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Coastal protection and flood defence



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Coastal protection and flood defence involves protecting the coast and the coastal regions from ocean flooding, shoreline retreat and erosion, and safeguarding the tidal flats. Only with the construction of dykes did it become possible to establish viable spaces for people to live and work along the coast.

1 A brief history

Only with the construction of artificial dwelling mounds known as terps approximately 2,000 years ago and of dykes in the past 1,000 years did it become possible to establish viable spaces for people to live and work along the coast. The first dykes built with wooden reinforcements can be traced back to the 15th century. The experiences of coastal inhabitants led to a German saying: *Kein Deich – kein Land – kein Leben* ('No dyke, no land, no life'). Not only did the people on the coast need protection against storm surges, but also those living along the tidal rivers Eider, Elbe, Weser and Ems and their tributaries.

2 What is coastal protection and flood defence?

Coastal protection and flood defence can be defined as the entirety of technical measures taken to protect coastal living spaces from ocean floods and land loss. In the State Water Act of Schleswig-Holstein (*Landeswassergesetz des Landes Schleswig-Holstein, LWG SH*), coastal protection and flood defence is further defined in section 62 as protection against shoreline retreat and erosion, including safeguarding the tidal flats. It comprises:

- *coastal flood defence* of low-lying areas against ocean flooding by building, reinforcing and maintaining dykes, artificial dwelling mounds known as terps, barriers and other flood protection measures (▷ *Flood protection*),
- *coastal protection* to prevent shoreline retreat and erosion by building, reinforcing and maintaining groynes, revetments and breakwaters, by preserving dyke forelands, and other measures. Of equal importance to the coasts and coastal regions are the lowlands and shores affected by the sea.

3 Legal framework

The European Union's (EU; ▷ *European Union*) Directive on the Assessment and Management of Flood Risks (Directive 2007/60/EC, Floods Directive) provides the higher-level EU legal framework for coastal protection and flood defence. This directive was transposed into national law in Germany when the amendment of the Federal Water Act (*Wasserhaushaltsgesetz*) entered into force on 1 March 2010. This legislation establishes general requirements for coastal flood defence, which in turn affect ▷ *Spatial development* and settlement development in the coastal lowlands. Areas with significant potential flood risks were identified based on the effects of past floods. The objective risk for these areas in various hydrological scenarios was determined and represented in flood hazard and risk maps. On this basis, the measures envisaged for mitigating existing risks and controlling residual risks have been compiled in flood risk management plans (▷ *Risk management*).

In Germany, the federal states of Bremen, Hamburg, Mecklenburg-Western Pomerania, Lower Saxony and Schleswig-Holstein undertake coastal protection and flood defence activities. Though the statutory bases of these activities are comparable, they do differ from state to state. While

coastal protection and flood defence in Bremen and Lower Saxony is mostly delegated to the dyke associations as self-regulatory bodies under federal state law, in Mecklenburg-Western Pomerania and Schleswig-Holstein it is largely the federal state's responsibility. Because of the importance of its port, in Hamburg the Hamburg Port Authority is responsible along with the city government for coastal protection and flood defence in the port area. The regulations that apply in Schleswig-Holstein are discussed below.

According to the provisions of the State Water Act of Schleswig-Holstein, coastal protection and flood defence is in principle a duty of those who benefit from it. In addition to this, individual tasks are assigned to certain bodies. According to section 63 of the Act, the construction and maintenance of dykes, breakwaters and related structures required for the *> Common good* is a public duty; the federal state of Schleswig-Holstein is responsible for the land-protection dykes (section 64(2) no. 1), the regional dykes (section 64(2) no. 2) on the *Halligen* and islands, and the breakwaters (section 64(3)) to the *Halligen* and islands. The water and soil boards are responsible for all other regional dykes (section 64(2) no. 2), the secondary and inland dykes (section 64(2) nos. 3 and 4), and other structures (section 64(4)). If the formation of a water and soil board is deemed inexpedient, the local authorities are responsible for construction and maintenance. The federal state of Schleswig-Holstein is responsible for preserving dyke forelands (section 64(8)) to the extent that this is necessary in order to safeguard the protective function of the dykes it is obligated to maintain.

According to section 66 of the Act, all parties responsible for maintenance are required to compile and maintain a register of their coastal protection and flood defence structures or inland dykes, and to update it in the event of any modifications. In Schleswig-Holstein, coastal protection and flood defence structures are listed in an official water management register (*Amtliches Wasserwirtschaftliches Gewässerverzeichnis Schleswig-Holstein, AWGV-SH*) or in a coastal protection and flood defence information system (*Küstenschutz-Informationssystem, KIS*).

