Experiment No 1

1] Study of Environmental Components and Ecosystem

Ans – **Environmental components :**

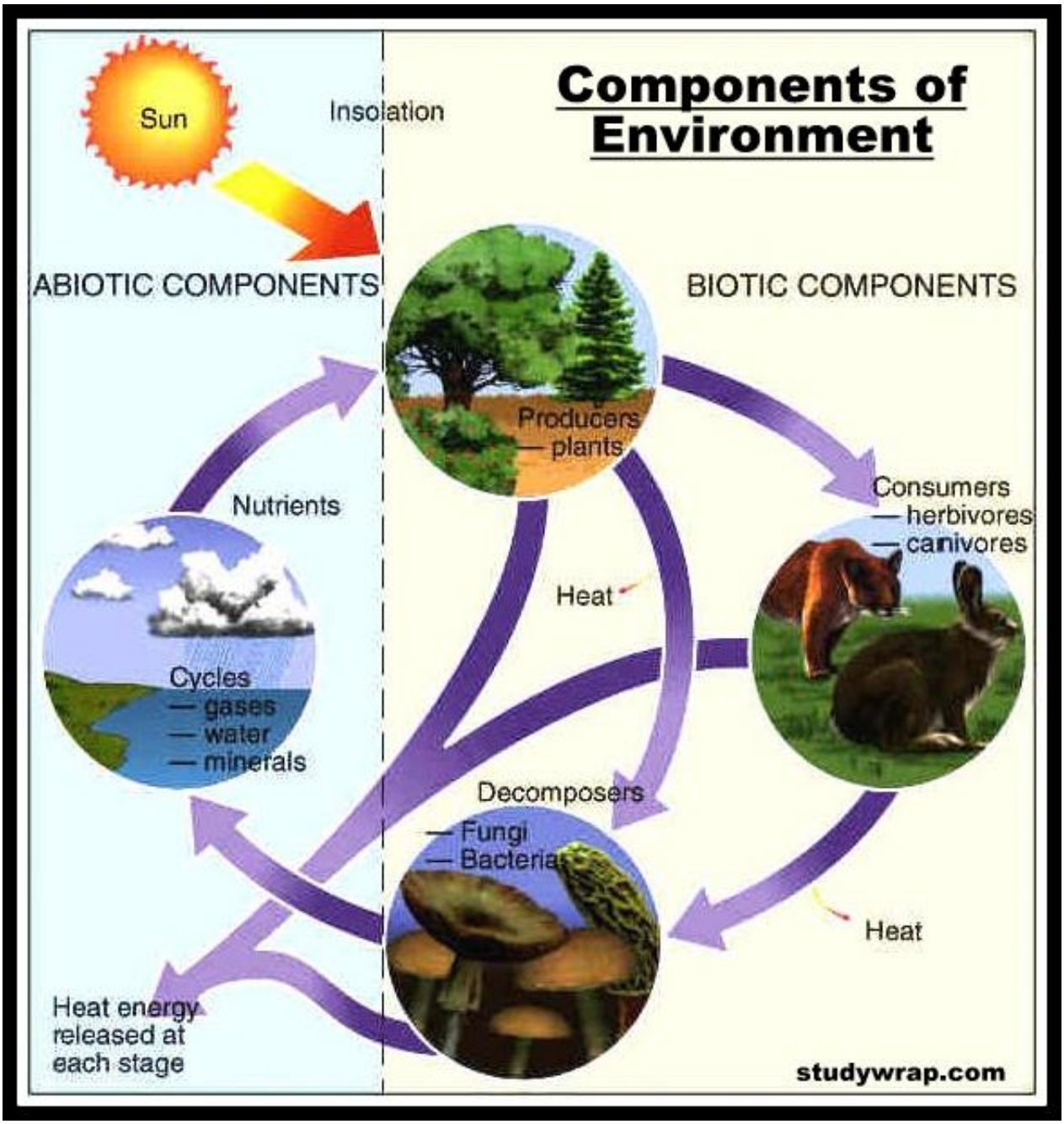
The environment consists of everything around us – air, water, land, plants, animals, and even microorganisms. To understand how the environment works, it is divided into different components. These are broadly classified into two main types:

I. **Abiotic Components (Non-Living Things):**
Abiotic components are the non-living physical and chemical parts of the environment. These include air, water, soil, sunlight, temperature and minerals. They provide the necessary conditions for life to exist and support various natural processes like water cycle, photosynthesis, and soil formation.

