

Chapter 4. Aligning coastal risk decision making and funding responsibilities on the German Baltic Sea coast

This chapter provides an in-depth look at the German federal state of Schleswig-Holstein, which has differing coastal risk profiles on its North Sea and Baltic Sea coasts. By examining adaptation and coastal protection decisions in several communities on the German Baltic Sea coast, this case study will illustrate the enabling factors and barriers to central government support for local level action to address long-term coastal risks driven by sea-level rise.

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4.1. Overview

The German coast, located on both the North Sea and the Baltic Sea, encompasses five federal states (*Länder*): two are densely populated urban areas of Hamburg and Bremen, the other three contain a mix of small to mid-sized towns and sparsely populated rural areas, mostly used for agriculture.

The relevant German laws (state water acts) stipulate that coastal flood and erosion risks are a private responsibility. Only if public interests are concerned, public administration (Federal States, Water and Soil Associations (WSA), municipalities) is responsible. The division of public responsibilities is stipulated in the law. For instance, the state is responsible for the so-called state dikes (i.e. embankments), regional embankments on the islands and coastal erosion protection on the islands, whereas the WSA and (a few) municipalities are responsible for regional embankments along the mainland coast. Further, states also have significant responsibilities regarding adaptation to climate change. The federal government's responsibilities are to support research and knowledge sharing on adaptation, while the states are responsible for developing regional adaptation strategies. The states are also responsible for integrating climate change into planning instruments. Regarding sea-level rise in particular, states are thus responsible for integrating climate change into coastal protection and flood defence (CPCFD) strategies and land-use planning. The extent to which these responsibilities have been formalised varies across states, with some having already enacted laws addressing both climate change mitigation and adaptation (*Klimaschutzgesetz*) and others having only established sectoral plans addressing adaptation (BMUB, 2017^[1]).

While there is variation across the different federal states, generally some responsibilities in these areas also remain with local authorities (public obligations as stipulated in the respective laws).

This case study explores how federal state planning and finance for CPCFD, as it is defined in state law and adaptation to sea-level rise (SLR) is addressed in the federal state of Schleswig-Holstein, and how local communities are involved in these processes. The focus is on CPCFD, thus including both hard (e.g. dikes or embankments) and soft (e.g. beach nourishment) measures, and how SLR information is included into decision making and financing of coastal protection. As the case study focuses on current practice, less attention is given to other adaptation measures, such as accommodation or retreat, as these are less prominent in Schleswig-Holstein. Indeed, as we discuss below, the federal state law focuses on “protecting life and limb” with an emphasis on providing CPCFD. While flood insurance has recently become available in Germany, it is not yet widely taken up in coastal areas.

The following section discusses the strengths and weaknesses of governance arrangements addressing coastal risks. In terms of strengths, the federal state master planning process is discussed, and how adaptation has been incorporated into it through building in flexibility to hard protection measures. In terms of weaknesses, sharing of responsibilities presents barriers to local authorities raising funds on their own, due to the lack of transparency of federal state funding decisions, and ambiguity in the law. Further, emerging lessons regarding strengthening existing institutional arrangements to incorporate a consideration of a broader range of adaptation measures and pathways in the federal state planning processes are discussed.

4.1.1. Current flood risk exposure, historical damages and trends

In the German federal state of Schleswig-Holstein, exposure to coastal hazards and risk levels differ at the states' North Sea and Baltic Sea coasts. Extreme high water levels are higher and large storm surge events have occurred more frequently at the North Sea. The most recent significant flood event took place in 1962, with storm surge heights of up to 5.8 m above mean sea level (MSL) (von Storch and Woth, 2008_[2]). This event caused widespread damage and hundreds of fatalities. In contrast, at the Baltic Sea, the most recent major flooding event occurred in 1872, with a storm surge height of 2.5-3.3 m above MSL. In these flood risk areas, around 250 000 people live at the North Sea while only 91 000 live at the Baltic Sea. Similarly, assets in the flood risk zone at the North Sea (EUR 31 billion) are about double those at the Baltic Sea (EUR 15 billion). However, gross value added are very similar (EUR 4.3 billion for the North Sea and EUR 4 billion for the Baltic Sea), as are the number of jobs in the flood risk zone (both approximately 85 000) (MELUR, 2012_[3]).

