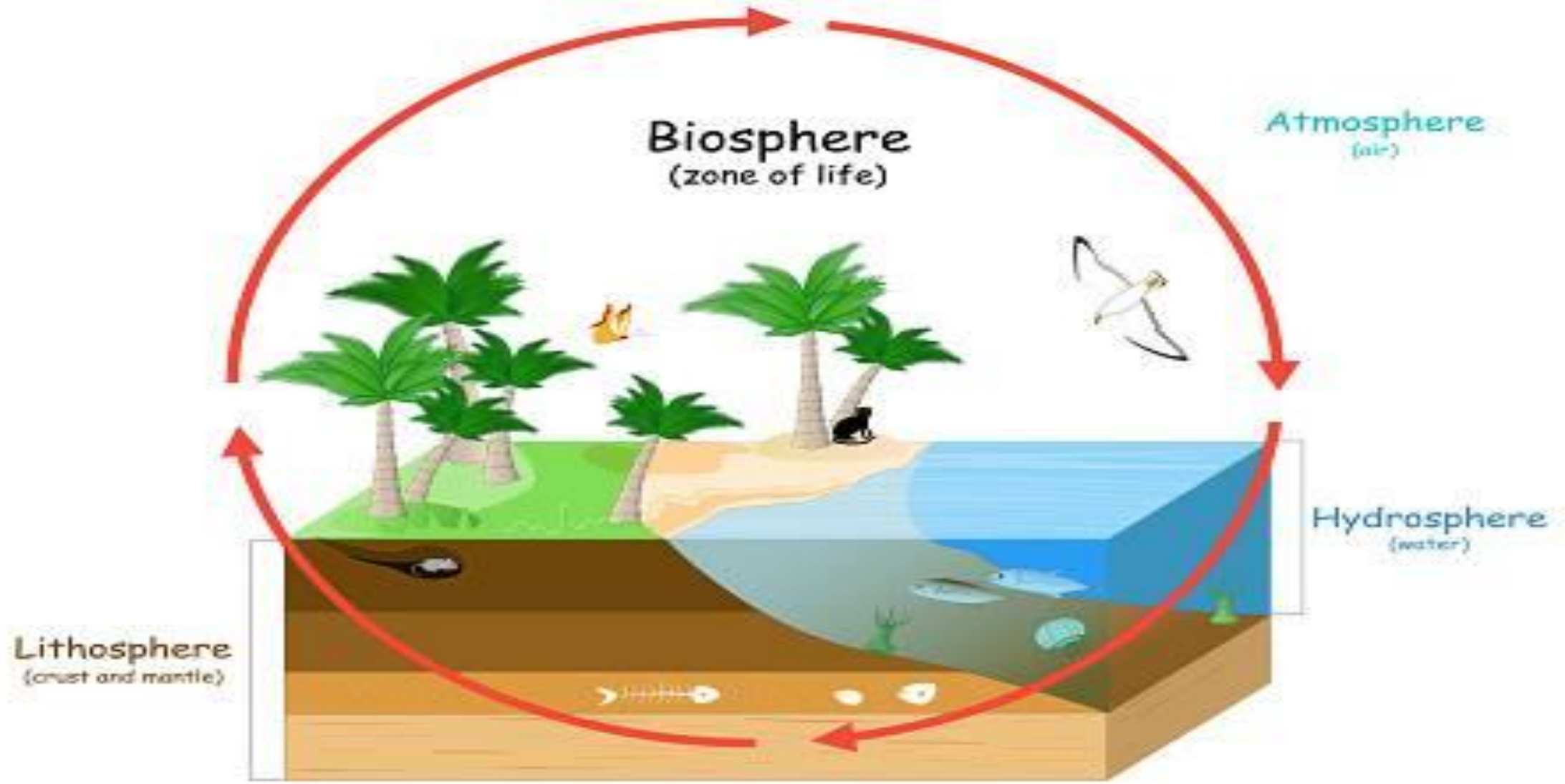
Ecosystem : Structural and functional unit of biosphere consisting of community of living beings and the physical environment, both interacting and exchanging materials between them.

"Can the definition of environment be scale-dependent — for example, is a microchip's environment different from a city's environment?"

CLASSIFICATION OF ENVIRONMENT



Four Major Domains of Earth



ATMOSPHERE

Blanket of gases; extend upto several thousand km.

- Composed mainly of Nitrogen (78%), Oxygen (21%), and other gases like CO_2, Argon, and water vapour.
- Protects from harmful solar radiation, regulates temperature, and enables respiration.

