

PG Sem I, Unit IV, Paper 1

Abiotic and Biotic Factors of Ecosystem

Biotic and abiotic are the two essential factors responsible for shaping the ecosystem. The biotic factors refer to all the living beings present in an ecosystem, and the abiotic factors refer to all the non-living components like physical conditions (temperature, pH, humidity, salinity, sunlight, etc.) and chemical agents (different gases and mineral nutrients present in the air, water, soil, etc.) in an ecosystem. Therefore, both the abiotic and biotic resources affect survival and reproduction process.

Furthermore, both these components are reliant on each other. Suppose if one of the factors is removed or altered, its repercussions will be faced by the entire ecosystem. Without a doubt, abiotic factors directly affect the survival of organisms. Read on to explore what role do abiotic and biotic resources play in the ecosystem.

Biotic Meaning

The term “biotic” is formed by the combination of two terms, “**bio**” meaning life and “**ic**” meaning like. Thus, the term means life-like and is related to all the living entities present in an ecosystem.

Biotic Factors

Biotic factors relate to all the living things in the ecosystem. Their presence and their biological by-products affect the composition of an ecosystem. Biotic factors refer to all living organisms from animals and humans, to plants, fungi, and bacteria. The interactions between various biotic factors are necessary for the reproduction of each species and to fulfil essential requirements like food, etc.

Biotic factors are both organisms and the food the organisms eat. There are 3 categories of biotic factors, autotrophs, heterotrophs, and detritivores.

Autotrophs

The word autotroph means “self-feeder.” Also known as producers, the organisms in this category are mostly green plants and algae which make their own food through photosynthesis.

The energy that they store serves as food for the consumers and decomposers (see below) either directly or indirectly.

Autotrophs that don't use photosynthesis to make their food use another process called chemosynthesis. In this case, organisms take organic material from their environment and transform it into organic nutrients, without the need for sunlight. A good example of this are the specialized bacteria that live near hydrothermal vents in the ocean and extract hydrogen sulfide from the water.

Autotrophs use some of the energy they make to change elemental carbon into organic compounds (called carbon fixation) during photosynthesis or chemosynthesis. Although they feed on simple food sources, autotrophs are the base that drives the entire ecosystem.

Heterotrophs

Heterotrophs ("other feeders") are consumers in the ecosystem. They eat more complex organisms like plants and/or animals. Some examples of heterotrophs are bacteria, protists, fungi, herbivores (deer, cows, sheep), carnivores (bears, lions, dogs), and omnivores (birds, squirrels, rats, and humans). In fact, about 95% of all living things on Earth are heterotrophs. Unlike autotrophs, heterotrophs don't have to fix carbon, so they can take advantage of all the energy from the food they eat.

Detritivores

Detritivores are also consumers but they get their own category because of what they feed on. These organisms are also referred to as the decomposers, and they either eat dead organisms directly or break down dead things to get energy. Examples of detritivores are earthworms, fungi, dung beetles, millipedes, sea stars, and fiddler crabs. The complex cycle of interaction between biotic and abiotic factors continues as the decomposers clean up after the producers and consumers but serve as food for the heterotrophs at the same time.

Abiotic Meaning

The term abiotic refers to all the non-living factors present in an ecosystem. Sunlight, water, land, all constitute the abiotic factors.

Abiotic Factors

Abiotic factors refer to all the non-living, i.e. chemical and physical factors present in the atmosphere, hydrosphere, and lithosphere. Sunlight, air, precipitation, minerals, and soil are some examples of abiotic factors. These factors have a significant impact on the survival and reproduction of species in an ecosystem.

For instance, without an adequate amount of sunlight, autotrophic organisms may not be able to survive. When these organisms eventually die, it will create a shortage of food for primary

consumers. This effect cascades up the food chain, affecting every organism. Consequently, it leads to an imbalance in the ecosystem.

The non-living abiotic factors control which organisms live in an ecosystem, where they live, and how many of them are there. Even slight changes in abiotic factors can have a significant effect on organisms in an ecosystem. Broadly, there are 3 categories of abiotic factors, climatic, edaphic, and social.

Climatic

Climatic factors are components such as water, sunlight, humidity, climate, temperature, and pH. For organisms that live in the water, sound waves, tides, water clarity, sunlight exposure, and pressure are also considered abiotic factors. Living organisms can take advantage of abiotic factors. For example, the wind can disperse seeds in the air which helps with pollination and gives plants the opportunity to spread. The wind is also a great example of an abiotic factor that affects many others. For example, wind direction and speed can affect humidity.

Edaphic

Edaphic comes from the Greek word *edaphos* which means floor. It refers to abiotic factors like the geography of the land, and soil characteristics such as the mineral content. The topography of the land such as elevations, mountains, valleys, depressions, and slopes all contribute to the characteristics of an ecosystem. Similarly, soil characteristics like composition, texture, structure, and density determine what creatures can live there, and which plants can grow.

Social

Social abiotic factors describe how human activity can impact the land and resources in the area. Humans have an impact on many features of an ecosystem, but social factors are most likely to cause larger-scale change. Thus, they can have profound impacts on other abiotic factors, biotic factors, entire ecosystems, and even entire biomes. Examples of social abiotic factors are clear-cutting of forests, mining, dam building, and farming.

Examples of Abiotic Factors

Abiotic examples typically depend on the type of ecosystem. For instance, abiotic components in a terrestrial ecosystem include air, weather, water, temperature, humidity, altitude, the pH level of soil, type of soil and more. Abiotic examples in an aquatic ecosystem include water salinity, oxygen levels, pH levels, water flow rate, water depth and temperature.

Now, let's have a look at the significant difference between the abiotic and biotic factors.

Difference between Abiotic and Biotic Resources

Following are the important difference between abiotic and biotic factors:

Difference Between Biotic Resources and Abiotic Resources	
Biotic Resources	Abiotic Resources
Definition	
Biotic factors include all the living components present in an ecosystem	Abiotic factors refer to all the non-living, i.e. physical conditions and chemical factors that influence an ecosystem
Examples	
Examples of biotic resources include all flora and fauna	Examples of abiotic factors include sunlight, water, air, humidity, pH, temperature, salinity, precipitation, altitude, type of soil, minerals, wind, dissolved oxygen, mineral nutrients present in the soil, air and water, etc.
Dependence	
Biotic factors depend on abiotic factors for survival and reproduction	Abiotic factors are completely independent of biotic factors
Origin	
Biotic components originate from the biosphere	Abiotic components originate from the lithosphere, hydrosphere and atmosphere

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