Considering future risks, it is projected that sea-level rise will increase storm surge flood hazard in the future, significantly reducing the return periods of major storm surge events. Assessing vulnerability to SLR at national, regional and local levels in Germany, Sterr (2008_[4]) notes that it is not possible to ascertain significant trends in extreme storm floods, partly due to the lack of long time-series data. However, applying a sea-level rise scenario of 1 m by 2100 to the current storm flood frequency distribution leads to a significant reduction of return periods for extreme water levels. At Cuxhaven on the North Sea, for example, the current 1-in-100-year flood event is reduced to a 5-year flood event in 2100. While on the Baltic Sea, the reduction in return periods under SLR may be even more significant because of the micro-tidal environment, i.e. the near absence of tides, gives rises to a gentle storm flood frequency curve. Thus, at Travemuende on the Baltic Sea, maximum flood levels, with a return period greater than 1-in-250 years in the past, would be reduced to a 1 in 2-10 year period (Sterr, 2008_[4]).

Coastal erosion and cliff retreat is also a salient issue on both the North Sea and the Baltic Sea coasts in Schleswig-Holstein. For instance, the federal state has spent approximately EUR 6 million annually for over 30 years on combatting coastal erosion on the North Sea island of Sylt alone (MELUR, 2012_[3]). Future SLR will also exacerbate risks in this regard. A 2005 study found that in the German Wadden Sea area, for SLR rates of up to 5 mm per year, coastal erosion could be addressed with locally available sediment material. For higher SLR rates, locally available sediment would no longer be sufficient to present loss of coastal land areas in the Wadden Sea (MELUR, 2012_[3]).

4.1.2. Measures in place in the federal state of Schleswig-Holstein

Historically, coastal flood protection levels have differed widely on each coast. There are 540 km of coast at the Baltic Sea in Schleswig-Holstein, only short sections of which are protected at all. State dikes, the highest level of protection, at an average height of 4.0-4.6 metres above MSL, protect 67 km of coast. An additional 54 km of Baltic Sea coast are protected by regional dikes, which do not have a uniform design standard and generally do not protect to the same level as state dikes (MELUR, 2012_[3]). At the North Sea, the situation is quite different, as state dikes protect 364 km of the 553 km long coast, and the state embankments have a general height of about 8-9 m above MSL. These differences reflect varying hydro-morphological settings between the coasts. On the North Sea coast, a mean tidal range of up to 4.0 m has to be considered in the necessary height of embankments, whereas the Baltic Sea coast is a micro-tidal environment. Further, due to

the shallow water environment of the Wadden Sea, the surge levels along the North Sea coast are much higher than those along the Baltic Sea coast.

The coastal defence master plan, developed by state governments, is the key coastal risk planning instrument in Germany. It sets out the state dikes' safety standards and areas of general welfare interest. The first Schleswig-Holstein Master Plan was developed in 1963 following the 1962 storm surge, in which the failure of protection led to widespread flooding and several hundred fatalities. The Master Plan is regularly updated (1977, 1986, 2001 and 2012). Flood safety standards have moved towards a more harmonised approach between the North Sea and the Baltic Sea.

The current Master Plan planning process is based on an integrated coastal zone management (ICZM) concept, which was adopted in German federal law in 2006 through the national ICZM strategy (BMU, 2010_[5]). The scope of the ICZM strategy is intersectoral planning for the marine environment, as well as coastal land use, and thus entails coastal protection decisions. ICZM stipulates that all relevant stakeholders for a given planning process are able to communicate their interests in the planning process. This includes federal ministries as well as federal states and their ministries, and private sector actors including civil society. The Master Planning process is thus a participatory process and gives the opportunity for public and private stakeholders to comment, and further requires an environmental impact assessment that considers national and EU regulations for nature conservation. A key instrument in this process is the "Advisory Council Integrated Coastal Protection Management", which exists in Schleswig-Holstein since 1999. Under the chairmanship of the minister responsible for coastal protection, coastal protection stakeholders meet twice a year to discuss general aspects of coastal protection, and major individual measures, in an open exchange and in advance of decisions (see Chapter 3). In addition to the coastal and nature conservation administrations, members include the municipal districts, towns and municipalities, water and soil associations, and nature conservation associations. For example, the updates to the General Plan for Coastal Protection, which take place approximately every ten years, are presented and discussed in depth during its creation, in addition to regional citizens' information events. Approval of the plan rests with the Schleswig-Holstein state government. The ministry responsible for CPCFD (Ministerium für Energiewende, Landwirtschaft, Umwelt und ländliche Räume des Landes Schleswig-Holstein, MELUR) establishes the plan, thereby considering all relevant regulations, comments and the environmental impact assessment (BMU, 2010_[5]).