Layers of Atmosphere

- Troposphere
- Stratosphere
- Mesosphere
- Thermosphere
- Exosphere

1.Troposphere

- Extends up to about 8–15 km (5–9 miles)
- Weather happens here (clouds, rain, storms)
- Temperature decreases with altitude

2.Stratosphere

- From about 15 km to 50 km (9 to 31 miles)
- Contains the ozone layer, which absorbs UV radiation
- Temperature increases with altitude because of ozone absorption of UV rays

3.Mesosphere

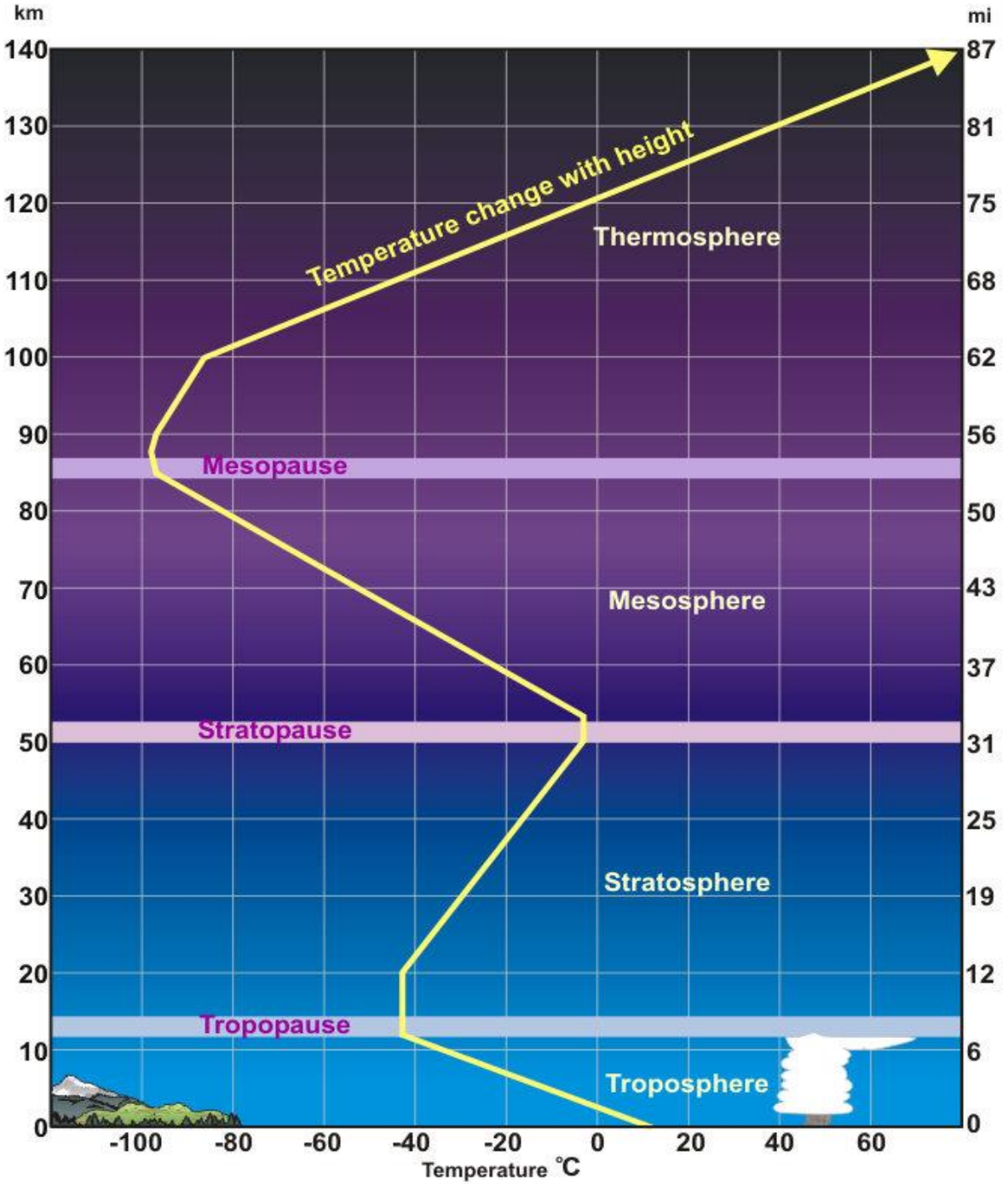
- From about 50 km to 85 km (31 to 53 miles)
- Meteors burn up here
- Temperature decreases with altitude, it's the coldest layer

4.Thermosphere

- From about 85 km to 600 km (53 to 373 miles)
- Very thin air, temperatures rise sharply with height due to solar radiation
- Auroras occur here

