

Module 1

**MULTIDISCIPLINARY NATURE  
OF  
ENVIRONMENTAL STUDIES**

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• **Definition:** Environmental Studies is an interdisciplinary study of the environment which deals with understanding our relation to the environment and our effects on it. It is also a study of finding solution to our adverse effects on it.

• Environmental studies involve the following disciplines of study:

01. Biology
02. Chemistry
03. Physics
04. Geology
05. Engineering
06. Sociology
07. Health
08. Anthropology
09. Economics
10. Statistics
11. Computers
12. Philosophy



- Environmental Studies deal with every issue that affects a living organism.
- Its multidisciplinary approach brings about an appreciation of our natural world and human impact on its integrity.
- It is an applied science because it seeks practical answers to the increasingly important questions on how to make human civilization sustainable on Earth's finite resources.



- **Scope of Environmental Studies:**

If we study the natural history of the area in which we live, we would see that our surroundings were originally a natural landscape like a forest with a river or a mountain or a desert etc.



**BEFORE**

**AFTER**

# WEB OF LIFE



Our dependence on nature is so great that we cannot continue to live without protecting the Earth's environmental resources.

Thus most traditions refer to our environment as **Mother Nature**.

Respecting, protecting and preserving our nature is essential to maintain our own livelihood.



Over the past 200 years, modern societies began to believe that easy answers to producing more resources could be provided by the indiscriminate application of technical advancements.



The industrial development and intensive agriculture that provides the good for our increasingly *consumer-oriented society* uses up large amounts of natural resources like water, minerals, petroleum products, woods etc.



Renewable Resources



Non-Renewable Resources

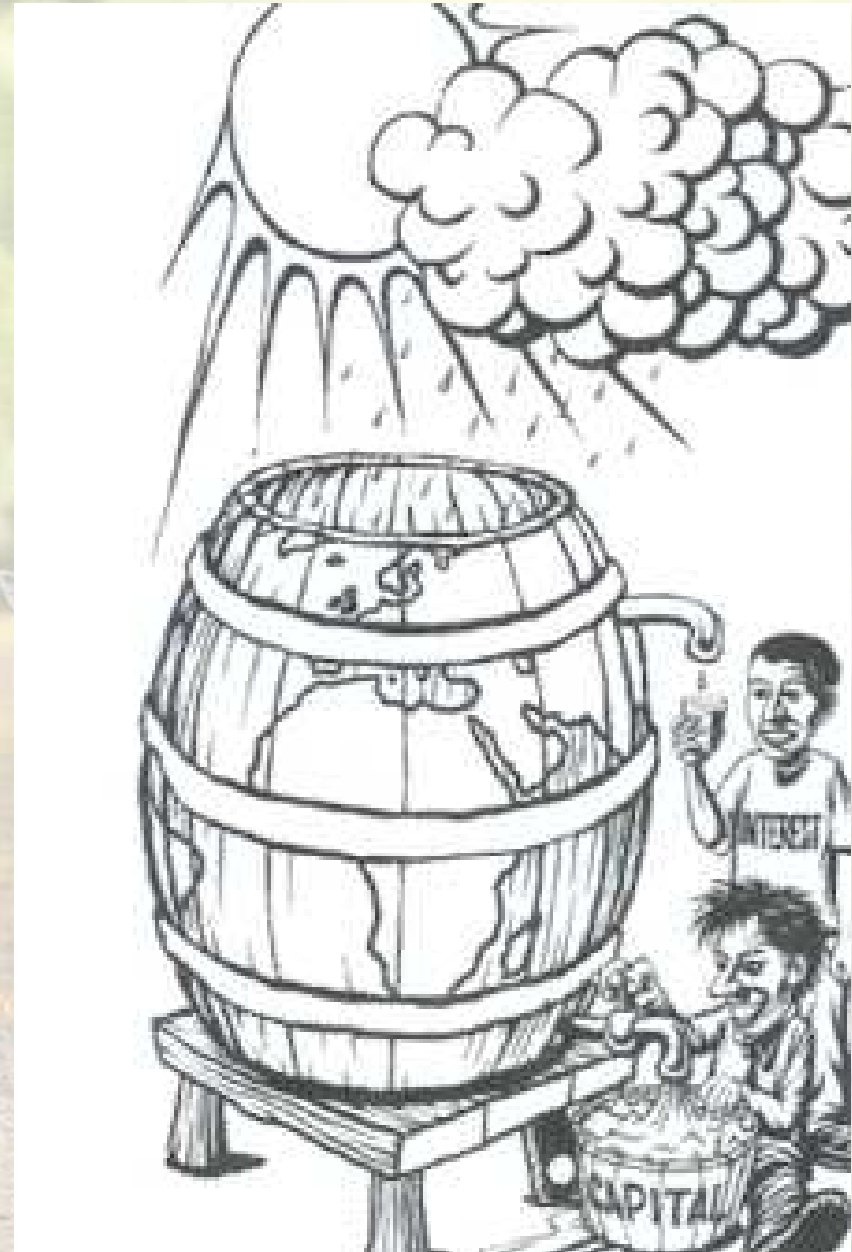


Our natural resources can be compared to money in a bank.

