## 1. What is ecology?

Ecology is the study of the relationships between living organisms, including humans, and their physical environment; it seeks to understand the vital connections between plants and animals and the world around them. Ecology also provides information about the benefits of ecosystems and how we can use Earth's resources in ways that leave the environment healthy for future generations.

## Who are Ecologists?

Ecologists study these relationships among organisms and habitats of many different sizes, ranging from the study of microscopic bacteria growing in a fish tank, to the complex interactions between the thousands of plant, animal, and other communities found in a desert.Ecologists also study many kinds of environments. For example, ecologists may study microbes living in the soil under your feet or animals and plants in a rain forest or the ocean.

## The Role of Ecology in Our Lives

The many specialties within ecology, such as marine, vegetation, and statistical ecology, provide us with information to better understand the world around us. - This information also can help us improve our environment, manage our natural resources, and protect human health. The following examples illustrate just a few of the ways that ecological knowledge has positively influenced our lives.

## Issues connected with the ecology

Ecology is one of the most discussed topics nowadays, since the climate crisis makes us vulnerable to disasters and tragedies, now and in the future.

We are in a state of planetary emergency and current environmental problems also require urgent attention. 20 major current environmental problems include pollution, soil degradation, global warming, overpopulation, natural resource depletion, unsustainable waste, waste disposal, deforestation, polar ice caps, loss of biodiversity, climate change, ocean acidification, the nitrogen cycle, ozone layer depletion, acid rain, water pollution, overfishing, urban sprawl, public health issues, genetic engineering.

There are 7 key types of pollution – air, water, soil, noise, radioactive, light and thermal and these are primary causes that affect our environment in many ways. All these types of pollution are interlinked and influence each other.

By raising awareness in your local community and within your families about these issues, you can help contribute to a more environmentally conscious and friendly place for you and your future generations to live.

## 2. Urban Ecology

The international scientific journal, Urban Ecology, defines its eponymous discipline as the study of ecosystems that include humans living in cities and urbanizing landscapes. It is an emerging, interdisciplinary field that aims to understand how human and ecological processes can coexist in human-dominated systems and help societies with their efforts to become more sustainable.…

Because of its interdisciplinary nature and unique focus on humans and natural systems, the term "urban ecology" has been used variously to describe the study of humans in cities, of nature in cities, and of the coupled relationships between humans and nature. Each of these research areas is contributing to our understanding of urban ecosystems and each must be understood to fully grasp the science of Urban Ecology.

### Why is this important?

A single generation from today, by 2030, the population of the world's cities will grow by 2 billion more people. At present, about half of the humans on earth live in urban areas. In 2030, according to *The CIA World Factbook*, 60 percent, or almost two-thirds of people will live in cities.
In addition to space in which to live, all of these people will need breathable air, drinkable water, and food, which will mostly be grown outside of cities and transported into them.

In short, the entire planet is becoming more urbanized, a phenomenon which is already having a profound effect on the natural systems that maintain breathable air, drinkable water, and fertile soil for agriculture. But large areas of green spaces exist within cities. Lawns, parks, golf courses, and nature preserves created decades ago and now surrounded by development help filter pollution in air and water, produce oxygen, mitigate heat absorption by asphalt and concrete, and provide habitat for songbirds and other wildlife.

In the past quarter century, scientists have recognized that understanding the interactions of the living and non-living components of these urban ecosystems is vital to the future of all life on earth, including ourselves.

## 3. Types of Ecology

There are many ways to study ecology. Some types are landscape ecology, population ecology, and behavioural ecology.

