10 years of Building with Nature

The Sand Motor

Photo: Roel Wijnants

Photo: Maurits Verbiest

Why coastal maintenance?

A quarter of the Netherlands lies below sea level. Our dunes and beaches provide essential protection against the sea. But wind, sea and currents erode sand from the coast, and the rising sea level is speeding up this process. Therefore, every three to five years, the Dutch government collects sand from deep in the North Sea and deposits it onto our beaches. We call this 'nourishment'. Nourishments keeps the coastline in place and our feet dry. This fits the natural character of the sea, the beach and the dunes.

However, the repeated nourishments with sand disrupts the balance of nature and life in the benthic zone. It is better for the flora and fauna to limit the amount and frequency of nourishment. Policy makers and coastal experts are therefore looking for alternatives. "Building with Nature" is a design philosophy that has increased in popularity in recent years. It focuses on the use of natural processes to protect us from the forces of water. The idea behind the Sand Motor was based on this philosophy.

The Sand Motor

The Sand Motor is a peninsula in front of the Delfland coast. It was constructed in 2011 by depositing 21.5 million cubic meters (gross) of sand. This is much more than would be needed for 'normal' replenishment. It was expected that the Sand Motor would have a lifespan of 20 years. We now know that it will be much longer. Under the influence of waves, sea currents and the wind, sand moves from the Sand Motor along the coast, both towards the north and the south.

The large quantity of sand makes the Sand Motor unique, as does the idea of leaving nature do its work. It is unique in the Netherlands, as well as on a global scale. But it goes even further than that. The Sand Motor is an endeavour in which the government has joined forces with knowledge institutions the business community to combine several objectives into one project, which is relatively unusual for replenishment. These objectives are:

- Increasing coastal safety in the long-term
- Creating natural surroundings and a recreation area
- Developing knowledge and innovation for coastal management and maintenance

A pilot, not an experiment

The Sand Motor is a pilot. At the time of its construction, in 2011, there were expectations as to what nature would do with the sand, and at what rate, but these were estimates. The development of the Sand Motor and its effects on coastal protection, nature and recreation have been carefully monitored over the past 10 years. Several universities, researchers and expert agencies have been involved.

The Sandmotor is a pilot, not an experiment. That may sound contradictory, but it is not. At no point was coastal safety at risk. This was already established before the Sand Motor was built. So, it really is a project aimed at learning.

Policy evaluation

Now, in 2021, it is time to look back and conclude whether the Sand Motor has been a success. Cautiously, because the Sand Motor is by no means 'finished'. The area will continue to develop over the coming decades. It will also remain important to monitor its progress and the consequences of its further development.

Consultancy firm Rebel carried out the policy evaluation in 2021. For this purpose, it held interviews and studied many documents. The result is an independent assessment, 10 years after construction, of whether the Sand Motor's objectives have been achieved.

Goal 1: Coastal protection

As mentioned, coastal safety along the Delfland coast had already been established in 2011. The Sand Motor has reinforced coastal safety and guaranteed it in the longer term because more sand (than normal) has become available on the coast. The initial expectation was that new dunes would also form, providing additional coastal protection. But the development of new dunes in the period up to 2016 was less than expected. An important reason for this is that a large amount of windblown sand is 'caught' on its way towards the dunes by the two large waters on the Sand Motor: the lagoon and the dune lake.

In the period 2016-2020, however, the development of dunes was well underway. This is visible on the Sand Motor itself. And the pace of dune development may increase even faster in the coming years. One reason for this is that the lagoon and the dune lake are becoming smaller and smaller and can therefore 'capture' less and less sand on its journey towards the dunes.

Goal 2: Nature and recreation

As more sand spreads along the coast, less of it will be left behind. In the long run there will be, at most, a slightly thicker coastal strip, but without the presence of a large sandbar. This ensures that the effects on nature and recreation will also be temporary. They will exist for as long as the Sand Motor remains large enough for nature to develop and for people to enjoy the area.

In terms of landscape and dynamics, the Sand Motor is a valuable area. The diversity of plant species has not increased enormously, but the conditions (such as drifting sand) are unfavourable for that. There does seem to be a richer diversity of benthic animals (such as shellfish and snails). This in turn attracts many shorebirds. The Sand Motor appears to be very suitable for shorebirds searching for rest and food, but not for breeding shorebirds. Recreational users (especially their dogs) cause too much disturbance.

The area attracts recreational users. Seaside visitors to a lesser extent because the area is less accessible than other beaches in the vicinity and because the surf is further away. The Sand Motor (the lagoon) has proved to be unexpectedly popular among kite surfers. They have become a fixed characteristic in the area. Furthermore, the perception of visitors has been measured and appears to be very positive.