If we use it rapidly, the capital will be reduced to zero.

But if we use only the interest, it can sustain us over a long term.

This is known as sustainable development.



# ACTIVITY 1

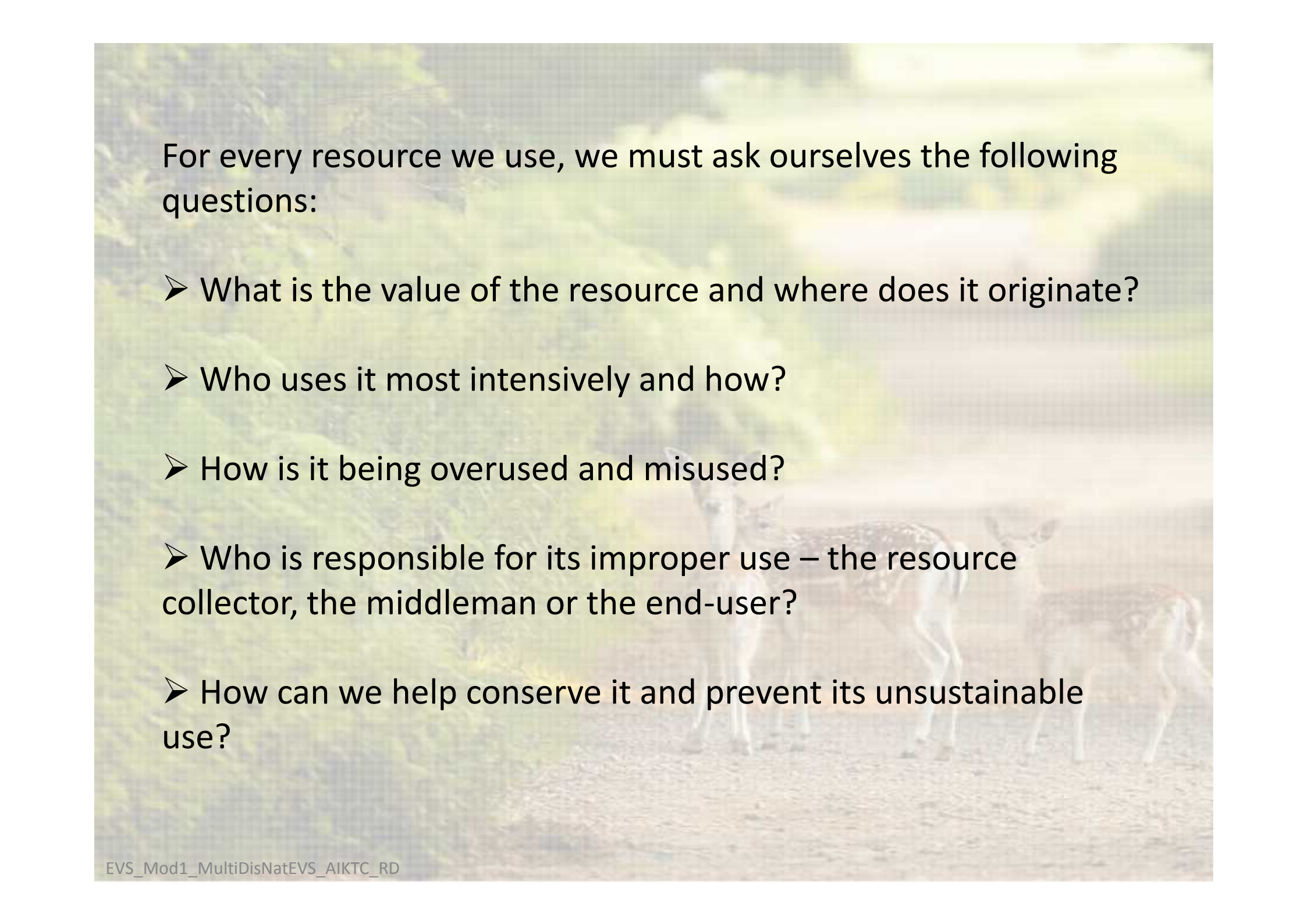
- Take an item that you use in your daily life: a pen, a table etc.
- Trace its components through a journey backwards from your home to its origin as a natural resource in our environment.
- How many of these resources are renewable and how many are non-renewable?

