



EUROPEAN UNION



EU MISSIONS

ADAPTATION TO CLIMATE CHANGE



December 2023

Unlocking Green Potential with Adaptation: Natural Habitat and Leisure Activities by the River

Transforming a river path in Cascais, Portugal, into a recreational flood retention area

In light of the intensifying heat in summer and drought and flood risks, an adaptation project in Cascais, Portugal, has developed a green corridor along a river connecting the mountains to the sea, providing many benefits for residents.

Key Learnings

- **Process:** Creatively thinking about how space can be used by the river brings benefits to those who live there directly. By including residents in the process, suitable climate adaptation measures were formed rather than having a fixed outcome from the beginning.
- **Operational:** As the water level of the river fluctuates, this nature-based solution can adapt to accommodate, which makes it the most viable adaptation option.
- **Considering all users:** How can the project contribute to biodiversity? In what way does it have to be made to protect wildlife and serve citizens needs at the same time?

About the region

Cascais is a coastal municipality with a unique landscape in Portugal. The Atlantic Sea and the UNESCO-protected Sintra mountain range border the 97 km² territory. The region is home to 214,124 inhabitants. In Cascais, the summers are warm, dry, and mostly clear; the winters are cool and partly cloudy; and it is windy all year round. During the months of June to October the average temperatures are between 20 to 26°C.

Climate Hazards

Droughts, extreme temperature, flooding, water scarcity.

Sector

Water Management

Key system

Ecosystem and nature-based solutions



Climate Threats

The effects of climate change are making Cascais' summer months hotter and drier. Estimates show that by mid-century, the average annual temperature variation will increase from 1.7°C to 3.2 °C. The temperature rise in the summer months (2.8°C to 5.0°C) will be much more intense than during the winter (0.9°C – 1.8°C). Heat waves are still rare due to the presence of the Atlantic Ocean, but they will become more frequent and long-lasting, occurring even during spring and autumn. This will mean a higher frequency of “tropical nights” with temperatures over 30°C.

June to September will become drier, and the number of dry summers will likely double or triple. Significant decreases in precipitation are forecasted. With a current accumulated annual value of 630 mm, it is expected to fall to 530 mm to 600 mm by mid-century and 420 mm to 580 mm by the end of the century. However, the risk of flash floods is increasing, and flooding, with the associated destruction and devastation, is expected to intensify.

Working with landowners to reduce flood risk and create a green corridor

Cascais is bordered to the north by the Sintra-Cascais mountain range, a UNESCO-classified and protected site, and to the west and south by the Atlantic coastline, with riverbeds and valleys connecting these two areas. For many years, these riverbeds have been perceived only as flood zones without any ambition to conserve and promote them as a natural habitat.

This is the case for the 10km long Vinhas River, which had previously been used for agricultural and rural activities but has since been affected by flooding and drainage. These watercourses and valleys link densely populated urban areas and the naturally protected landscape. Consequently, they have the potential to evolve into 'green corridors,' functioning not only as flood zones but also offering advantages for residents and acting as a haven for wildlife.

In 2017, the Cascais Municipality recognised this potential. It embarked on a project to restore the natural state of the Ribeira das Vinhas, a stretch of river extending from the Sintra-Cascais Mountain

Range to the coastline. The renaturalisation of the Vinhas Greenway is an integral part of Cascais' Local Climate Adaptation Plan.

The project implementation included river restoration, stabilisation of the permeable pathway, and construction. Key interventions included:

- Removal of debris and grey infrastructure, like weirs and other concrete structures.
- Restoring the slopes of the valley and the riverbed.
- Rebuilding the trail using compacted sand.
- Planting indigenous trees and plant species.
- Flexible and adaptable infrastructure.
 - For instance, instead of employing a concrete structure, the bridges spanning the river were constructed as semi-permanent structures. This design allows for the relatively easy replacement and reassembly of components when minor damage occurs. This was demonstrated during the summer of 2022 when flash floods caused the displacement of vegetation and some structures along the river. The adaptation solution can work with the river, adapting to variations in the water level and mitigating flooding risks. The re-naturalisation of the river and valley will restore the ecosystem to a point where it will be self-sustaining.

As the Municipality of Cascais faces more frequent extreme weather events, it is considering new techniques for climate adaptation, including the renaturalisation of the Vinhas Greenway initiative. The city is interested in using urban rewilding methods that work harmoniously with the local geography and topography and require minimal long-term maintenance.



Figure 1: Permeable pathway and vegetation created for the river valley (Image Credit: Camara Municipal de Cascais)

From its inception, this project actively involved residents and space users, such as landowners, and their knowledge of past flooding events was vital in informing the plan. Considering the flood risk and the high forest fire hazard in summer, the technical team engaged citizens in “co-design” sessions to develop the trail and naturalised areas. These sessions included artistic designs, cleaning actions, tree-planting workshops, and nature conservation awareness workshops.

