

1.3 The difference between natural and artificial ecosystems

There are several differences between natural and artificial ecosystems, including sustainability, diversity and purpose. A natural ecosystem has a diverse amount of species and plants, whereas artificial ecosystems are limited. Natural ecosystems are self-sustaining and result from spontaneous natural reaction, while artificial ecosystems require the assistance of humans.

A natural ecosystem is the result of interactions between organisms and the environment. For example, an ocean is classified as a marine ecosystem, which consists of algae, consumers and decomposers. A cycle occurs in this type of ecosystem that begins with algae converting energy via photosynthesis. After consumers feed on the algae, energy is transferred between the organisms. Once consumers die in this system, decomposers turn them into organic matter. This process occurs naturally over a period of time, whereas in an artificial ecosystem, human intervention is required.

An artificial ecosystem is not self-sustaining, and the ecosystem would perish without human assistance. For example, a farm is an artificial ecosystem that consists of plants and species outside their natural habitat. Without humans, this ecosystem could not sustain itself. The plants and animals need the help of humans to eat and survive. Another major difference between a natural ecosystem and artificial ecosystems is diversity. Natural ecosystems contain more natural factors and organisms. The relationships between organisms, each other and the environment in this ecosystem are more complex than that of artificial ecosystems.

Living walls are artificial ecosystems. All living walls require human intervention in order to thrive, in the form of water and nutrient supply, and the management of pests and diseases. Indoor living walls also need the right kind of light. Engineered components, such as the irrigation system, are essential to the functioning of the system; for example, the kind of geotextile used in a hydroponic living wall system will directly influence the ability of the plants to receive the right amount of water – not too much, and not too little. Engineered components also support and influence the biological components of the systems. Human design is thus an essential factor underlying all artificial ecosystems. Living walls feature relatively simple designs, compared with the obvious complexity of natural ecosystems.

Living walls may feature high levels of ecological novelty, such as combinations of species that have not occurred in the evolutionary history of the organisms or populations involved. If novelty results in conditions that exceed the tolerance of individual organisms, then stress, reduced fitness, changes to community structure and consequences to ecosystem functioning can result. A major cause of novelty

in artificial ecosystems comes from their creation from scratch in disconnection from natural ecosystems, often resulting in a lack of biological legacy and ecological memory inherent to the dynamics of natural ecosystems. In natural ecosystems, the soil represents an ecological reservoir containing seeds and an entire food web based on microbial activities, but natural soils rarely form the basis of plant-based artificial ecosystems of living walls. This lack of biological legacy or ecological memory may result in depauperate microbial communities which could have profound effects on ecosystem functioning. Including greater biodiversity in living walls can improve their functionality.

Natural ecosystem	Artificial ecosystem
Consists of many species of plants and animals	Species diversity is low
Genetic diversity is very high	Genetic diversity is very low
Sunlight is the energy source for plants and this energy drives all biological cycles	Sunlight is the ultimate energy source for plants but artificial fertilizers and other nutrients are externally supplied to the soil
Food chains are long and complex	Food chains are simple and often incomplete as other species are killed as pests or weeds
Ecological succession takes place over time	No ecological succession
Natural nutrient cycling	Incomplete nutrient cycling
Naturally sustainable	Unsustainable as most fertilizers are made from non-renewable fossil fuels, and they add to water pollution, biomagnification and other ecological disturbance

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