# Environmental Science Cheat Sheet

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## Environment

The surroundings or conditions in which a person, animal, or plant lives or operates.

## Environmentalism

A social movement dedicated to protecting the earth's life support systems for us and other species.

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| Key principles and goals of environmentalism include: | Conservation |
| | Sustainability |
| | Pollution Prevention |
| | Climate Action |
| | Environmental Justice |
| | Public Awareness and Education |

## Biodiversity

The variety of life in the world or in a particular habitat or ecosystem.

It encompasses the diversity of species of plants, animals, fungi, and microorganisms, as well as the genetic diversity within each species and the variety of ecosystems and habitats in which they live.

## Ecology

Scientific study of interactions among organisms and between organisms and their environment

## Ecosystem

A biological community of interacting organisms and their physical environment.

## Biotic

It refers to the living components or factors of an ecosystem.

These include all living organisms such as plants, animals, fungi, bacteria, and other microorganisms that interact with each other and with their environment.

Play essential roles in ecosystem functioning, including energy production, nutrient cycling, and maintaining ecological balance.

## Abiotic

refers to the non-living components or factors of an ecosystem.

These are physical and chemical factors that influence the structure and function of ecosystems but do not involve living organisms.

Abiotic factors play crucial roles in shaping the environment, determining the distribution and abundance of species, and regulating ecosystem processes.

Ex. climate, geology, soil, water, light and atmosphere.

## Biogeochemical cycles

Process in which elements, chemical compounds, and other forms of matter are passed from one organism to another and from one part of the biosphere to another.

Pathways through which nutrients and other elements move through the biotic (living) and abiotic (non-living) components of Earth's ecosystems.

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| Examples | Carbon Cycle |
| | Nitrogen Cycle |
| | Phosphorus Cycle |
| | Water Cycle |
| | Sulfur Cycle |

## Biogeochemical cycles (cont)

They play critical roles in regulating nutrient availability, supporting ecosystem functioning, and sustaining life on Earth.

## Producers

Organisms that make their own food.

## Biosphere

Part of Earth in which life exists including land, water, and air or atmosphere.

## Niche

An organism's particular role in an ecosystem, or how it makes its living.

It describes how an organism meets its needs for survival and reproduction, including its habitat requirements, resource use, behavior, and ecological relationships.

## Habitat

The natural home or environment of an animal, plant, or other organism.

## Community

All the different populations that live together in an area.

## Consumers

Organisms that rely on other organisms for energy and nutrients.

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| Consumers can be broadly categorized into different groups based on their feeding habits and position in the food chain: | Primary Consumers (Herbivores) |
| | Secondary Consumers (Carnivores) |

## Consumers (cont)

Tertiary Consumers (apex predators)

## Population

It refers to a group of individuals of the same species that live in the same geographic area and interbreed, producing offspring.

It is one of the fundamental units of ecological study and is characterized by its size, density, distribution, age structure, and genetic composition.

## Individual

A single organism.

## Decomposers (saprophytes)

Eat organisms that are already dead or the waste products of the living.

Play a vital role in breaking down dead organic matter into simpler substances, such as nutrients and minerals, and returning them to the environment.

Example: bacteria, fungi, certain types of protists, and invertebrates such as earthworms, millipedes, and beetles.

## Forest

An ecosystem characterized by land dominated by trees.

## Marine ecosystem

An ecosystem found in oceans, seas, and gulfs where the water has a salt content of at least 3.5%.

## Fresh-water ecosystem

An ecosystem that is classified as having lakes, ponds, rivers, or streams, but can include a variety of habitats.

## Food chain

a linear sequence of organisms, each of which serves as a source of food or energy for the next organism in the sequence.

It represents the flow of energy and nutrients through an ecosystem.

Composed of primary producer, primary consumer, secondary consumer, tertiary consumers, quaternary consumers, and so on.

also include decomposers, such as bacteria and fungi, which break down dead organic matter and return nutrients to the soil, completing the nutrient cycle.

## Food web

A community of organisms where there are several interrelated food chains.

More complex and interconnected representation of the feeding relationships within an ecosystem compared to a simple linear food chain.

Multiple food chains are interconnected, showing the network of feeding relationships between different species.

It accounts for the fact that most organisms in an ecosystem feed on multiple species and are themselves consumed by multiple predators. This complexity reflects the diverse interactions and interdependencies that exist within ecosystems.

## Eutrophication

A process by which nutrients, particularly phosphorus and nitrogen, become highly concentrated in a body of water, leading to increased growth of organisms such as algae or cyanobacteria.

## Pollution

Release of harmful materials into the environment.

## Pollutants

Harmful substances in the air, water, or soil.

are substances or agents that contaminate the environment and cause adverse effects on living organisms, ecosystems, and the environment as a whole.

## Air pollution

The contamination of the atmosphere by the introduction of pollutants from human and natural sources.

## Ozone layer

Protective layer in atmosphere that shields earth from UV radiation.

## Carbon monoxide

A colorless, odorless, and tasteless gas that is produced by the incomplete combustion of carbon-containing fuels such as gasoline, natural gas, coal, wood, and oil.

It is often referred to as the "silent killer" because it is difficult to detect without special equipment, and exposure to high levels of carbon monoxide can be deadly.

## Carbon dioxide

A colorless, odorless gas produced by burning carbon and organic compounds and by respiration. It is naturally present in air (about 0.03 percent) and is absorbed by plants in photosynthesis.