"Climate adaptation creates a momentum to spread innovation which generates greener, safer and more competitive cities at the global scale."

João Dinis, climate and sustainability strategies implementation lead for Cascais

The pathway along the river is primarily used by people going for walks or doing sports activities. Still, it also has a few attractions beyond its vegetation: drainage covers along the trail have been transformed into small artworks by a local artist, and the corridor serves as a habitat for wildlife because there is no artificial light once it gets dark.

Success of the project

The project received an initial €380,000 in funding from the Municipality of Cascais and €10,000 from the Portuguese Environmental Fund. It succeeded in decreasing flooding levels, increasing the capacity of the valley and river to store water, and reducing the urban heat island effect by 2°C. Two meteorological sensors and a water-flow sensor installed alongside the riverbed provided data to determine the effectiveness of this nature-based solution to be prepared for potential floods. As a result, the project measured a one-metre reduction in flood levels during rainfall of 65mm in 24 hours.

The project diversified and improved Cascais' flooding mitigation programme as it illustrated the effectiveness of nature-based solutions like urban rewilding. It further demonstrated the benefits of using nature-based solutions compared to traditional grey infrastructure measures. In addition, residents began using the route to commute between uptown and downtown Cascais.

The project has delivered multiple benefits at a low cost and led to widespread support. Furthermore, it has influenced the development of additional rewilding plans across the city, such as the greening of roundabouts and alternative techniques for park management.

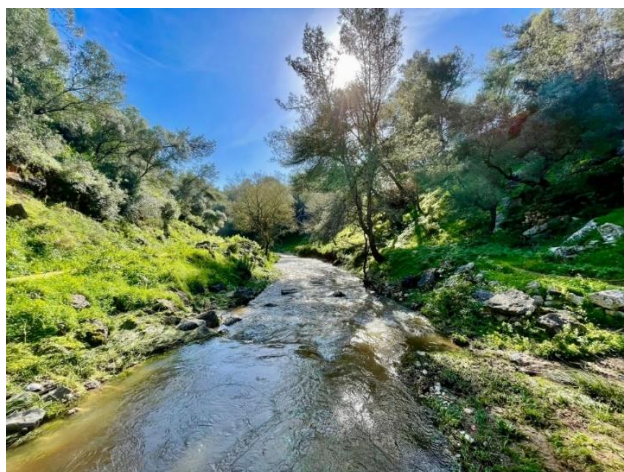


Figure 2: Valley in Spring (Image Credit: Camara Municipal de Cascais)

Summary

To increase biodiversity and climate resilience and create a new space for nature and people, Cascais restored the Vinhas River and the surrounding valley. The project established a green corridor from the mountains to the coast as a natural barrier to flooding and wildfires. The city was interested in using urban nature-based solutions that work harmoniously with the local geography and topography and require minimal long-term maintenance.

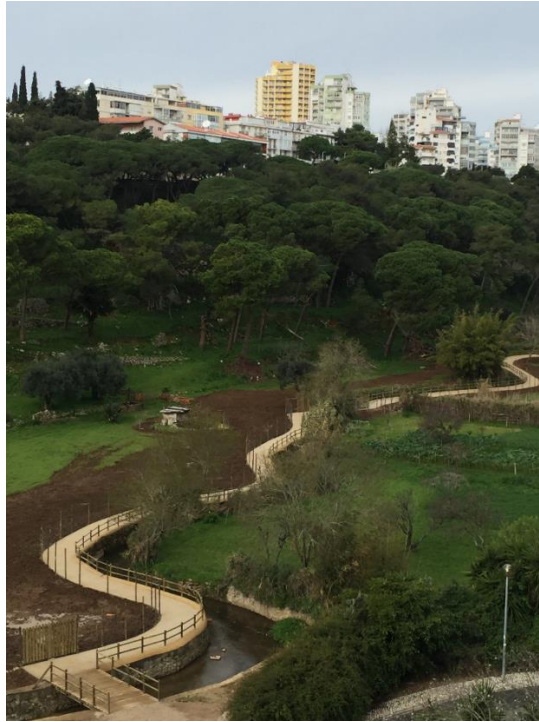


Figure 3: Path through agricultural land in the valley (Image Credit: Camara Municipal de Cascais)

Further information

For further information on Cascais's climatic and environmental development, refer to information on temperature and precipitation, the [environmental agency work](#) in Cascais, and [civil protection measures and warning systems across Portugal](#).

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**Funded by
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