

ENVIRONMENTAL STUDIES



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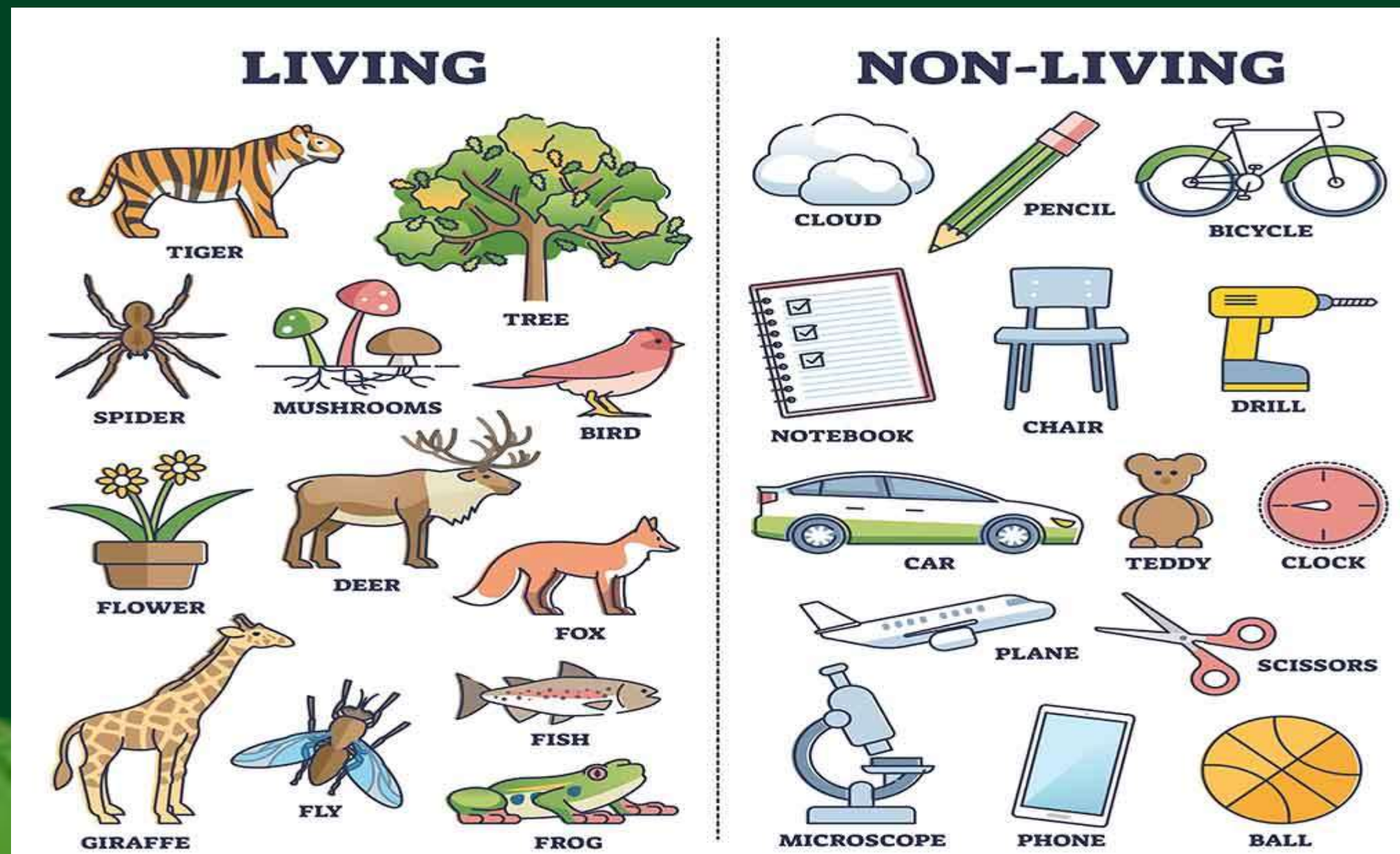
Overview

- Focusing on **Air, Water, Soil, Ecosystem, Climate changes** & many other factors.
- The world's population is growing & we are facing challenges like **resource depletion, pollution, climate change** and many others.
- How can we create solutions for both, **promote development & protect the environment?**
 - Whether it's designing renewable energy system or creating waste management technologies or developing sustainable buildings.
- Your work will directly influence the future of the planet.



What is Environment?

- The word Environment is derived from the French Word “**Environ**” Which means **Surroundings**.
- Hence, **Everything Surrounding us** is called **Environment**.
- The environment encompasses all **Living & Non-living things**



What is Environmental Science?

- Environment science is an interdisciplinary field of study that includes:
 - How life is sustained on Earth?
 - How the natural world functions?
 - How the environment affects humans and vice-versa?
 - Explores the causes of environmental problems.
 - And find the solutions to address these issues.



Course Objectives

- Create awareness about sustainable development as a key to securing the future of mankind.
- Foster the ability to propose solutions to critical challenges like:
 - Pollution
 - Population explosion
 - Solid waste disposal
 - Environmental degradation
 - Economic productivity challenges
 - Global warming
 - Ozone layer depletion
 - Loss of biodiversity



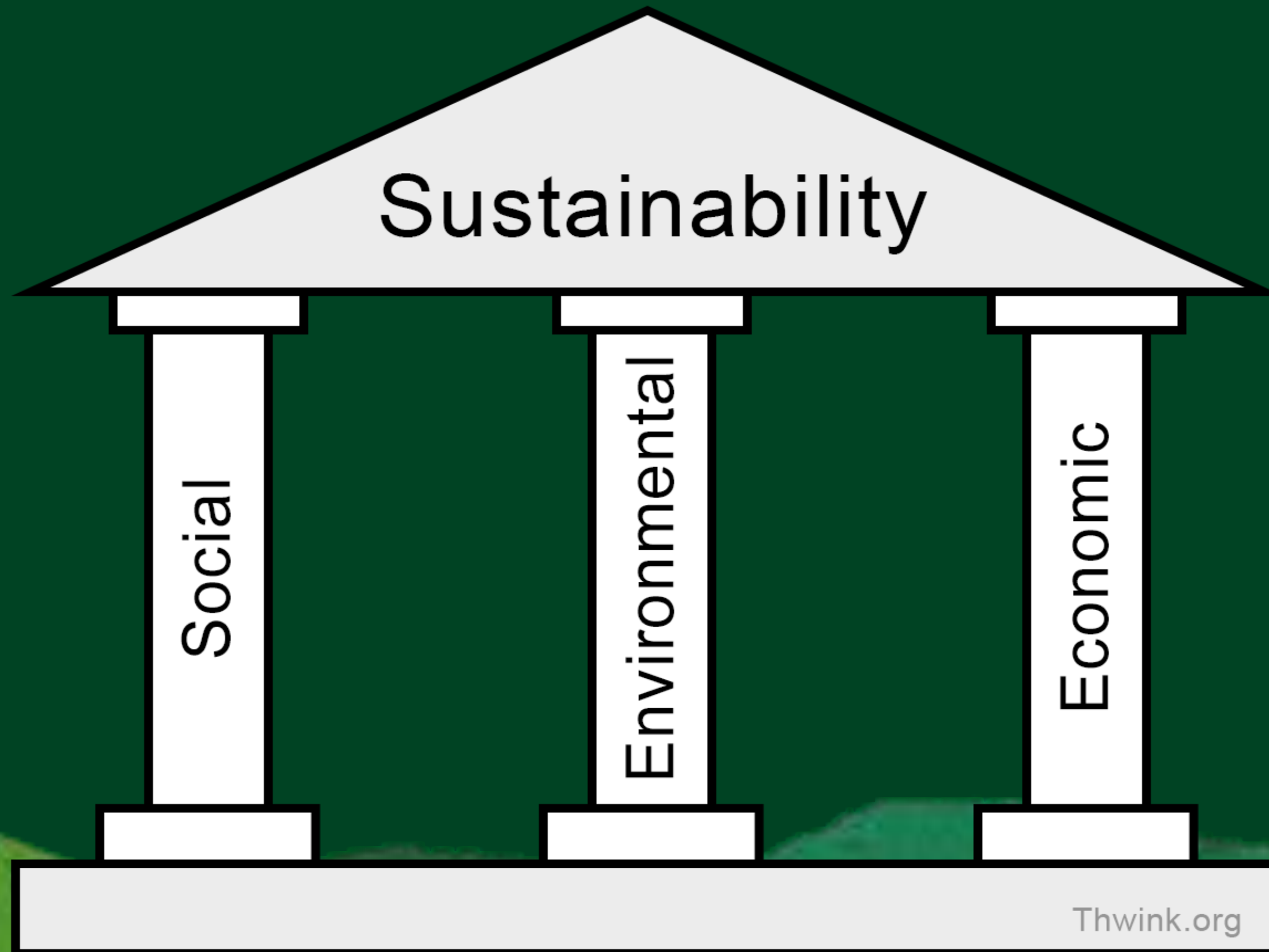
Sustainable Development: A Path to the Future

