

Sand nourishment of a long coastline to combat long-term sea-level rise - NL

1. Policy Objective & Theme

- ADAPTATION TO RISK: Managing impacts of climate change and safeguarding resilience of coasts/coastal systems
- SUSTAINABLE USE OF RESOURCES: Preserving coastal environment (its functioning and integrity) to share space
- SUSTAINABLE ECONOMIC GROWTH: Balancing economic, social, cultural development whilst enhancing environment

2. Key Approaches

- Technical

3. Experiences that can be exchanged

The ability to combat long term sea level rise using the technique of sand nourishment, a method which involves the deposition of a layer of sand on the seabed or beach .

4. Overview of the case

An example of a means to combat coastal erosion as a mitigation measure against sea level rise using soft technical approaches (sand suppletion) whilst maintaining safety, a high-quality living environment and improved nature and recreational values.

5. Context and Objectives

a) Context

The coast of the Netherlands is situated between the northern Wadden coast and the southern estuary of the Meuse, at the North Sea. It consists of 350 kilometres of almost continuous shoreline, without the presence of tidal inlets, sea arms and islands. The coastline consists of sandy, multi-barred beaches and can be characterised as a wave dominated coast. The dunes, together with the beach and the shore face, offer a natural, sandy defence to the sea. Some areas are protected by hard structures such as dykes and dams.

The coast as a whole shows erosive behaviour. In most northern coastal sections, erosion occurs into deep water and the nearshore zone. In most southern sections, sedimentation occurs in the nearshore zone with erosion into deep water. Over the last 30 years, sand loss of approximately 1 million m³/yr has occurred from the coast of the Netherlands into deep water. Erosion is also occurring due to sea level rise and, in some spots, because of harbour dams; breakwaters constructed 30 years ago are still blocking sand flow. Although hard technical fixes had been largely used in the past to combat erosion, sand nourishment has been used since the early 1990's.

b) Objectives

The main objective is to control erosion in different parts of the coastline based upon different sea level rise scenarios. The timescale takes into account three sea level rise scenarios covering 5, 50-100, 100-200 years respectively. There are three options:

1. Keeping pace with sea level changes which entails maintaining the current location of the erosion lines.
2. The inland scenario which allows for the inland shift of the erosion lines. Narrow dunes are widened by creating sand buffers.
3. The offshore solution which focuses on reducing the level of erosion during storms by moving the erosion lines offshore.

The Dutch have further identified ten locations along the coast which will have to be reinforced by 2020 in order to continue to meet needed safety standards. These 'weak links' were revealed in 2003 when tests showed that waves strike the coast with a greater force than had previously been assumed. These approaches for improvement of safety have been integrated with enhancing spatial values (nature, recreation etc.) and involving all stakeholders in the plan development.

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

a) Management

The Ministry of Transport, Public Works and Water Management is the main body responsible at National level with complete responsibility for the work.

b) ICZM tools

The sea level rise scenarios are governed by the national Third Coastal Policy and based upon the Intergovernmental Panel on Climate Change reports. Parliament adopted "Hold the line", a policy which established the 'basal coastline' as the position of the coastline on 1st January 1990, and determined that the coastline should be prevented from moving inland. This is referred to as 'dynamic preservation' because where possible (from a safety point of view) maximum freedom is offered for natural processes. The sand nourishment method has been chosen because it is relatively cheap and because it fits with the natural characters of the Dutch coast. It also allows more flexibility towards combating coastal recession. Each year, approximately 12 million m³ of sand is applied to the beaches or seabed just off the coast.

7. Cost and resources

No information is available.

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

The goal in the short term has been achieved. Good ICZM practice was taken into account (e.g. long term vision, different policy levels (horizontal) and different sectors (vertical policy integration) and stakeholders cooperated). The technique has received good support from the local populations largely because of the effect on recreational activities associated with beach extension and the protection of freshwater induced by the consolidation of dunes.

9. Success and Fail factors

Structural erosion is under control and this soft approach is offering opportunities for new developments. There are also prospects for allowing natural fluctuations whilst unwanted impacts can be stopped or reversed. Only in a few locations which have very steep underwater slopes is there concern about the sustainability of the method.

The effects of using artificial constructions to retain sand are unpredictable and those already built will affect the coast for years. Breakwaters constructed at IJmuiden in 1870, and extended at the beginning of the 1960s, are blocking sand flow as a result of which sand is able to accumulate on two sides. This has enabled the development of the Kennemerstrand beach on the southern side. However, further to the north (Heemskerk, Wijk aan Zee) and to the south (Bloemendaal, Zandvoort), the effects of the breakwaters are still visible as increased coastal erosion. The construction of breakwaters at Hook of Holland has had a similar result.

10. Unforeseen outcomes

Deposition of a layer of sand on the seabed or beach can cause burial of its habitats but also provide new surface areas to be colonised. After sand extraction and nourishment, a decrease in species abundance and biomass occurs, followed by development of opportunistic species. Colonisation of a disturbed area may take place by immigration from its surroundings and by settlement of larvae from the water column. As a result of beach nourishment the safety of the dunes increases but can affect the local morphology of banks and gullies. This might have consequences for navigation, especially close to the harbour. Although the policy has proven to be successful to keep the coastline at its 1990 position, there is increased concern with regard to the fate of the strategic sediment reserves in deeper water, in view of sea level rise, new claims for sand mining and construction of new harbours

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13. Sources

- A Case Study Documenting Coastal Monitoring and Modelling Techniques in the Netherlands (2005). Isle of Wight Council. MESSINA Project.
- 3e Kustnota. Traditie, Trends en Toekomst (2000). Ministerie van Verkeer en Waterstaat.
- Nota Ruimte. Ruimte voor ontwikkeling (2006). Ministerie van Verkeer en Waterstaat.
- Procesplan Zwakke Schakels in de Nederlandse Kust (2003). Ministerie van Verkeer en Waterstaat.
- Sistermans S & Nieuwenhuis O. (2004): Holland Coast (The Netherlands). Eurosion case study.
- Towards an Integrated Coastal Zone Policy: Policy Agenda for the Coast (2002). Ministry of Transport, Public Works and Water Management (V & W), Directorate-General of Public Works and Water Management.

	3e Kustnota Traditie, Trends en Toekomst_2000 (1.79 MB)	
	A Case-Study Netherlands MESSINA_2005 (295.57 KB)	
	Holland Coast (The Netherlands) (477.49 KB)	
	Nota Ruimte_2006 (14.36 MB)	
	Procesplan Zwakke Schakels in de Nederlandse Kust_2003 (297.62 KB)	
	Towards an Integrated Coastal Zone Policy_2002 (875.34 KB)	