The 2012 update of the Schleswig-Holstein Master Plan introduced a uniform flood safety standard of the 1-in-200-year event for the entire Schleswig-Holstein coast, partly to meet the EU Flood Directive. The design water height is thus determined using statistical modeling, incorporating an allowance for SLR, provided the resulting protection level against the 1-in-200-year event is not lower than the observed highest water levels. Further, design water heights SLR allowance used a unified 0.5 m MSLR scenario to 2100 for both the North Sea and the Baltic Sea. The sea-level rise scenarios were updated to reflect increases in the projected level and range of future SLR following the IPCC's Third Assessment Report. SLR of 0.5-1.4 m in this century was thus considered in the 2012 Master Plan.

In order to deal with increased future SLR, and also increased uncertainty, Schleswig-Holstein implemented a flattening of the outer embankment slope and a widening of dike crowns from 2.5-5.0 m during their reinforcement. With this profile, the embankment may be further heightened in a second phase at relatively low cost and little planning efforts. Thus, in two phases, an SLR of about 1.5 m can be accommodated. Dike

widening will, as far as possible, occur on the land side of the dike in order not to disturb valuable ecosystems, e.g. salt marshes, on the seaward side.

For areas not under the responsibility of the state, the Master Plan mentions alternative means through which local communities can access federal state funding. For funding purposes, a so-called “*Förderrichtlinie*” (legal conditions for obtaining state funding for CPCFD measures) exists. For instance, the Master Plan mentions that sea-level rise will lead to increasing costs to maintain regional dikes that could overwhelm local authorities. In such cases, the responsibility (and ownership) for these regional dikes can be taken over by the federal state, provided that the dikes in question protect lives and assets comparable to those protected by state dikes. The decision to take over regional dikes is taken on a case-by-case basis and the process must be initiated by the responsible local authority. This is discussed further below (Section 4.2.1).

Finally, a further aspect of the Master Plan concerns measures to protect against coastal erosion. Responsibilities for measures against coastal erosion are stipulated in the State Water Act, i.e. coastal protection measures on islands that are in the public interest (welfare) are a state obligation. For instance, on the island of Sylt, approximately 12 million cubic metres of sand were pumped for beach nourishment at a cost of approximately EUR 61 million between 2001 and 2011. Indeed, annual spending by the federal state at Sylt has been approximately EUR 6 million for combatting coastal erosion since 1983 (MELUR, 2012^[3]). Public interest is underpinned by the fact that 22 000 people live on the island and would lose their place of residence if coastal protection were to cease. The State Water Act and its stipulations are the result of a political debate and represents, as such, a societal consensus (decided upon by democratically elected state parliamentarians).

4.2. Coastal protection responsibilities

4.2.1. Centralised federal state decision making

The German Constitution defines coastal protection as a “joint task” for all citizens (§91a), with associated responsibilities, including financial, distributed between three levels of government (federal [*Bund*], state [*Land*] and municipal [*Gemeinde*]) by federal and state laws.

Planning decisions relevant for coastal protection, e.g. on flood safety standards, are taken at the state level and implemented through these planning instruments. The ICZM and Master Plan require stakeholder consultation, as for example, ICZM plans bring together all coastal stakeholders to integrate planning in the coastal zone, including spatial planning, marine uses, biodiversity (e.g. Natura 2000 sites).