Definition:

- Sustainability is the practice of using resources in a way that ensures they can be maintained over the time without harming the environment or people.
- Meets the needs of the present without compromising the ability of future generations to meet their own needs.



Sustainable Development: A Path to the Future



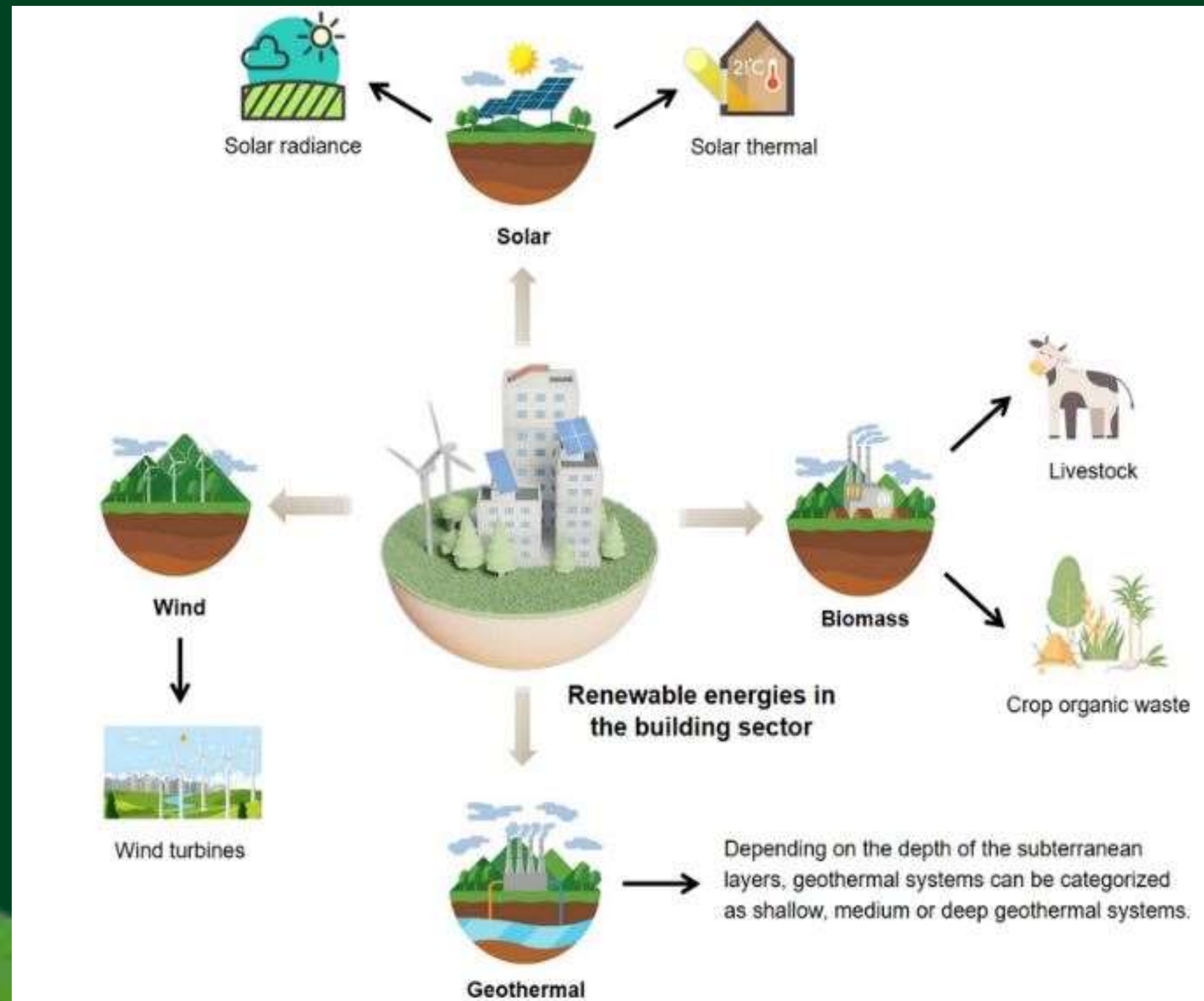
Sustainable Development: A Path to the Future

Key Pillars:

- **Environmental Protection:**
Conserving ecosystems and natural resources.
- **Social Equity:**
Ensuring equal opportunities and access to resources.
- **Economic Growth:**
Promoting prosperity without environmental harm.



Sustainable Development: A Path to the Future



Population Explosion

- As of 2024, India is the most populated country in the world, with a population of over 1.45 billion people.

Definition:

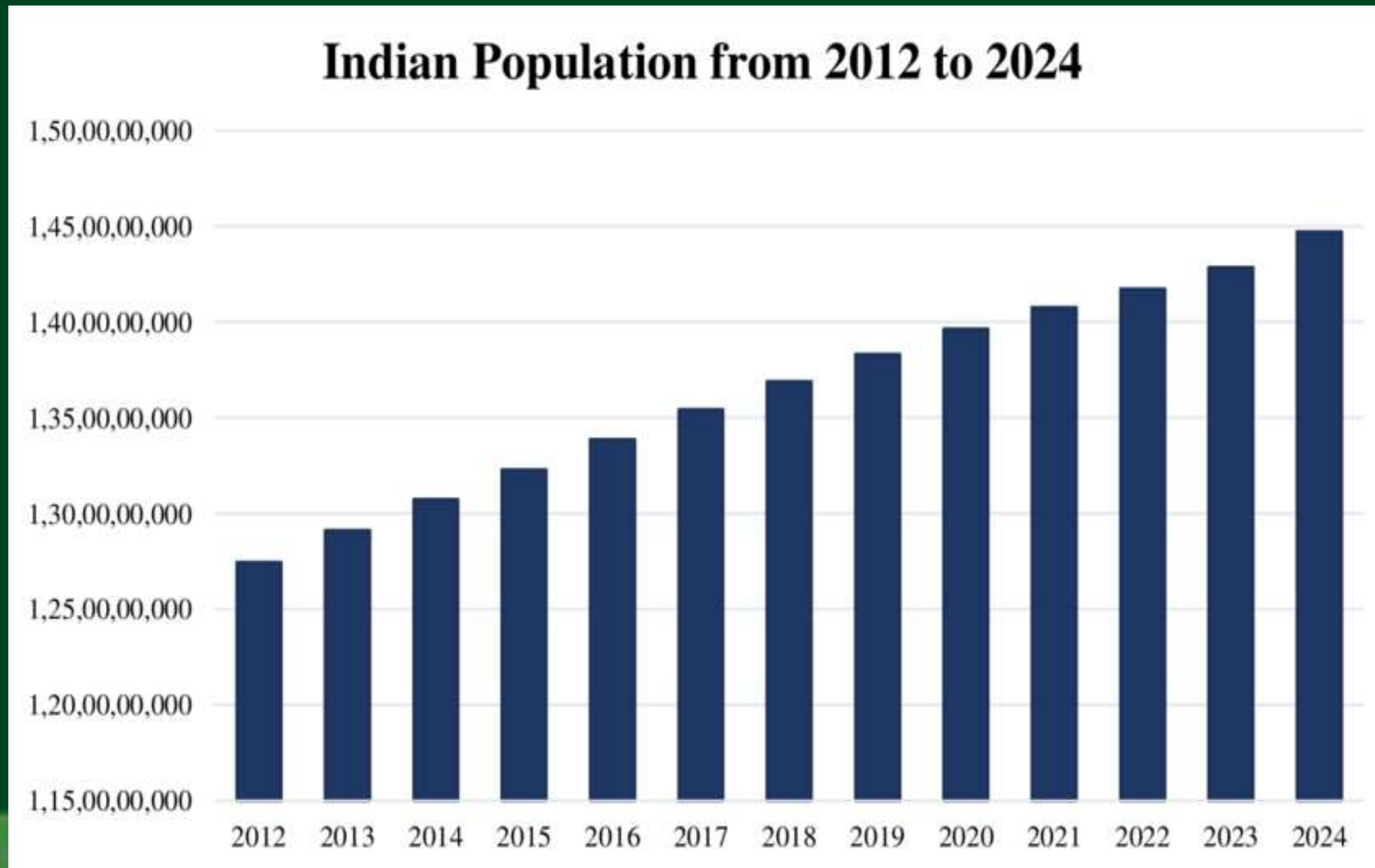
- Rapid and excessive increase in human population within a short timeframe.