**Landscape ecology** deals with spatial distribution, how people, places, things, events, are arranged across the Earth, patterns, and behaviours, anything an organism does, across large geographical areas. Landscape ecologists might study the impact of development on a particular species of native grass in a specific area. One type of grass may be resistant to chemicals, for example, indicating the area would be ideal for agricultural development, a modern farming method that include mechanical, chemical, engineering and technological methods. Also called industrial agriculture. Climate change is a major component in structuring current research in landscape ecology. Research in northern regions has examined landscape ecological processes, such as the accumulation of snow, melting, freeze-thaw action, percolation, soil moisture variation, and temperature regimes through long-term measurements in Norway. The study analyzes gradients across space and time between ecosystems of the central high mountains to determine relationships between distribution patterns of animals in their environment. Looking at where animals live, and how vegetation shifts over time, may provide insight into changes in snow and ice over long periods of time across the landscape as a whole.

**Population ecology** studies the rise and fall in the number of a species. A population ecologist may compare the population of a species near a new food source to a population that lacks access to that food source. The new food source may increase the numbers of the species, or, if the food source is contaminated, reduce it. A population is defined as a group of interacting organisms of the same species. A demographic structure of a population is how populations are often quantified. The total number of individuals in a population is defined as a population size, and how dense these individuals are is defined as population density. There is also a population's geographic range, which has limits that a species can tolerate (such as temperature). Population size can be influenced by the per capita population growth rate (rate at which the population size changes per individual in the population.) Births, deaths, emigration, and immigration rates all play a significant role in growth rate. The maximum per capita growth rate for a population is known as the intrinsic rate of increase.

**Behavioral ecology** the study of the evolutionary basis for animal behavior due to ecological pressures. What are the proximate causes, ontogeny, survival value and phylogeny of a behavior? If an organism has a trait that provides a selective advantage (i.e., has adaptive significance) in its environment, then natural selection favors it. Adaptive significance refers to the expression of a trait that affects fitness, measured by an individual's reproductive success. Adaptive traits are those that produce more copies of the individual's genes in future generations. Maladaptive traits are those that leave fewer. For example, if a bird that can call more loudly attracts more mates, then a loud call is an adaptive trait for that species because a louder bird mates more frequently than less loud birds—thus sending more loud-calling genes into future generations. Conversely, loud calling birds may attract the attention of predators more often, decreasing their presence in the gene pool.

## 4. Importance of Ecology

Ecology is the science that studies the relationships between living beings and the environment. It is very important because it has taught human beings to understand and value their environment, and to measure how much impact their actions generate.

The term ecology came into use in the mid-19th century. In 1963, Howard Thomas Odum defined ecology as the study of the structure and functioning of nature, emphasizing the idea that living organisms come together to function as a biological unit or ecosystem.

It is interesting to note that the word ecology comes from the Greek, in which *oicos* means house, that is, ecology is the study of how "our house" works.

As it is not possible to study all the interrelationships of the planet at the same time, ecology deals with them mainly at three levels of integration: that of the populations, the communities and that of the ecosystem, which would be the broadest group of the three.

Everything that affects a living being and conditions its growth is known as the environment. It includes the set of natural, social and cultural values that prevail in a given place and time.

Everything that happens in the environment influences the life of the human being and future generations. Every activity and action carried out by the human being has a direct or indirect impact on other living beings, in the water, the soil or the air.

It is necessary to admit that the human species has been exposed to various threats due to neglect and abuse of the environment, carried out for a long time. However, there is increasing awareness among humans about the irreparable damage and the change of habits necessary to avoid further damaging nature.

## 5. Global Ecology

Global ecology is a **relatively recent area of research**. It poses very serious challenges in terms of the strategies and methods of scientific research and its link with society.

The world is going through worrying ecological scenarios. The consumption of resources, the use of energy, the management of natural spaces, water sanitation, food poverty, environmental health and global warming are just some of the unknowns of the future. We must approach them to imagine other global scenarios, those that allow us a better relationship with Mother Earth.

As scientists, we cannot provide absolute answers as to what the specific consequences of global change will be for specific groups in particular regions of the planet.

Nor can we conduct controlled, repeatable experiments to test the goodness of predictions. At the same time, there is an urgent need for immediate action to avoid exacerbating the consequences of climate change. In short, a new scientific approach is required that strengthens interdisciplinary and systemic approaches, seeking an integrated and multi-scale understanding of the problems, based on participation and communication with the different social actors.