At the local level, two types of local authorities are relevant for coastal protection: WSAs and municipalities. WSAs are formalised as public corporations under the 1937 Federal Water Association Act. The law stipulates, first, compulsory membership for all landowners and municipalities within the assigned territory, below an individually defined contour line. The law also empowers WSAs to charge membership fees according to member benefits. The law further stipulates that WSAs can expropriate land for dike construction.

4.2.2. State and regional dikes

The federal state is thus responsible for the construction and maintenance of “state dikes”, which “protect life and limb” (State Water Act §64). State dikes protect approximately 90%

of the total flood risk areas in Schleswig-Holstein up to the standard of 1-in-200-year event (MELUR, 2012^[3]).

In the remaining flood risk areas, safety standards are lower (MELUR, 2012^[3]). In these areas, “regional dikes” may be implemented, and are not required to meet the state flood safety standard of protection against the 1-in-200-year flood event. “Regional dikes” are the responsibility of either the state (on the islands) or local WSAs or local municipalities. These local authorities need to fund a portion of flood risk-reduction measures themselves, but may receive state funding of up to 90% of investment costs, and 30% of maintenance costs (see Section 4.3).

One difficult issue regarding classifying areas for protection by state dikes is that the key legal term underpinning this classification, “general welfare”, is difficult to objectively define and measure. As mentioned above, state dikes protect nearly the entire North Sea coast, while several communities on the Baltic Sea coast have people and assets located below the 1-in-200-year flood event level with little or no protection. For example, the Baltic Sea communities of Behrendorf (40 residents), Strande (90 residents) and Eckernfoerde (600 residents) all have residents living below the 1-in-100-year flood event level (MELUR, 2012^[3]).

Communities not protected by measures under the responsibility of the state can receive further federal state support through two principle mechanisms. First, local authorities may apply for the reclassification of regional dikes to state dikes. Reclassification of a regional dike to a state dike can take place if the “purpose or significance” of the dike has changed (State Water Act §67). Second, grant funding from the federal state of up to 90% can be allocated for regional dike investment (strengthening) costs. Grant allocations are decided on a technical basis (as stipulated in the publicly available *Foerderrichtlinie*), in which the responsible federal state agency “decides at its own discretion and within the available budget” (MELUR, 2012^[3]).

One reason for these differing approaches to state dike classification is the local interests, which may compete with the public interest in CPCFD. Often measures to improve CPCFD measures, such as state dikes, may interfere with these local interests, as, for example, large dikes may be detrimental to the attractiveness of a beach for tourism. For instance, the Baltic Sea community of Eckernfoerde rejected the offer in the 1970s to establish a state embankment in an attractive area for tourism. Currently, alternative options for flood defence are being explored and negotiated, which would be the responsibility of the city and eligible for 90% co-financing by the state.

4.2.3. State and local responsibilities for coastal erosion

According to state law in Schleswig-Holstein, coastal protection (in the public interest) on the islands is a state responsibility and on the mainland coast a local municipal responsibility. If not in the public interest, coastal protection is the responsibility of the people who benefit. Moreover, the Water Act also stipulates that those whose property is protected can be asked to contribute to the costs of construction and maintenance according to the extent of their benefit (§63(4)).

Thus, where beach nourishment occurs on designated islands, often to ensure island stability and continued existence, the *Land* handles funding and implementation. Extensive beach nourishment has been undertaken by the state at Sylt, as discussed above. In contrast, in areas where beach nourishment addresses other concerns, such as the attractiveness of an area for tourism, local beneficiaries must fund and implement the measures themselves.

For example, in the Baltic Sea community of Strande, erosion of the beach in front of a sea-wall is handled by the municipality.

In practice, determining whether erosion primarily increases flood risk or not has been controversial, and has led to conflicts between state and local levels. In Strande, the municipality has lobbied the state government to assume funding responsibilities for beach nourishment, arguing that despite the presence of a sea-wall, erosion does increase flood risk in the community.