Causes:

- Decrease in mortality rates due to medical advancements.
- Lack of family planning and education.
- Cultural and religious influences promoting larger families.



Population Explosion



Population Explosion

Impacts:

- Resource depletion: Strain on water, food, and energy.
- Increased pollution and waste generation.
- Loss of biodiversity and overuse of land and forests.

Solutions:

- Promote family planning and access to contraceptives.
- Increase awareness and education, especially for women.



Pollution: A Global Challenge

Types of Pollution:

1. Air Pollution

- Vehicle emissions, industrial smoke, deforestation



Pollution: A Global Challenge

Burning Waste



- The open burning of solid waste, such as garbage, plastic or dry leaves.
- Impact of this, releases harmful pollutants like particulate matter(PM), carbon monoxide and other toxic gases.



Vehicle Emissions

- Transportation is a major source of air pollution, releasing carbon dioxide, nitrogen oxides and unburned hydrocarbons contributing to smog formation and health hazards.

Pollution: A Global Challenge



Industrial Emissions

- Industrial activities released greenhouse gases like carbon dioxide and pollutants such as sulfur dioxide and nitrogen oxides contributing to global warming and acid rain.



Indoor Cooking Smoke

- It's releases indoor air pollutants like particulate matters and carbon dioxide that affecting respiratory health, especially in poorly ventilated spaces.

Pollution: A Global Challenge



Stubble Burning

- burning of agricultural crop residues.
- It's released particulate matters, carbon dioxide and methane.

Pollution: A Global Challenge

Types of Pollution:

2. Water Pollution

- Industrial discharge, plastic waste, agricultural runoff



Pollution: A Global Challenge



Sewage Discharge or Industrial waste dumping into ocean

- Untreated or partially treated sewage being discharged into the ocean
- Industries discharging pollutants like chemical waste, oils and toxins into water bodies.
- It's affect of marine ecosystem.



Pollution: A Global Challenge



Sewage in Residential Areas

- Creates breeding grounds for mosquitoes, and Causes waterborne disease, spreads pathogens
- Leads to degradation of local water quality.



Pollution: A Global Challenge



Pollution in Rivers

- It's block the natural water flow and damage ecosystem.

Example :



- Yamuna has become **one of the most polluted rivers in the world.**
- The Yamuna is particularly polluted downstream of New Delhi, which dumps about 58% of its waste into the river.

Pollution: A Global Challenge

Types of Pollution:

3. Soil Pollution

- Pesticides, hazardous waste, mining activities



Pollution: A Global Challenge

Macroplastic



- It's refer to larger plastic debris found in the environment, such as bottles, bags and other discarded items.
- These materials degrade slowly, releasing harmful chemical and contributing to soil and water contamination.

Microplastic



- Tiny plastic particles resulting from the breakdown of larger plastic waste or from direct sources like synthetic clothing and cosmetic.

Pollution: A Global Challenge



Deforestation

- The removal of trees and vegetation cover, often for agriculture, urbanization or logging.



Pesticides

- Chemical used in agriculture to control pests.

Pollution: A Global Challenge



Overfertilization

- Excessive application of fertilizers, particularly nitrogen and phosphorus based.

Heavy Metal Toxins



- Metal like aluminum, lead, mercury
- These elements can accumulate in soil from industrial activities, mining and improper waste disposal, becoming toxic to plants and microorganisms.

Pollution: A Global Challenge

Impacts:

- **Health hazards:** Respiratory issues, waterborne diseases.
- **Environmental damage:** Climate change, ecosystem imbalance.
- **Economic loss:** Reduced agricultural productivity, cleanup costs.

Solutions:

- Transition to **renewable energy** sources.
- Implement **stricter pollution control regulations**.
- Promote **afforestation** and eco-friendly practices.



Solid Waste Management

The Problem:

- Growing waste generation due to urbanization and population growth.
- Mismanagement leads to landfills, pollution, and health risks.

Types of Waste:

1. Municipal waste (household waste).



Solid Waste Management

Blue bin:

- News papers, Magazines, cardboards and other paper product.
- Recycling paper helps to reduce deforestation.



Green bin:

- Glass bottles, jars and other glass materials
- Glass can be recycle endlessly without losing quality.



Orange bin:

- Plastic bottles, containers & packaging materials
- Recycling plastic helps to reduce pollution and save petroleum resources.



Solid Waste Management

Red bin:

- E-waste like old computers, phones, batteries and appliances



Yellow bin:

- Metal cans, aluminum foils, and other metallic items
- Recycling metal reduces the need for mining and save energy.



Black/Gray bin:

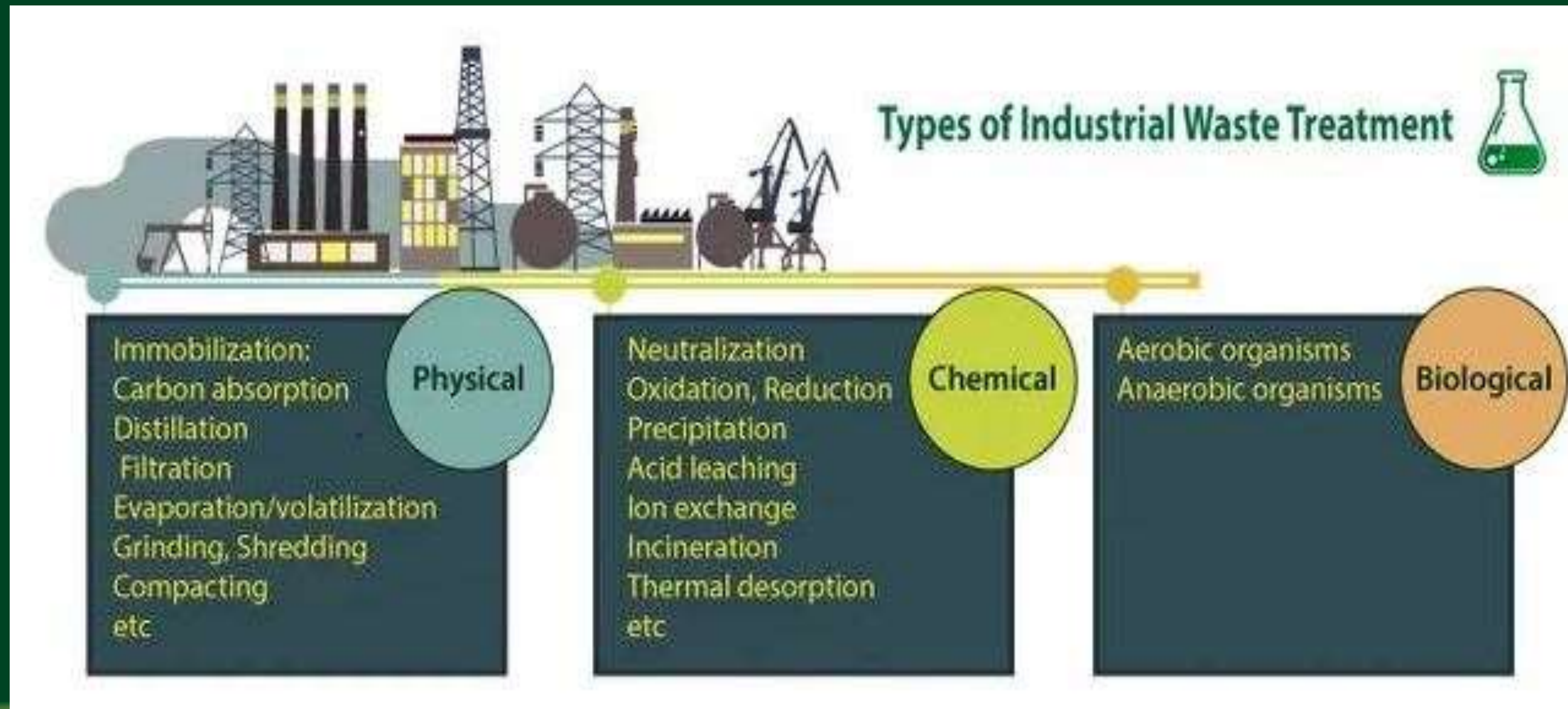
- Biodegradable waste like food scraps, vegetable peels and garden waste
- organic waste can be composed to create nutrient rich soil.



Solid Waste Management

Types of Waste:

2. Industrial waste (chemicals, byproducts).



Solid Waste Management

Types of Waste:

3. Hazardous waste (toxic substances)

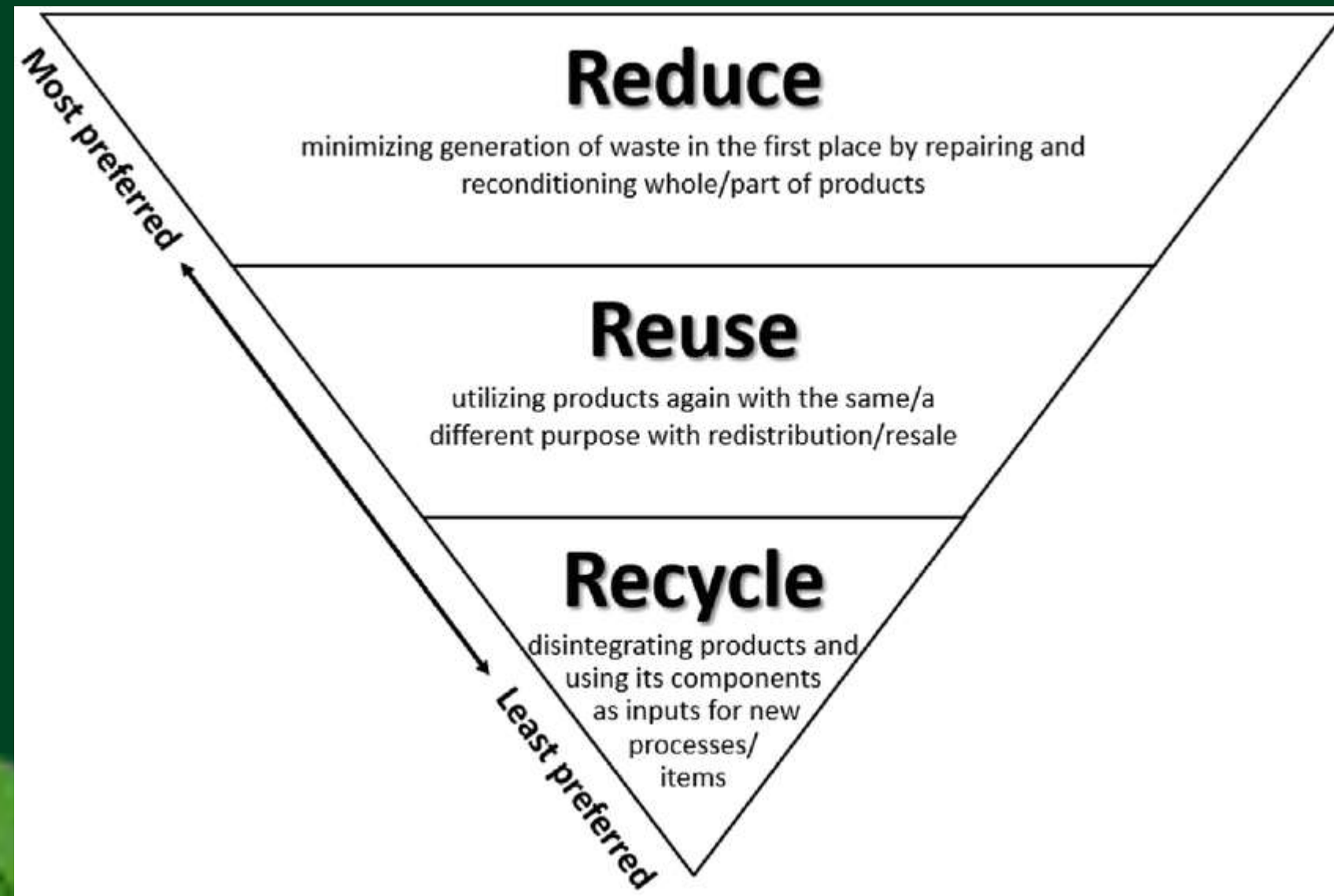
Toxic Explosive Radiation Acid Flammable Biohazard



Solid Waste Management

Solutions:

- Promote waste segregation at the source.
- Invest in composting and sustainable packaging materials.
- Adopt the 3Rs: Reduce, Reuse, Recycle.



Solid Waste Management

Reduce:

- Minimizing the amount of waste generated by consuming fewer resources and making mindful choices.

Example:

- Using digital document instead of printing paper.
- Avoiding single use plastic like straws and bags.
- purchasing products with minimal or eco-friendly packaging.



Solid Waste Management

Reuse:

- Extending the life of products by using them multiple times or repurposing them for new uses.

Example:

- Using reusable shopping bags and water bottles.
- Donating old clothes, furniture or electronics instead of discarding them.



Solid Waste Management

Recycle:

- Converting waste materials into new products through processing

Example:

- Recycling paper, glass, plastic and metal
- Composting organic waste like food scraps and garden waste.

Most preferred category is Reduce & Least Preferred category is Recycle.



Environmental Degradation

- **Environmental degradation** refers to the deterioration of the natural environment caused by human activities or natural processes.
- Resulting in the loss of biodiversity, destruction of ecosystems, and depletion of natural resources.
- It directly impacts the health, safety, and well-being of humans and other living organisms.