- **Atmosphere:** The layer of gases surrounding the Earth. It regulates temperature, provides oxygen, carbon dioxide, and shields living beings from harmful solar radiation.
- **Lithosphere:** The Earth's solid outer layer. It includes soil, rocks, and minerals and is the source of nutrients for plants and other organisms.
- **Hydrosphere**: All water bodies—oceans, rivers, lakes, glaciers, and groundwater. Water is essential for all forms of life and influences climate and weather patterns.
- **Climate and Temperature**: These factors affect species distribution, reproduction, and survival rates. For instance, polar and desert ecosystems differ mainly due to variations in temperature and rainfall.
- **Sunlight**: The primary source of energy for nearly all ecosystems, driving photosynthesis and influencing the behaviour of organisms.

II. **Biotic Components (Living Things):**

Biotic components include all the living organisms such as humans, animals, plants, and microorganisms. These living beings interact with each other and also depend on non-living components for survival.
Biotic components are generally classified into three major categories based on their role in the ecosystem:



1. Producers (Autotrophs)

Definition: Producers are organisms that can **synthesize their own food** from inorganic substances using sunlight (photosynthesis) or chemical energy (chemosynthesis).

Role in Ecosystem:

- Convert solar energy into **chemical energy** (glucose).
- Form the **base of the food chain**.
- Provide oxygen (as a byproduct of photosynthesis) and food for consumers.

Example: In a grassland, **grass** acts as the producer, converting sunlight into usable energy through photosynthesis.

2. <u>Consumers (Heterotrophs)</u>

Definition: Consumers are organisms that **cannot produce their own food** and must consume other organisms to obtain energy.

A. Herbivores- These animals eat only plants or plant-based materials Example- Cow, Goat, Deer, Elephant etc.
B. Carnivores- These animals eat only the flesh of other animals. Example- Lion, Tiger, Hyena etc.
C. Omnivores- These organisms eat both plants and animals. Example- Human, Dog, Bear etc.

Role in Ecosystem:

Transfer energy from one trophic level to another.

- Control population of other species.
- Help maintain ecological balance.

3. <u>Decomposers (Saprotrophs)</u>

Definition: Decomposers are organisms that **break down dead and decaying organisms**, turning complex organic material into simpler substances.

Types of Decomposers:

- **Fungi**: Molds, mushrooms.
- **Bacteria**: Soil bacteria, actinomycetes.

Role in Ecosystem:

- Recycle nutrients and maintain **soil fertility**.
- Prevent accumulation of dead material.
- Close the loop in the **nutrient cycle**.

Example:

When a tree dies, fungi and bacteria decompose its wood and leaves,enriching the soil with nutrients.

Conclusion:

The environment is made up of living things and non-living things. These parts work together to form an ecosystem, where all life

depends on each other to survive. Ecosystems give us clean air, food, water, and many other benefits. But human activities like cutting trees, pollution, and climate change are harming these systems. To keep nature healthy, we must take care of all its parts. By protecting the environment and using resources wisely, we can make sure life on Earth stays safe and balanced for the future.

EXPERIMENT NO 2

2] Visit and Report on Solid Waste Management Plant.

Ans – A Solid Waste Management Plant is a facility where solid waste (garbage) is collected, sorted, treated, and either recycled, reused, or safely disposed of. Its main purpose is to manage in an organized and eco-friendly way to reduce pollution and protect human health and the environment.

Definition:

A Solid Waste Management Plant is a system or facility designed to handle and process solid waste through methods such as collection, segregation, recycling, composting, incineration, and landfill disposal.