4.3. Coastal risk-reduction financing arrangements

4.3.1. State and regional dike funding

Both the investment and maintenance costs of state dikes as well as regional embankments on islands are 100% funded by the federal state of Schleswig-Holstein (with co-financing from the federal government and the European Union [EU]). For regional dikes along the mainland coast, municipalities or WSAs may receive 90% funding of investment costs from the federal state, and need to cover 10% of these costs themselves. For maintenance of mainland regional dikes, responsible bodies receive a fixed yearly grant from the state. Even this relatively small contribution for investment costs remains a significant barrier in several communities on the Baltic Sea coast (Wolff, 2016^[7]). For example, in the community of Strande, the municipality has not provided the approximately EUR 100 000 needed to receive around EUR 900 000 of federal state support for a coastal protection measure.

4.3.2. Federal funding instruments for coastal protection and adaptation

Federal state investment expenditures are funded in part by the federal government and the EU. The EU co-finances 50% of CPCFD measures. At the federal level, the *Bund* pays for coastal planning, as well as 70% of investment costs for CPCFD. The *Land* must pay the remaining 30% of the investment costs for coastal protection measures. Maintenance is financed 100% by the state.

The principle federal instrument for coastal protection funding is the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (GAK). The GAK reimburses 70% of investment costs for coastal protection measures, as mentioned above, paid out as grants to the federal states, and not otherwise covered by EU funding. Within the GAK, a special instrument (*Sonderrahmenplan*) to speed up implementation of coastal protection due to climate change risks was established in 2009. This provides an additional combined EUR 25 million for all coastal federal states annually until 2025 (EUR 550 million total) on the condition that the coastal federal states spent a total of EUR 109 million the previous year (BMEL, 2013). In the years 2015-17, around EUR 8 million were distributed annually to the federal state of Schleswig-Holstein through this instrument for coastal protection (BEL, 2018^[6]). EU funding of the GAK itself has varied between 5% and 13% annually (BMEL, 2013).

Since 1962, spending on coastal protection in Schleswig-Holstein amounts to EUR 2.73 billion, with EUR 1.84 billion spent on coastal protection investment and another EUR 862 million of federal state funds on maintenance costs. Since the 2001 Master Plan, total spending is EUR 600 million, with roughly half coming from the federal state, 37% from the federal level (Bund), largely from GAK funds, and another 13% from the EU (MELUR, 2012^[3]).

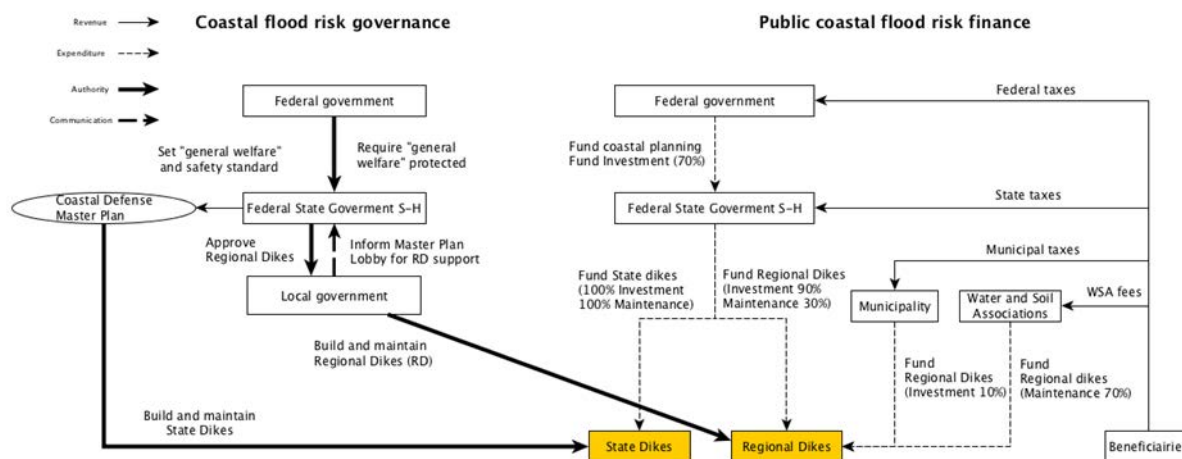
4.3.3. Local funding instruments

At the local level, municipalities are required to fund 10% of coastal flood risk-reduction measures through their general budget. WSAs can raise funds for coastal flood risk reduction through membership fees. However, these are generally not sufficient to cover the 10% of investment costs, e.g. for building new dikes or upgrading existing ones, and are only used for maintenance costs. Further, the state gives a yearly grant for maintenance.

