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ECOSYSTEM

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ABSTRACT:

Ecology is the scientific study of the distributions, abundance and relations of organisms and their interactions with the environment. Ecology includes the study of plant and animal populations, plant and animal communities and ecosystems. Ecosystems describe the web or network of relations among organisms at different scales of organisation. Since ecology refers to any form of biodiversity, ecologists research everything from tiny bacteria's role in nutrient recycling to the effects of tropical rain forest on the Earth's atmosphere. Ecology is closely related to the disciplines of physiology, evolution, genetics and behaviour.

Ecosystems are controlled by external and internal factors. External factors—including climate and what parent materials form the soil and topography—control the overall structure of an ecosystem, but are not themselves influenced by it. By contrast, internal factors both control and are controlled by ecosystem processes. include decomposition, the types of species present, root competition, shading, disturbance, and succession. While external factors generally determine which resource inputs an ecosystem has, the availability of said resources within the ecosystem is controlled by internal factors.

Keywords: *Ecology, Ecosystems, climate, topography,etc*

INTRODUCTION

The ecosystem concept is the idea that living organisms are continually engaged in a set of relationships with every other element constituting the environment in which they exist.

The study of ecosystem is called ecology; ecosystem is a subset area. The term ecosystem was coined in 1930 by Roy Clapham, to denote the physical and biological components of an environment considered in relation to each other as a unit. British ecologist Arthur G. Tansley in 1935 refined the term, describing it as the interactive system established between biocoenosis and their biotope.

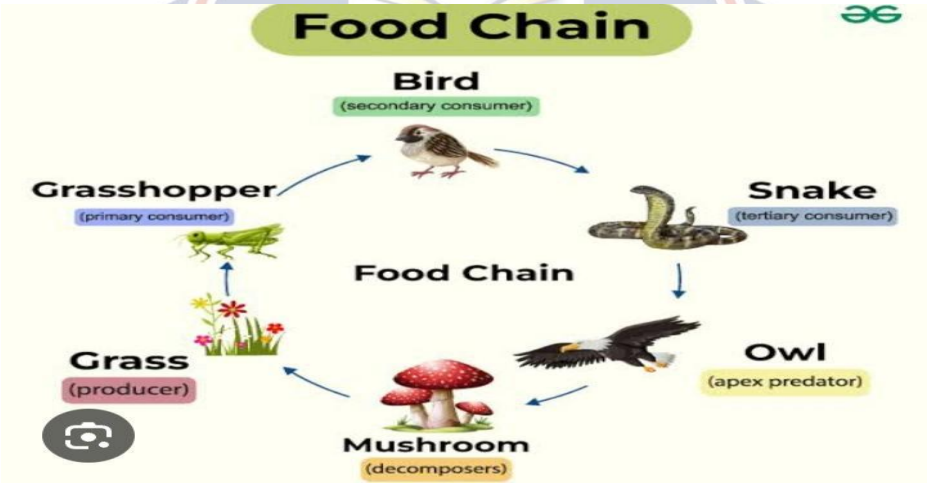
According to A.G. Tansley, "Ecosystem is the system resulting from the integration of all the living and non-living factors of the environment."

According to Christofferson,

"An ecosystem is a natural system consisting of all plants, animals and microorganisms in an area functioning together with all the non-living physical factors of the environment."

Ecosystems provide a variety of goods and services upon which people depend, and may be part of. Ecosystem goods include the "tangible, material products" of ecosystem processes such as water, food, fuel, construction material, and medicinal plants. Ecosystem services, on the other hand, are generally "improvements in the condition or location of things of value". These include things like the maintenance of hydrological cycles, cleaning air and water, the maintenance of oxygen in the atmosphere, crop pollination and even things like beauty, inspiration and opportunities for research. Many ecosystems become degraded through human impacts, such as soil loss, air and water pollution, habitat fragmentation, water diversion, fire suppression, and introduced species and invasive species. These threats can lead to abrupt transformation of the ecosystem or to gradual disruption of biotic processes and degradation of abiotic conditions of the ecosystem. Once the original ecosystem has lost its defining features, it is considered "collapsed". Ecosystem restoration can contribute to achieving the Sustainable Development Goals.