Graphite

Wood

Rubber





For every resource we use, we must ask ourselves the following questions:

- What is the value of the resource and where does it originate?
- Who uses it most intensively and how?
- How is it being overused and misused?
- Who is responsible for its improper use – the resource collector, the middleman or the end-user?
- How can we help conserve it and prevent its unsustainable use?



This is the origin of one of the items of your daily use. Can you guess which item is that? (Clue: It's most probably in your pocket right now)

## ACTIVITY 2

Try to answer the questions below for one of the resources in the item you chose in Activity 1.

- Are you using the resource unsustainably?
- In what ways could you reduce, reuse and recycle the resource?
- Is there an unequal distribution of this resource, so that we are more fortunate than many others who have less access to it?

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## SCOPE OF ENVIRONMENTAL STUDIES

- To study the interdisciplinary nature of the subject with emphasis on need for public awareness, depleting nature of the environmental resources, global environmental crisis and ecosystems
- To learn about the concept of sustainable development with its socio-economic and environmental aspects and control measures
- To gain knowledge about the sources, effects and control measures of various environmental pollutions (like air pollution, water pollution, land pollution, noise pollution and e-pollution)
- To take an overview of the environmental legislation by studying the functions & powers of various environmental ministries, boards and acts
- To study renewable sources of energy like solar energy, wind energy, hydel energy & geothermal energy over conventional sources of energy
- To learn the role of technology in environment, green building, indoor air pollution, carbon credit, disaster management etc.

# IMPORTANCE OF ENVIRONMENTAL STUDIES

- Environmental issues are of international importance in today's world
- EVS enlightens us about the present environmental crisis
- EVS teaches us about the present exponential increase in population
- EVS warns us of the possibility of human extinction
- EVS proposes alternative solutions to the above problems
- EVS emphasises on the need for wise planning of development

## NEED FOR CREATING PUBLIC AWARENESS

- To inspire every citizen to use our environmental resources with care and protect them from degradation.
- To explain the concept of environmental degradation
- To identify various factors causing environmental degradation.
- To explain the concept of sustainable development.
- To recognize the national and international commitment to the protection of environment.
- To gain support for environmental protection, environmental cost-recovery and sustainable development of resources.
- It is clear that no citizen of the earth can be ignorant of the environmental issues.
- To prevent ill-effects on our environment by our actions is economically more viable than cleaning up the environment when it is damaged as we know prevention is better than cure.



# WAYS OF CREATING PUBLIC AWARENESS

- Generating public awareness and environmental education, particularly among targeted groups, about relevant laws and regulations and about their rights, interests, duties and responsibilities, as well as about the social, environmental and economic consequences of non-compliance.
- Promoting responsible action in the community through the media by involving key public figures, decision makers, opinion builders in such campaigns.



## WAYS OF CREATING PUBLIC AWARENESS

- Organising campaigns for foresting environmental awareness among communities, NGOs, the private sector and industrial and trade associations.
- Inclusion of awareness and environmental educational programs in schools and other educational establishments as part of education.
- Organizing campaigns for foresting environmental awareness and environmental education programs for women and youth.
- Organizing campaigns for encouraging public involvement in monitoring of compliance.

# NATURAL RESOURCES

- A resource can be defined as any material that can be transformed into more valuable and useful product or service.
- Everything that nature provides has some utility for mankind but its utilization is possible only with the help of some appropriate technology.
- Naturally found materials are called as natural resources only after a suitable technology is discovered for its extraction, utilization and conversion to a more valuable product.
- Example: Soil, water, minerals, forests etc.



# CLASSIFICATION OF NATURAL RESOURCES

- Based on Origin:

- i) Biotic

- ii) Abiotic



- Based on Renewability:

- i) Renewable Resource

- ii) Non-renewable Resource



# RENEWABLE RESOURCES

- Natural resources which can be replaced by natural processes at a rate comparable or faster than its rate of consumption by humans.
- Also called as non-exhaustible resources.
- Eg: Solar radiation, tides, winds, water, etc. Also includes paper, hydroelectricity, forest cover if harvesting is done in a sustainable manner.
- Some resources are renewable only to some extent & hence they must be carefully managed to avoid their depletion.