Currently, WSAs face financial challenges in providing adequate coastal flood risk-reduction measures. First, revenue generation is insufficient to finance dike reinforcement and maintenance because the defined areas for fee collection are too small and the fees are too low (Wolff, 2016). Second, even where WSAs are empowered by the law to collect fees, their rights have been challenged. This has been particularly the case in urban areas, where the definition of beneficiaries of protection measures by the WSA has been contested with several lawsuits initiated in urban areas.

Figure 4.1 depicts the coastal decision-making and public finance responsibilities in Schleswig-Holstein. The German federal system distributes responsibilities regarding coastal risk across several levels of governance, and funding responsibilities come from EU, federal, state and local levels, the latter covering both municipal taxes and WSA fees. Some responsibility for funding is put on local entities, i.e. municipalities or WSAs.

Figure 4.1. Coastal governance and financing in the German federal state of Schleswig-Holstein



Strengths and weakness of current arrangements

As shown in Figure 4.1, institutional arrangements regarding coastal risk and adaptation distribute responsibilities across different levels of government. Decision-making responsibilities regarding coastal risk are largely centralised with the federal state, though local authorities in some Baltic Sea communities also take on these responsibilities. Funding responsibilities, particularly for coastal protection, also lie largely with the federal state, while it also receives funding from the federal government and the EU. In addition, local-level funding instruments, e.g. the WSA levy, also have a legal basis in state law, and provide a funding source, albeit relatively small.

Coastal protection measures and planning instruments addressing SLR entail a mix of protection measures, both hard and soft, or nature-based, as discussed in Chapter 2. Due to the increasing strain, particularly on local authorities to invest in and maintain protection measures not owned and operated by the federal state, private individual adaptation measures may also become more important in the future (see Chapter 2). Some of the strengths and weaknesses of the mixed institutional arrangements are discussed below, with a large share of responsibility centralised with the federal state, and local authorities taking on responsibility for dike maintenance and combating coastal erosion, particularly in Baltic Sea communities.

4.3.4. Federal state co-ordination and flexibility to address sea-level rise and uncertainty

One strength of the relatively centralised federal state approach is that it has allowed Schleswig-Holstein to address adaptation in a co-ordinated way across most of its coastline. The Master Plan process, as a planning instrument, introduced a co-ordinated approach to SLR incorporating SLR into the safety standards and protection design height determinations. Further, the Master Plan also addressed the uncertainties associated with mid- to long-term sea-level rise in a consistent and coherent manner for the majority of the coastline, as the buffer built into dike upgrades by flattening the outer slope and widening the crest of existing dikes. This will allow future coastal planners to adjust dike upgrades and dike heightening as information on how SLR is progressing becomes available in the future.

A further strength of the centralised aspects of Schleswig-Holstein's approach involves the ability to prioritise dike upgrades across different segments of the coastline and thus take efficiency and equity into consideration in state spending on coastal risk reduction. Public adaptation budgets in particular, and public infrastructure budgets more generally, are strained, thus decisions on coastal risk and adaptation need to carefully consider project prioritisation. The centralised approach of the federal state Master Plan allows for dike upgrading prioritisation based on engineering criteria, e.g. flow rate from overtopping event, as well as socio-economic criteria such as exposed people and assets.

In contrast, one potential weakness of the current arrangements, in the context of increasing SLR risks and associated costs, is that focus remains largely on hard protection measures. The main reason for this is historical. Hard defences have been put in place in reaction to major past flooding events, in particular, at the North Sea. As a result, more than 350 000 people (on both the North Sea and the Baltic Sea coasts) live in flood-prone coastal lowlands behind embankments. Relocation of these people, their assets and the infrastructure is neither feasible nor enforceable (nor is the need to do so inevitable due to available technical options). Further, state legislation and planning instruments shaping public decision making on coastal risk and adaptation to sea-level rise focuses on a "security" approach. The current legislative framework, as well as the historical legacy of major CPCFD works has, thus, committed the federal state to protect large parts of the North Sea coast at ever increasing cost. For the communities where no state responsibilities exist, financing coastal risk reduction is already burdensome, even with federal state support, and financial burden of pursuing hard protection options is likely to become overwhelming with rising seas, even though local communities may receive 90% co-financing for CPCFD investments from the state.