## Chloroflourocarbons

Widely used, man-made chemical that destroys stratospheric ozone and lasts a long time in the stratosphere.

## Lead

A toxic metal that is harmful to human health and the environment. It is found naturally in the earth's crust and can be released into the environment through human activities such as mining, smelting, and refining.

## Ozone

A form of oxygen that has three oxygen atoms in each molecule instead of the usual two.

Found both in the Earth's upper atmosphere (stratosphere) and at ground level (troposphere).

Forms a protective layer known as the ozone layer, which absorbs the majority of the sun's harmful ultraviolet (UV) radiation.

Formed through complex chemical reactions involving sunlight, nitrogen oxides (NOx), and volatile organic compounds (VOCs) emitted from sources such as vehicle exhaust, industrial emissions, and chemical solvents.

## Nitrogen dioxide (NO2)

Produced from humans by vehicle emissions, contributes to photochemical smog and acid rain. It is also referred as brown gas.

It can also be produced by natural sources such as wildfires and lightning can also contribute to NO2 emissions.

## Particulate matter

A small discrete mass of solid or liquid matter that remains individually dispersed in gas or liquid emissions (usually considered to be an atmospheric pollutant).

PM10 (particles with a diameter of 10 micrometers or less) and PM2.5 (particles with a diameter of 2.5 micrometers or less)

## Particulate matter (cont)

It can originate from both natural and human-made sources.

Natural sources include dust, pollen, sea salt, and particles from wildfires and volcanic eruptions.

Human-made sources include emissions from vehicles, industrial processes, construction activities, agricultural practices, and burning of fossil fuels.

## Sulfur dioxide

A colorless, corrosive gas directly damaging to both plants and animals.

Sulfur dioxide is produced primarily by the combustion of sulfur-containing fossil fuels, such as coal and oil, in power plants and industrial facilities. It is also emitted during volcanic eruptions and some natural processes.

When released into the atmosphere, sulfur dioxide can react with other compounds to form sulfuric acid (H2SO4), contributing to acid rain.

## Volatile Organic Compounds

Abbreviated VOCs; compounds that contain carbon (organic) and evaporate very easily (volatile).

ex. benzene, formaldehyde, toluene, and xylene, among many others.

It can be found in paints, solvents, cleaning agents, fuels, and building materials, as well as in outdoor air pollutants such as vehicle exhaust and industrial emissions.

It causes formation of ground-level ozone and smog

## Water Pollution

The contamination of streams, rivers, lakes, oceans, or groundwater with substances produced through human activities.

## Land Pollution

The contamination of land by both solid and hazardous waste.

## Nuclear Pollution

Sometimes also referred to as radioactive contamination. It is the deposition or presence of radioactive materials within solids, liquids, gases, or on surfaces.

## Radioactivity

The spontaneous emission of radiation from a nuclear reaction. It can be alpha, beta, or gamma decay, and it has different units and modes.

## Noise Pollution

Type of pollution characterized by unwanted or potentially damaging sound.

## Alpha Particles

Positively charged particles with about four times the mass of a hydrogen atom

Are a type of ionizing radiation, consisting of two protons and two neutrons, essentially a helium nucleus. They are relatively large and heavy compared to other types of radiation, such as beta particles and gamma rays.

Alpha particles are commonly emitted during the radioactive decay of certain heavy elements, such as uranium and radium.

Have low penetrating power and can be stopped by a sheet of paper or the outer layers of skin.

## Beta Particle

A high-speed electron or positron emitted in the decay of a radioactive isotope.

It can penetrate materials such as paper and skin, but they can be stopped by denser materials like aluminum or plastic.

During beta decay, a neutron in the nucleus of an atom is transformed into a proton and either an electron (β-) or a positron (β+). The electron or positron is ejected from the nucleus at high speed, carrying away energy.

## Gamma Rays

High-energy electromagnetic waves emitted from a nucleus as it changes from an excited state to a ground energy state

Highly penetrating and can travel through most materials, including human tissue.

Produced by certain nuclear reactions, such as the decay of radioactive isotopes, nuclear fission, or fusion processes.

## Half-life

The time it takes for half of the radioactive atoms in a substance to decay into a different element or isotope.

For example, if you have a sample of a radioactive substance with a half-life of 10 years, after 10 years, half of the radioactive atoms in the sample will have decayed into a different element or isotope, and after another 10 years, half of the remaining radioactive atoms will have decayed, and so on.

Different radioactive elements and isotopes have different half-lives, ranging from fractions of a second to billions of years.

## Becquerel

Unit that measures the rate at which a sample of radioactive material decays; 1 Bq = decay of 1 atom or nucleus per second.

## Radiation

Energy that is radiated or transmitted in the form of rays or waves or particles.

It is a natural phenomenon that exists throughout the universe and comes in various forms, including electromagnetic radiation (such as light, radio waves, microwaves, X-rays, and gamma rays) and particulate radiation (such as alpha particles, beta particles, and neutrons).

It can be classified into two main types based on its effect on atoms: ionizing radiation and non-ionizing radiation.

Radiation is produced by natural sources such as the sun, cosmic rays, and radioactive elements in the Earth's crust, as well as human-made sources such as X-ray machines, nuclear power plants, and nuclear weapons.

## Radioactive Pollution

The release of radioactive substances or high-energy particles into the air, water, or earth as a result of human activity.