Goal 3: Knowledge and innovation

The Sand Motor has been important in developing knowledge about innovative coastal maintenance. This is due to a well-functioning combination of monitoring ('what do we see happening?') and scientific research ('how can we explain that?'). There was a ten-year monitoring programme, commissioned by Rijkswaterstaat and led by Deltares, in which a large amount of data was collected. Several Dutch universities also played a role in the research programmes NatureCoast and NEMO, which have been described as valuable collaborations between knowledge institutions and disciplines.

No similar design to the Sand Motor has emerged since 2011, except for Bacton in England. Nevertheless, the knowledge and innovation value of the Sand Motor is considerable. According to many, the Sand Motor has kickstarted a focus on innovative coastal maintenance. The Sand Motor has been an inspiration for other so-called 'sandy' coastal protection projects in the Netherlands. And it was partly thanks to the Sand Motor that the replenishment in England was realised.

Additional objective: Management

A management objective was also formulated after the construction of the Sand Motor. In short: 'to gather the right information to be able to manage the Sand Motor properly'. There are three forms of management:

- *Surveillance and beach monitoring,* aimed at beach and swimming safety (quicksand, slack water, etc.).
- *Nature and recreation management*, aimed at providing information for visitors, cleaning, monitoring flora/fauna and ad hoc management measures.
- *Nature management of Solleveld (the dune area behind the Sand Motor)*, aimed at preventing any adverse effects of the Sand Motor on the nature in this area.

Photo: Jurriaan Brobbel

In the field of supervision and beach monitoring, the risks have proved to be easily manageable and there was good cooperation between agencies. Nature management in Solleveld also went well. Initially, it was thought that the Sand Motor could have a negative impact on the nature in Solleveld, but in practice this did not happen or was managed well. This also applies to the risk to drinking water production, for which a drainage system has been successfully installed.

Logically, there is some friction between nature and recreation. The presence of humans inevitably hinders the development of nature. This pressure has also been visible on the Sand Motor. The decision not to designate separate recreational zones, but to view the Sand Motor as a single nature and recreational area, has led to the disturbance of brooding shorebirds caused by the presence of people. Motorised traffic and cleaning activities have slowed down the development of vegetation and new dunes. Over the course of time, however, appropriate management agreements have been made. To give nature more space.

What is the conclusion?

Those involved largely regard the Sand Motor as a success story. Most people indicated that, with the benefit of hindsight, they would like to see the Sand Motor constructed again. One of the most important success factors mentioned was an underlying respect for the dynamics and uncertainty of the Sand Motor, and that there was not an overwhelming focus on results beforehand.

For the same reason, it is not possible to say with absolute certainty whether all the Sand Motor objectives have been achieved. The fact that 'hard' targets have not been set beforehand suits the dynamics and uncertainty of the Sand Motor. What is clear is that an effect has been achieved on all three goals:

- The Sand Motor contributes to long-term coastal protection, even though the growth of new dunes has become clearly apparent in recent years.
- That the Sand Motor has generated attractive space for nature and recreation in the Delfland landscape is beyond dispute. But only temporarily, for as long as the Sand Motor exists.
- The Sand Motor has undeniably contributed to knowledge and innovation in coastal maintenance and is an inspiration for other coastal protection projects.

The lifespan of the Sand Motor is longer than expected. Whether the Sand Motor can be a cheaper, long-term solution than repeated replenishment, is subject to further elaboration of the results.

Photo: Roel Wijnants

The management has sometimes been positive and sometimes negative, but all in all it has not stood in the way of achieving the main goals. The objectives relating to nature and recreation are in conflict to a certain extent, but this is understandable.

Recommendations

The policy evaluation has also produced several recommendations:

1. Formulate a vision for the future - how do we want to proceed with coastal maintenance at this location? Do we want to preserve certain natural areas, for example?
2. Continue to disseminate the Sand Motor - communicate actively about it and bring together insights from the various coastal maintenance pilots.
3. Evaluate the monitoring programme – how has monitoring been significant? And what policy-related value has it had?
4. Continue to monitor - because the Sand Motor has not yet been 'fully developed'. But do reconsider how this can best be organized.
5. Streamline management - reassess the existing management agreements, consider more structure in the coordination between authorities and draw up a vision of who has what role.

Contact

The commissioning parties for the Sand Motor are Rijkswaterstaat (Water, Traffic and Environment) and the Province of South Holland. Rijkswaterstaat is the commissioning party for the policy evaluation 2021. The full policy evaluation can be downloaded from www.dezandmotor.nl.

Rijkswaterstaat
Ministry of Infrastructure and Water Management

ZANDMOTOR MONITORING

provincie Zuid-Holland

The Sand Motor is a pilot project from Rijkswaterstaat and the Province of South Holland in collaboration with universities and knowledge institutions.

Published by

Rijkswaterstaat

For more information go to
www.rijkswaterstaat.nl/en
Tel. 0800 - 8002
(free within the Netherlands)

July 2021 | WVL0621ZB55