# NON - RENEWABLE RESOURCES

- Natural resources which cannot be produced or replaced easily by natural processes and takes thousands of years to form in combination with highly favourable climatic conditions.
- Eg: fossil fuels (such as coal, petroleum and natural gas), minerals, etc.
- These resources once used, remain on the Earth in different forms & unless recycled properly it becomes waste material.
- If exploited recklessly at the present rate, they will be exhausted.
- These resources often exist in a fixed amount or are consumed much faster than nature can create them.



## DEPLETING NATURE OF RESOURCES

- Due to continuous increase in population, demand for natural resources has also increased.
- This is tackled by scientific progress followed by technological advancement for the extraction & utilization of natural resources.
- These two factors are responsible for the over-utilization of natural resources.
- Over-exploitation of non-renewable resources will not only lead to economic imbalances between developed & developing countries but also to ecological imbalance between nature and population growth.
- This is the depleting nature of the natural resources right now.

# DEPLETING NATURE OF RESOURCES - SOIL

- Soil or land is a very important resource as it is important for food production, animal husbandry, industry & for our growing settlements.
- To meet these extensive land requirements, our wild lands i.e. forests, grasslands, deserts etc are being used up.
- It is essential to evolve rational land use policy that examines how much land must be made available for different purposes & where it must be situated.





# DEPLETING NATURE OF RESOURCES - SOIL

## **Causes of Soil Depletion:**

- Soil Degradation
- Landslides
- Over-grazing
- Water-logging
- Soil salinity
- Soil erosion
- Loss of fertility
- Excess and toxic sedimentation
- Change in land use pattern
- Loss of generic biodiversity
- Fertilizer and pesticide problems
- Climate change
- Irrigation related problems

# DEPLETING NATURE OF RESOURCES - WATER

- Water is the most vital natural resource.
- It is the most essential component of all living things.
- Human civilization flourished wherever water was available in abundance.
- In fact, several civilizations have disappeared due to the shortage of water.



# DEPLETING NATURE OF RESOURCES - WATER

## Causes of Water Depletion:

- Overuse for agricultural use
- Misuse for domestic use (*wasting of water*)
- Abuse for industrial use (*dumping of waste*)
- Altering flow of rivers

## Remedies:

- Conservation and replenishment
- Rain water harvesting
- Effective irrigation techniques
- Desalinization
- Forrestation

# DEPLETING NATURE OF RESOURCES - MINERALS

- A mineral is a naturally occurring substance that forms in the earth's crust over a period of millions of years.
- It has a definite chemical composition and identifiable physical properties.
- On extraction from the earth with or without technological & economic benefits, minerals can be used as raw materials for industries or domestic purposes.
- But over-extraction of minerals can lead to its depletion.



# DEPLETING NATURE OF RESOURCES - MINERALS

## **Causes of Mineral Depletion:**

- Population growth leading to increased demands
- Minerals used for construction of buildings
- Increase in the consumption of medicines, gems and precious metals
- Rapid industrialization

## **Remedies:**

- Strong global and local legislations
- Use of synthetic building materials
- Use of new technologies at thermal power stations , ignition engines, metallurgy , industries etc. so that big outputs can be obtained from low inputs.

# DEPLETING NATURE OF RESOURCES - FORESTS

- Forests are an important renewable natural resource. Major part of the Earth's land is covered with forests.
- Forests which are considered the centers of biodiversity are complex & they constantly change their environment to house wild-life, flora & fauna, etc.
- They are not only valuable from the economic, historical, cultural & recreational point of view but their resources are extremely important for mankind.



# DEPLETING NATURE OF RESOURCES - FORESTS

## **Causes of Forest Depletion:**

- Agriculture
- Commercial logging
- Expansion of cities
- Demand for firewood
- Cash crop economy
- Construction of irrigation structures
- Establishment of Industrial areas
- Mining

## **Remedies:**

- Mining activities should be prohibited in areas declared as protected forests.
- Cutting of trees should be followed by massive plantation.
- Environmental laws and legal provisions should be strictly enforced.
- Reduce the consumption of forest related products

# ECOSYSTEM

- Definition:

An ecosystem is a community of living or biotic components in an area (like plants, animals etc.) together with the non-living or abiotic components of that environment (like soil, water etc.) interacting with each other as one system.

These biotic and abiotic components are linked together through *nutrient cycles* and *energy flows*.





# PRODUCERS, CONSUMERS AND DECOMPOSERS

Every living organism is in a way dependent on other organisms. Plants are food for herbivorous animals, who are in turn food for carnivorous animals and some organisms live on dead materials and inorganic matter, thereby producing nutrients for the plants to grow.



# PRODUCERS

Plants are the PRODUCERS in the ecosystem as they manufacture their own food by using energy from the sun, carbon dioxide from the air and nutrients from the soil.  
In the forest, these form communities of plant life.  
In the sea, these include tiny algal forms to large seaweed.