Types of Solid Waste Handled:

- **Household Waste (foods, plastics, papers):** Household waste, also known as domestic waste or residential waste, refers to the waste materials that are generated from homes during everyday activities. This type of waste includes all the items that people throw away after use in kitchens, bathrooms, living rooms, gardens, and other parts of a house.

- **Industrial Waste:** Industrial waste refers to the unwanted or leftover materials generated by industrial activities during the manufacturing or production process. This waste can come from factories, mining operations, power plants, textile mills, chemical plants, and other industrial facilities.

  It can be solid, liquid, or gaseous, and may be hazardous (toxic, flammable, corrosive) or non-hazardous.

- **Agricultural Waste:** Agricultural waste refers to the unwanted or leftover materials produced from farming and livestock activities. This includes waste generated during the growing, harvesting, processing, and packaging of agricultural pr**o**ducts**.**

- **Electronic Waste:** Electronic waste (e-waste) refers to discarded electrical or electronic devices that are no longer functional, obsolete, or unwanted. This includes everyday gadgets like computers, smartphones, televisions, refrigerators, and other appliances

Main Steps in a Solid Waste Management Plant:

- **Waste Collection and Transportation:**

Waste is collected from households, businesses, and other sources.

Segregation at source (wet and dry waste separated) is encouraged.

Collected waste is transported in covered trucks to the SWM plant.

- **Weighing and Entry Recording**
  - Waste trucks are weighed at the plant's weighbridge.
  - Records of the amount and type of waste received are maintained for monitoring.
- **Unloading and Primary Sorting**
  - Waste is unloaded in the receiving area.

- Large items and hazardous waste are removed manually or mechanically.
- Primary segregation of waste into organic, recyclable, and inert waste happens.

➢ **Mechanical and Manual Segregation**

- Further sorting using machines like trommel screens, magnets, air classifiers.
- Workers pick out recyclables like plastics, metals, glass, and paper.

➢ **Processing and Treatment**

- Organic waste is sent for composting or anaerobic digestion (biogas).
- Dry recyclables are cleaned, shredded, and baled for sale.
- Non-recyclable combustible waste may be processed into RDF (Refuse-Derived Fuel).
- Hazardous waste is segregated and sent for special treatment.

➢ **Emission Control and Environmental Monitoring**

- Air and water emissions are controlled with filters, scrubbers, and treatment units.
- Regular environmental monitoring ensures compliance with regulations.