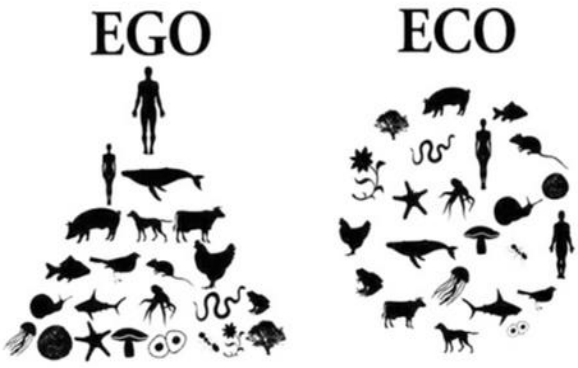
It should also be clear to us that a catastrophic future for the planet is not inevitable. There are a number of options to change the course we are on, alternatives for resource management, energy and social organization that bring us closer to more sustainable socio-environmental systems. Currently, thousands of organizations and groups are bringing hope at all scales by proposing, testing and promoting these types of alternatives. Therefore, the task of all of us is to overcome fatalism and actively participate in promoting projects for a truly sustainable relationship between human beings and nature.

Almost all the countries of the world have reconsidered different styles of development with a more careful orientation towards the environment. The exploitation of natural resources and the degradation of ecosystems is an agenda item for most governments. There are commissions of experts at the international level that analyse possible ecological problems in different scenarios, such as changes in biotic communities, extinction of species, variations in resistance to disturbance agents or significant alterations in the biogeochemical cycles of different elements, among others.

## 6. What is its Deep Ecology

*“The smaller we come to feel ourselves compared to the mountain, the nearer we come too participating in this greatness”* – Arne Naess

For centuries after the industrial revolution, we have had great technology to live longer, to change vegetation, or shape a river. Such a thing provides us a human-centered sense that we can control nature in the way we want. Including environmental conservation, we also use the lens of the human centre in which we want to conserve nature for our benefits, the perception of seeing the Earth as a resource for human business.




Anthropocentric Biocentric

However, in 1973 the Norwegian philosopher Arne Naess, believed that humans must radically change their relationship to nature from one that values nature solely for its usefulness to human beings to one that recognizes that nature has an inherent value. Therefore, he coined the term *Deep ecology*: a philosophical approach and a social movement that philosophical approach and a social movement which recognises the right to life of all beings, not just humans.

The philosophy emphasizes the interdependent value of human and non-human life as well as the importance of the ecosystem and natural processes. It provides a foundation for the environmental and green movements and has led to a new system of environmental ethics.

The central spiritual tenet of deep ecology is that the human species is a part of the Earth and not separate from it. A process of self-realisation or "re-earthing" is used for an individual to intuitively gain an ecocentric perspective. The notion is based on the idea that the more we expand the self to identify with "others" (people, animals, ecosystems), the more we realize ourselves.

## 7. Principles of Deep Ecology

The ethics of deep ecology hold that a whole system is superior to any of its parts. They offer an eight-tier platform to elucidate their claims:

1. The well-being and flourishing of human and nonhuman life on Earth have value in themselves (synonyms: intrinsic value, inherent value). These values are independent of the usefulness of the nonhuman world for human purposes.

2. Richness and diversity of life forms contribute to the realization of these values and are also values in themselves.

3. Humans have no right to reduce this richness and diversity except to satisfy vital human needs.

4. The flourishing of human life and cultures is compatible with a substantial decrease of the human population. The flourishing of nonhuman life requires such a decrease.

5. Present human interference with the nonhuman world is excessive, and the situation is rapidly worsening.

6. Policies must therefore be changed. These policies affect basic economic, technological, and ideological structures. The resulting state of affairs will be deeply different from the present.