# PRIMARY CONSUMERS

The herbivorous animals are the PRIMARY CONSUMERS in the ecosystem as they feed on the plants.

In the forest, these include deer, buffaloes, elephants etc.

In the sea, there are small fish that feed on algae and other plants.



## SECONDARY CONSUMERS

The carnivorous animals are the SECONDARY CONSUMERS in the ecosystem as they feed on the primary consumers. In the forest, these include tigers, leopards, foxes etc. In the sea, there are piranha, whales etc.



# DECOMPOSERS

DECOMPOSERS are a group of organisms consisting of small animals like worms, insects, bacteria and fungi which break down dead organic material into smaller particles and finally into simpler substances that are used by plants as nutrition.

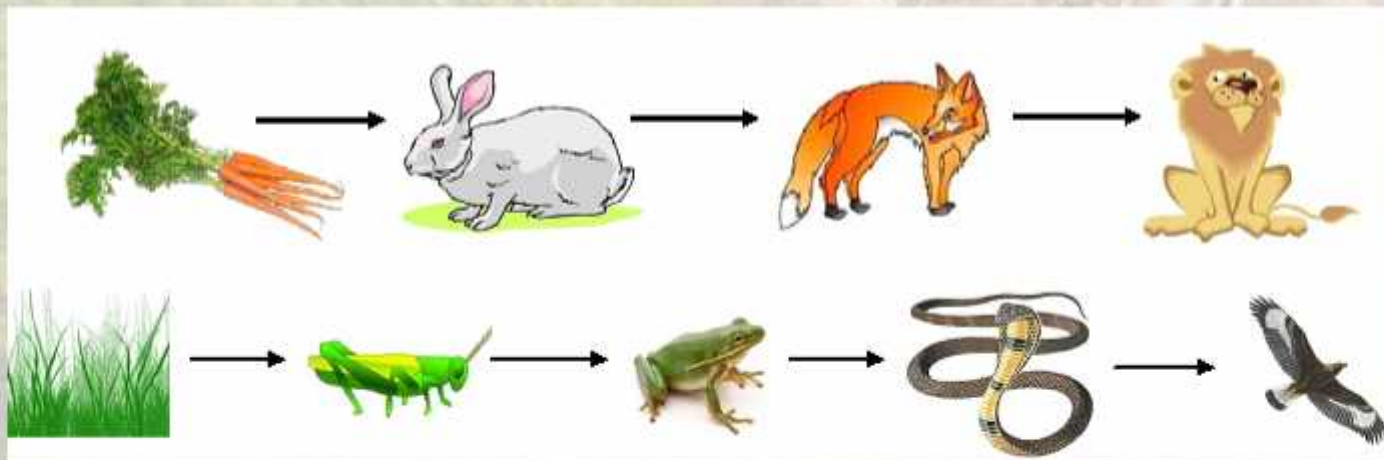


# FOOD CHAIN

A food chain is a linear system of links starting from producers such as grass or trees and ending at Secondary Consumers like lions and whales or Decomposers like fungi or bacteria.

A food chain also shows how the organisms are related to each other by the food they eat.

Each level in a food chain represents a different trophic level.