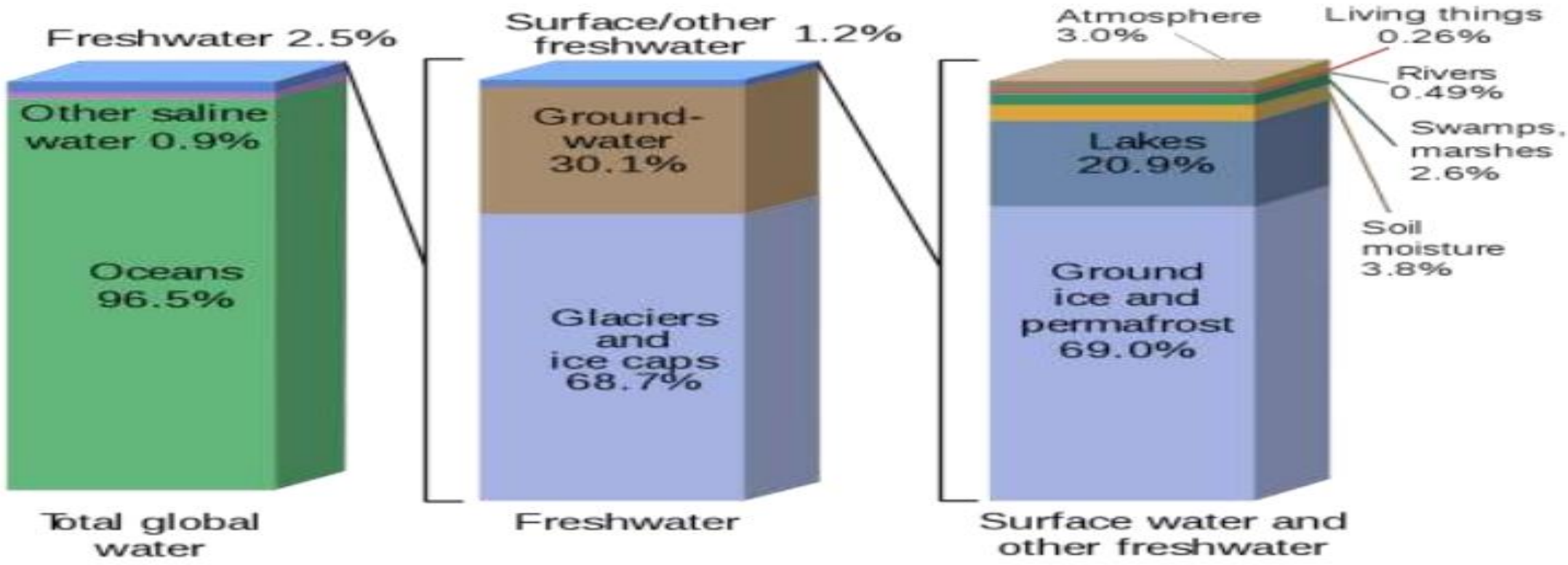
5.Exosphere

- From about 600 km to 10,000 km (373 to 6,200 miles)
- The outermost layer, gradually fades into space
- Very few particles, mainly hydrogen and helium



