

# Saarth

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**Natural Environment**

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The natural environment is the set of living and non-living things on Earth which occur in a state substantially not influenced by humans. The term is most often applied to an ecological complex, which includes all of the plants; animals; microorganisms; abiotic factors such as minerals; rocks and magma; water bodies; and atmosphere (Atmosphere layers) layers. There are extremely complex interactions between the living organisms and abiotic elements as well as meteorological influences, all of which combine to form rich speciation and biodiversity in most natural systems. Exceptions to this species richness are in extreme conditions of pH, temperature and deep ocean conditions, where only a limited number of biological species are able to survive as a result of specialized adaptations to these difficult environments.

In contrast to the natural environment is the built environment. In such areas where man has fundamentally transformed landscapes such as urban settings and agricultural land conversion, the natural environment is greatly modified and diminished, with a much more simplified human environment largely replacing it. Even events which seem less extreme such as hydroelectric dam construction, or solar array construction in the desert, the natural environment is substantially altered.

### **Lithosphere**

The Earth's crust is the outermost solid surface of the planet and is chemically and mechanically different from the underlying mantle. The crust has been produced chiefly by igneous processes in which magma cools and solidifies to form solid rock. Beneath this lithosphere lies the mantle which is heated by radioactive decay. This solid mantle exists in a state of rheic convection, which process causes the lithospheric plates to move very slowly. The resulting process is known as plate tectonics. Volcanoes result primarily from the melting of subducted crust material or of rising mantle at mid-ocean ridges and mantle plumes.

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The outer crust has rich diversity of mineral features and rock geometrics, due to the compression of sedimentary layers, uplift, volcanism and diverse weathering of surface soils. In addition to the mechanical forces, there are numerous chemical processes which enrich the diversity of natural mineral occurrences.

### **Hydrosphere**

Various types of water bodies are present throughout the world, including oceans, rivers and lakes. In addition, groundwater basins are important storage areas, which have their own ecosystems and can exchange flows with surface waters.

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### **Ocean**

An ocean is a major body of surface saline water, and represents a major component of the hydrosphere.

Approximately 71% of the Earth's surface is inundated by oceans or seas, a continuous feature comprising five major oceans and numerous seas, gulfs and estuaries. More than half of this ocean expanse is greater than 3000 meters in depth. The average oceanic salinity is approximately 3.5%, with extrema ranging from 3.0 to 3.8 percent.

The lateral exchange of waters amongst the oceans is relatively unencumbered, with natural forces of winds, currents and tides driving these exchanges; however, vertical exchange is less free, with water residence times quite high in the deeper ocean layers, e.g. 900 years in the bathypelagic zone. The major oceanic divisions are defined in part by the continents, various archipelagos, and other criteria: these divisions are (starting with the largest) the Pacific Ocean, the Atlantic Ocean, the Indian Ocean, the Southern Ocean and the Arctic Ocean.

### **Rivers and streams**

A river is a natural watercourse, usually freshwater, that eventually discharges to an ocean, sea, lake or another river. In some cases, a river simply flows into the ground when soils are porous and flow rates low, leading to opportunity for groundwater recharge. A river or stream is typically within a channel, made up of a streambed between banks; on vast level expanses, there are often multiple or braided channels. Floodplains represent overflow regimes when flow rates are high. Generally the river flow is fed by precipitation driven surface runoff (Surface runoff) from a significant watershed area.

Rivers and streams have two important ecosystems associated with their geometry: the aquatic environment and the riparian corridor, or terrestrial habitat adjacent to the stream. Such ecosystems represent special opportunities for biological corridors or ecological connectivity.

### **Lakes**

A lake is generally a static freshwater body, situated within a topographic basin, subject to internal fluid circulation. True lakes are generally land-locked except for hydrologic exchange via river inflow and/or outflow. Geologically lakes are viewed as temporary features, since they are in a process of sedimentation, which will lead to their demise. Most lakes occur in mountainous locales, rift zones or places of past or ongoing glaciation.