7. The ideological change is mainly that of appreciating life quality (dwelling in situations of inherent value) rather than adhering to an increasingly higher standard of living. There will be a profound awareness of the difference between big and great

8. Those who subscribe to the foregoing points have an obligation directly or indirectly to try to implement the necessary changes.

## Deep ecology criticism

Some aspects of deep ecology have been targets of criticism. For example, deep ecology's call for human population control is regarded by some within the ecology field as being too radical and damaging to the global population. Some critics have even argued that the idea of population control is even misanthropic.

Another criticism of deep ecologists is their claim to understand the interests of non-human organisms. Critics argue that the interests that deep ecologists assign to nature (growth and survival) are just human interests.

Finally, social ecologists, many of whom believe that environmental crises are closely intertwined with human social interaction, argue that deep ecology fails to link these environmental crises with things like authoritarianism and hierarchy.

## 8. The 7 R’s of Sustainability

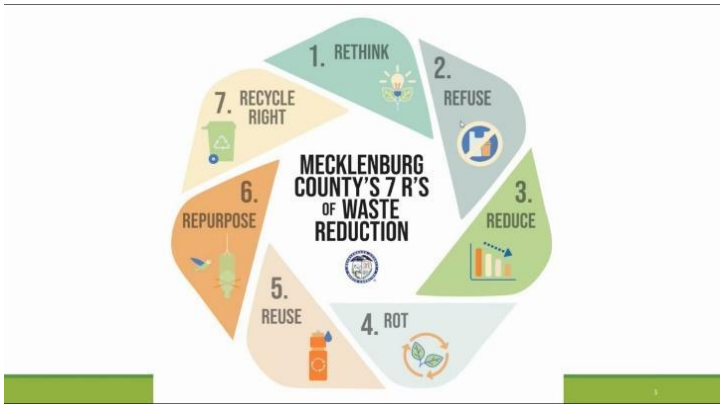
The 7 T’s of Sustainability defines the models necessary to ensure the survival of the human race and planet Earth. This includes ways to slow or reverse pollution, conserve natural resources, and protect our environment. These 7 R’s are:

**RETHINK:** Step back and think about the type of consumer you want to be and what this means for the environment.

**REFUSE:** Think before you buy and be prepared to not buy at all. Green consumers place themselves at the start of the buy-and-use cycle. They buy less and buy products that do the least harm to the environment.

**REDUCE:** Buy less, buy products that have little or no packaging and that last a long time, borrow instead of buy, and compost. Items that are no longer needed or used are donated or sold.

**REUSE:** Upcycle instead of throw away. Examples: glass jars can be used to store dry goods, old calendar pages are used as DIY envelopes, old toothbrushes are used to clean hard to reach places, empty toothpaste tubes are used as funnels.




**REPAIR:** Try to fix items before disposing of them. Our current culture has been called a "throwaway society" because more items end up in the landfill than need to. This harms the environment and uses more of the earth's resources to make new items. We can help conserve the earth's resources by fixing things and participating in the "Repair Movement".

**REGIFT:** When you regift, you give someone a gift that you received from someone else. Don't feel guilty! Passing it on to someone who will enjoy it more than you is a good thing. You just need to follow this etiquette: You are certain the gift is something the recipient would enjoy. The gift is brand new and comes in its original box. The gift isn't handmade or a family treasure.

**RECYCLE (Compost)**: Put things back into the waste stream to be used again for something else. Glass is used for roads, plastics are melted down to make new products, and the organic waste that we compost is used to fertilize our gardens.

## 9. Compost for Ecology

Compost is a mixture of ingredients used as plant fertilizer and improves soil physical, chemical and biological properties. It is commonly prepared by decomposing plant, food waste, recycling organic materials and manure. The resulting mixture is rich in plant nutrients and beneficial organisms, such as bacteria, protozoa, nematodes and fungi. Compost improves soil fertility in gardens, landscaping, horticulture, urban agriculture, and organic farming, reducing dependency on commercial chemical fertilizers. The benefits of compost include providing nutrients to crops as fertilizer, acting as a soil conditioner, increasing the humus or humic acid contents of the soil, and introducing beneficial microbes that help to suppress pathogens in the soil and reduce soil-borne diseases.