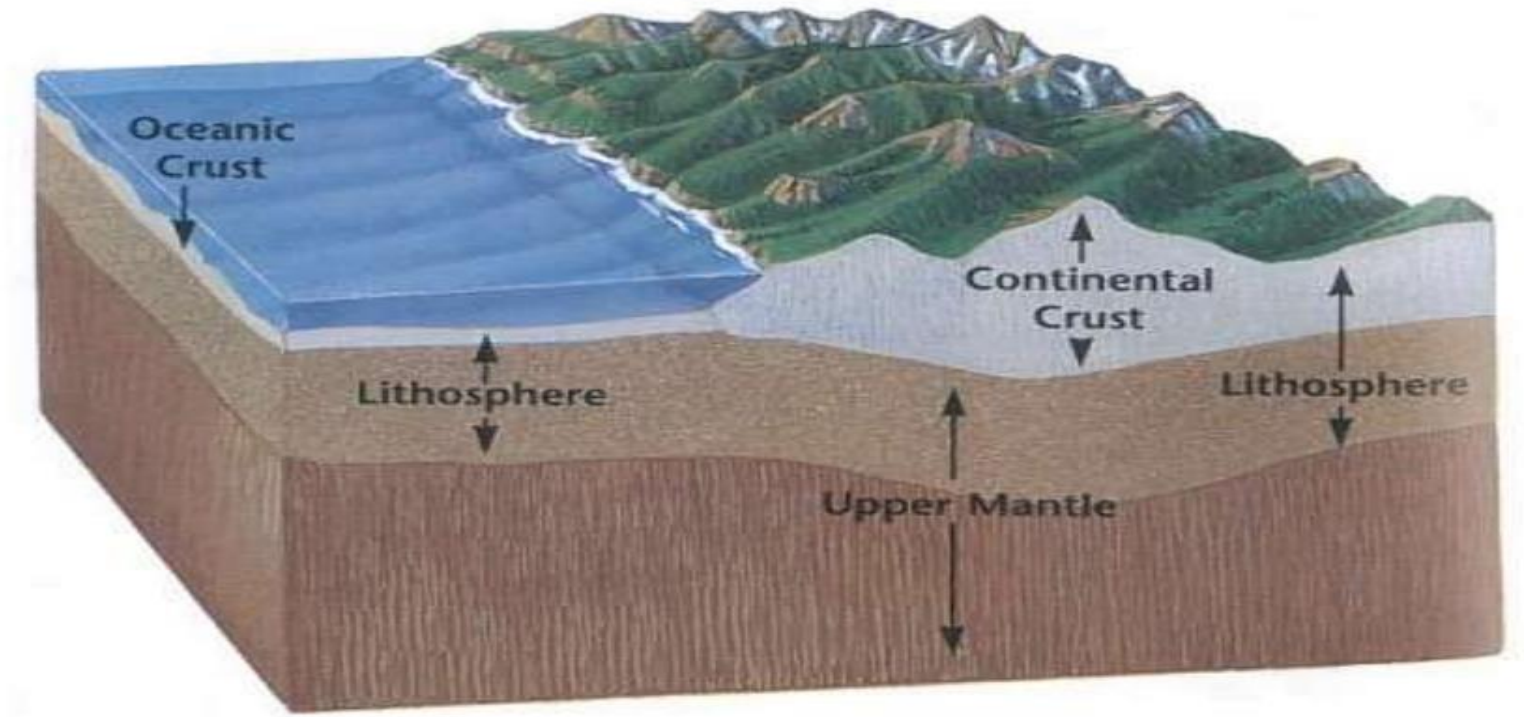
HYDROSPHERE

- All forms of water — oceans, rivers, lakes, groundwater, glaciers, and atmospheric water vapour.
- Covers about 71% of Earth's surface.
- Essential for climate regulation, life processes, and transportation



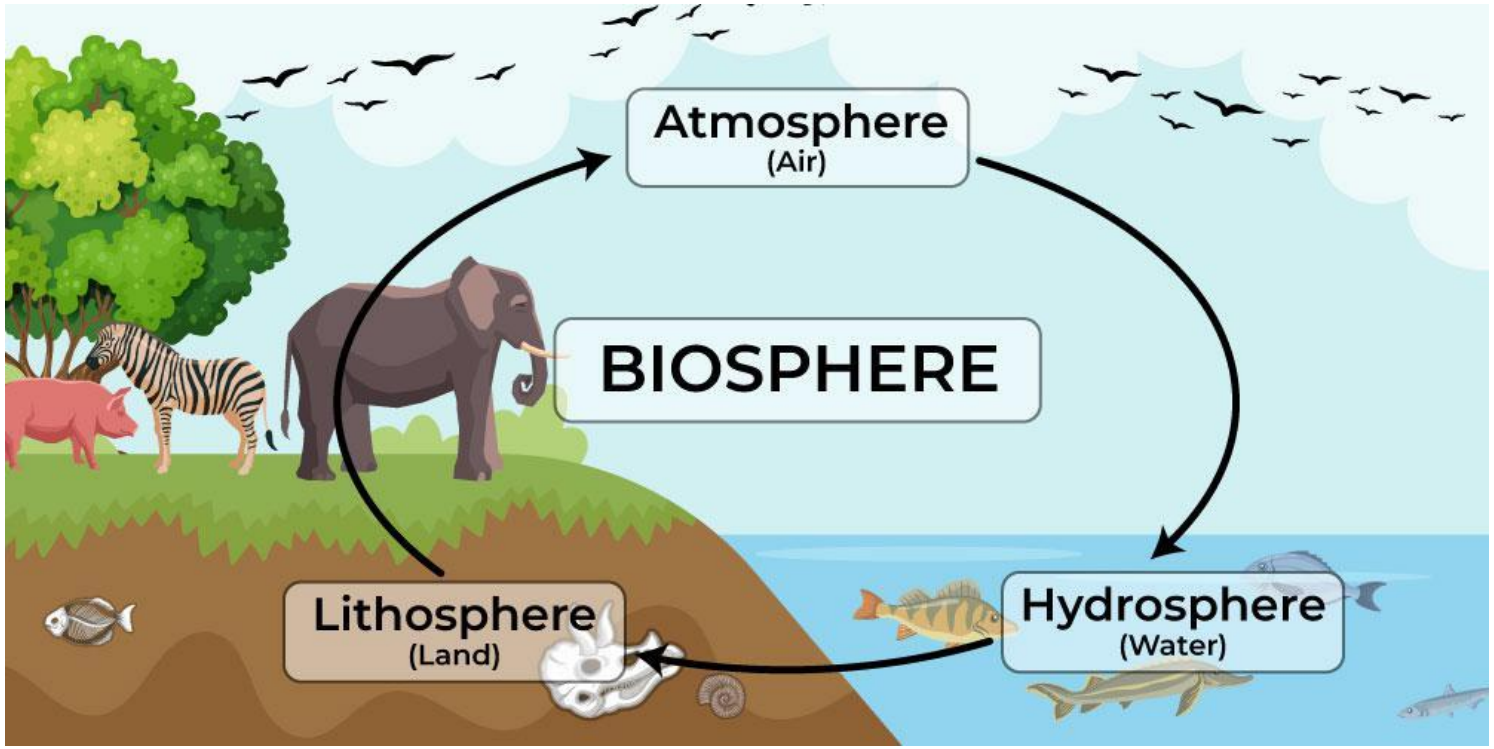
LITHOSPHERE

- The solid outer layer of the Earth, including continents, mountains, valleys, and the ocean floor.
- Provides habitat, minerals, and raw materials.
- Examples: Himalayas, Deccan Plateau, oceanic crust.