Food Chains



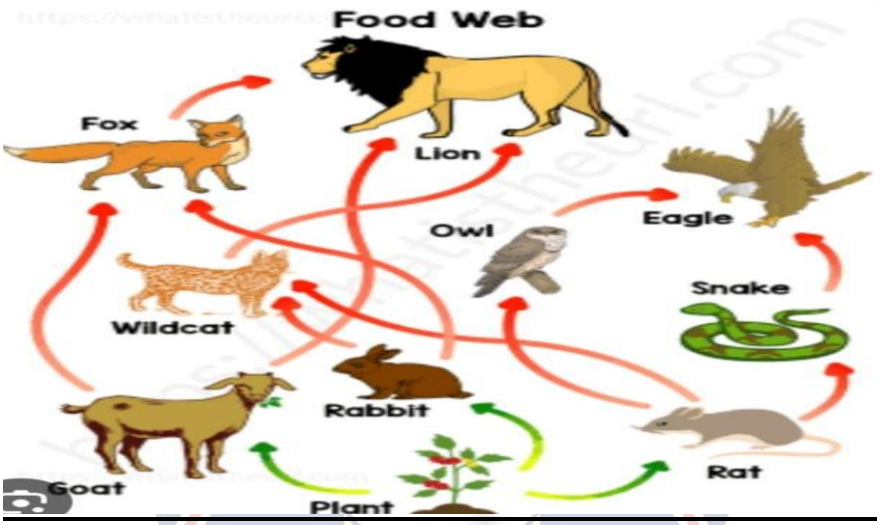
A food chain is a linear sequence of links in a food web, starting from a trophic species that eats no other species in the web and ending at a trophic species that is eaten by no other species in the web. A food chain differs from a food web because the complex polyphagous network of feeding relations is aggregated into trophic species, and the chain only follows linear monophagous pathways. A food chain shows how each living thing gets food.

Food chains, also called food networks and trophic (feeding) networks, describe the feeding relationships between species within a community. Organisms are connected within an ecosystem or community by lines representing the direction of organism or energy transfers.

Food chain studies play an important role in many biological studies.Food chain stability is very important for the survival of most species. When only one element is removed from the food chain it can result in extinction or immense decreases of survival of a species. Many food chains and food webs contain a keystone

species, a species that has a large impact on the surrounding environment and that can directly affect the food chain. If a keystone species is removed it can set the entire food chain off balance.The efficiency of a food chain depends on the energy first consumed by the primary producers. This energy then moves through the trophic levels.

Food Web



A food web is a graphical description of feeding relationships among species in an ecological community, i.e., of who eats whom. It shows the relationships between these organisms much more realistically than a food chain or trophic pyramids. It is also a means of showing how energy and materials flow through a community of species as a result of these feeding relationships. Typically, species are connected by lines or arrows called "links", and the species are sometimes referred to as "nodes" in food webs.

A food web is the natural interconnection of food chains and a graphical representation of what-eats-what in an ecological community. Position in the food web, or trophic level, is used in ecology to broadly classify organisms as autotrophs or heterotrophs. This is a non-binary classification; some organisms (such as carnivorous plants) occupy the role of mixotrophs, or autotrophs that additionally obtain organic matter from non-atmospheric sources.

Food webs are limited representations of real ecosystems as they necessarily aggregate many species into trophic species, which are functional groups of species that have the same predators and prey in a food web. Ecologists use these simplifications in quantitative (or mathematical representation) models of trophic or consumer-resource systems dynamics. Using these models they can measure and test for generalized patterns in the structure of real food web networks.

Ecological Pyramids

The energy pyramid shows how the amount of energy entering each level varies across trophic levels. In general, only about 10% of the energy entering one trophic level is transferred to the trophic level above. The energy pyramid may be viewed as a distinct step-like pattern, with less energy entering each higher level of

the food chain. The shape of the energy pyramid affects the length of food chains because, eventually, the amount of energy entering the highest trophic level is not large enough to support a higher trophic level.
You can copy this text into a Word document or use it to create a PDF. If you need a ready-to-download PDF, let me know and I can provide the content in a format suitable for PDF generation.

Importance of Ecosystem

Ensures Biodiversity:

All the millions of species that exist on planet earth are sustained by their particular ecosystems. Ecosystems are thus important places for ensuring that biodiversity continues on this planet.

Enables Us to Understand the Organisms:

Understanding ecosystems enables us to understand the organisms that live within them. The whole of planet earth may itself be thought of as one giant ecosystem, where all organisms live together and interact as part of a huge global system.

