



**Sandy reinforcement of the
Hondsbossche and Pettemer Sea defence**

Summary

Who: Van Oord Nederland BV and Boskalis Nederland BV (both recognised CEDA member)

What: Reinforcing the Dutch coastline at the Hondsbossche and Pettemer Sea Defence by using a total of 35.5 million m³ of sand and planting 640,000 m² of marram grass

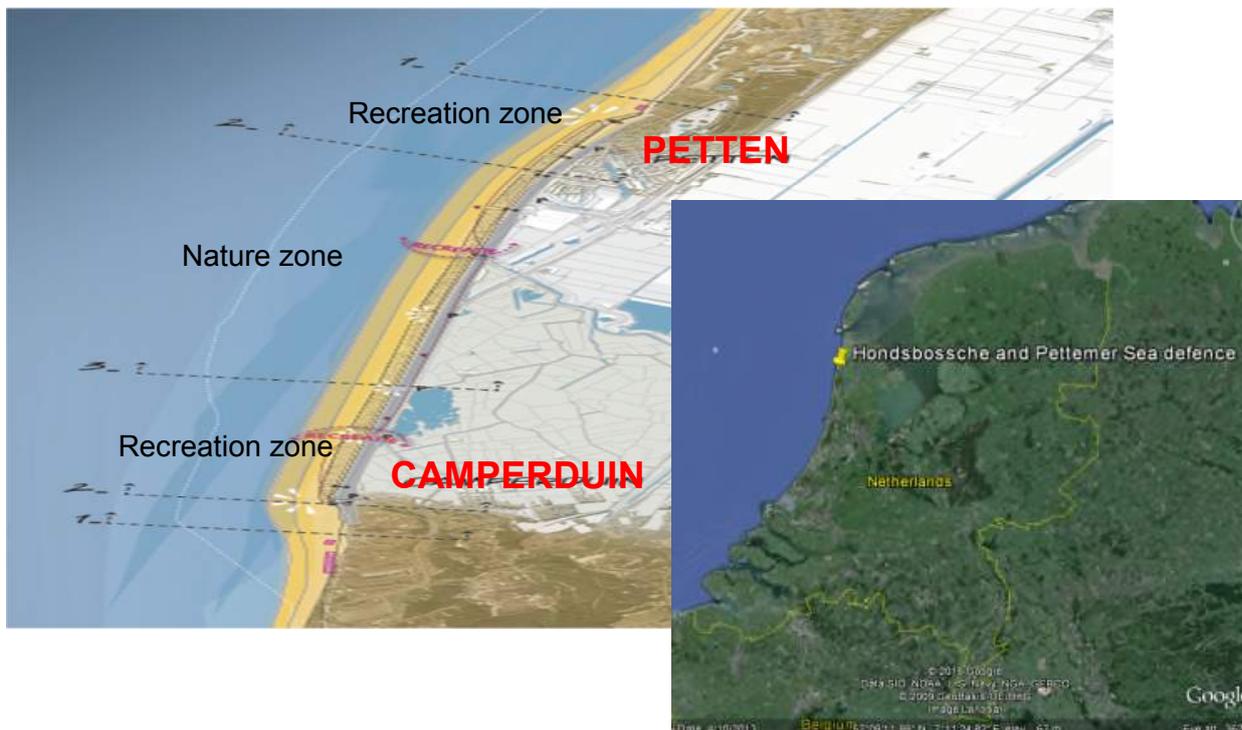
Client: Hollands Noorderkwartier Regional Water Board

Completion date: End 2015

Category: Sand and gravel dredging (for coastal reinforcement)

