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Coastal Protection along the North Sea and Baltic Sea Coasts

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Introduction and Overview

The Mean Sea Level (MSL) has been rising at different rates over the past millennia. Inhabitants along the coast have reacted to this in different ways. As a first resource, they left the inundated areas and resettled on higher-lying ground.

For more than 1,000 years, the inhabitants of coastal regions and the shoreline zones of estuaries have protected themselves against the destructive forces of the sea by means of artificial dwelling mounds, dykes and other coastal protection structures. The choice of strategies and priorities depended on the one hand on the degree of protection necessary (the objective), and on the other hand on the technical and economic resources available for constructing coastal protection structures.

People in very early times were only concerned about protecting their dwellings from flooding. The strategy at that time was to resettle on artificial dwelling mounds. Around the 11th century, however, they also began to protect their agricultural land by means of dykes. The dyke profiles developed over the course of the centuries in response to the rise in sea level. The new dykes were built according to the previously registered highest water level plus a small tolerance height. In contrast to the strategy adopted nowadays, no account was taken of expected future conditions. Dyke construction and dyke maintenance were tasks undertaken by farmers. With an increasing awareness of the importance of dykes for the well-being of the local community, larger groups gradually took on responsibility for dyke construction and maintenance. Due to the limited technical resources then available, an enormous amount of physical effort was required to build the dykes and protection structures. Due to the fact that these structures were often destroyed by storm surges in a matter of hours, many people lost their lives or were forced to resettle.

This vacillating development of coastal protection over almost two millennia up to the present-day appearance of the coastal zone is inseparably linked to the history of the landscape. Today, this has resulted in a special relationship between the inhabitants of the lowlands and the marshes as well as the Wadden Sea and the land where their ancestors bitterly fought against and often lost their battle against the destructive forces of the sea.

In the case of the one and only German deep-sea island, Helgoland, the original incentive for coastal protection had little to do with agriculture but was far more concerned with the strategic importance of the island and its relevance to maritime shipping. An additional concern today is the preservation of the island in the interest of its inhabitants.

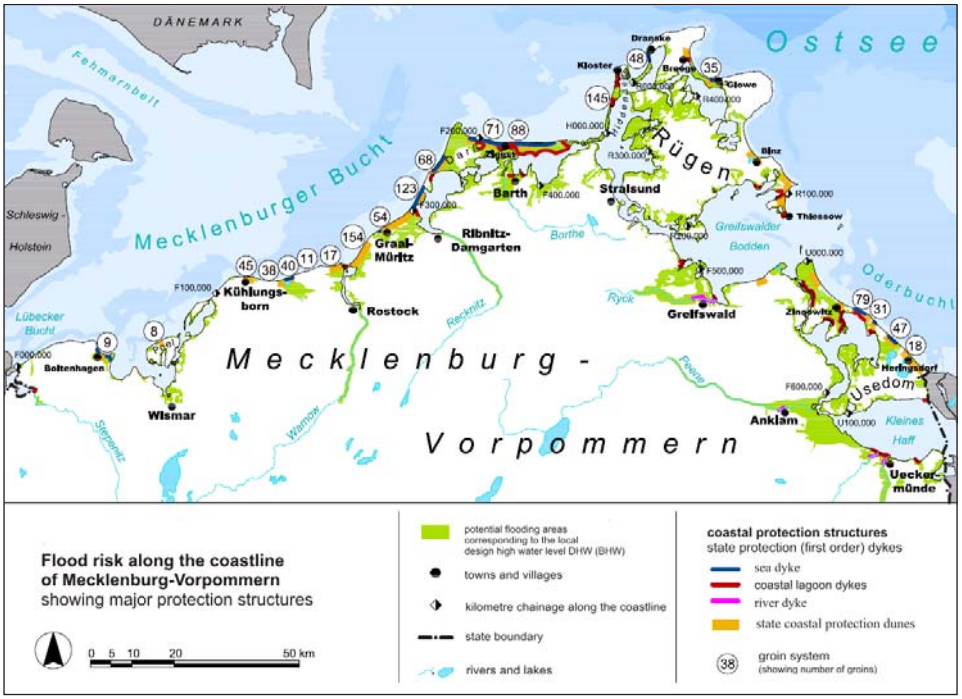
Totally different bio-geographical conditions exist on the Baltic Sea coast. In contrast to the North Sea coast, the number of interconnected low-lying areas on the Baltic Sea coast is relatively small. The history of coastal protection along this coast is hence shorter. Systematic coastal and flood protection along the coastlines of the Baltic Sea only began in the first half of the 19th century.