Self-Sustaining:

The delicate balance of organisms within an ecosystem helps to keep that ecosystem going.

Regulating the Climate:

The 'respirations' of forest ecosystems and the ability of insects to pollinate wide swathes of flower meadows means that many ecosystems help to regulate the amounts of carbon in our climate.

Functions of Ecosystem

Habitat Functions

Natural ecosystems provide refuge and reproduction habitat to wild plants and animals and thereby contribute to the conservation of biological and genetic diversity and evolutionary processes.

Production Functions

Photosynthesis and nutrient uptake by autotrophs converts energy, carbon dioxide, water and nutrients into a wide variety of carbohydrate structures which are then used by secondary producers to create an even larger variety of living biomass. This broad diversity in carbohydrate structures provides many ecosystem goods for human consumption, ranging from food and raw materials to energy resources and genetic material.

Information Functions

Because most of human evolution took place within the context of undomesticated habitat, natural ecosystems provide an essential reference function and contribute to the maintenance of human health by providing opportunities for reflection, spiritual enrichment, cognitive development, recreation and aesthetic experience.

Types of Ecosystem

- Forest Ecosystem
- Grassland Ecosystem
- Desert Ecosystem
- Aquatic Ecosystem

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- Forest Ecosystem

Forest Ecosystem

The forest ecosystem covers the flora, fauna and ground conditions within the parameters of a forest. From the climatic conditions to the members and relationships in the food chain, the forest ecosystem is dependent on the major resources available. In the forest ecosystem the proportion of flora, including the varieties of trees, grasses, fungi and flowers will affect the way in which fauna exist.

Grassland Ecosystem

The grassland ecosystem is an ecosystem which there is more water than in a desert, but not enough water to support a forest. Grasslands begin at the edges of the desert biome and stretch across the land to the forest biome. Over one quarter of the Earth's surface is covered by grasslands. Grasslands are found on every continent except Antarctica, and they make up most of Africa and Asia. These are several types of grasslands. They are distinguished by different names like plains, prairies, savannas and pampas.

Desert Ecosystem

In geographical studies, deserts are defined as regions wherein the average annual precipitation seldom exceeds more than 10 inches per year, and the amount of water lost to evapotranspiration is much more than the amount of water gained by precipitation. Like hot deserts, such as the Sahara and Mojave, there are cold deserts as well, the best example is Antarctica. One of the prominent differences between the two is the form of precipitation, which is snowfall in cold deserts and rainfall in hot deserts. Though a desert may seem like a barren land devoid of life forms, life does exist in this harsh environment. Numerous plants and animal species have adapted to these seemingly unsuitable conditions.

Aquatic Ecosystem

The aquatic ecosystems comprise of the marine environments of the seas and the fresh water systems in lakes, rivers, ponds, and wetlands. These ecosystems provide human beings with a wealth of natural resources. They provide food like fish and crustaceans. Natural aquatic systems, such as rivers and seas, break-down the chemical and organic wastes created by man.

Ecological Pyramids

An ecological pyramid is a graphical representation designed to show the biomass or biomass productivity at each trophic level in a given ecosystem. Biomass is the amount of living or organic matter present in an organism. Biomass pyramids show how much biomass is present in the organisms at each trophic level, while productivity pyramids show the production or turnover in biomass.

Ecological pyramids begin with producers on the bottom (such as plants) and proceed through the various trophic levels (such as herbivores that eat plants, then carnivores that eat herbivores, then carnivores that eat those carnivores, and so on). The highest level is the top of the food chain.