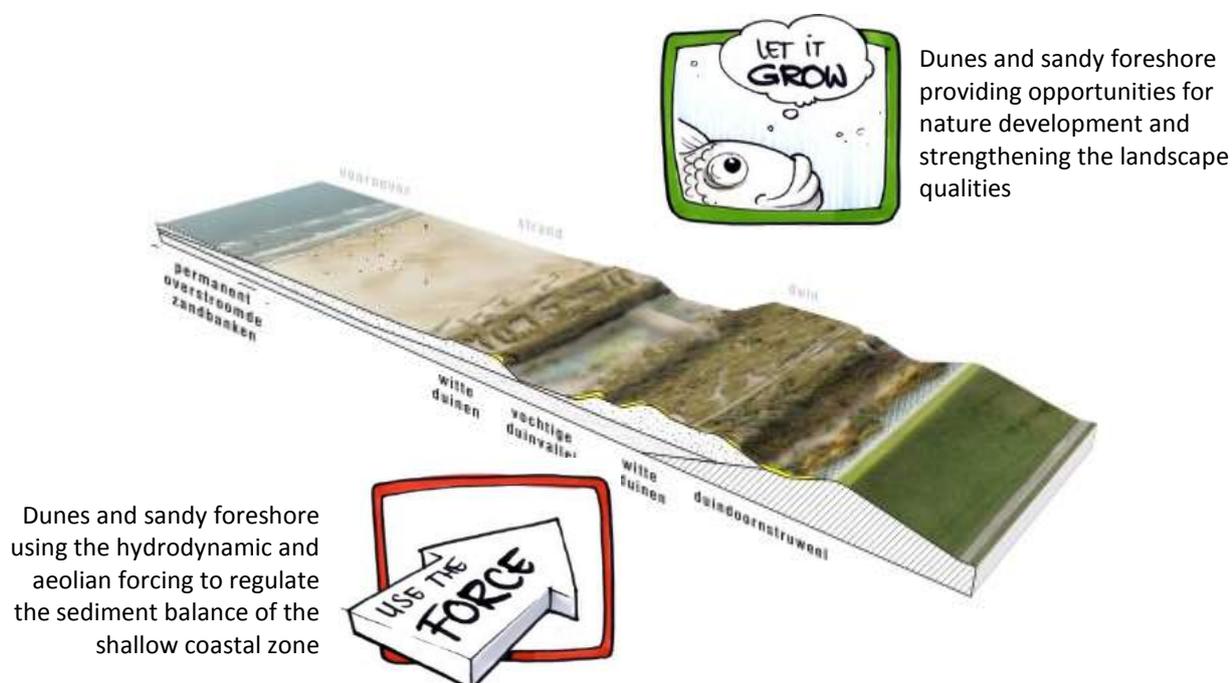
Background and Goal: The Hondsbossche and Pettemer Sea Defence no longer met current safety standards and was classified as one of the ten weak spots along the Dutch coast in 2004. To resist a once in 10.000 year superstorm – one of the Dutch government’s safety requirements – the dike would need to be at least 4 metres higher and about 20 metres wider. The existing infrastructure behind the dike made it impossible to alter it in that way. The Regional Water Board instead decided to reinforce the coastline by creating broad dunes and beaches. The consortium of Van Oord and Boskalis is responsible not only for building the coastal defences, but also for maintaining them for the next twenty years. That means a planning horizon that is five times longer than the usual sand replenishment programmes. Besides protecting the coast, the design allows leeway for nature conservation and leisure activities. The design is innovative in that it creates a 3-kilometre-long nature reserve with a damp dune valley and extends the existing leisure zones by adding 1.5 kilometres of beach with a lagoon. Also, a 25-metre-high panorama dune is created. The new dune area is an impressive feature that merges seamlessly with the existing dunes of the Noord-Holland coast. The development of this area will be investigated in the coming year by an innovation project executed by EcoShape and funded by an Alliance of Hollands Noorderkwartier Regional Water Board (HHNK), High Water Protection Program-2 (HWBP-2) and the EcoShape research consortium, to which both Boskalis and Van Oord belongs as well.

Location overview:



Environmental benefits

Within the design of the sandy reinforcement of the Hondsbossche and Pettemer Sea defence, a lot of attention was paid to the natural values that the newly constructed dune area could create. Not only is the creation of these dunes considered an important additional value for landscape experience, a more pro-active approach was chosen in creating these dunes. Instead of having natural dune development solely, artificial dunes were constructed and planted with marram grass, with irregular open patches as part of the nourishment activities. Grown-up marram plants were used for planting during spring. Furthermore screens were positioned at the toe of these artificial dunes to stabilize dune foot position and prevent substantial dune migration. Taking on the challenge to construct the dunes in a way to allow some natural variation and trying to use the natural (aeolian) forces within this idea, fits perfectly in the concept of Building with Nature.



BwN concepts of the sandy reinforcement of the Hondsbossche and Pettemer sea defence

The 6 kilometres along the sea defence have been divided in different sections, the first section of 800 metres near the southern village of Camperduin is intended for recreational use. Then, northbound, follows a section of 3 kilometres that has been labelled as a nature area, the remaining section, up until the northern village of Petten, is again destined for recreational use. In the nature area, a humid dune is realized, which will enable the development of a wetland habitat that is usually rich in species. Furthermore, as part of the aim to enhance recreational and cultural values, a panorama dune with a height of 25 metres is erected near Petten and a construction with wooden posts is made representing the silhouette of the old village of Petten. Finally, bicycle paths are constructed along the dunes to allow for recreation and near the village of Camperduin, a special lagoon is created in the beach with an opening to the sea.



Design and construction of footpaths and cycling paths

Innovation

Both the DBM (Design, Build, Maintenance) contract form and the innovative engineering approach of the consortium demonstrate some of the innovative features of the project. Most remarkable innovative feature though is the choice to break with the long tradition of a hard construction acting as the primary sea defence, and to construct a sandy reinforcement of the Hondsbossche and Pettemer Sea defence. As explained in the paper on 'Challenges in developing sustainable sandy strategies' by Van Thiel de Vries et al. presented at this WODCON conference, such transition is not trivial and requires an ingenious approach, in which the constructed beach dune system is to be regarded as a suspension point (including maintenance) from where sand distributes to other coasts within the larger system.