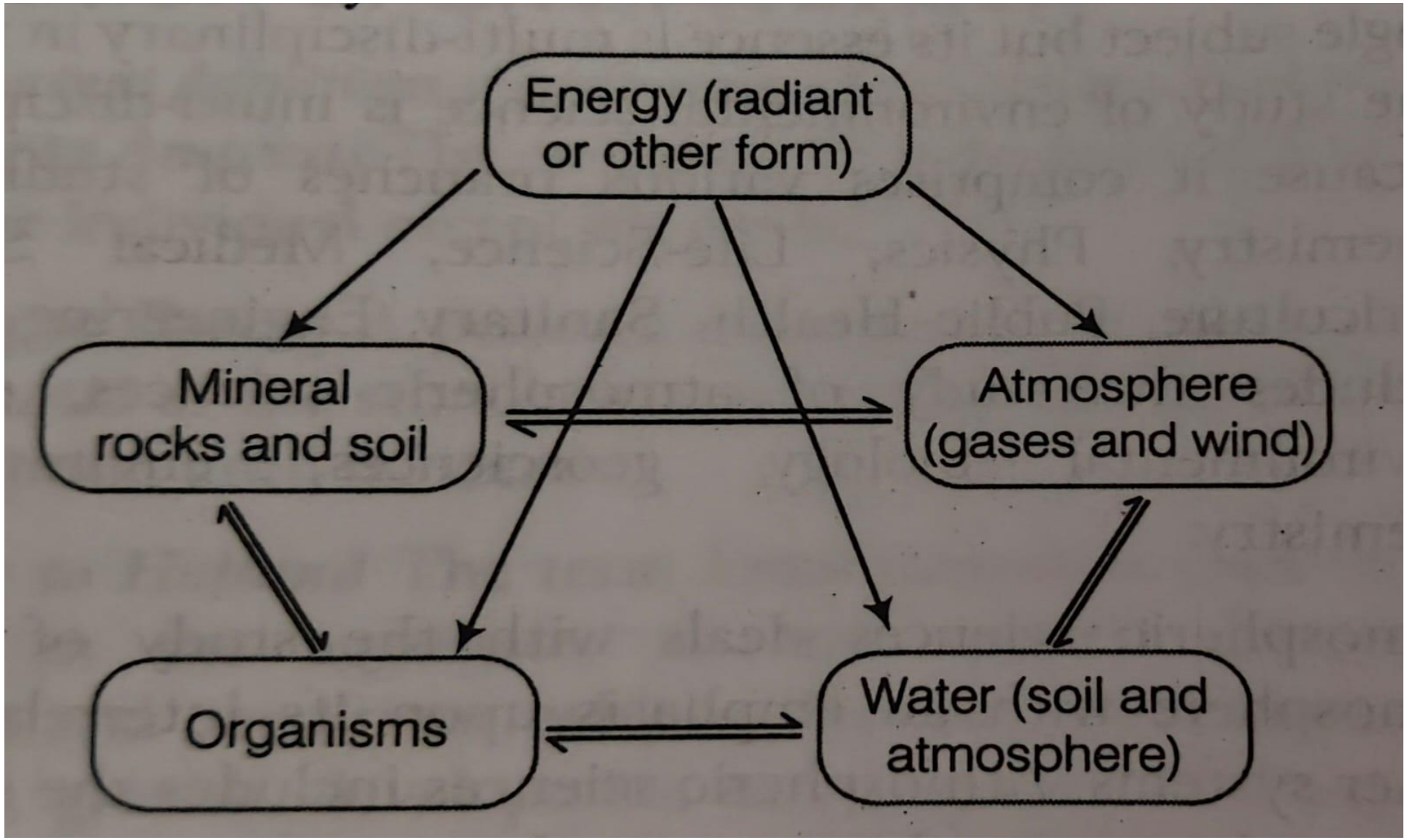


BIOSPHERE

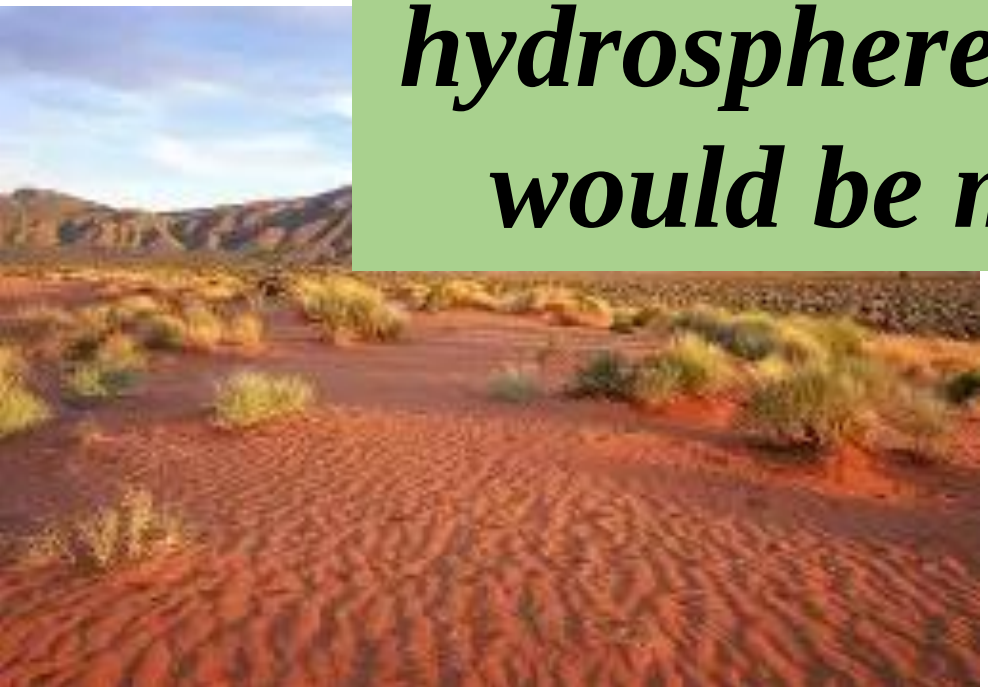
- The zone where life exists - overlaps with lithosphere, hydrosphere, and atmosphere.
- Includes all living organisms and their interactions with the environment.
- Dynamic and self-regulating.



IMPORTANCE OF ENVIRONMENTAL FACTORS



If a server farm (data center) is placed in a desert area, what environmental domains (lithosphere, hydrosphere, atmosphere, biosphere) would be most affected and how?



ENVIRONMENTAL ETHICS

Environmental ethics refers to the issues, principles and guidelines relating to human interactions with their environment.

Study of moral relationship between humans and the environment

Explores how humans should treat nature and other living beings

Guides environmental laws, policies, and personal actions

Anthropocentrism

Biocentrism

Ecocentrism

Anthropocentric Worldview: This view is guiding most industrial societies. It puts human beings in the center giving them the highest status. Man is considered to be most capable for managing the planet earth.

The guiding principles of this view are:

(i) Man is the planet's most important species and is the in-charge of the rest of nature.

(ii) Earth has an unlimited supply of resources and it all belongs to us.

(iii)Economic growth is very good and more the growth, the better it is, because it raises our quality of life and the potential for economic growth is unlimited.

(iv) A healthy environment depends upon a healthy economy.

(v) The success of mankind depends upon how good managers we are for deriving benefits for us from nature.

Eco-centric Worldview: This is based on earth-wisdom.

The basic beliefs are as follows:

(i) Nature exists not for human beings alone, but for all the species.

(ii) The earth resources are limited and they do not belong only to human beings.