Ecological pyramids are of three general types which are as follows:-

a) Pyramid of Numbers

b) Pyramid of Biomass

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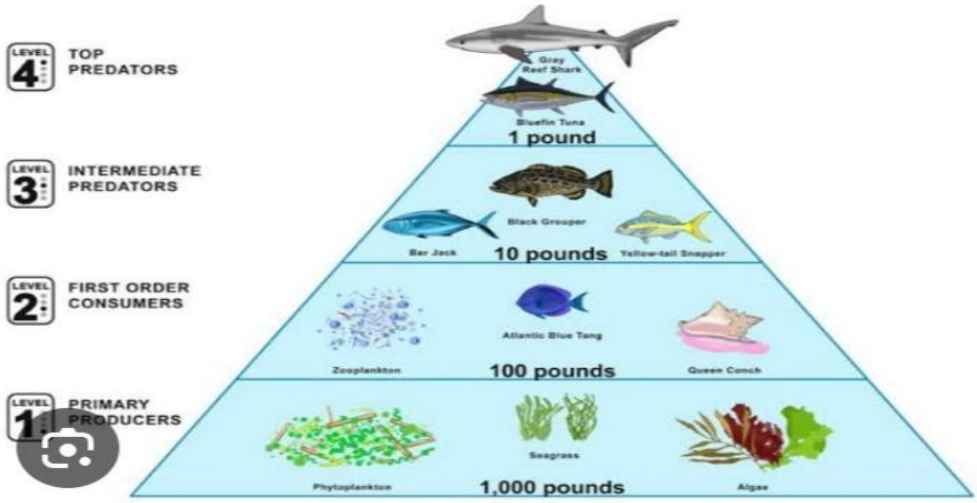
c) Pyramid of Energy



Pyramid of Numbers

Showing the number of individual organisms at each level. This pyramid deals with the relationships between the numbers of primary producers and consumers of different orders. At the base is always the number of primary producers and subsequent structures on this base are represented by the numbers of consumers at successive levels. The top represents the number of top carnivores in an ecosystem

Pyramid of Biomass

Showing the total dry weight and other suitable measures of the total amount of living matter. An ecological pyramid of biomass shows the relationship between biomass and trophic level by quantifying the amount of biomass present at each trophic level of an ecological community at a particular moment in time. Typical units for a biomass pyramid could be grams per meter^2, or calories per meter^2.

Pyramid of Energy

Showing the rate of energy flow and/or productivity at successive trophic levels. The energy pyramids give the best picture of overall nature of the ecosystem. These, number and weight of organisms at any level depends not on the amount of fixed energy present at any one time in the level just below but rather on the rate at which food is being produced. In contrast with the pyramids of numbers and biomass, which are pictures of the standing situations, the pyramid of energy is a picture of the rates of passage of food mass through the food chain.

Biogeochemical Cycles

Biogeochemical cycles are pathways for the transport and transformation of matter within four categorical areas that make up planet Earth.

Biogeochemical cycles are components of the broader cycle that govern the functioning of planet Earth. The Earth is a system open to electromagnetic radiation from the sun and outer space, but is a virtually closed system with regard to matter.

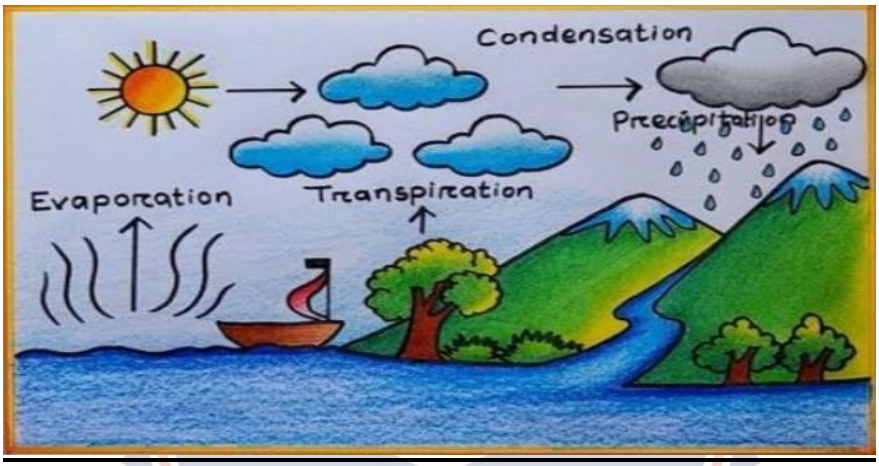
This means that the planet has minimal flux of matter, other than meteorite collisions and minor amounts of intergalactic particle trapping by the upper atmosphere. Therefore, matter that Earth contained from the time

of its birth is transformed and circulated geographically. This is in line with the law of conservation of matter which states that matter cannot be created nor destroyed but can be transformed including the transformation between matter and energy.

