

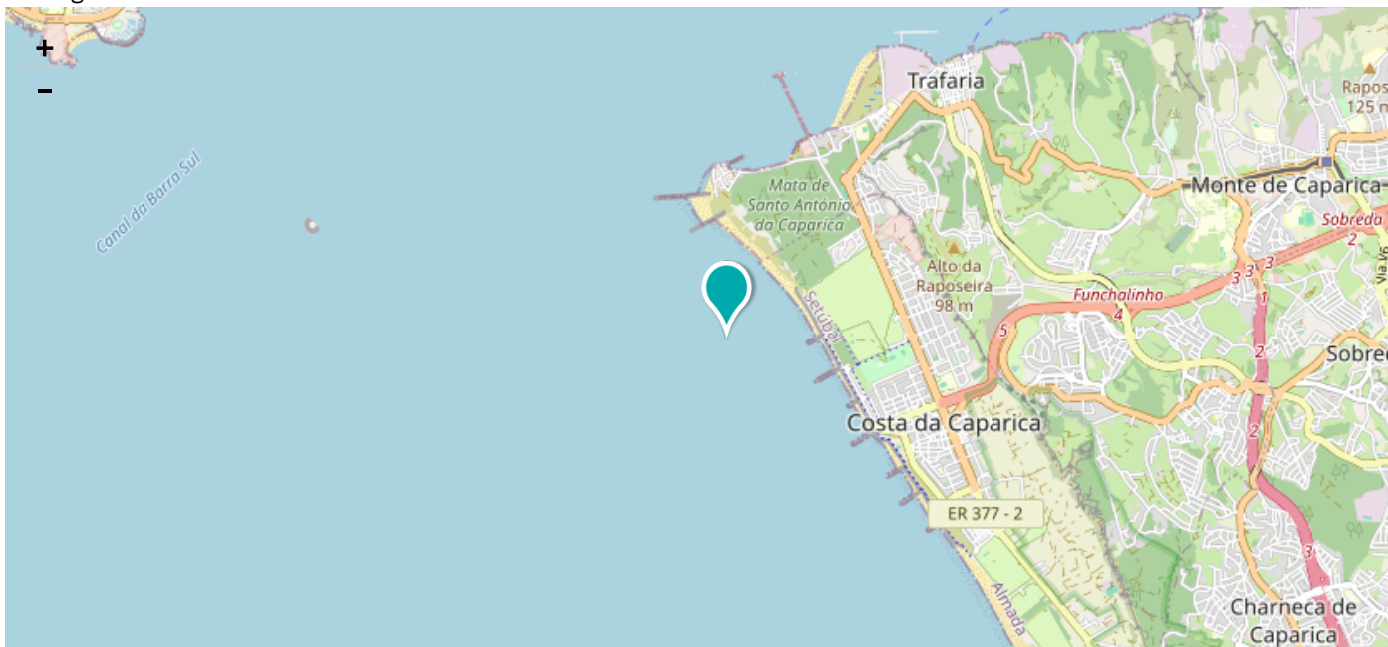
Resources (/nbs-resources) > Case studies (/network-nature-case-study-finder)

ReDuna - Restoration of S. João da Caparica Sand Dunes



Area characterisation:

Almada is a coastal city with a 13km 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 the existing private infrastructure, making coastal protection a high priority in Almada, Portugal.



Objective:

One of the consequences of global warming is the sea level rise. In urban settings along coastlines, rising seas threaten not only houses, but also several types of infrastructures 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 kilometers 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.

Actions:

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 1km of coast was restored using willow sand fences and native dune plant species (100,000) were planted to help the recovery process. For this end, seeds were collected from a close 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. The project's monitoring works are being carried out until these days, showing how an ecosystem-based protective structure can be self-sustainable.

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.

Maintenance campaigns are foreseen within the dune system after each summer and each storm season, as there is need to refresh the willow fences infrastructure, replace part of the vegetation and renovate some walkthroughs.

Potential impacts/benefits:

ReDuna project aimed to prove NbS useful as a complementary action to artificial beach nourishment, improving ecosystem resilience and therefore the services provided as tourism attraction, well-being, nature conservancy and coastal protection.