(iii) Economic growth is good till it encourages earth-sustaining development and discourages earth-degrading development.

(iv) A healthy economy depends upon a healthy environment.

(v) The success of mankind depends upon how best we can cooperate with the rest of the nature while trying to use the resources of nature for our benefit.

A company wants to mine lithium for EV batteries in a fragile Himalayan ecosystem. The project will create jobs but may damage biodiversity.
What decision would you make as a policymaker?

Environmental ethics can provide us the guidelines for putting our beliefs into action and help us decide what to do when faced with crucial situations.

Some important ethical guidelines known as Earth ethics or Environmental Ethics are as follows:

- You should love and honour the earth since it has blessed you with life and governs your survival.
- You should keep each day sacred to earth and celebrate the turning of its seasons.
- You should not hold yourself above other living things and have no right to drive them to extinction.
- You should be grateful to the plants and animals which nourish you by giving you food.
- You should limit your offsprings because too many people will overburden the earth.
- You should not waste your resources on destructive weapons.
- You should not run after gains at the cost of nature, rather should strive to restore its damaged majesty.
- You should not conceal from others the effects you have caused by your actions on earth.

- You should not steal from future generations their right to live in a clean and safe planet by impoverishing or polluting it.

- You should consume the material goods in moderate amounts so that all may share the earth's precious treasure of resources.

If we critically go through the above ten commandments for earth ethics and reflect upon the same, we will find that various religions teach us the same things in one form or the other.