Categories of Material Cycles

- Water Cycle
- Carbon Cycle
- Nitrogen Cycle
- Oxygen Cycle
- Sulphur Cycle
- Energy Cycle

Water Cycle



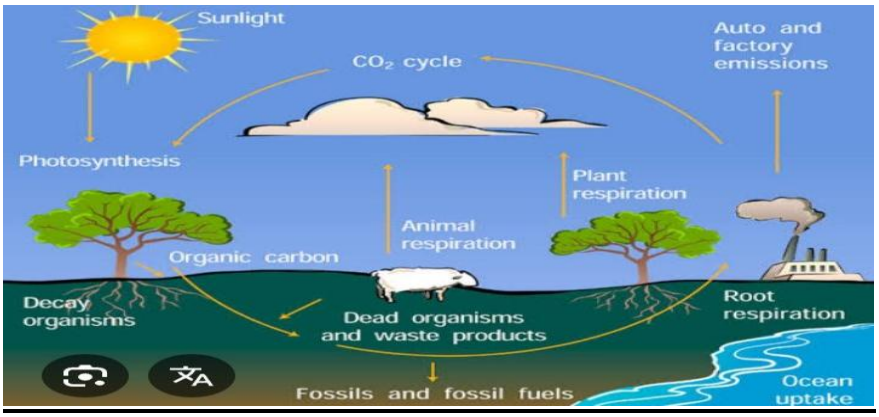
The water cycle also known as the hydrologic cycle or H_2O cycle, describes the continuous movement of water on, above and below the surface of the Earth. Water can change states among liquid, vapour, and ice at various places in the water cycle. The hydrologic cycle involves the exchange of heat energy which leads to temperature changes, for instance, in the process of evaporation, water takes up energy from the surroundings and cools the environment. Conversely, in the process of condensation, water releases energy to its surroundings, warming the environment.

The sun which drives the water cycle, heats water in oceans and seas, water evaporates as water vapour into the air, ice and snow can sublimate directly into water-vapour. Evapotranspiration is the water transpired from plants and evaporated from the soil.

Rising air currents take the vapour up into the atmosphere where cooler temperatures cause it to condense into clouds. Air currents move water vapour around the globe, cloud particles collide, grow and fall out of the sky as precipitation. Some precipitation falls as snow or haill and can accumulate as ice caps and glaciers, which can store frozen water for thousands of years. Snow packs can thaw and melt, and the melted water flows over land as snowmelt.

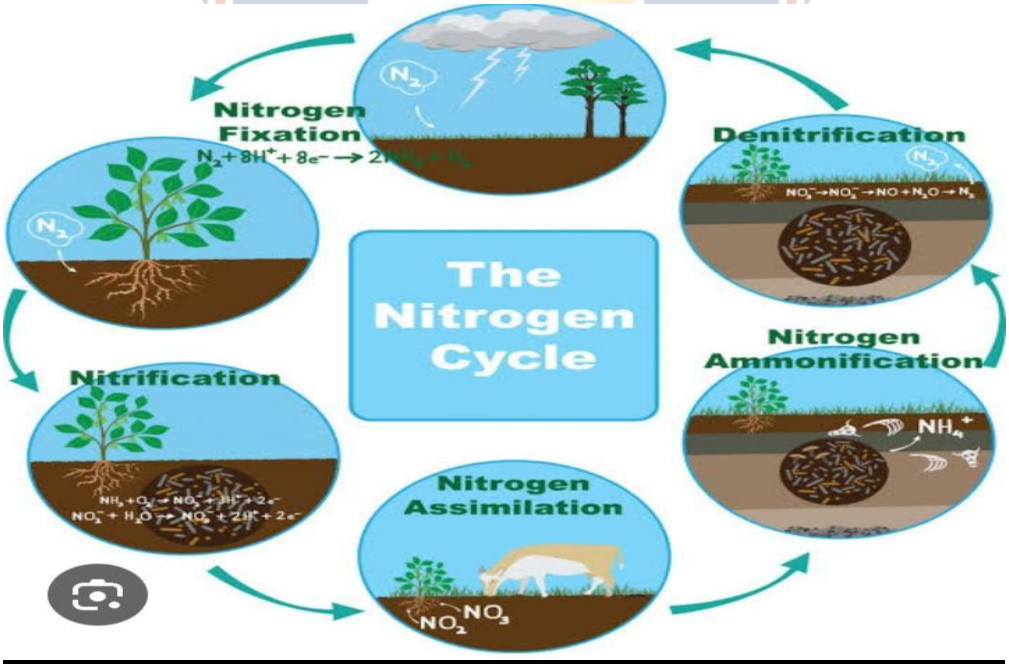
Most water falls back into the oceans. Over time, the water returns to the ocean, where our water cycle started.