# FOOD WEB

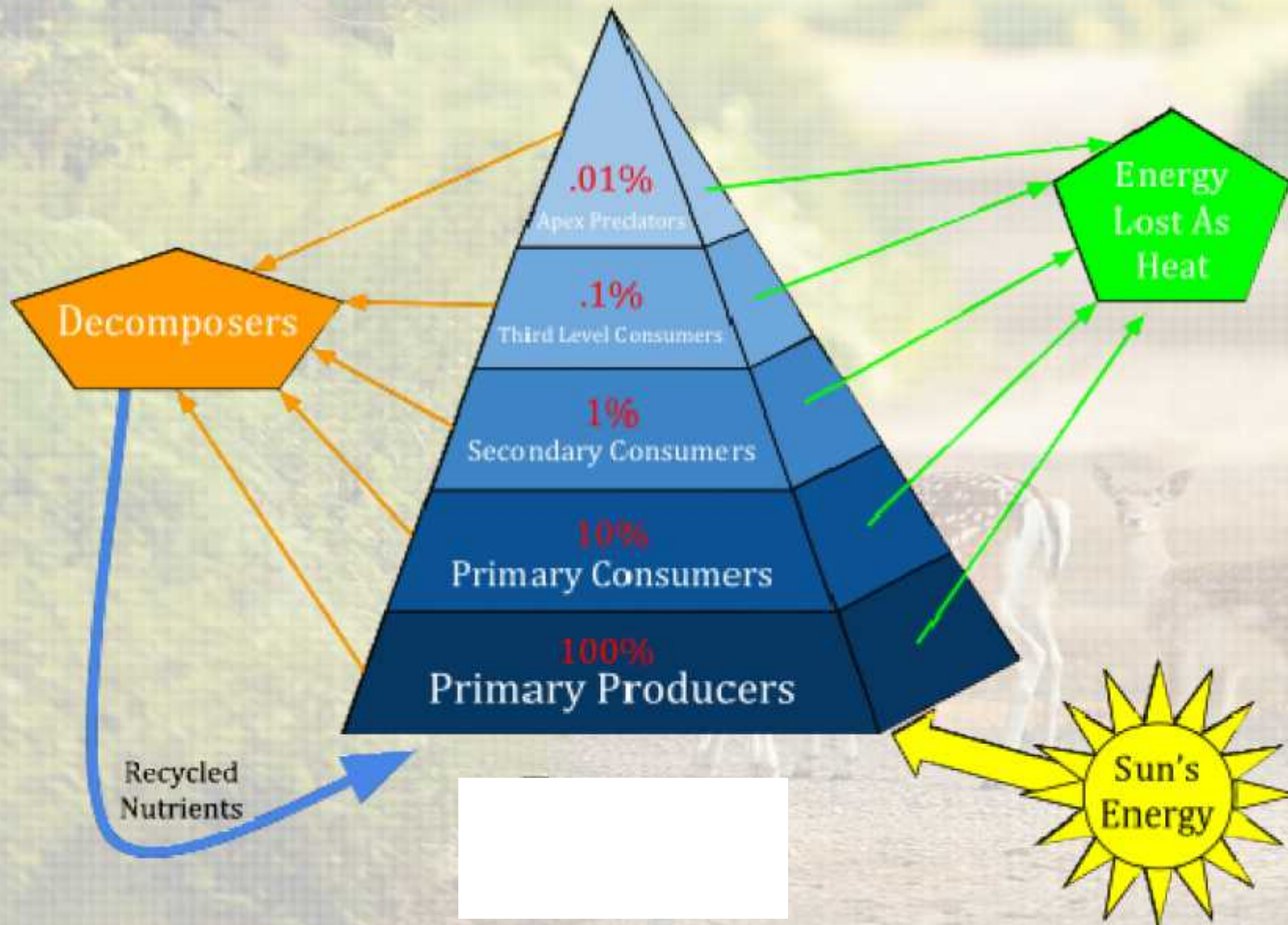
A food web is the natural interconnection of food chains and generally a pictorial representation of what-eats-what in an ecosystem.

Two or more food chains form a food web in an ecological system.

Another name for food web is a consumer-resource system.



# ECOLOGICAL PYRAMID





# ENERGY FLOW IN AN ECOSYSTEM

- All the functions of the ecosystem is someway or the other related to the growth and regeneration of its plant and animal species.
- These are basically certain interlinked processes via which energy flows in an ecosystem. They can be depicted by the following cycles:

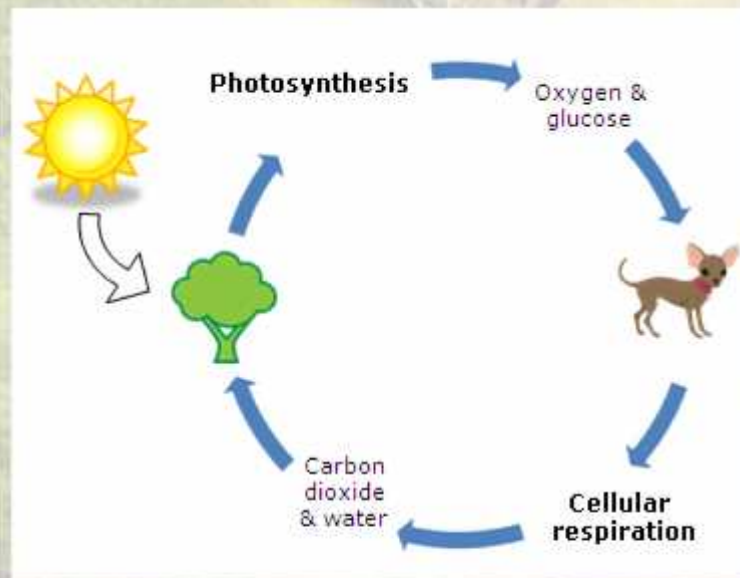
1. Water Cycle
2. Oxygen Cycle
3. Carbon Cycle
4. Nitrogen Cycle

# WATER CYCLE

- Rain from the clouds fall on the land or on water bodies.
- Rain fallen on ground either runs off to water bodies or evaporates or percolates to the ground.
- Water from the water bodies evaporates.
- Water from the ground is taken up by plants and transpired through the leaves as water vapour.
- These water vapour being lighter than air rises up and forms clouds.
- These clouds as they rise further up, condenses and comes down as rainfall, thereby completing the water cycle.