Innovative step change: from hard dike protection (right arrow) to a sandy solution (left arrow)

Economic benefits

The economic benefits of sandy strategies and solutions like the sandy reinforcement of the Hondsbossche and Pettemer Sea defence are two-sided. Firstly, sandy solutions allow for adaptive management in the form of nourishments, which introduces the flexibility to postpone maintenance measures with respect to hard alternatives. Secondly, it serves the increasing demand for measures that can harmonize multiple functions (coastal safety, economy and nature) at once.

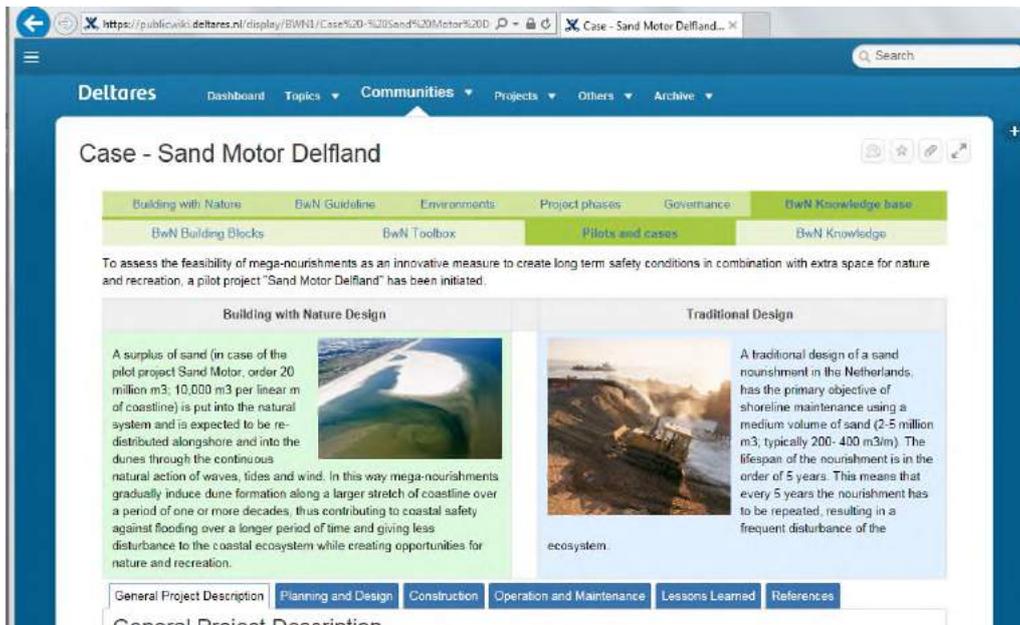
Within the sandy reinforcement of the Hondsbossche and Pettemer Sea defence, both sides are being developed as a maintenance period is included in the contract, making the decision on balancing the execution of maintenance versus the application of an extra initial buffer part of the tender process, and therefore a decision for the contracting consortium. The economic benefits for the region are best observed in the high number of visitors that are attracted to the area. Further studies will pay attention to monetarize these effects.



Economic benefits from recreational features such as this frequently visited beach lagoon

Transferability

The potential for sandy solutions like the sandy reinforcement of the Hondsbossche and Pettemer Sea defence is quite large. As indicated in the paper 'Challenges in developing sustainable sandy strategies' by Van Thiel de Vries et al. presented at this WODCON conference, the popularity and interest in these kind of solutions is increasing. Within the Building with Nature innovation programme of the EcoShape consortium, overarching themes and aspects in developing sandy strategies are being researched via a learning by doing approach in several pilot cases as to benchmark the potential for innovative sandy solution strategies. As indicated above, the sandy reinforcement of the Hondsbossche and Pettemer Sea defence is one of these pilots and the EUR 1.4 million innovation project executed by EcoShape and partners aims to translate insights from this project to more general applicable tools and assistance for other sandy solutions. This innovation project started in 2015 and will be finished by the end of 2018.



Screenshot Building with Nature Guideline on sandy solutions (case description Sand Motor Delfland)

Outreach and education

During tendering and execution, stakeholder interaction has been one of the key focus points of the realization of the project. During a Dialogue Phase in the tender, interaction between tendering contractors and relevant stakeholders including the public were organised. Also after award, interaction with the public was well organised as the works attracted quite some visitors. Next to information at the project location and a visitors centre, also effective efforts were made to inform the public online, both from the perspective of the Client and the contracting consortium (see for instance: www.kustopkracht.nl).



Attention of the public during the start of the construction works

Also on outreach and educational themes, the project has joined forces with the Building with Nature innovation program of EcoShape. By embedding the project in the infrastructure of this program it is certain that insights and lessons learned from this project will land in generally applicable tools and guidelines for future sandy solution development. The project will actively contribute to the Building with Nature Guidelines which are publicly available via http://www.ecoshape.nl/en_GB/guidelines.html.