Carbon Cycle



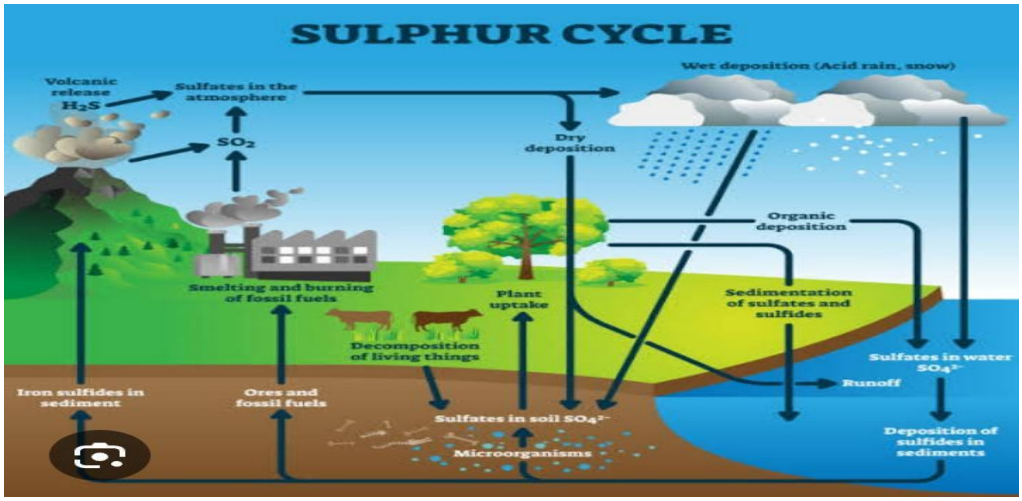
The carbon cycle is the biogeochemical cycle by which carbon is exchanged among the biospere, pedosphere, geosphere, hydrosphere,and atmospere of the Earth. It is one of the most important cycles of the earth and allows for carbon to be recycled and reused throughout the biosphere and all of its organisms. Carbon exists in the Earth's atmosphere primarily as the gas carbon dioxide. Although it is a small percentage of the atmosphere, it plays a vital role in supporting life. Other gases containing carbon in the atmosphere are methane and chloroflurocarbons. Trees and other green plants such as grass convert carbon dioxide into carbohydrates during photosynthesis, releasing oxygen in the process. This process is most prolific in relatively new forests where tree growth is still rapid.

Nitrogen Cycle



It is present in the environment in a wide variety of chemical forms including organic nitrogen, (NH4), (NO2), (N2). The organic nitrogen may be in the form of any living organism, or humus, and in the intermediate product of organic matter decomposition or humus built up. The process of nitrogen cycle transform nitrogen from one chemical to another.