# OXYGEN CYCLE

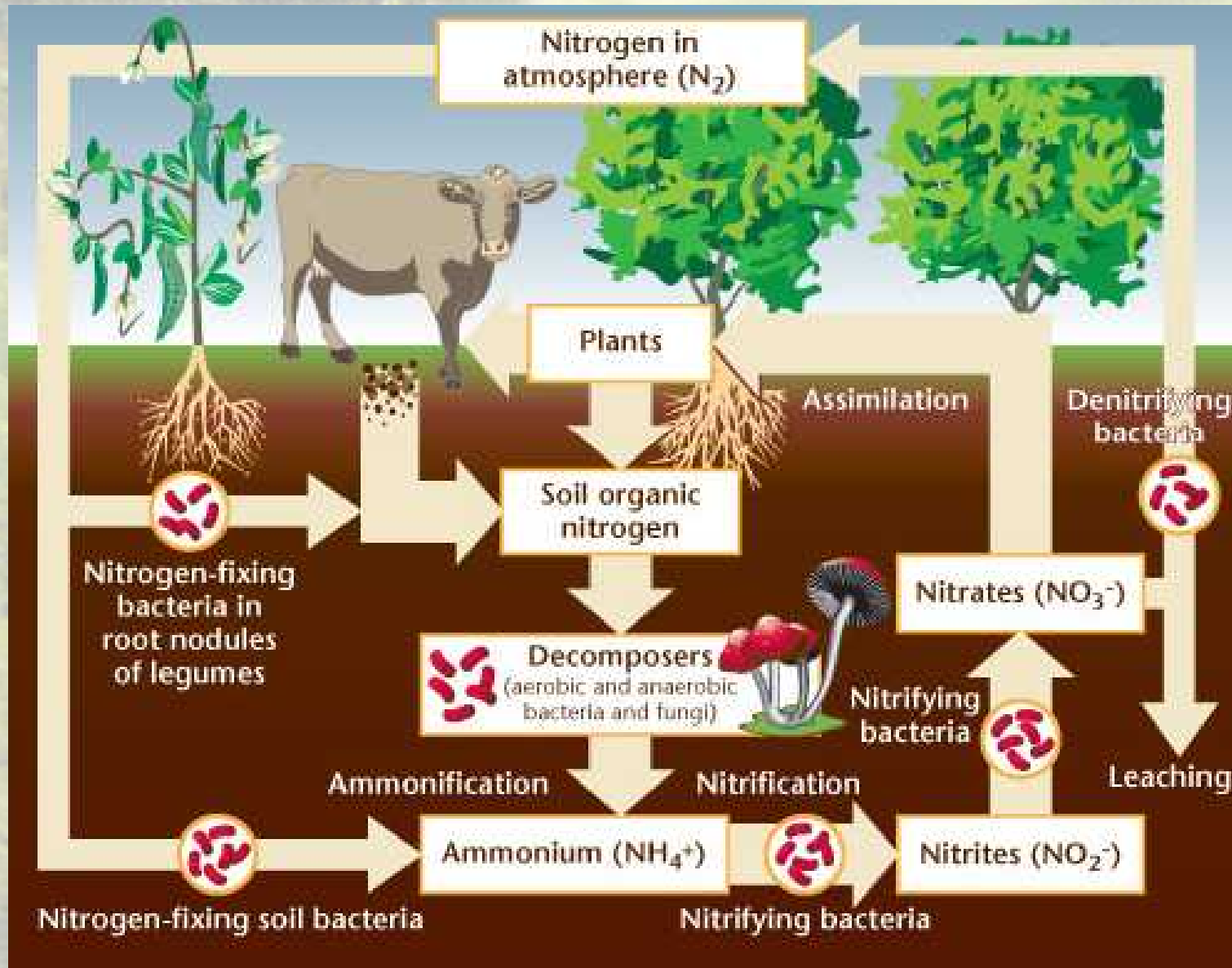
- Plants take in carbon dioxide for photosynthesis and give out oxygen.
- Animals take in oxygen for respiration and give out carbon dioxide, thereby completing the oxygen cycle.