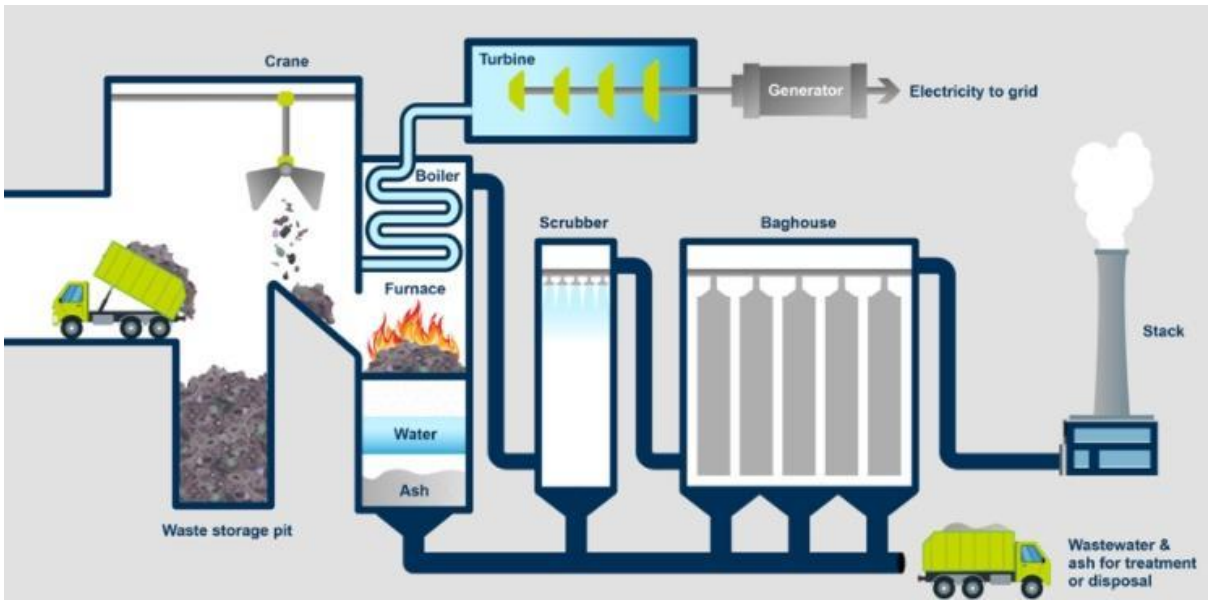
➢ **Disposal**

Waste disposal is the final step in the solid waste management process where waste materials are safely discarded or treated so they no longer pose a threat to human health or the environment.

Disposal is used mainly for waste that cannot be recycled, reused, or treated further, such as non-recyclable plastics, contaminated waste, or industrial by-products.

❖ **Importance of a Solid Waste management Plant**

- Reduces land, air, and water pollution.
- Helps in recycling useful material.
- Prevents the spread of diseases.
- Create cleaner and healthier cites.
- Supports sustainable development.



Experiment No- 5

Report on Study of Local Biodiversity and Conservation Methods

1.Introduction

Biodiversity refers to the wide variety of life on Earth—plants, animals, microorganisms, and ecosystems. Local biodiversity is the diversity of living organisms found within a specific geographic area. It includes trees, herbs, shrubs, insects, animals, and aquatic life. Understanding and preserving this diversity is crucial for environmental balance and sustainable development.

2. **Objectives of the Study**

- To study the variety of species in the local region.
- To identify the major threats to local biodiversity.
- To understand methods of biodiversity conservation.
- To encourage community participation in biodiversity protection.

3. **Study Area**

The study was conducted in and around **Dombivli (East), Thane District, Maharashtra**, including:

- Local parks and gardens
- Lakes and water bodies (e.g., Khidkali Lake)
- Open green spaces
- Urban biodiversity pockets

4. **Methodology**

The following methods were used to study biodiversity:

1. **Transect Walk** – Walking along a fixed path and recording species.
2. **Quadrant Sampling** – Dividing area into small plots and studying species.
3. **Checklist Method** – Noting all plant and animal species observed.
4. **Photography** – Documenting biodiversity through images.
5. **Interviews with Locals** – Learning from farmers, elders, and nature groups.

5. **Observations**

A. **Flora (Plants) Observed**:

- **Trees**: Banyan, Neem, Mango, Tamarind, Ashoka
- **Shrubs**: Hibiscus, Bougainvillea, Tulsi

- **Herbs**: Aloe vera, Lemongrass, Mint
- **Aquatic Plants**: Lotus, Water hyacinth
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- **B. Fauna (Animals) Observed:**

- **Birds**: Sparrow, Peacock, Koel, Parrot
- **Mammals**: Squirrel, Monkey, Mongoose
- **Insects**: Butterflies, Honeybees, Beetles
- **Reptiles**: Garden Lizard, Rat Snake
- **Aquatic Life**: Frogs, Catfish, Crabs

6. **Threats to Local Biodiversity**

- Rapid urbanization and deforestation
- Dumping of waste and sewage into water bodies
- Overuse of pesticides in farming
- Invasive species like water hyacinth
- Lack of environmental awareness

7. Conservation Methods

A. In-situ Conservation:

- Establishment of protected areas like parks and sanctuaries
- Preservation of sacred groves
- Community-managed forests

B. **Ex-situ Conservation:**

- Botanical gardens and nurseries
- Zoological parks
- Seed banks

C. **Local Initiatives:**

- Tree plantation drives by schools and colleges
- Biodiversity clubs and student groups
- Lake clean-up campaigns
- Waste management awareness