Environmental Degradation

Causes:

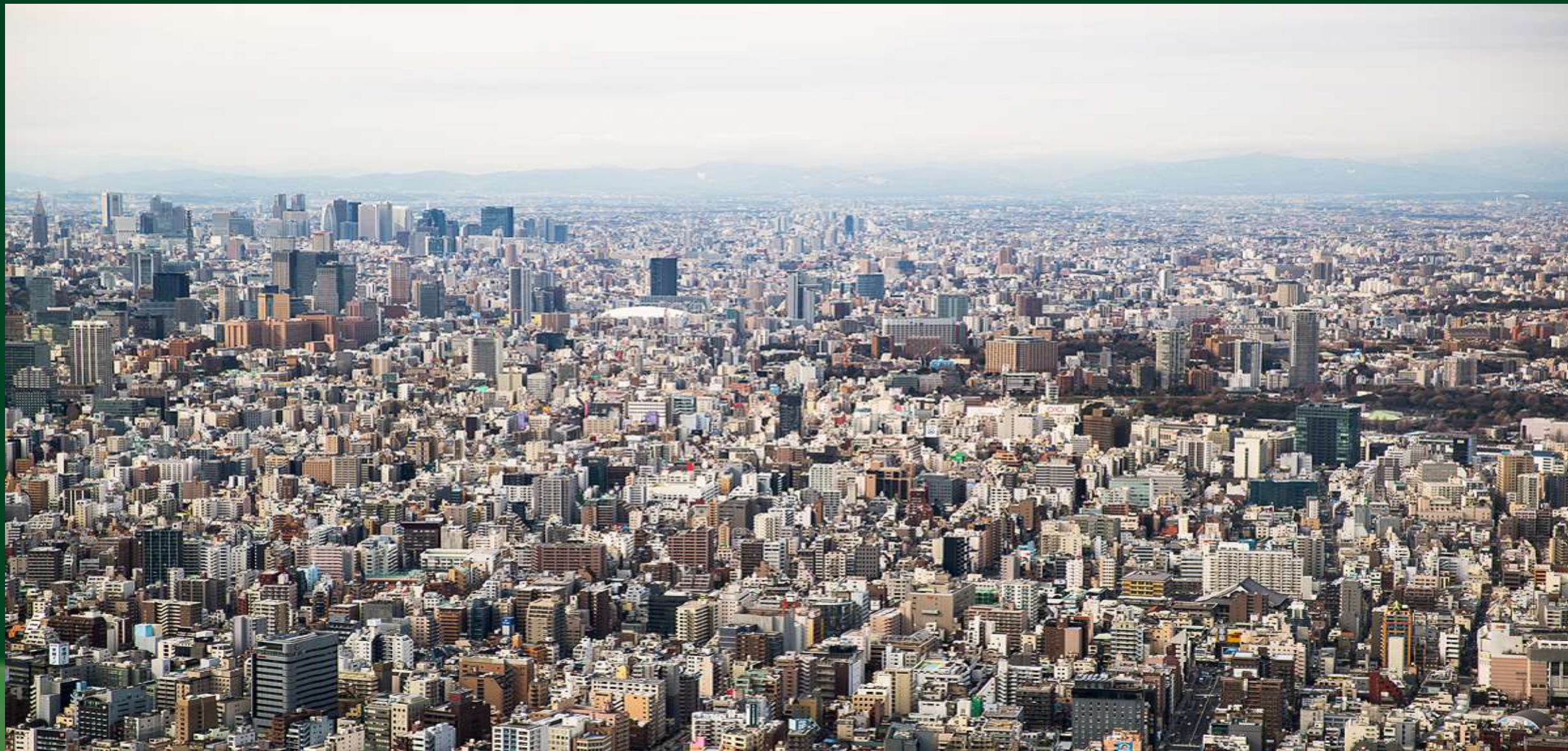
1. Deforestation: Clearing forests for agriculture, urbanization, and logging.



Environmental Degradation

Causes:

2. Urbanization: Unplanned expansion leading to loss of green spaces.



Environmental Degradation

Causes:

3. Industrialization: Resource overuse and pollution.



Environmental Degradation

Impacts:

1. Loss of Biodiversity
2. Climate Change
3. Health Issues
4. Reduced Agricultural Productivity
5. Water Scarcity
6. Natural Disasters
7. Economic Losses



Environmental Degradation

Solutions to Prevent Environmental Degradation

1. Promote Sustainable Practices
2. Conserve Resources
3. Protect Ecosystems
4. Reduce Pollution
5. Adopt Green Technology
6. Raise Awareness
7. Legislation and Policy Enforcement



Global Warming and Climate Change: Challenges for the Future



Global Warming and Climate Change: Challenges for the Future

Causes:

- Global warming and climate change are driven by a combination of natural and human-induced factors.

1. Human-Induced Causes

- A. Greenhouse Gas Emissions
 - a) Carbon Dioxide (CO₂)
 - b) Methane (CH₄)
 - c) Nitrous Oxide (N₂O)
 - d) Fluorinated Gases
- B. Deforestation
- C. Industrialization
- D. Agriculture
- E. Urbanization and Overpopulation
- F. Transportation



Global Warming and Climate Change: Challenges for the Future

2. Natural Causes

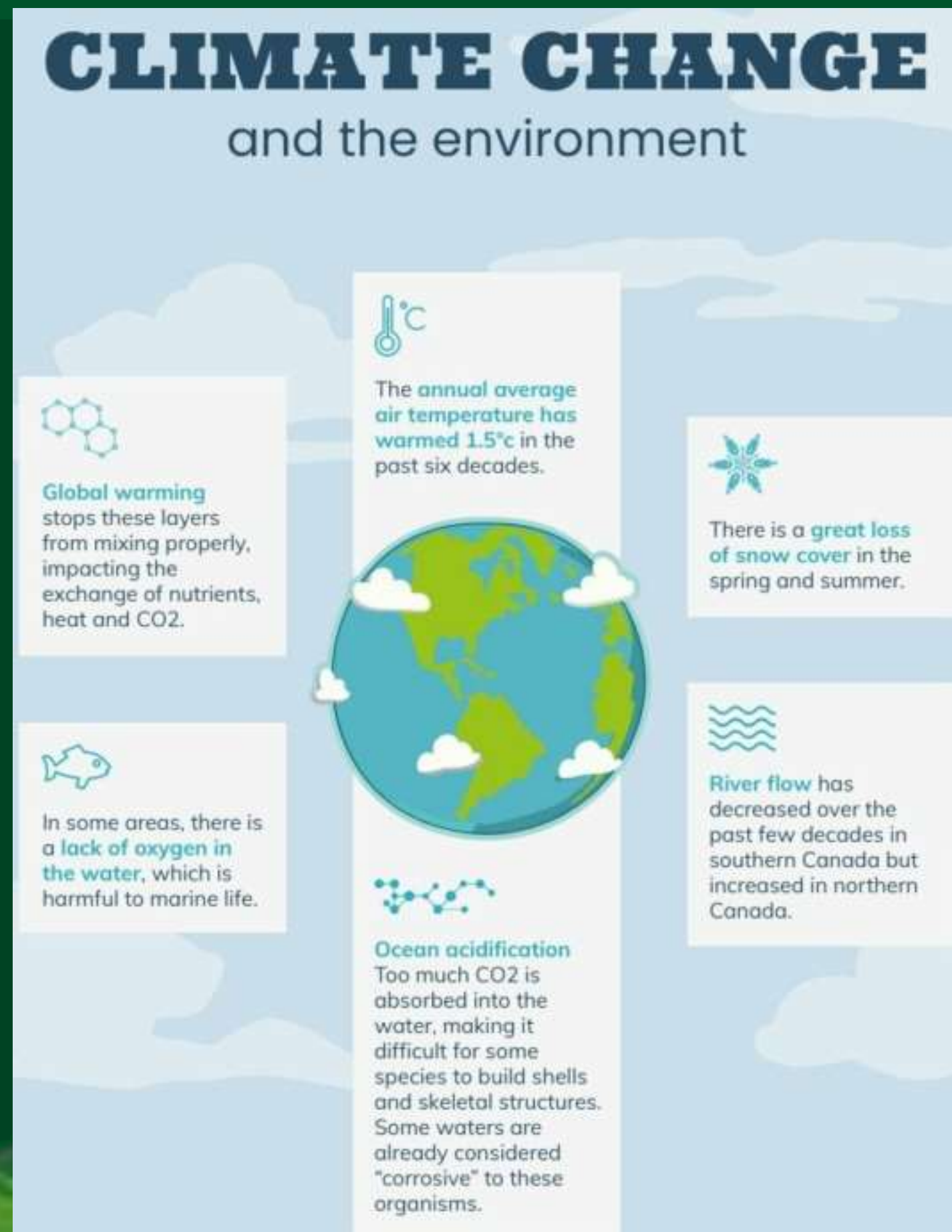
- A. Volcanic Eruptions
- B. Solar Variations
- C. Ocean Currents
- D. Earth's Orbital Changes
- E. Ice-Albedo Feedback
- F. Release of Methane from Permafrost

Impacts:

- Rising temperatures and melting glaciers.
- Sea-level rise causing flooding in coastal areas.
- Increased frequency of extreme weather events (storms, droughts, heatwaves).
- Threats to food security due to changing agricultural patterns.