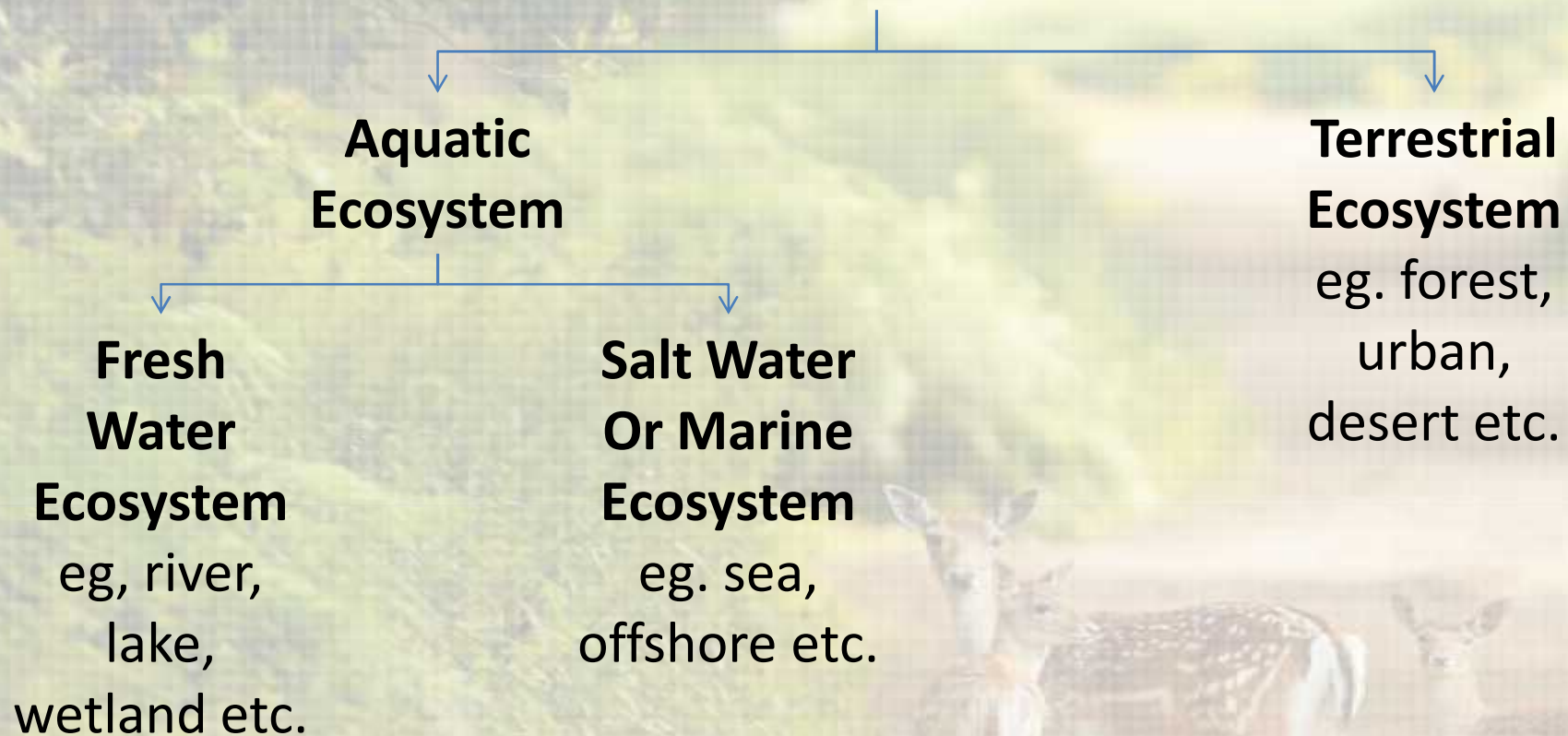
# CARBON CYCLE

- Carbon is the building block of both plant and animal tissue.
- During photosynthesis, plants take in carbon dioxide from the atmosphere and produce carbohydrates that contain carbon.
- Herbivores feed on plants.
- Carnivores eat herbivores.
- They both return fixed carbon to the soil in the form of excreta.
- When plants and animals die, they return their carbon to the soil due to disintegration by decomposers.
- The carbon from the soil is taken up by the plants for nutrition, thereby completing the carbon cycle.

# NITROGEN CYCLE



# CLASSIFICATION OF ECOSYSTEM



**Exercise:** Try to identify the produces, consumer and decomposers in each of these ecosystems. Further, try to identify some food chains, food webs and ecological pyramids in each of them. Take help of text books and the Internet if necessary.



**Artificial Wetland Ecosystem created by Indonesian farmers**

*Thank you!*

