

# THE WADDEN SEA

The Wadden Sea is the largest tidal flat system in the world. It stretches 500 km along the eastern and southern coastline of the North Sea, covering an area of 11,500 km<sup>2</sup>. Since 1978, the three Wadden Sea countries Denmark, Germany, and the Netherlands have worked together to protect the Wadden Sea as one ecological entity. The Wadden Sea Plan (WSP) is the policy framework developed to harmonise the trilateral management efforts of the UNESCO World Heritage Site, 'to achieve, as far as possible, a natural and sustainable ecosystem in which natural processes proceed in an undisturbed way'.

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# WHAT WE DO

The Trilateral Monitoring and Assessment Programme (TMAP) was launched in 1997 to assess the status of the Wadden Sea ecosystem. The programme focuses on the morphological and ecological processes of the Wadden Sea, including the impact of human activities. The trilateral 'Expert Group Salt Marshes and Dunes' monitors the vegetation, habitats and area of both salt marshes and dunes.

Salt marshes and dunes are the result of dynamic geomorphological, physical, and biological processes which control their shape and functionality. Human activities add to their spatial and temporal dynamics. As salt marshes and dunes provide essential habitats for a wide range of organisms, while also delivering ecosystem services for society such as coastal protection, or carbon sequestration. Sound knowledge about habitat quality and spatial distribution is required for an effective management.

The "TMAP Typology of Coastal Vegetation in the Wadden Sea Area" (Petersen et al., 2014) has been developed to harmonise the monitoring approaches of the national and regional mapping schemes. It translates all known mapping units into common TMAP types and assigns them to habitat types protected by the European Habitats Directive. This allows for monitoring of the changes in area and quality, providing data to assess the progress in reaching the Wadden Sea Plan targets and recommendations for management actions.

*Petersen J., Kers B. & Stock M. (2014) TMAP-typology of coastal vegetation in the Wadden Sea area. Wadden Sea Ecosystems 32: 1-86. Common Wadden Sea Secretariat, Wilhelmshaven.*



THE TRANSITION BETWEEN LAND AND SEA

## SALT MARSHES

Barrier-connected marshes © Rijkswaterstaat, QSR 2017

Salt marshes form the transition between land and sea. They are covered by unique plant species that can tolerate periodic flooding by saline water. Based on their geomorphology and substrate, three main types of salt marshes may be distinguished: a) barrier-connected marshes (35%) which are mainly found on the Wadden Sea islands in the lee of the dunes, b) foreland-type marshes on the mainland (60%) and c) hallig marshes which developed on remnant fragment of historic mainland (5%). Barrier-connected marshes are regarded as natural salt marshes, whereas the foreland salt marshes largely result from coastal engineering. Hallig salt marshes are generally protected by revetments and found almost only in Schleswig-Holstein.

Salt marshes in the Wadden Sea cover over 40,000 ha, representing 1/5 of Europe's coastal salt marshes. After centuries of habitat loss of mainland marshes, both barrier-connected and mainland salt marshes have expanded by 3,750 ha in recent years. Restoration projects, especially de-embankment of summer polders in the Netherlands and Lower Saxony, added 1,160 ha of salt marshes since 1995.



Natural barrier-connected marsh © Martin Stock



Hallig Marsh © Martin Stock

# DUNES

Dune systems develop by plants catching wind-transported sand. A typical succession starts with highly dynamic embryonic dunes on beaches, which develop into white dunes and proceed into grey and brown dunes. Dune slacks can develop within dune systems in low areas with high groundwater availability. On the seaward area of dune ridges green beaches with a mixture of salt marsh and dune slack plant species can occur. The relatively nutrient-poor conditions, small-scale alternations between humid and dry areas and the dynamics prevailing in natural dune systems, create habitat for a unique species community, many of which are endangered.

In total, there are about 20,000 ha of dunes and dune slacks in the Wadden Sea. Most are located on the seaside of the barrier islands, on small islands and a few locations along the mainland coast. Data on long-term development on the entire dune area is not available.



White and brown dunes © Martin Stock



Wet dune slack © Martin Stock

Dynamic embryonic dunes © Martin Stock



## SALT MARSHES AND DUNES

# TARGETS

General targets with relevance for salt marshes and dunes are a) to harmonise different management approaches, b) to harmonise TMAP datasets, including a GIS-dataset on legal protection status, ownership, and land use, and c) to bring the Wadden Sea Plan targets in line with the area's cultural heritage.

## TARGETS FOR SALT MARSHES

- Increase natural morphology and dynamics, including natural drainage of mainland salt marshes, under the condition that the present surface area is not reduced.
- Maintain diversity in salt marsh vegetation in relation to the geomorphological conditions.

## TARGETS FOR DUNES AND BEACHES

- Increase the natural dynamics in connection with the offshore zone.
- Increase the presence of a natural vegetation succession from beaches to grey dunes.

In addition, the habitat types shall maintain favourable conditions for all typical species.

Achieving these targets is threatened by rising sea levels, coastal protection, changing sediment availability, invasive plant species as well as eutrophication, ground water extraction and recreational use. These can lead to the loss of natural coastal habitat and its biodiversity. 



Grazed dune areas © Nicole Janinhoff-Verdaat

## SALT MARSHES AND DUNES

# MANAGEMENT

In line with the guiding principle of achieving natural processes, a management approach of no or minimum intervention is generally preferred to give way to natural dynamics such as cliff erosion or creek formation, and natural expansion of early successional stages in plant communities. However, depending on anthropogenic pressures and influences there may be a need for enhancement of natural dynamics and biodiversity. For example, restoration measures, such as top-soil removal may be considered. Livestock grazing and mowing can be used to enhance vegetation diversity. Both the supply of drinking water to the islands and proper well management prevent drying out of dunes slacks. Defining areas for different management and recreational use may reduce human impact. 

## THE WSP TARGETS

# OUTLOOK

Achieving the WSP targets under changing environmental conditions requires additional knowledge on the functioning of salt marshes and dunes and close collaboration with experts from other disciplines. Our specific aims for the next years therefore are listed below.

We call upon experts and managers from other disciplines to get in contact, so we can start addressing these pressing issues at the trilateral level. Please feel free to reach out to experts from the listed organisations, involved in the trilateral monitoring of saltmarshes and dunes.

## OUR AIMS

### 1. HARMONISE AND IMPROVE THE TMAP MONITORING OF SALT MARSHES AND DUNES

- Implementation of the TMAP monitoring in all Wadden Sea countries
- Expansion of the TMAP monitoring to include marsh accretion rates

### 2. COLLABORATION WITH OTHER EXPERTS TO

- Understand the impact of climate change on salt marshes and dunes and implement a climate adapted management
- Explore nature-based solutions for coastal protection
- Ensure that salt marshes and dunes provide favourable conditions for all typical species

### 3. IMPORTANT RESEARCH NEEDS ARE

- Sediment balance and biogeomorphological feedback
- Anthropogenic impacts on the natural dynamics of beaches
- Climate mitigation potential of coastal habitats through carbon sequestration

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## COMMON WADDEN SEA SECRETARIAT

# PROTECTING AND MONITORING HABITATS IN THE WADDEN SEA

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