Recovery of urban landscape and biodiversity through phytopurification

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Abstract

Water, such a small word, with great meaning. Indispensable to say that without it nothing would survive. Major civilizations grew where there was an abundance of liquid. It is known that it remains unsolved in contemporary times, maintaining the point of attention regarding emphasizing the preservation of water and the life of the planet. This scarcity situation has been reported worldwide, which corroborates a preview of the possible environmental catastrophe. It is a chain reaction: environmental liabilities, such as decreasing the volume of river channels, increasing salinity and reducing riparian forest that protects the water body from silting. The urbanization of cities is still based on outdated models, where anthropizations and waterproofing of surfaces were prioritized, most of the time next to water bodies. In the 21st century the challenge for contemporary cities is to maintain the balance between population growth and preservation of the environment. The new cities are already being thought of in a new model, integrating social and economic life with the preservation of the environment. Sustainable cities are aiming to preserve wetlands in order to maintain ecological balance, preserving the environment and integrating into the urban landscape. In this scenario, the wetlands built being successfully applied for the recovery of degraded urban spaces, restoring biodiversity, with a vital role in maintaining health.

1. Introduction

The planet's biodiversity would be doomed to death without the presence of water. The facts show since the last century, the real finding that water in the 21st century will be a global challenge, with new policies and guidelines pertinent to environmental management that must necessarily be improved.

Historically, water has caused floods, droughts, and pollution of water bodies, but it has also been an essential element for the economic development of the main ancient civilizations, such as those in Egypt, Greece, Rome.

The world water crisis, observed in this century, warns that the maintenance of environmental health is of paramount importance. The lack of water is one of the most serious problems. The study by the United Nations (UN, 2006) on the lack of fresh water in the world already warned that the reduction of the supply of liquid goes beyond the issue of thirst, extending to the degradation of the ecosystem, with consequent damage to the ecosystem, as well as the supply of living beings that inhabit planet Earth.

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The urbanization of cities is still based on outdated models, where priority was given to anthropizations and waterproofing of surfaces, most often with water bodies, necessary for the development of economic activities and

Figure 1. Tietê river – São Paulo - Brazil
Source: <https://www.pensamentoverde.com.br/meio-ambiente/conheca-rios-poluidos-mundo/> Acessed at: Sep, 2019.

supplying the population. Sustainable cities are aiming at preserving wetlands in order to maintain ecological balance, preserving the environment and integrating the urban and natural landscape.

In this scenario, wetlands built through phytopurification have been successfully applied for the recovery of degraded urban spaces and the conservation of riparian zones and the resilience of rivers and lakes, preserving the ecological cycle, seeking the revitalization and recovery of biodiversity, with the vital function of maintenance to health.

2. Twenty first century cities

The disordered urban occupation has been causing the devastation of areas of native vegetation. This occurs incessantly, repeatedly, which makes it even more harmful and striking. The degradation of the surrounding floodplains accentuated with the construction of landfills for the expansion of urban agglomerations (fig. 01).

In the 21st century the challenge for contemporary cities is to maintain the balance between population growth and preservation of the environment. Contemporary cities are already being thought of in a new model, integrating social and economic life with the preservation of the environment.

The built wetlands are fundamental for the recovery of moisture in these areas. Because they can restore a more balanced ecosystem, as they purify water bodies, increase the humidity of the region, assisting in the recovery of flora and fauna, and improving thermal comfort to cities.

In January 2010, WASH (international organization Wetlands International) published a list of benefits resulting from the implementation of wetlands, such as: climate regularization, socio-cultural gains, the possibility of recreational and leisure activities and, mainly, the opportunity for environmental education directly or indirectly. (WASH, 2010).

The Parc du Chemin de L'ile, in Nanterre, France, built between 2003 and 2006, and expanded in May 2012, obtained the certification of ecological green space. The park is part of a major urban revitalization action. Appropriate technologies are used to contribute to the clean-up of the waters of the River Seine through integrated natural systems. At the end of the process, clean water is used to irrigate community gardens.

It offers visitors 14.5 hectares of relaxation and leisure (fig. 02). It exemplifies the concept of urban restoration, since it was an old industrial area and roads and railways. Today it generates a new quality economic, social and urban activity.

The project sought an alliance between city and nature, regenerating the local biodiversity with the creation of green areas and connections between neighborhoods, and cleaning up part of the water of the River Seine through filtering water gardens (WASH, 2010).

In this way, the formation of fish spawning areas is promoted, enriching the park's ecosystem. The protected natural reservoir (fig. 03) favors the maintenance of biodiversity, constituting a refuge for birds and animals integrated with social activities.

Figure 3. Natural reserve of the Park of Chemin de L'le. Source: Feijó, 2015.

