WATER AND BRAZILIAN BIOMES

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Water is found practically anywhere on the planet and in the human beings that populate it, establishing connections between these elements, dissolving, joining, dragging and redistributing them permanently in its movement powered by solar energy. Known as the water cycle, this continuous movement renews the same water by drawing it up from the surface with heat and pouring it over everyone and everything in the form of rain, snow or ice, depending on the temperature. Once it reaches the ground, the seas, lakes and rivers, or organisms, most of it is evaporated again, while another part flows down to the lowest points of the Earth. As it flows, it forms glaciers, rivers, lakes, seas and aquifers – the water that runs through the gaps formed between rocks and their particles in the subsoil.

The life that unfolded and occupied Earth originating from this precious liquid shows, in all its manifestations, that water is its main “material” of formation and basis of “operation”. Studies on this relationship allow us to understand that life strives to make available the water that allows it to exist by aiding in the renewal and purging process of itself and of this liquid. In addition to biology, other factors of a physical and chemical nature condition the distribution and characteristics of water, making it differentiated in regions and seasons of the year. Its presence, in turn, moulds the characteristics and “habits” of life forms, revealing the other side of the relationship, which is the huge diversification of species and biomes.

In Brazil, the availability and condition of fresh water are directly related to the presence of highly diverse environments, such as those found in the Atlantic Forest, Cerrado, Amazon Rainforest, Pantanal, Caatinga and the Pampas. Equivalent distinctions can be observed in relation to brackish water, that enables the existence of mangroves, and to saline water, in which coral reefs develop, for example.

In each of these ecosystems, an infinity of vital relationships develop with water and temperature, which is also partially conditioned by water. The Atlantic Forest is internationally known as rainforest because it harbours one of the largest biodiversities in the world due to its high level of humidity in a tropical climate. Its occurrence along almost all of the east coast of Brazil reveals its dependence on the large amount of water evaporated from the Atlantic Ocean and the continent, which is hastened when it encounters the cold fronts from the South and Southeast. Furthermore, since the populating of the country from the coast and development of extractivist and agricultural activities in successive cycles, there has been a drastic reduction of plant cover that affect water supply and its quantity, and a simultaneous increase in demand.

Another formation that also develops in a highly humid environment, the Amazon Rainforest, depends on rain formed by the influence of another stretch of the Atlantic Ocean and comprises a large area that is submerged in periods of greater rainfall. This phenomenon, which helps to scatter seeds, thus renewing the forest, brings together land and water species and partly explains why gigantic trees grow in its soil, which is not generally thick, clutching to webs of roots and leaves. This “water world” creates the largest river in the world in terms of size and volume, in the unparallel growth of the largest tropical rainforest in the world, and in evaporation, which is sufficient to renew its supply and “export” through air currents the equivalent of 30% of rain that falls in the South and Southeast of Brazil and bordering countries.

Based on these characteristics, the territory of Amazonia pulls average water availability figures upwards, placing Brazil among the countries with the largest freshwater reserve in the world. However, this water is not, in fact, available to the rest of the country and its inhabitants unless it is indirectly provided through the strong climatic influence of its biome. This shows that maintaining the integrity of this forest is essential for the equilibrium and availability of water in distant regions, especially the more populated, dry regions that are most dependant on food and, therefore, on the thirsty agriculture.

Our drier landscapes, like the Cerrado and Caatinga, reveal a mutual adaptation between water and life and show the effects of the water “pulse”. Rain in these regions, which is highly concentrated in certain periods and virtually absent during the rest of the year, conditioned their species to reduce activity during the dry season and adopt the appearance of dead vegetation, which shows, however, how it has learned to overcome harsh climates, including fires, and to sprout as soon as the rain returns. Its strategies include storing water in roots or stalks, which helps people and animals in these areas during the most difficult times. Its non-exuberant appearance, in comparison to tropical forests, is frequently interpreted as being of lesser importance for protection that could explain its low resistance to the extensive devastation it suffers caused by agricultural expansion and use of its resources, such as timber, for much less defendable purposes, like burning in charcoal factories and steelworks.

