Eco engineering

In the Netherlands, research is ongoing on long-term sediment nourishment strategies for the coastal zone. Large scale sand nourishment on the ebb-tidal deltas is being considered and also being tested (project Kustgenese 2.0), as it might be needed in the future. In Schleswig-Holstein, the possible role of sand nourishments on the island of Sylt for balancing the sediment deficits in the Wadden Sea due to sea level rise is being investigated in the North Sea Region INTERREG-project "Building with Nature", which also includes coastal laboratories in Denmark and the Netherlands.

Interreg North Sea Region Building with Nature
European Regional Development Fund
EUROPEAN UNION

More knowledge for sound decisions

For the future of the Wadden Sea, it is crucial to have a good understanding of the processes of sediment import and export through the tidal inlets. Only then can we make sound decisions on long term management including measures for climate change adaptation. Therefore it is important to monitor and understand the changes in the tidal inlet systems and on the ebb tidal deltas.

Trilateral Cooperation is crucial

The Wadden Sea does not stop at national borders. Trilateral cooperation and exchange of data is important. If we work together and share information, we have more capacity, more data and more field experience. We can learn from the success, failures and insights of others. Under the Trilateral Wadden Sea Cooperation, a trilateral expert group (TG-C) is active that stimulates cooperation and exchange of best practices on climate change adaptation. On the initiative of this group, a morphological overview of all ebb-tidal deltas in the Wadden Sea has been established.

Sand nourishments

More information

Trilateral Climate Change Adaptation Strategy (CCAS) (2014)
www.waddensea-secretariat.org/CCAS

CCAS monitoring report (2017)
www.waddensea-secretariat.org/CCAS-report

Trilateral overview of ebb-tidal deltas of the Wadden Sea (2018)
www.waddensea-secretariat.org/ebb-tidal-deltas-overview

Building with Nature
www.northsearegion.eu/building-with-nature

Kustgenese 2.0
www.helpdeskwater.nl/onderwerpen/waterveiligheid/programma-projecten/kustgenese-2-0

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Images
Front: Aerial photo Amelander Inlet, Rijkswaterstaat
Back: Sand nourishment, https://beeldbank.rws.nl, Rijkswaterstaat/ Harry van Reeken
Map: CWSS
Schematic tidal inlet system: Deltares

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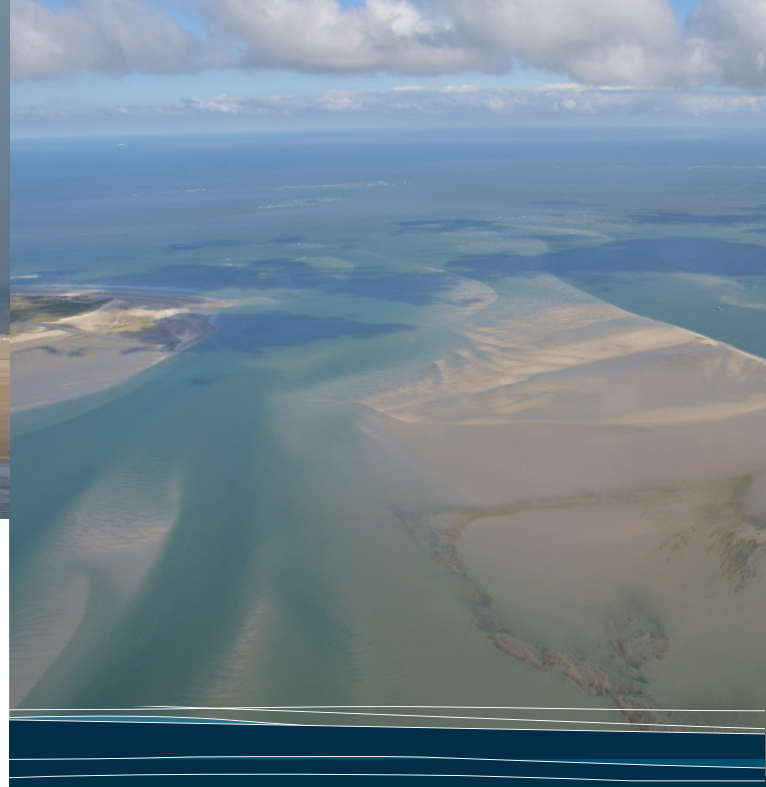