4 Planning and coastal protection and flood defence

The requirements to be observed when safeguarding the coasts are drawn up by the federal states in overarching, comprehensive plans; however, these plans differ in their designation and structure. The contents of Schleswig-Holstein's current general coastal protection and flood defence plan (*Generalplan Küstenschutz*) (MELUR-SH 2013) are discussed below.

The general coastal protection and flood defence plan is reviewed and revised every ten years; the first general coastal protection and flood defence plan was drawn up after the 1962 North Sea flood disaster. These general plans describe how well the protective infrastructure and its surroundings are holding up according to the latest data and draw conclusions on the measures required, for coastal protection and flood defence in general and for land-protection dykes in particular, to safeguard the coastal population. The current version of the general coastal protection plan was adopted by the federal state government of Schleswig-Holstein in 2022. It forms the basis for the implementation of coastal protection and flood defence measures.

The general coastal protection and flood defence plan is supplemented by sectoral plans (Minister-President of Schleswig-Holstein, undated). The sectoral plans reflect the current state

of knowledge on the status of coastal protection and flood defence, the structure of the coast, the load parameters, and the development and uses of the coastal area (▷ *Spatially-relevant sectoral planning*). They describe the scope and effects of the measures carried out thus far – to the extent that relevant documentation is available – and serve as a basis for the technical planning of coastal protection and flood defence measures and other planning for coastal areas. There are sectoral plans for the Baltic Sea coast and the islands of Sylt, Föhr and Amrum. The sectoral plan for government-operated coastal protection and flood defence sets out the general planning (▷ *Planning*) for the maintenance of coastal protection and flood defence structures and lists tasks and objectives. These compendia are supplemented by databases on coastal protection and flood defence in Schleswig-Holstein (Stadelmann 2008, 2010).

Coastal protection and flood defence is inextricably linked to the drainage of lowlands. Topographical and hydrological conditions and the sea level have a significant impact on the drainage of low-lying coastal areas. Sluice gates and pumping stations form the interfaces between coastal protection and flood defence structures and bodies of water. Accelerating sea-level rise, the subsidence and settling of organic soils, and more intense precipitation are intensifying the demands on ▷ *Water management* in the marshes and lowlands at or below sea level in the coastal regions. In 2014, the final report of the *Niederungen 2050* working group (Marschenverband Schleswig-Holstein e. V. / MELUR-SH / Arbeitsgruppe Niederungen 2050 2014) presented the first draft proposals for possible adaptations required to meet intensifying future needs.

The options for and limits of adapting both coastal protection and flood defence structures and water management infrastructure (▷ *Infrastructure*) are determinative for settlement development (▷ *Settlement/settlement structure*) that is focused on healthy living and working conditions; they are also reflected in the priority areas and reserve areas used in ▷ *Spatial planning* (▷ *Priority area, reserve area and suitable area for development*).

5 The Wadden Sea

The Wadden Sea Strategy 2100, published in 2015, describes ways to preserve natural habitats in the Wadden Sea and to ensure the safety of the coastal population in various scenarios of accelerated sea-level rise (cf. MELUR-SH 2015). The next steps in the strategy should be taken in a partnership between coastal protection and flood defence and nature conservation organisations (▷ *Nature conservation*) and with the active participation of regional stakeholders (▷ *Region*). The future course for subsequent coastal protection and flood defence and nature conservation measures should be set jointly by the aforementioned organisations and stakeholders.

As part of the ▷ *Provision of public services*, coastal protection and flood defence is an essential prerequisite for the success of ▷ *Integrated coastal zone management* (ICZM) as an informal management approach. Through integration, communication, coordination and participation, it aids in the sustainable development coastal and marine regions. In 2003, the federal state government of Schleswig-Holstein drew up an ICZM framework plan (Interior Ministry of Schleswig-Holstein, 2013) that accounts for the Recommendation of the European Parliament and of the Council of 30 May 2002 concerning the implementation of Integrated Coastal Zone Management in Europe (2002/413/EC, OJ no. L 148, 6 June 2002, 24-27) and the national ICZM strategy.

6 The Joint Task

The Federal Republic of Germany provides financial support to the federal states for infrastructure measures in ▷ *Rural areas* according to the law on the Joint Task for the Improvement of Agricultural Structures and Coastal Protection and Flood Defence, including measures to improve safety against storm surges on the North Sea and Baltic Sea coasts and on the flowing surface waters in tidal areas. This requires that the objectives and requirements of spatial planning (▷ *Objectives, principles and other requirements of spatial planning (Raumordnung)*), regional planning (▷ *Federal state spatial planning, federal state development*), environmental protection and nature conservation be observed.

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