### **Groundwater**

Groundwater is any subsurface water held within the Earth's crust, which water is not in direct contact with the atmosphere (Atmosphere layers). Functionally, groundwater saturates the pores and fractures of sand, gravel, and rock formations. Groundwater is a major

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set of water bodies that interact with surface waters through groundwater recharge on gravelly plains by feeding surface streams in mountainous areas.

Some water underlies the Earth's surface almost everywhere, beneath mountains, plains, and deserts and sometimes at lower depths below surface waters. This water may occur very close to the Earth's surface, as in a wetland, or it may lie many hundreds of feet below the surface, as in some arid regions. Water at very shallow depths might have been resident in the terrestrial earth's crust for only a few hours; at moderate depth, it may have been resident in the terrestrial crust for hundreds of years old; and at great depth or after having flowed long distances from places of entry, groundwater may have resided in the same location within the terrestrial crust for several thousands of years.

Groundwater is stored in, and moves slowly through, moderately to highly permeable rocks called aquifers . The quantity of groundwater greatly exceeds that in rivers and lakes combined.

### Atmosphere

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The atmosphere of the Earth plays an essential role in sustaining ecosystems. The atmospheric layer closest to the Earth's surface is the troposphere, which contains water vapor and clouds (these may also be considered part of the hydrosphere), as well as other gases, that envelop the Earth. This layer of gases is held in place by gravity, and is the most important layer of the atmosphere for the natural environment, since this layer spans the lowest seven kilometers above the surface, where most of the landforms and biota are present. Dry air consists of 78% nitrogen, 21% oxygen, 1% argon and other minor constituents such as helium and carbon dioxide.

The physical processes of interaction with the lithosphere, hydrosphere, and solar radiation are addressed by the study of meteorology. Meteorological parameters having the greatest influence on the natural environment are: temperature, barometric pressure (Pressure), humidity, wind and the gradients and interactions of each variable, as well as their temporal variability. These meteorological variables are governed by crustal topography, ocean currents, diurnal and seasonal solar patterns and vegetative cover; in turn the metabolism of plants and animals are strongly influenced by these climatic variables, so that the regional meteorology is an intrinsic part of the natural environment.

### Biosphere

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The Earth's biosphere is the composite of all living organisms within the atmosphere, lithosphere and hydrosphere; moreover, all biomass of the dead and decaying matter from previously living biota can also be considered an integral part of the biosphere. In spite of the extremes in elevation, temperature and ocean depth, there is literally no part of the planet that is devoid of life.

Microbes live deep beneath the Earth's terrestrial surface, such that the total biomass of subsurface microbial life likely exceeds all surface animal and plant biomass. The total thickness of the biosphere on earth is difficult to assess, with fish that are found deep underwater at depths of 8372 meters in the Puerto Rico Trench. The Rüppell's Vulture has been observed at altitudes of 11.3 kilometers, or well above the troposphere; even some large

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terrestrial mammals such as Yaks can be found at elevations of 5.4 km. Herbivorous animals at these elevations consume lichens, grasses (Grassland biome) and herbs.

Microscopic organisms survive at such extreme heights, depths and temperatures that the biosphere can be construed even more expansive. Culturable microbes have been found in the Earth's upper atmosphere as high as 41 km, even though it is unlikely they have appreciable metabolism in that realm, where temperature and pressure are extremely low and ultraviolet radiation high. More likely these microbes were transported to the upper atmosphere by vertical convection. Barophilic marine microbes occur at depths greater than ten km in the Marianas Trench; moreover, thermophilic microbes have been extracted from cores drilled more than five km into solid crust in Sweden, from rock formations as hot as 65<sup>0</sup>C. The record temperature for microbial occurrence is 122<sup>0</sup>C for a strain of *Methanopyrus kandleri*; moreover, it is thought that the depth limit of living organisms is governed by temperature rather than depth.

The Earth's biosphere is categorized into biomes, inhabited by broadly similar plants and animals. On land, biomes are categorized chiefly by latitude. Arctic and Antarctic biomes have relatively low species diversity and low biomass densities, while most of the more species-rich and biomass-dense biomes are equatorial. Terrestrial organisms in temperate and Arctic biomes have relatively small amounts of total biomass, small energy budgets, and evince adaptations to cold, including long distance migration, homeothermy, hibernation and complex insulation.

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