- Our Vedas have glorified each and every component of nature as gods or goddesses so that people have a feeling of reverence for them. Our religious and cultural rituals make us perform such actions that would help in the conservation of nature and natural resources.

- The concept of .ahimsa. (non-violence) in Buddhism and Jainism ensure the protection and conservation of all forms of life, thereby keeping the ecological balance of the earth intact. Our teachings on .having fewer wants. ensures to put .limits to growth and thus, guide us to have an eco-centric life style.

Brief History of Environmentalism

1.Early Awareness (Pre-19th Century)

1. Ancient civilizations (e.g., Greeks, Romans, Indus Valley) practiced forms of resource management such as crop rotation, irrigation, and forest preservation.
2. Religious and cultural traditions often promoted harmony with nature.

2.Industrial Revolution (Late 18th–19th Century)

1. Rapid industrialization led to pollution, deforestation, and urban crowding.
2. Early environmental thinkers like **Henry David Thoreau** (*Walden*, 1854) and **George Perkins Marsh** (*Man and Nature*, 1864) warned about human impacts on nature.

3.Conservation Movement (Late 19th–Early 20th Century)

1. Focused on protecting forests, wildlife, and natural resources.
2. Creation of national parks (e.g., Yellowstone, 1872 in the USA).
3. Leaders: John Muir (wilderness preservation), Gifford Pinchot (sustainable use).

4. Modern Environmental Movement (1960s–1980s)

1. Triggered by pollution disasters and scientific awareness.
2. Rachel Carson's *Silent Spring* (1962) exposed pesticide dangers.
3. First Earth Day (1970) mobilized millions globally.
4. Rise of environmental laws: Clean Air Act, Clean Water Act.

5. Global Environmentalism (1990s–Present)

1. Recognition of climate change, biodiversity loss, and sustainability challenges.
2. International agreements: Kyoto Protocol (1997), Paris Agreement (2015).
3. Integration of technology: renewable energy, environmental monitoring, and AI for climate solutions.

Movement	**Year / Period**	***Leader(s)***	**Idea / Objective**	**Significance**
Bishnoi Movement	1730, Rajasthan	***Amrita Devi Bishnoi & Bishnoi community***	Protect Khejri trees from being cut	Early eco-protest; 360+ lives sacrificed; showed deep respect for nature
Chipko Movement	1973, Uttarakhand	***Sunderlal Bahuguna, Chandi Prasad Bhatt, Gaura Devi***	Hugging trees to stop commercial logging	Raised awareness on deforestation; role of women; symbol of ecofeminism
Silent Valley Movement	Mid-1970s–1985, Kerala	***Kerala Sastra Sahitya Parishad, scientists, activists***	Opposed hydroelectric project in Silent Valley rainforest	Saved unique rainforest; Silent Valley declared National Park

Appiko Movement	1983, Karnataka (Western Ghats)	***Panduranga Hegde***	Inspired by Chipko, villagers hugged trees to stop logging & monoculture plantations	Spread awareness on forest conservation & sustainable use
Narmada Bachao Andolan	1985 onwards, MP, Gujarat, Maharashtra	***Medha Patkar, Baba Amte***	Opposed big dams (Sardar Sarovar, Narmada project) for displacement & ecological damage	Brought global attention to rehabilitation, displacement, and ecological justice
Tehri Dam Movement	1970s–2004, Uttarakhand	***Sunderlal Bahuguna & villagers***	Protested Tehri Dam due to seismic risks, displacement, ecological harm	Delayed project for decades; highlighted fragile Himalayan ecosystem issues
Navdanya Movement	1982 onwards (nationwide)	***Dr. Vandana Shiva***	Promoted seed sovereignty, organic farming, biodiversity	Established seed banks; fought GM crops; promoted sustainable agriculture

📄 **1962** – *Silent Spring* (Rachel Carson) – sparks global awareness about pesticides
🌊 **1971** – Ramsar Convention on Wetlands
🌍 **1972** – UN Conference on Human Environment (Stockholm) → World Environment Day established
🐯 **1973** – Project Tiger launched in India
☢️ **1979** – Three Mile Island Nuclear Accident (USA)
☠️ **1984** – Bhopal Gas Tragedy (India)
🛡️ **1985** – Vienna Convention for the Protection of the Ozone Layer
☢️ **1986** – Chernobyl Nuclear Disaster & Environment (Protection) Act, India
📜 **1987** – Montreal Protocol on Ozone-Depleting Substances & Brundtland Report defines "Sustainable Development"
🌎 **1992** – Earth Summit at Rio → Agenda 21, Rio Declaration, UNFCCC, UNCBD, UNCCD established
📜 **1997** – Kyoto Protocol (legally binding GHG emission targets)

🌐 **2000** – Millennium Development Goals (MDGs) adopted
🌐 **2002** – Earth Summit (Rio+10), Johannesburg → Plan of Implementation
🌀 **2004** – Indian Ocean Tsunami highlights disaster risk reduction importance
☀️ **2015** – International Solar Alliance launched (Paris)
🌱 **2015** – Paris Agreement under UNFCCC adopted
 2011–2020 – UN Decade on Biodiversity
🌍 **2020–2030** – UN Decade on Ecosystem Restoration
🔥 **2021** – IPCC 6th Assessment Report warns of irreversible climate change impacts
🌳 **2023** – Kunming-Montreal Global Biodiversity Framework adopted at COP15

Only one Earth

🌍 1972 : UN CONFERENCE ON THE HUMAN ENVIRONMENT (STOCKHOLM)

Key Points:

Date & Place: 5–16 June 1972, Stockholm, Sweden.