NbS benefits

- Developing climate change adaptation; improving risk management and resilience
- Better protection and restoration of coastal ecosystems
- Increase infiltration / Water storage
- Reduce flood risk
- Carbon sequestration and storage
- Restoring ecosystems and their functions
- Improve connectivity and functionality of green and blue infrastructures
- Increase achievements of biodiversity targets
- Increase Biodiversity
- Increase quality and quantity of green and blue infrastructures
- Increased cultural richness and biodiversity
- Creation of green jobs relating to construction & maintenance of NBS
- Increase awareness of NBS solution & their effectiveness and co benefits
- Increase communities' sense of ownership
- Increase stakeholder awareness & knowledge about NBS
- Increase well-being
- Increase willingness to invest in NBS
- Sustainable development of coastal regions

Transferability of the result:

The beaches and the dunes are structures that are extremely sensitive and 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 idea was to help the ecosystem restore itself and regain complexity, while tracking the changes through a strong monitoring led by the Faculty of Science of Lisbon University, Center of Ecology / Geology research group and ongoing adaptive management. 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. Four years after the initial plantation, roots were more than 4m deep and in high density, forming a strong root network that stabilized 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.

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 to have the typology of 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 arrive at a "beautiful design". Therefore, in the ReDuna project, the landscape changes were made visible via numerous communication campaigns and the dissemination of positive messages to engage people. Some applied dune restoration techniques and plantations, for example, received a quite geometric shape in certain spots, so that people would immediately recognise that man-made measures were carried out.

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.

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.

Financing:

The ReDuna project was financed by the EU Structural & Cohesion Funds for coastal protection through the National Environmental Agency of Portugal. In this first phase the fund financed the hard costs associated with structural actions.

The municipality covered human resources, conducted studies, project development and monitoring.

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Sustainable Development Goals

3. Good Health and Well-being
4. Quality Education
6. Clean Water and Sanitation
8. Decent Work and Economic Growth
11. Sustainable Cities and Communities
13. Climate Action
14. Life Below Water
15. Life On Land
17. Partnerships for the Goals

GOAL(S):

- Developing climate change adaptation
- Improving risk management and resilience

NBS ACTIONS:

- Establishing nature-based solutions for coastal resilience
- Nature-based solutions and the insurance value of ecosystems

KEYWORDS:

ACTIVE INVOLVEMENT OF CITIZENS (/NETWORK-NATURE-CASE-STUDY-KEYWORDS/429)

BIODIVERSITY (/NETWORK-NATURE-CASE-STUDY-KEYWORDS/85)

CITIZENS' AWARENESS ABOUT THE IMPORTANCE OF ES (/NETWORK-NATURE-CASE-STUDY-KEYWORDS/430)

CLIMATE CHANGE (/NETWORK-NATURE-CASE-STUDY-KEYWORDS/88)

CLIMATE RESILIENCE (/NETWORK-NATURE-CASE-STUDY-KEYWORDS/423)

COASTAL (/NETWORK-NATURE-CASE-STUDY-KEYWORDS/1)

COASTAL RESILIENCE (/NETWORK-NATURE-CASE-STUDY-KEYWORDS/196)

CONSERVATION (/NETWORK-NATURE-CASE-STUDY-KEYWORDS/90)

CULTURAL ECOSYSTEM SERVICES (/NETWORK-NATURE-CASE-STUDY-KEYWORDS/314)

ECOSYSTEM BASED MANAGEMENT (/NETWORK-NATURE-CASE-STUDY-KEYWORDS/282)

ECOSYSTEM SERVICES (/NETWORK-NATURE-CASE-STUDY-KEYWORDS/97)

EUROPE (/NETWORK-NATURE-CASE-STUDY-KEYWORDS/476)

FLOOD PREVENTION (/NETWORK-NATURE-CASE-STUDY-KEYWORDS/419)

NATURAL RESTORATION (/NETWORK-NATURE-CASE-STUDY-KEYWORDS/962)

RE-NATURALIZATION (/NETWORK-NATURE-CASE-STUDY-KEYWORDS/960)

SUSTAINABLE DEVELOPMENT (/NETWORK-NATURE-CASE-STUDY-KEYWORDS/426)

TOURISM (/NETWORK-NATURE-CASE-STUDY-KEYWORDS/283)

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Department for Innovation, Environment, Climate and Sustainability of the Municipality of Almada
Portuguese Environmental Agency

CLIENT:

x

DESIGN TEAM:

MUNICIPALITY OF ALMADA – Department for Innovation, Environment, Climate and Sustainability

AWARDS:

The project has been recognized by UNEP as an example of a successful coastal protection project by providing good practices to achieve SDG 11 (page 82 of the report “Land restoration for achieving the Sustainable Development Goals”).

PUBLICATIONS AND REPORTS:

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