The millennial relationship with this discontinuous water supply shows that these biomes have more to contribute to human action than the cultivation of species that have not adapted to their climate or soil, and are therefore dependant on agrochemicals either for “correcting” the soil or to prevent local species from repopulating its area. The most serious issue, however, is to try to alter the regional water regime and intensify its use with irrigation at a higher level than the level guaranteed by its reserves, which are even further diminished after the vegetation that maintains and survives with the available water is eliminated.

The Cerrado is known as the “water tank of Brazil” due to its location on the highest parts of the central plateau and because it supplies all the main national rivers, including River São Francisco that has a basin with vast cerrado and caatinga areas. This river illustrates the challenges that these environments must face, considering that for several weeks during the year, its waters are exhausted along their course and cannot reach the sea. This has important effects on the maintenance of most of marine life, that depends on the nutrients and sediments carried by the rivers, and for the crops and fertility of the valley near its mouth. If there is no freshwater to push water from the sea, it enters the river bed and also penetrates the aquifers, making agriculture and supply to riverine populations non-viable in one of the driest regions in the country. In this context, it becomes impossible to keep the promise with works that seek to share, among a greater number of consumers and for a greater number of purposes, the little water that remains of this river, with a flow that will diminish at an even more alarming rate, according to climate science previsions.

These mutual adaptations that dictate the physiognomy of the different biomes and their waters can also be recognized in the Pantanal and the Pampas. In the case of Pantanal, there is an area of fundamental size and importance in the international basin of River Plate, and in a global context, considering the strategic role of humid areas all over the world for the renewal of water and maintenance of life, which consequently triggered an international treaty for the protection of these territories: the Ramsar Convention.

The existence of the Pantanal depends on feeding its headwaters and the low declivity of its relief, responsible for retaining water, to form an extensive flooded environment that is full of life. However, it is being threatened by financial activities and projects, such as sugarcane plantations and the implementation of industrial plants for its processing at the headwaters, which is replacing the original vegetation and should substantially alter the water regime of the formers of Pantanal, in addition to seriously compromising the quality of water and life of species that depend on it. On the other end, the creation of waterways that are being proposed to drain regional agricultural production presupposes the drawdown of beds of rivers that form this biome to facilitate navigability, draining them more rapidly; all of which tends to dry out the entire humid area and make it non-viable.

The marine environments to where all these waters flow also suffer the effects of human activity in the continents or oceans. The acceleration or reduction of sediment and nutrient inputs and other forms of unbalance in the conditions in which its life forms developed has serious repercussions on oceans. The capacity that water has to dissolve and drag objects and substances is traditionally used to steer away rubbish and sewage, which is also extensive in the coastal cities of Brazil. In these regions, usual “sanitation” consists of dumping wastewater into the sea, preferably far from the beaches, by means of long pipes known as “submarine emissaries”. Their effect are increasingly difficult to conceal, either close to the actual cities or their beaches, or in the middle of the Atlantic and Pacific oceans where there are continents of floating rubbish that are causing serious damage to marine ecosystems.

The invisible fraction of these pollutants is not less serious; on the contrary, considering studied cases of dilution in the sea and the invasion of substances that reach deep sea levels released from oil exploration, navigation of all types of vessels and the deliberate dumping of toxic and radioactive waste produced by developed countries. These have been identified at the bottom of the seas and in beaches, especially in regions that are distant from producing countries and closer to poorer countries. These cases also show that current concepts of “sovereignty”, “development” and “technological advancement” do not incorporate or account for their social and environmental costs, or assume responsibility for them; which is the reason for their growing and urgent contestation.

They also show that we cannot readily accept technological solutions adopted to treat water that supplies our cities considering that demand grows more than the population and that the population and economic activities advance over ecosystems that produce good quality water. In urban ecosystems, where most Brazilians live, property appreciation and the low number of beneficiaries also prevent a viable relationship with the biomes and water itself, which has repercussions on everyone and everything that depends on it.

The water that maintains life and connects all these environments is a fundamental indicator of our relationship with this medium; and one that is sadly late in reacting, considering that the effects embedded in our organism, albeit more eloquent, are still difficult to comprehend.