First major international meeting to address global environmental issues.

- **Outcome:**
  - **Stockholm Declaration** → 26 Principles on human–environment interaction and action plan (109 recommendations)
  - Formation of **United Nations Environment Programme (UNEP)**.
  - Recognition that environmental protection and development are interconnected.
- **Impact on Policy:** Inspired many countries (including India) to establish environment ministries and laws.
- **Tech Relevance:** Set the stage for considering the environmental footprint of industrial growth, including modern ICT infrastructure.

📜 1987 – Brundtland Commission
(Our Common Future)

•Officially the **World Commission on Environment and Development (WCED)**, chaired by **Gro Harlem Brundtland** (PM of Norway).
•Established by the UN in 1983 to address the accelerating deterioration of the human environment and natural resources.

Key Contribution:
•**Definition of Sustainable Development:**
"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."
•Emphasized **interdependence** of environment, economy, and social equity.

Impact:
•Made *sustainability* a global political and academic priority.
•Laid intellectual foundation for the **1992 Earth Summit** and future climate agreements.
•Introduced the concept of **long-term thinking** in development planning.

Our common future depends on sustainable choices today.

🌍 1992 United Nations Conference on Environment and Development (Earth Summit) – Rio de Janeiro

Key Points:

- ❑ **Date & Place:** 3–14 June 1992, Rio de Janeiro, Brazil.
- ❑ **Purpose:** Balance **economic development**, **social equity**, and **environmental protection** on a global scale.

Major Outcomes:

- ❑ **Agenda 21** – Global action plan for sustainable development.
- ❑ **Rio Declaration** – 27 principles guiding sustainable policy.
- ❑ **Forest Principles** – Non-binding guidelines for forest management.
- ❑ **Conventions Signed:**
  - ❑ **UNFCCC** – Framework for climate change action.
  - ❑ **CBD** – Convention on Biological Diversity.
  - ❑ **UNCCD** – Convention to Combat Desertification.
- ❑ **Legacy:** Put “sustainable development” into the mainstream of global policy

What is Sustainable Development?
Definition (Brundtland Commission, 1987):

“Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

Three Pillars:

1.Environmental Sustainability – Protect ecosystems, conserve resources.

2.Economic Sustainability – Support growth without degrading natural capital.

3.Social Sustainability – Equity, justice, and community well-being.

SUSTAINABLE DEVELOPMENT GOALS

17 Goals ------ 169
Targets ----- 232
Indicators

2015 → *SDGs formally adopted at UN Summit*
2016 → *SDGs take effect*
2030 → *Target year for achievement*

- The 2030 Agenda for Sustainable Development,

- Adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future.

- At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - **in a global partnership.**

- They recognize that **ending poverty and other deprivations must go hand-in-hand with strategies that**

- **improve** health and education
- reduce inequality, and spur economic growth
- all while **tackling climate change and working to preserve our oceans and forests.**

Ecological Footprint

A measure of the demand humans place on Earth's ecosystems — the amount of land and water area needed to produce the resources we consume and to absorb the waste we generate.

- ❑ Expressed in **global hectares (gha)** per person.
- ❑ Compares **human demand** with **Earth's regenerative capacity** (*biocapacity*).
- ❑ Higher footprint = greater environmental impact.

Common Contributors:

- ***Energy use*** *(electricity, transport, manufacturing)*
- ***Food production***
- ***Water consumption***
- ***Waste generation***

Carbon Footprint

(The environmental cost of our activities)

The total amount of greenhouse gases (mainly CO_2) released directly or indirectly by a person, organization, product, or activity, expressed in CO_2 equivalents (CO_2e).

Main Sources

- **Energy use** – electricity, heating/cooling
- **Transportation** – cars, flights, shipping
- **Industry & manufacturing** – factories, supply chains
- **Food production** – livestock, farming practices
- **Waste generation** – landfill methane emissions

Global Context

- World average per capita: **~ 4.7 tonnes CO_2e/year**
- India: **~1.9 tonnes CO_2e/year** (low per capita, but rising fast)
- Target for climate stability: **< 2 tonnes CO_2e/year per person**

Ecological footprints are not all equal

(footprintcalculator.org)

Thank You