There are four primary compost types: compost, farmyard manure, green manure, and vermicompost. Each type has its own benefit alongside mutual benefits. The point of compost is to nourish your soil to provide a healthy habitat in which your grass, plants, and trees can thrive. Let's break these four types down further and, yes, the pun was intended!

1. Compost - Compost is the result of a compost pile. Many people opt to make their own compost using pet waste, plant clippings, viable food scraps, and weeds. Compost is economical and environmentally-friendly, although some people do not like the smell of the pile, which is why you can buy compost if you don't feel like breaking it down in your yard. Compost is excellent for fruits and vegetables.

2. Farmyard manure - You can guess what farmyard manure is: cow, horse, or other farmyard animal poop. This is good for just about any plant, but be careful, some farmyard manures are stronger than others and can kill plants if used too much. Manure is nutrient-rich and it lasts long in your garden's soil, meaning you won't have to use it as often. It doesn't store well, however, so it's best to purchase only what you need.

3. Green manure - Green manure is a process that has been used for centuries by farmers to keep their crop soil healthy. Farmers grow crops of green and leguminous plants and then break them down into the soil. As the plants decompose, they fertilize the earth. Green manure helps cotton, maize, rice, sugarcane, and wheat grow. If you have a vegetable garden, this manure can help with your corn.

4. Vermicompost - Finally, vermicompost is made up of, well, vermin. Earthworms to be exact. These amazing creatures can turn your garden into a lush and flowering wonderland, provided the earthworms can thrive in the soil. Vermicompost is good for all plant life because the earthworms encourage plant germination and improve the soil's ability to retain water. You want these creepy crawlers in your yard.

## 10. Ecology, Ecosystems and Environments

### What is Ecology?

- Ecology is a vast field of study that encompasses all ecosystems.
- Biologists investigate the different relationships between living species in ecology.
- Intra-relationships between live creatures and inter-relationships between living and non-living components are examples.
- As a result, three major components of the subject are included in ecology.
- They are live creatures, organism-to-organism interactions, and organism-to-environment relationships.
- Ecology can also be categorized based on the sort of habitat that is studied.
- Ecologists classify creatures and interactions based on environmental factors such as temperature, soil type, water availability, humidity, and rainfall.

### What is an Ecosystem?

- Ecosystems are a subset of ecology. An ecosystem is made up of all of a community's biotic and abiotic components.
- All the live organisms in the community are considered biotic components.
- Non-living elements such as sunshine, water, minerals, and the climate in which they live are included in the abiotic components.
- The energy flow in the environment and the dietary demand connects these living and nonliving components.
- As a result, food chains that show the energy flow and nutritional needs of species are an important feature of an ecosystem.
- As a result, a food chain starts with autotrophic primary producers like green plants. Plants create food by utilizing the major energy source, sunlight.

### What is environment?

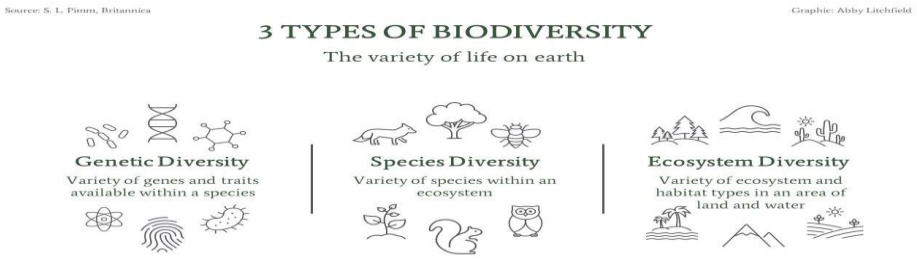
When hearing the word ‘environment’ most people tend to think of rainforests, oceans and climate change. While none of these thoughts are incorrect, the overall definition of ‘environment’ is a lot broader.