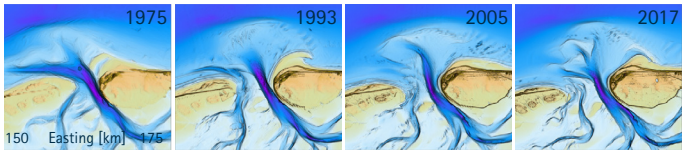
Understanding the TIDAL INLET SYSTEMS of the Wadden Sea

And consequences of a changing climate

UNESCO Organisation der Vereinten Nationen für Bildung, Wissenschaft und Kultur
Das Wattenmeer Welterbe seit 2009
WADDEN SEA WORLD HERITAGE
Common Wadden Sea Secretariat

What are tidal inlet systems and ebb-tidal deltas?

In the Wadden Sea, more than 30 tidal inlet systems with distinct structures exist. At each tide, water leaves and enters the back-barrier basins through these inlets. The tidal currents transport huge amounts of sediment. Where the currents weaken, the transported sediment settles and tidal flats, salt marshes and ebb-tidal deltas develop. In this sense, ebb-tidal deltas develop where the ebb current velocities decrease after leaving the tidal inlet towards the North Sea. Furthermore, waves influence the development of ebb-tidal deltas. Due to their rather remote position outside of the "real" Wadden Sea, the deltas have, so far, not been in the focus of research and management. Relatively little is known about these structures.

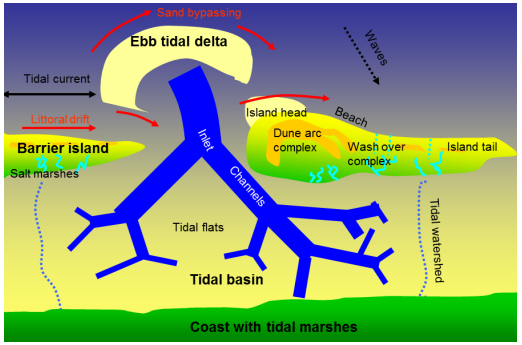


Changes of the Ameland/Borndiep inlet system

Why are ebb-tidal deltas important?

The ebb-tidal deltas contain huge amounts of sand, up to many hundreds of million cubic metres. The ebb-tidal deltas play an important role in the sediment distribution between the barrier island coast and the Wadden Sea. This is one reason why they may become even more important when sea level rises more rapidly. Without sufficient sediment to compensate for the rising sea, the tidal flats and salt marshes will increasingly be submerged, or rather drown and eventually disappear. Instead of Wadden environments, shallow lagoons will evolve. One potential source for this sediment may be the ebb-tidal deltas of the Wadden Sea. An example: the ebb-tidal delta of the Hörnum Tief inlet system contained about 475 million cubic metres of sand in 1975, enough to raise all tidal flats by about 3.5 meter.

The development of ebb tidal deltas is also important for coastal zone management of the islands. Changes in the configuration of a tidal inlet can have major impacts on coastal development. For instance, changes in the Ameland/Borndiep inlet system have caused strong erosion of the island tail of Terschelling and large changes on the west coast of Ameland.



Formation of ebb-tidal deltas

Interventions to adapt to sea level rise?

Natural dynamics are an important asset of the Wadden Sea. In the trilateral Climate Change Adaptation Strategy (CCAS), natural dynamics are a leading principle with regard to climate change adaptatoin, as it increases the resilience and adaptive capacity of the Wadden Sea ecosystem. But there are limits to the capacity of the natural system to adapt. We do not exactly know these limits and they differ for each inlet system. Along the island coasts sand nourishments are executed for coastal maintenance. With these nourishments sediment is added to the coastal zone, which supports the system in adjusting to sea level rise.

Tidal inlet systems of the Wadden Sea Area