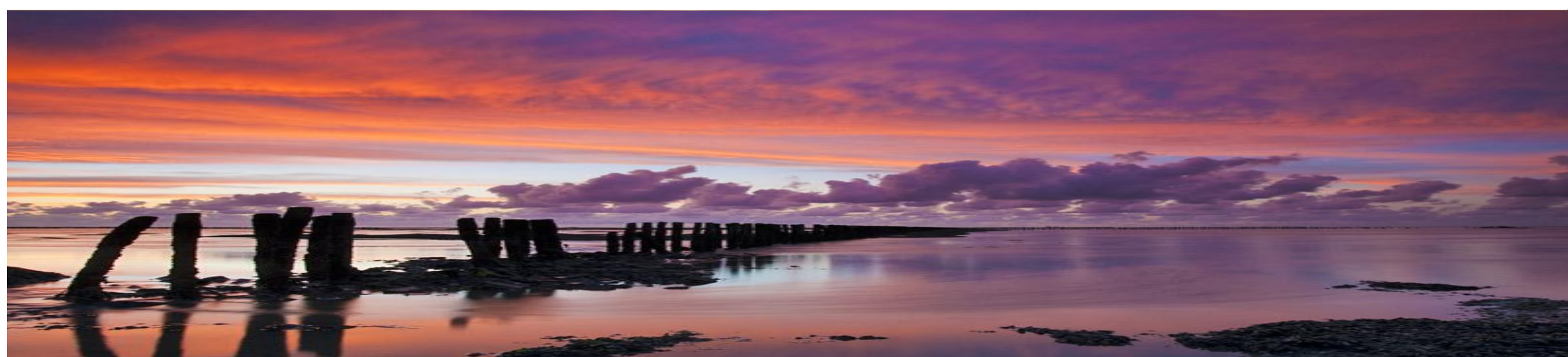




THE WADDEN SEA



Improving Coastal Lagoon Benefits Under Multiple Pressures



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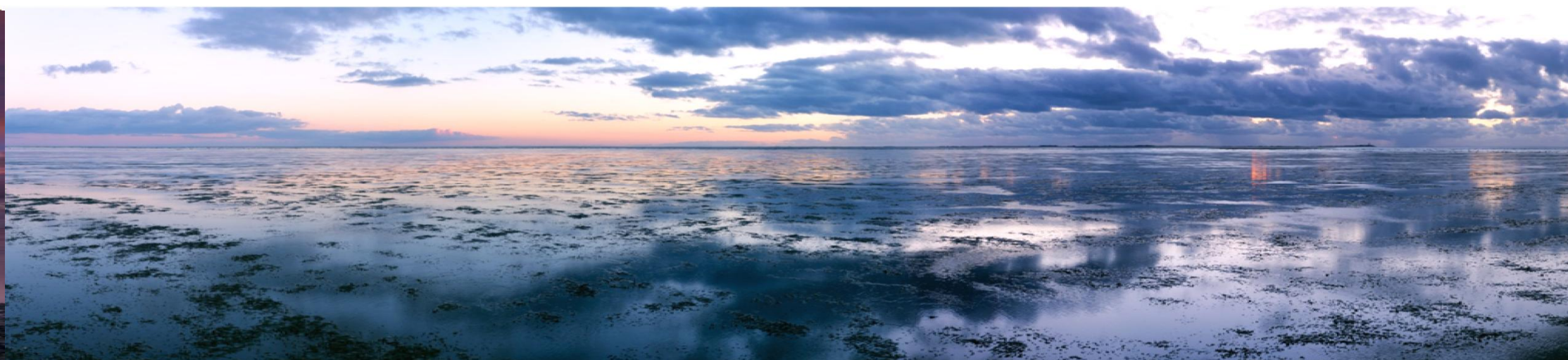


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Background

The Wadden Sea is an international, highly productive estuarine area and one of the largest coastal wetlands in the world. Situated abreast mainland Europe in the south-eastern portion of the North Sea, it borders Germany, the northern portion of the Netherlands, and western Denmark, thereby requiring tri-lateral cooperation in the management and protection of the system. This coastal area is a biodiversity hotspot due to its positioning as a convergence point of multiple domains, including terrestrial, fresh water, brackish and marine habitats. This multi-faceted combination allows for the support of a wide range of wildlife ranging from migratory birds to seals and down to juvenile fish. This system is subjected to highly dynamic natural processes in the context of hydrodynamics and geomorphology, creating a variety of different barrier islands which form the outer barrier of the Wadden Sea, as well as a mosaic of channels, flats, gullies, saltmarshes and other coastal or sedimentary features. The bulk of the system, almost half, is comprised of intertidal flats which provide ample feeding grounds for migratory birds and ideal habitat for many benthic species. It is approximately 500 km long with a surface area nearing 9000 km².