‘Environment’ refers to the surroundings or conditions that a living organism (people, animals, plants) finds themselves in.

## 11. Biodiversity

**Biodiversity** is a term used to describe the enormous variety of life on Earth. It can be used more specifically to refer to all the species in one region or ecosystem. Biodiversity refers to every living thing, including plants, bacteria, animals, and humans.

**TYPES OF BIODIVERSIT**Y




### REASONS FOR BIODIVERSITY LOSS:

- Changes in land use (e.g., deforestation, intensive monoculture, urbanization).
- Direct exploitation such as hunting and overfishing.
- Climate change.
- Pollution.
- Invasive alien species.

### HOW TO PRESERVE BIODIVERSITY AT HOME

- Support local farms.
- Save the bees.
- Plant local flowers fruits and vegetables.
- Take shorter showers.
- Respect local habitats.
- Know your source.

### Why is making compost at home important?

Nowadays, even though our decade has improved in terms of waste management, getting rid of waste is still a process that creates pollution. Indeed, the transportation from home to the landfill generates CO2 in the atmosphere, and what we do after creates pollution as well. Either we recycle them, or we burn them (that also releases CO2 in the atmosphere), but most of the time, they are just gathered in landfills with a very long and polluting process of decomposition.

That is for all these reasons that it is still important to reduce our waste, especially when that waste can become something that we can use to grow more food.

Food waste represents 30% of our waste, so, by creating compost, we reduce a lot of our waste while respecting the cycle of nature by reusing this waste to create soil.

## 12. Ecosystems of Europe and heat

Ecosystems of Europe, according to the research of EEA in 2020, comprises 47 land, freshwater and marine habitats, and five seabed types in an area of approximately 12 million square kilometres of land and sea.
In the last two decades, **Europe has been affected by extreme summer drought and heat** (DH) events, each characterized by record-breaking climate anomalies and large associated economic, social and environmental costs.
Both the 2003 and 2010 extreme summers in western Europe were caused by a combination of atmospheric circulation anomalies and land-atmosphere feedbacks.
In Europe, the summer of 2018 was the hottest since 1500, and dry in central and northern Europe, resulting in major losses in crop productivity and in increased fire occurrence in high-latitude ecosystems. **This DH event resulted in decreases in ecosystem productivity by up to 50 % in central Europe** and crop yield losses. Part of the central European region affected by the dry and hot summer in 2018 registered another extremely hot and dry summer in 2019.
In Europe, DH events usually have strong negative impacts on ecosystems, such as reduced ecosystem productivity. After severe drought and heat stress, plant recovery can be lagged, for example due to reduced growth or non-reversible losses in hydraulic conductance or carbon reserve depletion.

Nowadays one more term is used to describe the change in weather conditions that affect the ecosystems: heat waves. **Heat waves** are becoming increasingly intense, frequent and long lasting around the world because of climate change. But the pattern of heat waves unfolding in Europe is a global outlier. All of the potential drivers of European heat waves can interact, making it hard to determine a single cause for any given heat wave — or for the unusually strong pattern of extreme heat waves in Europe as a whole.
In the current climate, southern Europe is located in the transition zone between the dry subtropics (the Sahara Desert in North Africa) and the relatively wet midlatitudes (with a climate similar to that of the Pacific Northwest). High summertime temperatures tend to make the precipitation that falls to the ground evaporate quickly, and as a consequence soil moisture during summer is very dependent on springtime precipitation.
A dry **spring in Europe** (such as the 2022 one) causes dry soils in late spring and early summer. This lack of surface water in turn limits surface evaporation during summer. Two important consequences follow: First, incoming radiative energy from the sun preferentially goes into increasing air temperature rather than evaporating water; and second, the inflow of water into air layers near the surface decreases, which makes the air drier and precipitation less likely. Combined, these two influences increase the likelihood of heat waves and droughts.