Coastal protection is an expression of the historically-rooted and justified wish of coastal inhabitants to protect life and property against flooding and to avoid losses of land. Socio-economic utilisations such as colonisation, agriculture or industrial production in

these coastal lowlands were first made possible by coastal protection and can only persist in the long-term under the precondition of a functioning coastal protection strategy. Besides flood protection, certain coastal regions are protected by means of groin construction, beach replenishment and other measures in order to avoid or reduce land losses due to erosion. Coastal protection in terms of the protection of individuals, settlements and tangible assets against sea attack does not necessarily mean, however, that every flood event or loss of land can always be prevented. The fact that absolute protection is not possible means that coastal protection measures must strike a balance between the utilities or objects to be protected.

Special problems are posed by flood protection in built-up areas directly exposed to storm surges. Due to the fact that dyke construction is often not possible in such cases due to lack of space or town-planning restrictions, alternative solutions are required.

Coastal protection is not an intrinsic task of the state. The protection of property against hazards is essentially the responsibility of the property owner himself. During the course of historical developments, however, the state or regional water and land associations have increasingly accepted this liability for coastal protection measures in so far as these are necessary in the interest of the well-being of the community at large.



Planning practice in the field of coastal protection is based on master plans which are similar in character to special plans. These are neither binding for municipalities and districts nor for other planning bodies, but should rather be considered as programmatic statements by the Minister responsible with self-binding effect. For this reason, the coastal protection master plans do not fulfil the requirements of §§ 19a to 19d of the German Nature Conser-

vation Law (BNatSchG). As a special plan, the master plan is therefore not subject to environmental impact assessments.

Almost all states with coastlines have drawn up a master plan. The "Lower Saxony/ Bremen Coastal Protection Master Plan – mainland –" was published as a joint master plan for these two federal states in 2007. The "Coastal Protection Master Plan – Integrated Coastal Protection Management – in Schleswig-Holstein" was published in 2001. The "Coastal and Flood Protection Master Plan for Mecklenburg-Vorpommern" has existed since 1994.

In accordance with the Hamburg "Flood Protection Construction Programme", all public dykes and flood protection walls are rebuilt, reinforced or raised as necessary. The construction programme is updated at regular intervals. In accordance with the 1976 "Framework Concept for Improving Storm Surge Protection", the public flood protection facilities in the City of Hamburg were supplemented by private flood protection facilities in the port area. The private flood protection facilities in the Port of Hamburg are mainly intended to protect valuable goods and installations.

The master plans generally include a description of the bio-geographical conditions pertaining to the respective coastal regions. This is accompanied by a documentation of the utilisation of the respective regions, which provides a basis for formulating the aims of coastal protection measures and the required safety standards. The existing coastal protection structures are represented and assessed in lists and maps. An important component consists in the dimensioning base data, which, unless pursuant to the statutory regulations, are described in detail in the master plan. The dimensioning data finally indicate which structures should be constructed or reinforced in order to guarantee the necessary safety standard for a defined future period of time.

Within the framework of this synopsis of necessary construction measures, a priority categorization is undertaken in which a degree of urgency is assigned to each construction measure depending on the extent to which the structure is under-dimensioned, its structural state and also to some extent the gross value of the land or property to be protected. A cost estimate not only permits a determination of the required overall costs of the respective master plan, but also enables an appropriate medium-term plan of action to be implemented in combination with priorities. In addition, the plans clearly indicate special features typical of the region arising from bio-geographical or administrative differences.