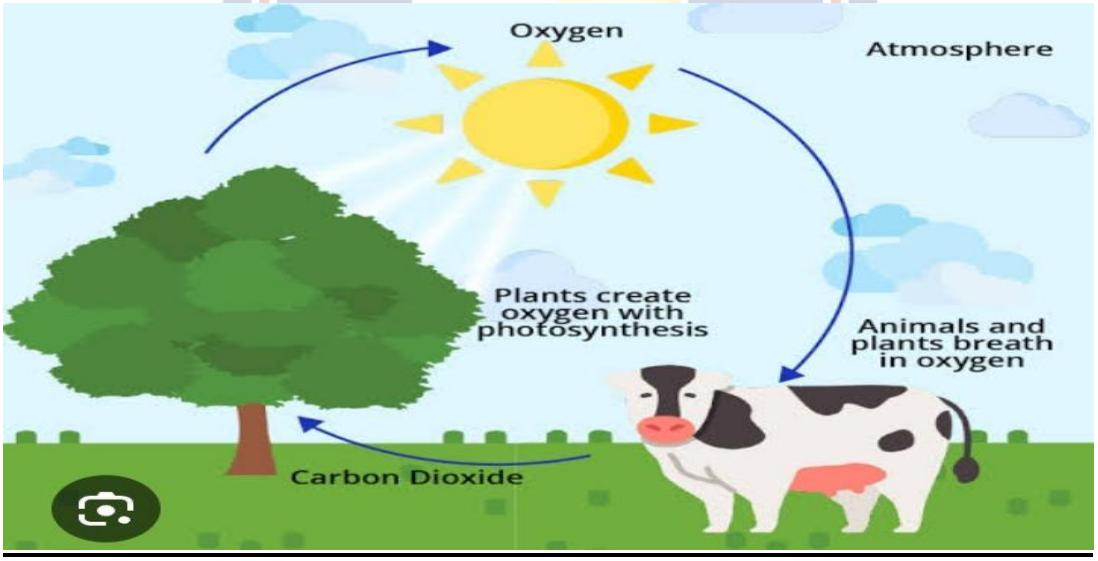
Sulphur Cycle



Sulphur is one of the most abundant elements on the earth. It is a yellow, brittle, tasteless, odourless non-metal. Sulphur is present in all kinds of proteins. Plants directly absorb sulphur-containing amino acids such as methionine, cysteine and cysteine.

The process of sulphur cycle is when the sulphur is released by the weathering of rocks. It comes in contact with air and is converted into sulphates. Then they are taken up by plants and microbes and are converted into organic forms. The organic form of sulphur is then consumed by the animals through their food chain and thus sulphur moves in the sulphur cycle. When the animals die, some of the sulphur is released by decomposition while some enters the tissues of microbes.

Oxygen Cycle



The oxygen cycle is the biogeochemical cycle that describes the movement of oxygen within its three main reservoirs: the atmosphere, the total content of biological matter within the biosphere, and the lithosphere.Failures in the oxygen cycle within the hydrosphere can result in the development of hypoxic zones. The main driving factor of the oxygen cycle is photosynthesis, which is responsible for the modern Earth's atmosphere and life.

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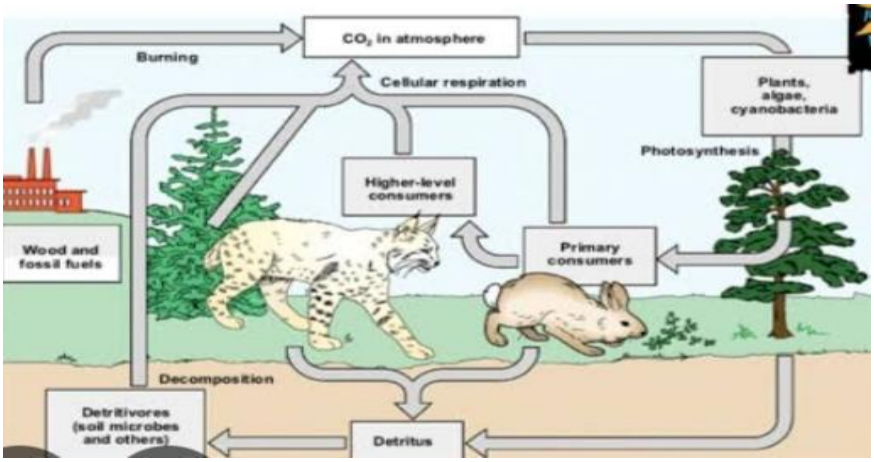
Energy Cycle



The energy cycle is based on the flow of energy through the ecosystem. The energy from sunlight is converted by plant them into growing new plants material which include the flowers, fruits, branches, trunks and roots of the plants. Since plants can grow by converting the sun energy directly into their tissues. They are known as producer in the ecosystem. so the energy in the ecosystem can be depicted in the form of a food pyramid or energy pyramid. The food pyramid has large based plants called producers. The pyramid has a narrower middle section that depicts the number and biomass of herbivores animals, which called first order consumers. Man is one of the animals at the apex of the pyramid.

CONCLUSION

This project has demonstrated that pollution remains a significant issue affecting the environment and public health. The data gathered through water and air sampling as well as the survey of public perception revealed high levels of contaminants from industrial, vehicular, and agricultural sources in our local community.These pollutants increase health risks for residents and damage local ecosystems. To mitigate these impacts, our research suggests implementing policy changes to regulate emissions and discharge, transitioning to cleaner technologies, and launching public education campaigns. Although our study was limited in scope, it contributes valuable insights into local pollution patterns.This project has also deepened our understanding of pollution while demonstrating the importance of scientific research and civic participation in shaping evidence-based solutions to this complex public health and environmental issue.

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