Management

Being such an extensive coastal lagoonal system, the Wadden Sea crosses three international borders and requires the joint cooperation of Germany, Denmark, and the Netherlands in the management and monitoring the natural capital and environmental properties there-in. The area is currently subject to the managerial requirements inherent in being deemed a Natura 200 and UNESCO World Heritage site. Also, the implications of the European Habitats and Birds directives in conjunction with the Water Framework Directive all play integral roles in the manner in which the Wadden Sea is managed. In addition to these over-arching directives, there are multiple regional and national legislations which also affect management decisions, for example the Dutch Nature Protection Act as well as the Flora and Fauna Act or Water Acts which have unique ramifications on Dutch management policies. Additionally several international agreements also play roles within the scope of the Wadden Sea; these include the OSPAR convention, ASCOBANS, and the Bonn Agreement among others. Due to the complexity of the system and multitude of goals and requirements set forth by the litany of legislative accords, there is an explicit need for wholesome integration of the various goals set forth by these directives and close cooperation between the three national bodies in order to assure an effective and coherent management plan. To this end, a Wadden Sea management council has been formed which creates a conduit for integration of the efforts from various national and international bodies conducting research and monitoring of the system as well as providing a forum through which various management strategies can be developed and deployed across the entire Wadden Sea. Currently, there is a heterogeneous mix of management plans focusing on tourism, economic development, and protection of natural capital.

The natural goals of the Wadden Sea currently utilize the ecosystem-based approach in the development of remediation and management plans. In regard to pressure management, strategies vary from the reversal of mainland land reclamation (summer polders) impacts to limiting fishing for blue mussels and mussel seed while increasing the growth of mussel seed on ropes. They also include decreasing the influence of sand extraction and dredging on shellfish and benthic communities, lowering nutrients and pollution (especially oil) introduction, and limiting the collection of cockles to hand raking only. Tourism is now moving towards a higher level of sustainability, due to the assignment of the Dutch and German Wadden Sea as a UNESCO site.

Main Ecosystem Services

Provisioning:

- 1) Seafood from wild animals such as shrimps, mussels, and fish
- 2) Glasswort (*Salicornia*) harvesting for consumption
- 3) Aquaculture in the context of shellfish farming in the deep gullies

Regulating & Maintenance:

- 1) Resting and feeding grounds for resident and migratory birds communities as well as mammalian populations
- 2) Waste treatment and nutrient cycling carried out by the various biotic components throughout the ecosystem
- 3) Carbon storage and sequestration as facilitated by the large primary and secondary production capabilities of the area.
- 4) Maintenance of nursery populations of various fish species and providing the unique mixture of habitats required for juvenile development
- 5) Erosion prevention of the mainland through assisted sediment retention. The barrier islands and wave dampening of the Wadden Sea also provides flood protection of the North-Western European coastline.
- 6) Gene pool protection through the supporting of a wide array of species
- 7) Waterway for trafficking utilized by transportation ferries as well as commercial shipping

Cultural:

- 1) Recreation and leisure in the form of vacationers and eco-tourists coming to appreciate the diverse landscape and multitude of animals which call the area home
- 2) A long history of scientific research has been conducted throughout the Wadden Sea coupled with educational programmes and
- 3) The unique aesthetics, pristine open space, as well as the national heritage from all three countries who claim a portion of the Wadden Sea makes it a cultural staple



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Pressures and Drivers of Change

Due to the extent of the Wadden Sea and its position along strategic coastlines for multiple countries, it has historically and continues to be extensively utilized and modified for societal needs. This has resulted in a number of anthropogenic pressures being placed upon the systems ranging from land reclamation and dredging for shipping channels, thereby modifying the terrestrial and hydrodynamic properties of the system to gas exploitation which has been attributed to the subduction of certain regions and introduction of pollution. Relatively new pressures such as the laying of cables for wind energy farms and alien species introduction have been recently introduced and require further monitoring in order to accurately assess the impacts on the ecosystems.

An emerging issue of great concern is that of climate change. As mentioned above, when compounded with the effects of subduction resulting from gas extraction, it is placing the functionality of the shallow low-dynamic regions at considerable risk. The intertidal zones and the salt marshes also risk becoming compromised as the depths increase leading to marsh flooding and intertidal become sub-tidal. Furthermore, the dredging of shipping lanes has been increasing, especially in the estuaries of the Weser, Elbe and Ems, thereby causing increased siltation and turbidity in these areas.

North Sea

Wadden Sea Focal Area

Netherlands

Germany

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