In Brazil, the Ponte dos Leites ETE, located in the municipality of Araruama, Rio de Janeiro, as shown in figure 04, is a case of success in the treatment of effluents by constructed wetlands. After its implantation, the region's flora and fauna were recovered, with the return of animal species that had left the site due to lack of food and favorable environmental conditions. In addition, this ETE reduced its operating costs and currently reuses all solid waste generated in the process for composting.

Figure 2. Parque do Chemin de L'le.

Source: https://www.paulchemetov.comAcessed. Jun, 2020.

It is a unique humus production process (fig. 05), which is formed by the decomposition of organic matter from animals and plants, being responsible for the fertility of the soil, without which it desertified. It is worth mentioning the importance of humus in terms of rainwater storage, as a sponge, prevents them from running freely over the surface, causing erosion, floods and droughts.

It is known that water problems in the world are due to the disappearance of humus, due to anthropic processes.

Commercial value is added to this by-product formed from solid waste, generating a source of income and employment. The liquid waste is returned to the water body, thus respecting the quality standards required by the legislation. This liquid waste is discarded due to the non-existence of companies that could reuse it.

Figure 4. Current aerial view of ETE Ponte dos Leites.

Source: Concessionária Águas de Juturnaíba, 2017.

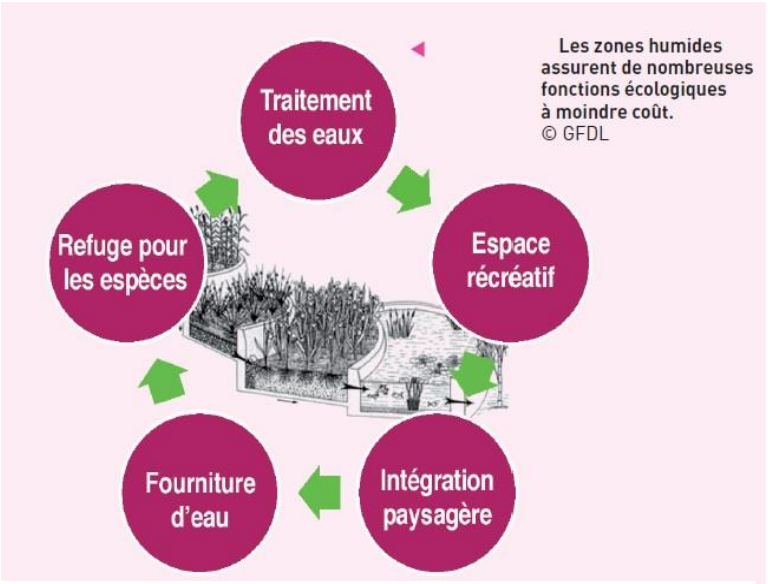

Figure 5. Preservation of humus

Source: La phyto-épuration: des plantes pour traiter les eaux usées.

The ETE is adjacent to an upper middle class condominium that does not oppose its operation, because it does not produce a bad smell and vectors that are harmful to the health and coexistence of its residents. It could serve as a leisure area with what happened in France in N´anterre, a suburb of Paris, revitalizing with the intention of purifying the water of the River Seine, performed an environmental function, returning life to the environment, creating a recreation space, revitalizing this marginalized region, reintegrating the Paris landscape. But the culture of society does not allow the place to be open to the public so that they can use the space with care and responsibility.

The built wetlands are also exemplified in the case of Australia: "The built wetlands are designed to maximize the removal of nutrients and pathogens from the effluents". Macrophytes promote natural disinfection by incorporating the ponds (Greenway, 2015, p.501). In Saudi Arabia, constructed wetlands are used for economic advantage and for being an efficient polishing step in the sewage treatment process, because they promote a natural barrier to the contaminants present in it (Bahaman Sheikh, 2001).

In this process, around 87% of pollutants are removed, with proven efficiency in agriculture (Yue Zhang, 2012). In some upper middle class condominiums in southern Brazil (fig. 06), filter gardens are used for decentralized sewage treatment.

The Ponte dos Leite ETE area cannot be opened to the public, due to the waste that can be freely disposed of without awareness causing impacts on the treatment process.

3. Conclusion

A relevant factor may return to the starting point for the beginning of this water crisis: a change in the culture of society as regards the perception of land use and natural resources; to demand that the competent agencies optimize sanitation networks in cities, an essential factor for the success of environmental preservation. This means that it is essential to understand who or who discards the daily routine has to be installed in appropriate facilities, or what generates passive environmental effects, filters of water bodies, causing diseases due to contamination of the population and consequent disappearance of flora and fauna, or that breaks or life cycle described here. As a major consequence is the resilience of the environment, which is essential to the good quality of life inserted in the urban context.

Figure6. Filter planted by macrophytes

Source: FUNASA, 2014.

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