8. **Case Study: Restoration of Khidkali Lake**

- **Problem**: Plastic waste, water hyacinth overgrowth, polluted water
- **Action Taken**: Clean-up drive by NGOs and locals, native plant reintroduction, bird habitat restoration

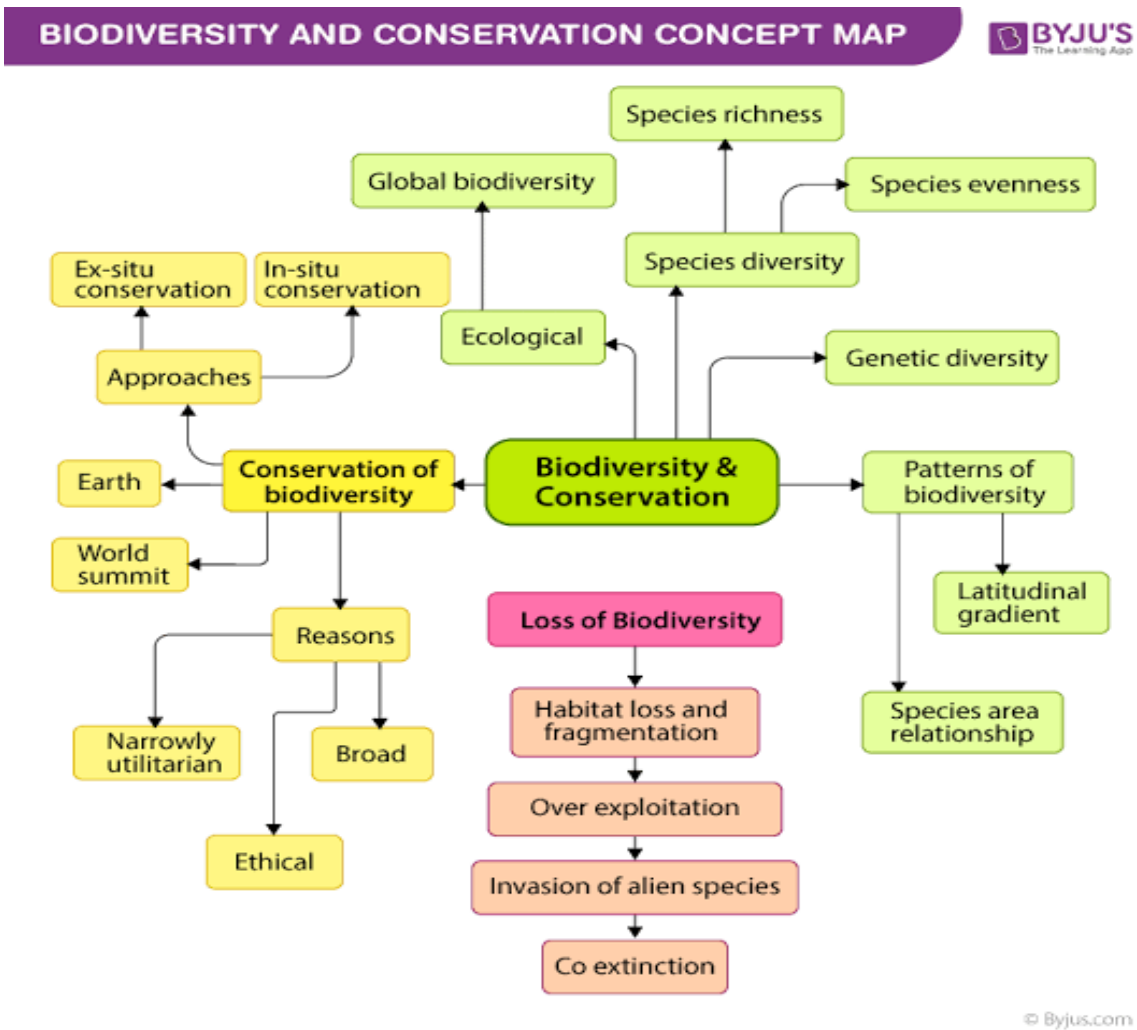
- **Result**: Increased bird sightings, community recreation space, improved water quality

9. **Conclusion**

Local biodiversity is an essential component of a healthy ecosystem. It supports ecological balance and provides resources for humans and wildlife. Conservation of biodiversity must involve local communities, youth, and educational institutions. Protecting biodiversity ensures a better and sustainable future for all.

