

THE REDUNA PROJECT IN ALMADA



Addressed SDGs:



Image: City of Almada

> OBJECTIVES

One of the consequences of global warming is sea-level rise. In urban settings along coastlines, rising seas threaten not only houses, but also infrastructure such as industries, roads, power plants, freshwater aquifers, etc. Rising sea-level also pushes destructive storm surges further inland, posing very high risks for coastal populations, as storm surges can push water kilometres inland, causing extreme flooding far from the coast.

The Portuguese ReDuna project aims to restore the natural capacity of the Almada sand dune-beach ecosystem to healthily respond to natural drivers, enhancing its resilience to sea-level rise and storms. By monitoring in detail the dune ecosystem, the project has been providing scientific and technical knowledge on effective restoration techniques, which provides valuable information for vulnerable coastal areas.

> DESCRIPTION

Almada is a coastal city with a 13 kilometres long coastline on the Atlantic shore. It is visited every year by 8 million tourists during summer. However, due to sea-level rise, the area's current coastline regression puts in danger tourist services and existing private infrastructure, making coastal protection a high priority in Almada, Portugal. The beaches and the dunes are structures that are at the same time extremely sensitive and highly adaptive ecosystems towards environmental drivers. Their flexibility makes them react easily to the forcing functions of wind, ocean and sediment supply patterns, acting as a natural barrier.

The ReDuna project started in 2014, in response to strong winter storms in the coast of Costa da Caparica, which caused the destruction of the dune system. After this event, the beach was sand nourished and the dune profile along 1.1 kilometre of coast was restored using willow sand fences and planting of native dune plant species (100,000 plants) to help the recovery process. For this end, seeds were collected from a nearby area to preserve the local genetic integrity of the site. Also, human pressure mitigation measures were implemented such as pathways, fences and project communication. The construction phase took 6 months. Project monitoring is still being carried out, to show how an ecosystem-based protective structure can be self-sustainable. Four years after the initial plantation, roots were more than 4 metre deep and in high density, forming a strong root network that stabilised the

foredune. The restored dune fostered resilience to storm effects and coastal erosion due to a more stable sediment transfer and balance between the dunes, the beach and the ocean floor. In March 2018, the restored dunes provided an effective response to Storm Emma.

The idea was to help the ecosystem restore itself and regain complexity, while tracking the changes through monitoring led by the Faculty of Science of Lisbon University, Centre of Ecology / Geology research group. Geomorphological and ecological parameters were monitored at six-monthly intervals initially, and then yearly with indicators as geomorphological evolution, beach-dune sediment stock, biodiversity colonization (new plants and animals), vegetation survival, community structure evolution, impact of fences on survival, growing and establishment of plants, for example. To detect the site's geomorphological changes, a GPS-based monitoring of the transect was performed, creating a 3D-model of the dunes. Nowadays, photographic data can be easily obtained by drones, which is a non-intrusive method. Thanks to these photos the survival and growth rate of the dune vegetation as well as the colonisation of new plants in the dune system can be analysed. The results obtained during the first two years of the project showed that 90% of the planted native species have survived, attracting 49 new wildlife species, which increased biodiversity and provided ecological resilience to the restored ecosystem.

The ReDuna project established strong community involvement from the very beginning. The area's design was presented, discussed and defined with engagement of target groups, who could identify themselves with the project goals and actions from an early stage. After the implementation phase, several maintenance actions followed, which included native species plantation and invasive alien species removal with the involvement of the local community, NGOs and schools, with the support of the Municipality's Environmental Education and Awareness Division. The ReDuna project was financed by the [EU Structural and Investment Funds](#) & [the EU Cohesion Fund](#) for coastal protection through the National Environmental Agency of Portugal. The hard costs during the first phase associated with structural actions, without considering human resources, conducted studies, project development and monitoring reached 250,000 EUR. Maintenance campaigns are foreseen within the dune system after each summer and each storm season, as there is a need to refresh the willow fences infrastructure, replace part of the vegetation and renovate some walkthroughs.

> CHALLENGES

The economic valuation of ecosystem services is still a challenge, as there is an inherent uncertainty in attempting to quantify the economic value of non-marketed services. Moreover, the costs of the depletion of these services are rarely tracked in local economic accounts. Also, from an ethical and philosophical perspective, ecosystem valuation is far from uncontroversial.

In this sense, the recognition of nature-based solutions as an effective solution for coastal defence is still not widely recognised. During the Portuguese coastal management plan revision, the main difficulty the project faced was to be eligible to apply for the Structural & Cohesion Funds. Technicians and local government staff had to elaborate on how NBS interventions and green infrastructure measures could effectively contribute to coastal management and foster disaster prevention. Initially, NBS were perceived exclusively as “biodiversity protection” measures. With the perception of the value of NBS for coastal resilience and risk prevention, Structural & Cohesion Funds could be activated. A holistic and integrated approach is recommended towards coastal resilience, so that the co-benefits and multi-functionality of NBS measures can be highlighted and properly disseminated.

> OPPORTUNITIES

ReDuna has promoted a strong community involvement from the beginning so that stakeholders could understand and engage in various of the project's activities, ensuring that the users' experience was incorporated in the area's design. The installation of facilities on the dune system, such as raised walkways and signage, enhanced the possibilities for the local population and tourists to interact with the sand ecosystem and get informed about its value and importance.

The project is equally praised by the local population for providing coastal protection and aesthetic values. Beach support-structure owners were also able to ensure economic revenue from the facilities throughout time, benefiting directly from the coastal defence through avoided damage and indirectly from increased tourism. To widen the dissemination of the project, during the first 2 years, the Almada local government shared publications about ReDuna and related results in the municipality bulletins and social networks. The project has also been recognised by UNEP as an example of a successful coastal protection project by providing good practices to achieve SDG 11 (see p. 82 of “[Land restoration for achieving the Sustainable Development Goals](#)”).

> LESSONS LEARNED

Concerning the policy level, it is of major relevance that the goals of the project are well aligned with regional/local strategies and policies. The main lesson learned in terms of policy making was having the option of nature-based dune restoration for coastal protection recognised in the Regional Coastal Management Plan.

Regarding the project implementation itself, it was relevant to understand that ecological restoration, when properly designed and implemented, is rather invisible, and therefore, the intangible values of biodiversity are usually not immediately recognised. So the tip is to make the landscape restoration changes visible via public awareness and communication campaigns and arrive at a design that is appraisable by the visitors.

It is also important that this typology of NBS is supported throughout by a strong technical and scientific staff, so that the measures to be implemented get continuously adjusted to the territory, from the environmental factors influencing the coastal dynamics and its vulnerabilities to the continuous monitoring works. This makes all the difference for a successful project.

> INSPIRATION FOR OTHERS

The experience of Almada is an extremely useful case for all the Portuguese coastal dunes facing similar erosion problems and coastal flood risk. It also posts a successful example for nature-based coastal dune management worldwide.

In fact, similar dune restoration projects in Portugal are nowadays integrated in the Regional Coastal Management Plans all over the country, in a typology of coastal protection measures.

Almada is a former participant of the International Union for Cooperation - IUC (2017-2020), which enabled the local government to exchange its knowledge with the Chilean City of Viña del Mar, which faces similar coastal resilience challenges. This reinforces the transferability potential of the initiative to other parts of the world.

FURTHER INFORMATION

All fact sheets were produced from questionnaires and interviews conducted by the ICLEI team. Contact ICLEI Europe for more information or access Oppla: <https://oppla.eu/casestudy/22495>

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under the grant agreement No 821016.