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Várzea Urban Park: An innovative climate adaptation project in the heart of Setúbal City, Portugal

Combining flood prevention and heat reduction with Nature-based Solutions

The Várzea Urban Park is an innovative climate change adaptation project that combines the construction of retention basins to prevent flash floods in the lower part of the city with the implementation of a green park to tackle overheating in urban areas.

Key Learnings

- **Effectively preventing flooding**: The Várzea retention basins have proven effective as they have repeatedly prevented flooding in the Setúbal downtown area during heavy rain events across the Lisbon Metropolitan Area.
- **Spatial planning as a useful tool**: Planning and implementing a green space, such as an urban park, enhances the soil's sponge effect and simultaneously reduces the heat in the city.
- **Environmental education**: Involving schools in different implementation activities, for example, in planting trees for the urban park, contributes to environmental education and early-on awareness-raising on environmental topics.

About the region

Setúbal, located on mainland Portugal, is influenced by both the Mediterranean and the Atlantic climates. Its territory is home to Arrábida Natural Park, the Luiz Saldanha Marine Park and the Sado Estuary Nature Reserve, all of which hold significant ecological value and contribute to the area's unique appeal. As the District Capital, south of the Lisbon Metropolitan Area, Setúbal's urban area spans approximately 230 km^2 and is home to around 123,000 inhabitants (Census 2021).

Climate Hazards

Flooding, Extreme Temperatures

Sector

Urban, Biodiversity

Key system

Ecosystem and Nature Based Solutions

Climate Threats

Setúbal's climate is becoming hotter and drier, a trend expected to intensify by the end of the century. By that time, Setúbal will face significant climate changes with the annual average temperature expected to rise between 1.6 °C and 3.3 °C accompanied by an increase in the number of extremely hot days (with 35 °C of maximum temperatures or higher). Experts expect an annual reduction between 5 and 17% in rainfall, with less rain throughout the year but greater intensity in short periods, increasing the risk of flash floods. Therefore, cities need to invest in more effective drainage systems and increase soil permeability by implementing nature-based solutions.

The Várzea Urban Park as a solution to Setúbal's climate threats

The city centre has experienced recurring flooding over the last decades resulting from heavy rainfall overwhelming the drainage systems' capacity to absorb large volumes of water in a short period. In response, the Setúbal City Council aimed to identify a potential area to address flood risk, reduce urban heat and implement an innovative, multi-purpose solution.

The Várzea Urban Park is a climate change adaptation project that works on multiple fronts to increase the resilience of Setúbal's territory. The project aims to prevent flash floods in the city centre by building retention basins that control the rainwater volume during periods of heavy rain. Simultaneously, the urban park increases the soil's sponge effect with extensive green areas in the city centre, supporting biodiversity and reducing urban heat.

Figure 1: Várzea Urban Park, a climate change adaptation project. Image Credit: Setúbal Municipality.

Figure 2: A green park planned for the leisure of the population. Image Credit: Setubal Municipality.

Through several EU funding programmes (POSEUR – Operational Programme for Sustainability and Efficiency in the Use of Resources, PORTUGAL 2020 and ERDF – European Regional Development Fund), the City Council has already invested more than €3 million in a project that goes far beyond the initial objective of flood control using retention basins.

Another important aspect of this project is to raise environmental awareness through a tree planting programme, which involves pupils in planting activities. To enhance understanding of retention basins and the significance of the Várzea Urban Park for the local environment, the municipality organised several sessions in public schools. These sessions, conducted by municipal technicians, used a prototype to help students comprehend the hydrological processes involved.

This initiative transformed the urban green space into an environmental education hub focused on climate change adaptation. Future interventions, such as educational trails that inform and engage visitors about climate challenges and their impacts, aim to raise public awareness and highlight the importance of preserving natural resources.

Promoting biodiversity and native vegetation as part of nature-based solutions is essential for building resilient, sustainable urban ecosystems and enhancing vital ecosystem services.

An example of an ecologically based spatial planning policy is the Setúbal Municipal Master Plan, a national reference for its ecological foundation. At its core is the Municipal Ecological Structure which shapes the plan's revision by integrating ecological values, landscape, and ecosystem services into the territorial framework.

The Várzea Urban Park embodies an ecologically driven spatial planning–policy providing Setúbal's population with an Urban Park encompassing a high-quality leisure and green space.

Figure 3: Pupil involvement in the tree planting activities at Várzea Urban Park. Image Credit: Setubal Municipality.

Project Success

The Várzea Urban Park project in Setúbal has proved innovative and successful, as an exemplary model of sustainable urbanism and climate adaptation. The climate change adaptation activities enhance Setúbal's resilience towards associated threats and actively involve the community in actions to promote environmental education. The Várzea retention basins have recently proven their effectiveness during heavy rain events across the Lisbon Metropolitan Area, protecting the city centre of Setúbal from flooding.

> *"The Várzea project protects Setúbal's city centre from annual flooding, reminding that 2008 floods submerged cars in the city centre. With the Várzea intervention, the water accumulates in the retention basins and then progressively flows into the sea preventing downtown flooding.",*
>
> *André Martins, Mayor of Setúbal*

Figure 4: Várzea Urban Park during an episode of flash floods. Image Credit: Setúbal Municipality.

Summary

The Várzea Urban Park is an innovative project that increases Setubal´s resilience, a highly vulnerable territory to climate change. By implementing retention basins, the project reduces the risk of sudden floods while promoting biodiversity and native vegetation as part of its nature-based solutions. Densifying the vegetation promotes the soil's sponge effect, enabling greater water absorption, and helps reduce heat in the city centre.

Further information

- https://www.mun-setubal.pt/dossier-especial-obras-de-prevencao-de-cheias/?highlight=Parque%20urbano%20v%C3%A1rzea

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