10. **Suggestions**

- Organize regular awareness and plantation programs.
- Encourage eco-clubs and student biodiversity projects.
- Implement stricter waste management policies.
- Promote organic farming to reduce chemical use.
- Protect wetlands and green belts from encroachment.



Experiment No -7

Rainwater Harvesting System Design

1. **Introduction**

Rainwater harvesting (RWH) is the process of collecting, storing, and utilizing rainwater for various purposes. It is a sustainable and eco-friendly method that reduces dependency on groundwater and municipal water systems, particularly in urban and drought-prone areas.

2. **Objectives of Rainwater Harvesting**

- To conserve water by capturing rainwater.
- To reduce groundwater depletion.
- To minimize waterlogging and soil erosion.
- To recharge groundwater through infiltration.
- To supply water for non-potable uses like gardening, flushing, and washing.

3. Types of Rainwater Harvesting Systems

A. **Rooftop Rainwater Harvesting**

Rainwater is collected from the roof of buildings and directed into storage tanks or recharge pits.

B. **Surface Runoff Harvesting**

Collects rainwater flowing over land and channels it into storage structures like ponds or tanks.

4. Components of a Rooftop Rainwater Harvesting System

Component	**Description**
Catchment Area	Roof or terrace that captures rainwater
Gutters	Channels to transport water from roof edges
Downpipes	Pipes that carry water from roof to storage or recharge
First-Flush System	A diverter to remove the first 10–20 minutes of dirty rainwater
Filter Unit	Sand, gravel, or charcoal filter to remove debris and impurities

Component	Description
Storage Tank	Underground or above-ground tank to store clean water
Recharge Pit	A pit filled with stones and sand for percolating water into the ground

5. System Design – Sample (Residential Building)

📐 Design Parameters:

- **Roof Area** = 100 sq. meters
- **Average Rainfall (Mumbai Region)** = 2200 mm = 2.2 m
- **Runoff Coefficient (RCC roof)** = 0.8

🟫 Rainwater Collected (Annually):

Rainwater=Roof Area×Rainfall×Runoff Coefficient=100×2.2×0.8=176 m3 (or 1,76,000 Liter s)Rainwater = Roof \ Area \times Rainfall \times Runoff \ Coefficient = 100 \times 2.2 \times 0.8 = 176 \ m^3 \ (or \ 1,76,000 \ Liters)

🔧 System Components for the Design:

- **Gutter size**: 150 mm wide PVC
- **Downpipe**: 100 mm diameter PVC
- **First-flush valve**: Manual or automatic
- **Filter**: Sand-gravel-charcoal filter
- **Storage Tank**: 10,000 to 20,000 liters capacity
- **Recharge Pit**: 1.5m × 1.5m × 2m depth filled with brick and gravel

6. Advantages of Rainwater Harvesting

- Reduces water bills
- Decreases dependence on groundwater
- Reduces flooding and water logging
- Recharges groundwater levels
- Environmentally sustainable

7. Challenges

- Initial cost of setup
- Requires regular maintenance
- Filtration system must be cleaned often
- Not suitable in highly polluted rooftop areas

8. Conclusion

Rainwater harvesting is a cost-effective, eco-friendly, and sustainable water management technique. Especially in urban areas like Dombivli, where water scarcity and groundwater depletion are becoming common, RWH systems can play a significant role in ensuring water security.

9. Diagram (To Include in Your Report)

You may include a labeled diagram showing:

1. Rooftop catchment
2. Gutter and downpipe
3. First-flush diverter
4. Filter unit
5. Storage tank and/or recharge pit