Global Warming and Climate Change: Challenges for the Future



Ozone Layer Depletion



Ozone Layer Depletion

Causes:

- It refers to the thinning of the ozone layer. which protects life by absorbing harmful ultraviolet (UV) radiation from the sun. The primary causes are due to human-made chemicals and natural factors.

1. Human-Induced Causes

- A. Chlorofluorocarbons (CFCs)
- B. Halons
- C. Carbon Tetrachloride (CCl_4)
- D. Methyl Chloroform
- E. Hydrochlorofluorocarbons (HCFCs)
Hydrobromofluorocarbons (HBFCs)
- F. Nitrous Oxide (N_2O)



Ozone Layer Depletion

2. Natural Causes

- A. Volcanic Eruptions
- B. Sunspots and Solar Flares
- C. Stratospheric Winds

Consequences of Ozone Depletion

- Increased UV radiation reaching Earth's surface leading to: Skin cancer and cataracts in humans.
- Reduced crop yields.
- Disruption of marine ecosystems, especially phytoplankton.





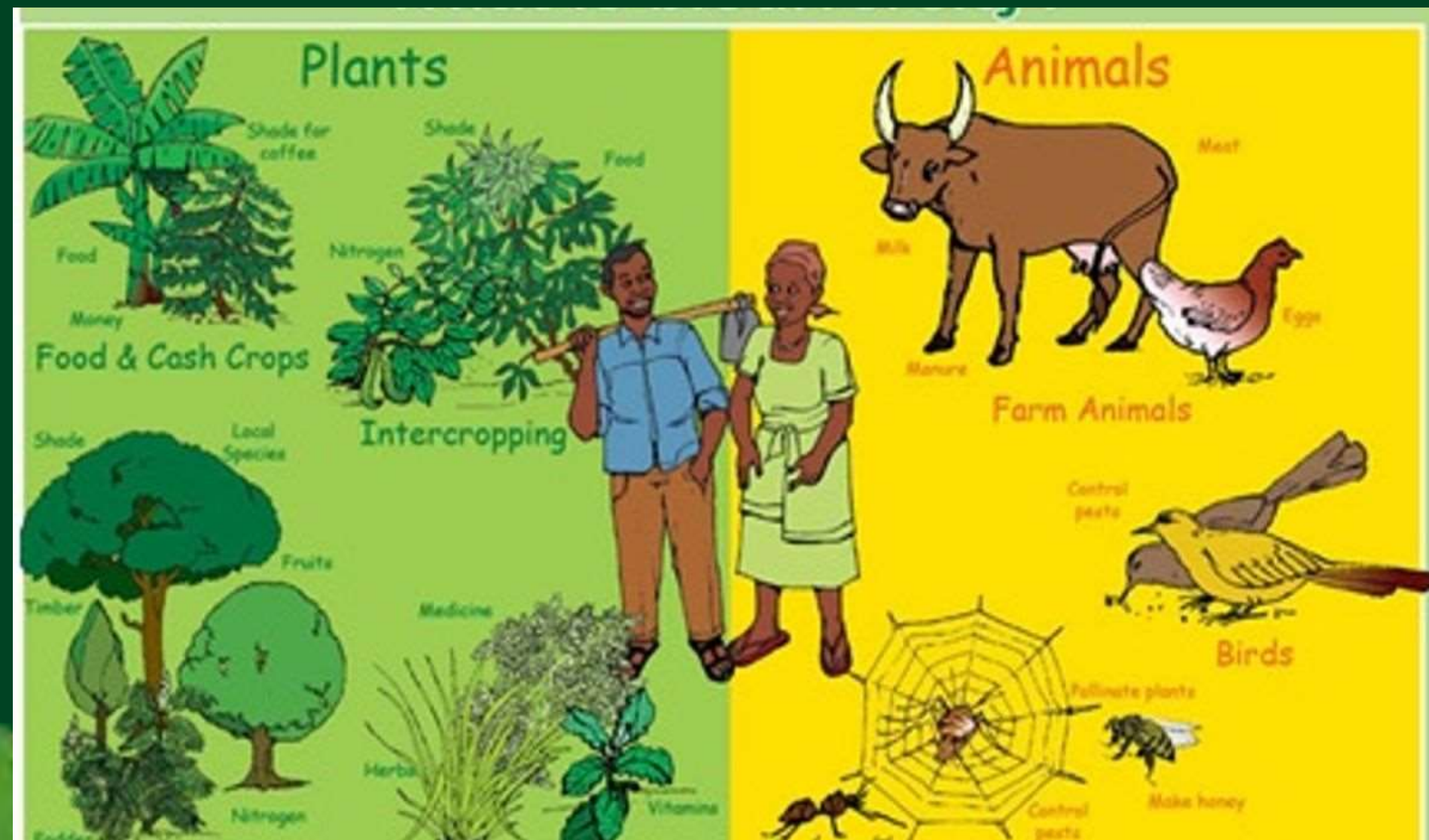
INTERNATIONAL DAY FOR THE
PRESERVATION OF THE
OZONE LAYER

SEPTEMBER 16

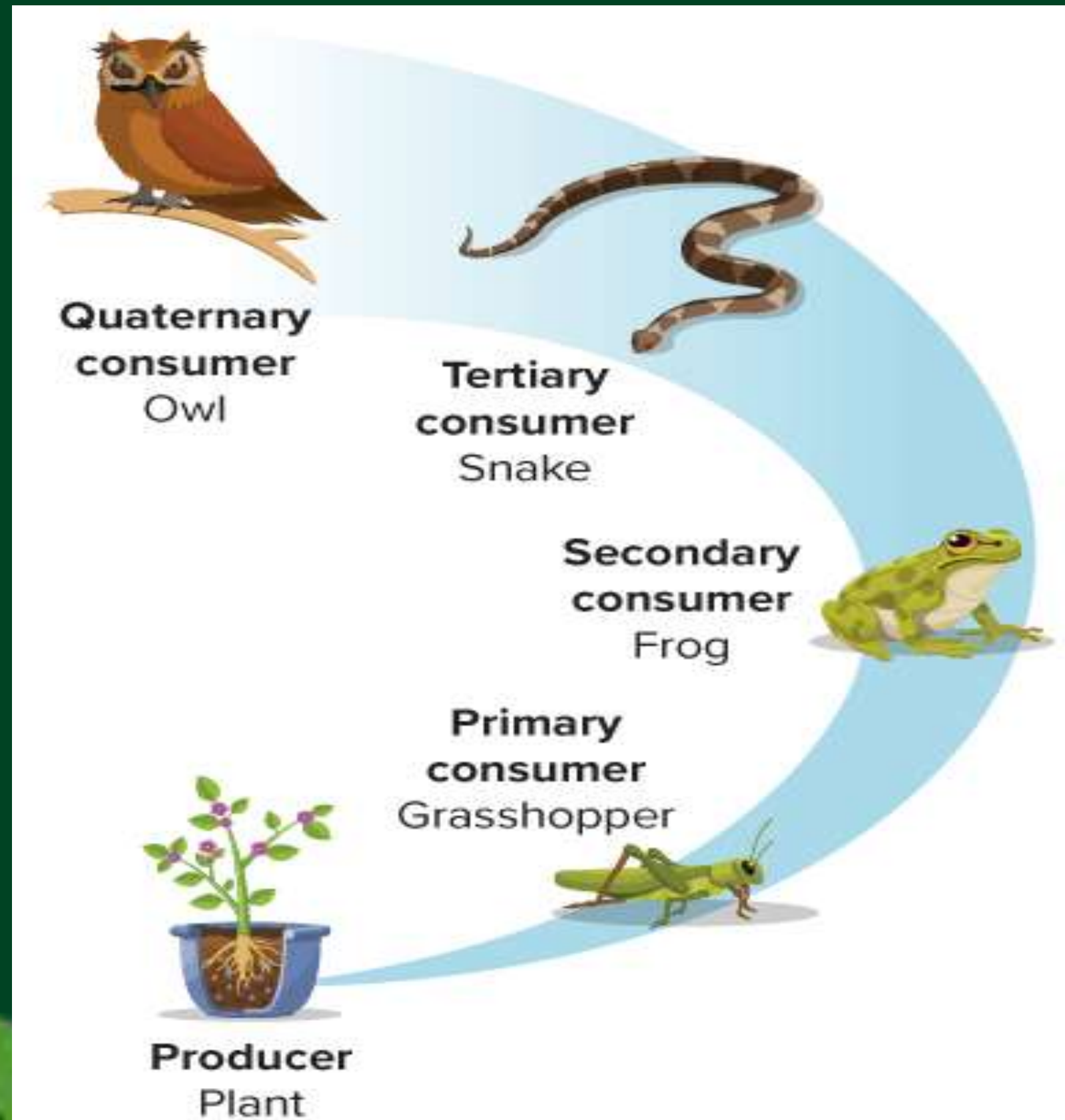
Biodiversity Loss: A Threat to Ecosystem Balance

