Chapter I: Introduction to the ecosystem

1.1.- Definition of the ecosystem

Ecosystems are biological systems that encompass all interactions and relationships between human beings and the habitat or environment in which they live.

As a result, it is possible to differentiate between a wide variety of ecosystems, depending on the type of habitat and the biotic and abiotic factors that constitute them. Thus, in terrestrial, aquatic, and mixed environments, it is possible to distinguish between natural ecosystems teeming with life.

1.2.- Concept of a natural ecosystem

A natural ecosystem consists of a biotope, physico-chemical parameters (soil, temperature, sunlight, etc.) and a biocoenosis, i.e., all living beings. Complex relationships are established between the biotope and the biocoenosis, and a balance is established.

Examples of ecosystems:

Herbivores that feed on vast plains, for example, maintain soil fertility with their droppings.

Similarly, the marine ecosystem consists of zooplankton, which feeds fish, which in turn are eaten by seals, which are themselves eaten by sharks.

1.3.- What factors distinguish different ecosystems?

Ecologists have several alternatives for distinguishing between different ecosystems:

1.3.1.- Based on the size of the biotope.

An ecosystem can thus be preceded by one of the prefixes micro, meso, or macro. A micro , therefore, is a small-scale ecosystem, such as a tree stump, as opposed to a macro , such as an island several square kilometers in size.

1.3.2.-Based on the biocoenosis present in the biotope

Observing all the living organisms interacting in the ecosystem already allows us to distinguish between different ecosystems.

Microorganisms and/or plant and animal species that coexist in this space may, for example, survive there for a temporary period of time, which may be short, long, or unlimited.

1.3.3.- Original biocoenosis and potential biocoenosis.

Depending on human activity, an ecosystem may undergo disturbances, changes, and/or degradation. This factor also allows us to distinguish between different ecosystems.

An ecosystem is considered original when the biocoenosis has not been affected by human activity, such as virgin forests.

1.4.- How important is the ecosystem?

As an ecosystem is a group of living beings interacting in an environment, it is of paramount importance for the sustainability of life.

Humans are an integral part of the planet's ecosystem and their existence depends on the resources drawn from nature. To feed themselves, to care for themselves, and to produce the goods they need for their development, the human populations of the planet exploit what their ecosystem offers them.

However, the countless ecosystems that exist on Earth require a balance to be maintained in order for the entire biocoenosis and biotopes to survive. Maintaining stability in an ecosystem depends on the presence of each species (animal and plant).

1.5.- How does a natural ecosystem work?

If an ecosystem consists of a biocoenosis and a biotope, its functioning is inextricably linked to the physical and chemical conditions of the environment in which it is located.

These physical and chemical parameters may include the geological conditions of the soil, exposure to sunlight, temperature, humidity, etc.

The functioning and/or evolution of the biocoenosis may vary depending on these conditions. When exposed to sunlight for much of the year, acidic soils are, for example, the preferred habitat of certain plant species, such as certain varieties of ferns. However, if climatic conditions are different, i.e., no sun and more snow, for example, it is quite possible that the ferns will disappear and be replaced by other plant species. There are therefore interactions between the living beings in an ecosystem and physical and chemical factors.

Although the functioning of the ecosystem depends on physical and chemical conditions, the relationships between different species are generally the same. These interactions between living beings include competition, predation, and parasitism. A sometimes complex food chain network exists within an ecosystem.

In the case of a forest, plant species are one of the primary producers in the chain. Plants grow thanks to the minerals present in the soil and feed herbivorous animals, which in turn serve as food for carnivores.

Decomposers, such as microorganisms, woodlice, millipedes, and fungi, feed on plant waste, animal excrement, and carcasses, converting this organic matter into mineral matter that can be used by primary producers.

1.6.- Definition of sustainable development

4. Sustainable mobility: Sustainable transportation systems encourage the use of environmentally friendly modes of transportation, such as public transit, carpooling, biking, and walking. Promoting shared mobility solutions and the electrification of transportation also contribute to sustainable development by reducing greenhouse gas emissions associated with travel.

5. Education and awareness: Education plays a crucial role in sustainable development. Educational programs that raise awareness of environmental, social, and economic issues encourage responsible behavior and contribute to the development of conscious and engaged citizens.

6. Circular economy: The circular economy aims to reduce waste by reusing, recycling, and recovering materials and products at the end of their life. Companies are adopting circular economic models to minimize their environmental impact while maintaining the value of products and materials in the economy.

7. Responsible finance: Responsible finance practices integrate environmental, social, and governance (ESG) criteria into investment decisions. Investors seek to support companies and projects that are aligned with sustainable values and responsible practices.

Sustainable development can be defined simply as a mode of development that meets the needs of the present without compromising the ability of future generations to meet their own needs. In other words, it is an approach that seeks to balance economic, social, and environmental aspects in order to preserve our planet for future generations.

1.6.1. Some concrete examples of sustainable development

1. Renewable energy: The transition to the use of renewable energies, such as solar, wind, hydro, or geothermal energy, is a classic example of sustainable development. These energy sources reduce dependence on fossil fuels, decrease greenhouse gas emissions, and promote cleaner and more sustainable energy production.

2. Sustainable agriculture: Sustainable agricultural practices aim to maximize productivity while minimizing environmental impacts. This can include the use of soil conservation techniques, crop rotation, sustainable water management, agroforestry, and the adoption of organic or agroecological methods.

3. Green building: Sustainable construction involves the use of environmentally friendly materials, the design of energy-efficient buildings, the effective management of construction waste, and the creation of urban spaces that promote biodiversity. Sustainable buildings seek to minimize their ecological footprint while providing healthy environments for occupants.

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8. Sustainable management of natural resources: Ecosystem conservation, sustainable forest management, water resource protection, and biodiversity preservation are examples of practices aimed at ensuring the responsible use of natural resources.

These examples illustrate how sustainable development can be put into practice in various contexts, showing how economic, social, and environmental aspects can be integrated to promote balanced and sustainable progress.