

Biome

The term biome, coined in the United States in the 1910 to 1920s following work by English-language ecologists (Carpenter, Forbes, Shelford, Clements), exemplifies an ecological trend that does not solely focus on knowledge of plant communities. Animal communities and their trophic relationships with plant communities (phyto-coenoses) are also taken into account in an "ecology of biotic successions". For Shelford (1931, in Acot, 1988) the biome has the status of a fundamental ecological unit that can be defined as a bio-geographical entity made up of a plant formation and the animal formation corresponding to it. It is thus considered that the main formations have functions that can only be explained by integrating the fauna and plant groups. The number of biomes defined worldwide (or more or less equivalent ecological units) varies from eight to some hundred, depending on authors. Since the typological process has never generated clear and indisputable classifications, depending on the resolution required and the degree of precision sought, these divisions and subdivisions result in differences of varying magnitude. In France, the term biome has only recently become popular after having been set aside for a long time in favour of terms that were more geographical or bio-geographical than ecological: the notion of the "milieu" predominated, even among ecologists, up to the 1980s. Thus reference was frequently to the "main terrestrial environments", or to "vegetation landscapes" (paysages végétaux) rather than to biomes.

Biomes and the zone model

Since biological diversity is not spread homogeneously across the surface of the globe, naturalists from as early as the end of the 18th century attempted, first of all on the basis of vegetation, to distinguish the main patterns of spatial distribution, also noting how narrow are the relationships between climate, climatic vagaries, and plant formations. The identification of horizontal spatial differentiations across the surface of the globe gave rise to the zonal model based on the primacy of climate, set out in the zone principle: in each climatic zone, the soils derived from the different parent rocks and the corresponding biocoenosis tend to converge towards a fairly uniform or even a single type. (Godron, 1984). But in reality, the principle of a fundamental differentiation among the various biomes in the world is based on their level of primary productivity and the quantity of biomass produced, which increase from the poles to the equator, for both plants and animals. Ricklefs and Miller (2005) indeed state that the concept of the biome organises the diversity of the living world on a large scale (referring in fact to the global scale). Thus the biome corresponds to a vast bio-climatic area on continental or sub-continental scale, that is superimposed on the climatic zones. It thus generates an ecological formation possessing a homogeneous aspect over a vast surface area.

A [transect](#) from the equator to the north pole gives the following biomes: evergreen tropical rainforest, tropical seasonal grassland, desert, the Mediterranean matorral (maquis), temperate deciduous forest, the taiga (coniferous forest) and the tundra. This gradient does not however account for the wide variety of vegetation gradients arising from zonal and regional temperature and moisture conditions. Thus it is possible to distinguish other biomes on other meridian transects: deciduous tropical forests, cold deserts, prairies and steppes. A biome will often be given a local name, for instance the "temperate prairie" biome is locally known as steppe, pampa or veld according to the continent in which it is located. The biome, which is a unit of landscape, is also a functional unit the components of which interact dynamically. The biomes, or places where life is possible, taken as a whole form the biosphere. There are terrestrial and aquatic biomes. Biomes are named after the plant formations that characterise them, with the exception of the classification of aquatic biomes which is based on physical characteristics. Other physical parameters can influence the nature of an environment, for instance altitude, or soils that are regularly flooded.

The biome – the largest natural ecological classification unit?

The above classic list of terrestrial biomes reflects the most habitual representation of our planet, going back to the ancient Greeks. It is the geography that children learn at school, a geography of the main "living" and "natural" environments. Thus it was for a long time the basis of teaching in French schools in the first year of secondary school, and indeed it is still prominent in the curriculum. However the typology of the biomes very often neglects the determining impact of the anthropization of the planet, and certain present-day biomes are mainly artificial entities. It is therefore interesting to mention the classification proposed by Duvigneaud (1980) who, for the continental biomes, recognises the following: silva (woodland), saltus (pasture), ager (cultivated land), desertus (desert), tundra, marshes and freshwater, thus shifting away from the zonal model, and taking into account the anthropisation of, or human impact on, environments. The biome should form, after the planet overall, the largest unit of ecological classification. This is not always the case. The distribution worldwide of the large biomes can be seen as a simplification, and possibly an over-simplification. Further to this, the attributes of a given biome merge gradually into those of the adjacent biome (either by progressive variation of the climatic gradients independent from human action, or indeed on account of human action which homogenises natural landscapes). Consequently, certain researchers have proposed typologies in which the types and sub-types are more numerous, establishing

various distinctions, rough or fine, among the biomes. In addition to this, is it not appropriate, in a geographical perspective, to adjust according to the scale of analysis? For one thing, the zonal model is far from perfect, in particular in the case of the contrasts from one continental fringe to the other, and also because marked regional features affect the distribution of the main "vegetation landscapes". Climatic determinism is neither simple, nor does it explain everything. It can be observed in this respect that certain authors refer to zono-biomes or zonal macro-ecosystems (nine zono-biomes for Grubb) where others refer to biomes, and that the biome in this case corresponds to a lower regional level. It is true that to take "vegetation landscapes" as indications of environmental factors can lead to ambiguities or approximations. Likewise, if certain organisations have developed hierarchical classification systems for the purpose of conservation or environmental protection, they have sometimes neglected the biome as a component of the biosphere; or in other instances, like the World Wildlife Fund, they have positioned it between the eco-zone and the eco-region

Frederic Alexandre

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