Importance of Biodiversity:

- Ensures ecosystem stability and resilience.
- Provides resources like food, medicine, and raw materials.
- Maintains ecological balance through species interactions.



Biodiversity Loss: A Threat to Ecosystem Balance



Biodiversity Loss: A Threat to Ecosystem Balance

Causes of Loss:

- Habitat destruction: Deforestation, urbanization, and agriculture.
- Climate change: Altered habitats and migration patterns.
- Overexploitation: Poaching, overfishing, and unsustainable resource use.

Solutions:

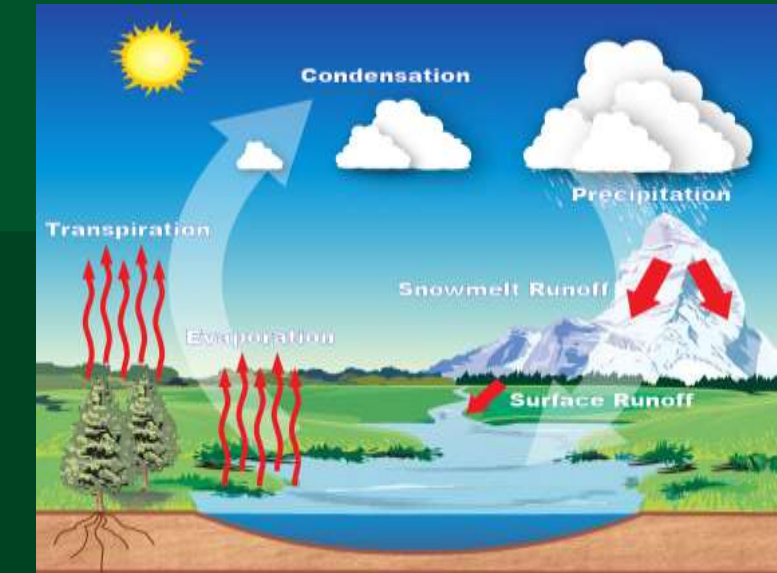
- Establish protected areas like national parks and wildlife sanctuaries.
- Enforce strict laws against poaching and illegal wildlife trade.



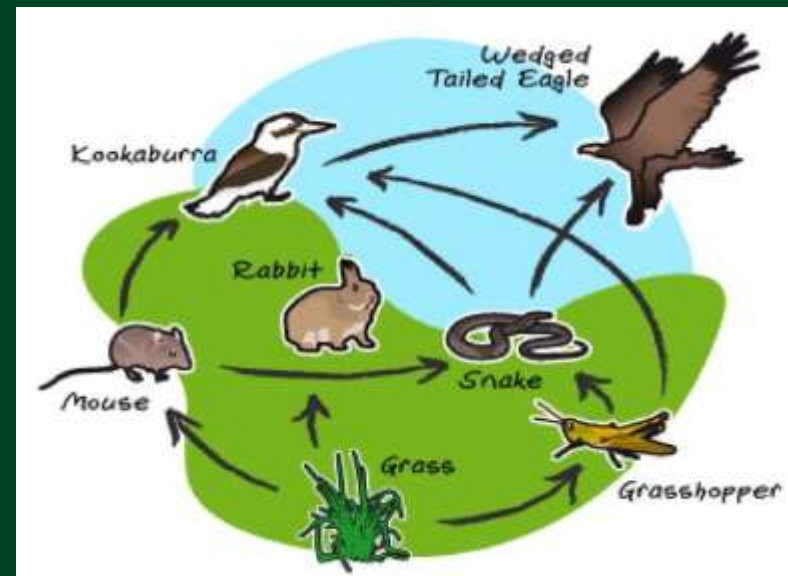
Geology



Hydrology



Biology(Ecology)



Environmental Studies



Meteorology



Climatology



Soil science



Environmental Studies

Geology :

- Geology is the scientific study of the Earth, including its materials (rocks, minerals, soils), processes and history.

Hydrology :

- Hydrology is the scientific study of water on and below earth's surface, including its distribution, movement and management.



Environmental Studies

Meteorology :

- Meteorology is the scientific study of the atmosphere, including weather processes, climate patterns, and atmospheric phenomena.
- It focuses on understanding the dynamics of weather and climate and their interactions with Earth's surface and ecosystems.

Climatology :

- Climatology is the scientific study of climate, which encompasses the long-term patterns and averages of temperature, humidity, wind, rain, and other atmospheric elements.



Environmental Studies

Soil Science :

- Soil Science is the study of soil as a natural resource, including its formation, classification, physical and chemical properties, fertility, and interactions with living organisms.

Ecology :

- Ecology is the branch of biology that studies the interactions between living organisms (plants, animals, and microorganisms) and their physical environment (air, water, soil).



UNIT – 1

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

- Definition, scope and importance
- Need for public awareness



UNIT – 1

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition

- Environmental Studies is a multidisciplinary field that examines the interaction between humans and their environment.
- The environment is constituted by the interacting system of physical, biological and social element.



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THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

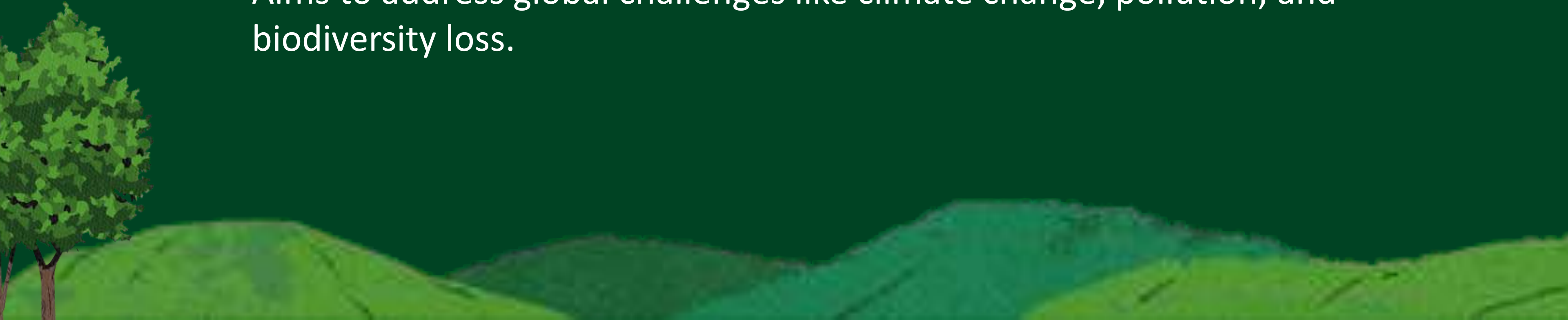
- **Physical Elements:**
 - Physical elements are Space, landforms, water bodies, climate, soils, rocks and minerals.
 - They determine the variable character of the human habitat, its opportunities and limitations
- **Biological Elements:**
 - Plants, animals, microorganisms and human beings are biological element.
- **Social Elements:**
 - Economic, social and political factors are essentially man-made features which are part of cultural or social element.



