

Building a dyke within the dunes to protect against future sea level rise, Noordwijk - NL

1. Policy Objective & Theme

- ADAPTATION TO RISK: Managing impacts of climate change and safeguarding resilience of coasts/coastal systems
- ADAPTATION TO RISK: Preventing and managing natural hazards and technological (human-made) hazards
- ADAPTATION TO RISK: Integrating coherent strategies covering the risk-dimension (prevention to response) into planning and investment

2. Key Approaches

- Technical

3. Experiences that can be exchanged

Building a dyke as a protective sea defence and disguising it as a dune so it forms a continuation with the dune system either side. The new dyke-in-dune, as well as offering defence also acts as an ecological corridor.

4. Overview of the case

Noordwijk was regarded as being a weak link in the Netherlands coastal defence system. This case shows how a novel way of protecting the coast through a dyke-dune system can also have ecological benefits.

5. Context and Objectives

a) Context

Along the North Sea coast, a number of places have been identified which cannot guarantee future safety from flooding in the event of sea-level rise. They have been called 'weak links' and one of the most important of them is the important tourist and bulb-growing town of Noordwijk. The town has 25,000 inhabitants covering an area of 52 km². The resort has a 14 km long sandy beach with a heavily built-up sea-front of recreation facilities, restaurants and hotels situated along two boulevards. On peak days, this population swells to four times the size and, in total, Noordwijk receives two million visitors/year. 60% of the working population are involved with tourism. Surrounding the town are open dune landscapes of which 3700 ha. have Natura 2000 status as well as 530 ha. of woodland with similar status. These areas contain 27 plant species found nowhere else in the Netherlands. Altogether some 56% of the territory is protected. Inland, behind the dunes, are bulb fields although their economic importance to the town is now second to the tourism market. Nonetheless, the Keukenhof Gardens each spring draw 800,000 visitors in a nine week spring flower festival. The town has also specialised in congress facilities to broaden the tourist prc

The coastal defence system to protect this coastal stretch was safe excepting for one weak, 125m strip of dune in front of the Palace Square. Here the dunes were less than 25m wide, insufficient to cope with a heavy storm. In order to ensure the safety for the next 50 years, structural and sustainable measures were needed. A defence system was needed that could prevent a flood event of once in ten thousand years.

b) Objectives

To strengthen the sea defence in front of the boulevard of Noordwijk.

6. Implementation of the ICZM Approach (i.e. management, tools, resources)

a) Management

Central government is responsible for coastal defences.

b) ICZM tools

Different plans were considered to strengthen the coast of Noordwijk and originally a simple dyke was planned. However, following consultation with stakeholders in the town and under influence of the municipality, it was decided to build a dyke within the dunes so that it would not be visible. Work began in the Autumn of 2007 to broaden the dunes to a maximum of 42m in the direction of the sea. At the beginning of the current dune system, parallel to the boulevard and along its complete length, a dyke was built. This was then covered with sand to form a continuation with the dunes either side. The new dyke-in-dune has a height of 9 - 10m above the Normal Amsterdam Level (an ordnance datum) and follow the contours of the natural dunes. The height of the new dyke-in-dune system is no more than the defence line it replaced and this was possible because of the extra width of the dunes which form a buffer against the sea. In order that the broader dyke-in-dune area flows continuously with the natural dunes, extra sand was added to the coast along a stretch of three kilometers. It has been estimated that ca. 1.5 m. m3 of sand was required. Coastal sand was supplied in a round-the-clock- operation lasting eight months. In order to protect the weak coastline during the winter-time while dyke-building was in progress, normally a time when no construction on the dunes occurs, a temporary, emergency dyke was constructed on the seaward side of the operations. The upper layer of sand from the old defence was removed and stored since it contained the seeds of the plants. It was put back in the spring after the dyke-in-dune had reached its planned height in time for them to germinate.

When the dunes were widened in the direction of the sea, they covered the previous beach for a considerable distance. This meant that a new beach had to be created in the direction of the sea so that the width of the beach remained the same. Sand was also introduced to raise the coastline on the beach and for 800 metres out to sea. The seabed still slopes away at the same angle as in the old situation so that the water gradually becomes deeper. It simply means that the visitors have to walk a little further across the dyke-in-dune and down a gradual decline to reach the beach. The extra width of the new dune system will allow many dune species to increase in numbers as their habitat has been expanded. This plan is also a flexible one for the future since both the width of the dyke-in-dune, as well the height, can be increased if it is felt that the defence is still not strong enough.

During a storm, the dunes form the first buffer and, if the waves break through these there is a second buffer, the dyke. The top layer of the dyke is made of stone which keeps the sand underneath it in place effectively. The dyke will therefore wash away less easily than the dunes. In total, 1150m of coastline was strengthened.

7. Cost and resources

The budget was €18.2 million to be shared between central government, the Province of South Holland and the Municipality of Noordwijk. The Rijnland district water board paid 25% of the Municipality costs.

8. Effectiveness (i.e. were the foreseen goals/objectives of the work reached?)

The dyke-in-dune has a protective effect for the dune above it since paths are not cut into the dunes where the visitors walk to the beach. It has enhanced the previous landscape and joined the previously separated dune system either side of the town.

9. Success and Fail factors

The long experience which the Netherlands has built up over the decades on coastal defence and particularly the ability to build innovative schemes. The participation that took place in the planning stages and the information that was generated prior to, and during, the works.

10. Unforeseen outcomes

Noordwijk was recipient of a QualityCoast Award in both 2007 and 2009. In both of these awards the planning and implementation of the coastal defence works were part of the criteria adjudicated

11. Prepared by

A. H. Pickaver, Coastal & Marine Union (EUCC), The Netherlands

12. Verified by

It has not been possible to verify this case.

13. Sources

- Coastal Reinforcement Noordwijk (2007) Hoogheemraadschap van Rijnland
- www.rijnland.net
- www.kustvisiezuidholland.nl



Coastal reinforcement Noordwijk (2.26 MB) 