UNIT – 1

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

- Key Features or scope of Environment Studies:
- Focuses on sustainable development and resource conservation.
- Explores the relationship between humans, ecosystems, and the biosphere.
- Aims to address global challenges like climate change, pollution, and biodiversity loss.



UNIT – 1

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Why Public Awareness is Important?

- Environmental issues affect everyone globally and locally.
- Active public participation is essential for conservation and sustainable practices.
- Awareness drives, behavioral change and supports policy implementation.

Goals of Public Awareness:

- Educate about environmental challenges.
- Promote sustainable habits in daily life.
- Empower communities to take collective action.



UNIT- 1

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

- The government alone cannot manage all the clean-up and conservation functions required to protect the environment.
- With more than 6.7 billion humans on Earth, we are consuming 30% more resources than the planet can sustainably provide. This overuse leads to:
 1. **Resource Depletion:** Over extraction of non-renewable resources like water, forests, and fossil fuels.
 2. **Environmental Degradation:** Increased pollution, deforestation, and habitat destruction.
 3. **Unsustainable Living:** A growing gap between resource availability and human demand.



UNIT- 1

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4. **Climate Change Negligence:** A lack of knowledge about human-induced climate change prevents individuals and governments from taking necessary actions to mitigate its effects.
5. **Overpopulation Impact:** Unawareness about the link between population growth and environmental strain leads to unregulated development and resource scarcity.
6. **Resistance to Sustainable Practices:** People unaware of the benefits of sustainable living may resist adopting renewable energy, recycling, or conservation efforts.
7. **Policy Gaps:** A poorly informed public may fail to demand strong environmental policies, leaving governments and industries unchecked in their practices.



UNIT- 1

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

- Addressing these challenges requires collective responsibility.
- Individuals, communities, businesses, and governments must work together to adopt sustainable practices, reduce waste, conserve resources and protect the environment for future generations.



Environmental awareness across the engineering branches

1. Civil Engineering

- Construction, infrastructure development, and urban planning

Key Areas:

- Use of Sustainable building materials.
- Green building design and energy-efficient architecture.
- Water resource management and rainwater harvesting.
- Wastewater treatment and solid waste management systems.



Environmental awareness across the engineering branches

2. Mechanical Engineering

- Design, manufacturing, and maintenance of machines and mechanical systems

Key Areas:

- Energy-efficient machinery and processes.
- Development of renewable energy systems (e.g., wind turbines, solar panels).
- Optimization of fuel consumption in engines and vehicles.
- Sustainable manufacturing and recycling of components.



Environmental awareness across the engineering branches

3. Electrical and Electronics Engineering

- Electrical systems, electronics and communication technologies.

Key Areas:

- Energy-efficient appliances and smart grid systems.
- Development of renewable energy technologies like solar PV systems.
- Waste reduction in electronic devices and e-waste recycling.
- Sustainable practices in battery technology and storage systems.



Environmental awareness across the engineering branches

- 4. Computer Science and IT Engineering
 - Software, algorithms, and IT systems.

Key Areas:

- Developing energy-efficient algorithms and data centers
- Promoting paperless work environments through digital solutions.
- Applications of AI and IoT in environmental monitoring (e.g., air quality sensors, smart irrigation).
- Cybersecurity in critical environmental infrastructure.



Environmental awareness across the engineering branches

5. Chemical Engineering

- Chemical processes and production.

Key Areas:

- Reduction of industrial emissions and carbon capture technologies.
- Development of biodegradable materials and green chemicals.
- Waste minimization and management in chemical industries.
- Processes for water purification and pollutant removal.



UNIT- 1

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

- India has several institutes and organizations dedicated to supporting environmental conservation, research and awareness. Some of the key ones are:

1. **The Energy and Resources Institute (TERI)**

Focuses on energy, environment and sustainable development through research and policy advocacy.

2. **Wildlife Institute of India (WII)**

Dehradun-based institute specializing in training, research, and advisory services for wildlife conservation and management.



UNIT- 1

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

3. Centre for Science and Environment (CSE)

A public interest research and advocacy organization that works on issues like air and water pollution, waste management, and climate change.

4. National Environmental Engineering Research Institute (NEERI)

Located in Nagpur, it conducts research and development in environmental science and engineering.

5. Indian Institute of Forest Management (IIFM)

Based in Bhopal, it focuses on forest management, environmental sustainability and rural development.



UNIT- 1

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

6. Salim Ali Centre for Ornithology and Natural History (SACON)

Named after the renowned ornithologist, this institute conducts research and education on birds and their habitats.

7. Indian Council of Forestry Research and Education (ICFRE)

Dehradun-based council dedicated to forestry research, education and extension.

8. Ashoka Trust for Research in Ecology and the Environment (ATREE)

Focuses on biodiversity conservation, sustainable development and ecosystem services.



UNIT- 1

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

9. Centre for Environment Education (CEE)

Based in Ahmedabad, it works on environmental education and sustainable development initiatives.

10. Bombay Natural History Society (BNHS)

One of the oldest conservation organizations in India, focusing on research, conservation, and awareness of biodiversity.

- These institutions play vital roles in environmental research, policy development, education, and conservation efforts in India.



UNIT- 1

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

- India has been home to many individuals who have significantly contributed to shaping the country's environmental history. Here are some notable figures:

1. **Sunderlal Bahuguna (1927–2021)**

A prominent environmentalist and activist, best known for the **Chipko Movement** in the 1970s, which focused on forest conservation.

2. **Medha Patkar**

A social and environmental activist who led the **Narmada Bachao Andolan**, opposing large dam projects on the Narmada River due to their adverse environmental and social impacts.



UNIT- 1

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

3. Salim Ali (1896–1987)

Known as the "Birdman of India," he was a pioneering ornithologist who made significant contributions to the study and conservation of Indian birds.

4. M.S. Swaminathan (1925–2023)

A key figure in India's Green Revolution, which enhanced food production while raising concerns about its environmental impacts.

5. Anil Agarwal (1947–2002)

Founder of the **Centre for Science and Environment (CSE)**, a leading environmental think tank in India.



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THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

6. Rajendra Singh

Known as the "Waterman of India," he has worked on water conservation and rejuvenation of rivers in Rajasthan through traditional water-harvesting methods.

7. Amrita Devi (17th Century)

A historical figure who, along with 363 villagers, sacrificed her life during the **Khejarli Massacre** to protect trees in Rajasthan.

8. Chandi Prasad Bhatt

An environmentalist and Gandhian, co-founder of the **Chipko Movement**, focusing on forest conservation and sustainable rural development.



UNIT- 1

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

9. Gaura Devi (1925–1991)

A leader in the **Chipko Movement**, she mobilized women to prevent the cutting of trees in the forests of Uttarakhand.

10. R.K. Pachauri (1940–2020)

Former head of the **Intergovernmental Panel on Climate Change (IPCC)**, which was awarded the Nobel Peace Prize in 2007.

- These individuals have played vital roles in raising awareness, conserving biodiversity, promoting sustainability and addressing environmental challenges in India.



THANK YOU