4.3.5. Local barriers to adaptation to sea-level rise

As described above, in those coastal communities where state obligations (i.e. state embankments, regional embankments and beach nourishment on islands) do not prevail, decision making and funding responsibilities regarding coastal risks remain with local authorities, i.e. either municipalities or WSAs, and thus entail some degree of fiscal autonomy for local authorities.

A potential strength of such an arrangement is that it embodies the subsidiary principle, locating decision making with local actors best-placed to understand the interests of the community. In practice, however, local authorities, i.e. municipalities or WSAs, currently struggle to adequately address coastal flood risk, a situation that is likely to worsen under SLR. Municipalities have often been unwilling to finance CPCFD measures out of their general budgets, even when required investments consist of only 10% of project costs with the remainder being covered by the federal state. Local WSAs are empowered under the law to determine fees charged, and control these revenues themselves. That is, they do not pay into more aggregated funds. However, while the level of fees collected by WSAs vary widely, fees collected generally remain too low to fund 10% of investments. Moreover, in some coastal communities, WSAs are not active at all (Wolff, 2016).

An apparent weakness of the current arrangements with respect to local-level adaptation is a lack of transparency in central government funding decisions, e.g. that decisions are taken on a case-by-case basis. This can act as a barrier to mobilising local-level funding. Such a lack of transparency can lead to the perception of unfairness in federal state funding allocation, and inhibit local communities from collectively funding their own adaptation. For example, the key concept of “general welfare” in federal state law determines the respective responsibility of beneficiaries or the federal state to pay for coastal protection, and is somewhat ambiguous. As discussed above, the definition of “general welfare” is not made explicit in state law, and, determining whether a specific project fulfils this criterion is done on a case-by-case basis. Thus, the process of state dike (re)classification has led to the perception among Baltic Sea communities of a lack of fairness in the allocation of state funds for coastal risk reduction. This perception makes the task of local fundraising for CPCFD more difficult because local communities are unwilling to contribute funds when they perceive that other communities are unfairly receiving high levels of state support.

Another weakness of the current arrangements is the lack of co-ordination between associations, which can also act as a barrier to higher fees, and thus greater revenue generation for the WSAs. Higher fees for one WSA can induce households or businesses to leave an area if fees become too high. Moreover, differences in fees between jurisdictions has exposed the WSAs to lawsuits, several of which have successfully challenged the beneficiary definitions used by the WSAs to assess fees (Wolff, 2016).

In order to address these issues, several mechanisms are in place to support co-ordination from the WSAs to higher levels of government in the development of state plans. First, the ICZM concept underpinning Master Planning in Schleswig-Holstein ensures that there is a process in place in which the preferences and interests of local communities are heard. The long-standing WSAs dedicated to coastal risk provide an effective voice for local interests regarding coastal risk, compared to municipalities, who are responsible for a much wider range of issues facing local communities. Second, specific channels for the WSAs or municipalities to apply for federal state support to address coastal risk consist of grant application mechanisms. Strengthening these mechanisms, through knowledge sharing with local authorities, can address the barriers discussed above, and further enable local-level adaptation.

4.4. Conclusions

Summarising, significant historical damages and more frequent large storm surge events have led to institutional arrangements centralising decision-making responsibilities regarding coastal risks and adaptation, particularly on the North Sea coast of Schleswig-Holstein. Such an approach can improve coastal risk reduction and adaptation efficiency, e.g. by prioritising dike upgrades based on hydrodynamic modelling and socio-economic criteria. Further, the centralised approach allowed this state to include flexibility in hard protection measures (i.e. dike crest widening) to account for SLR uncertainties.

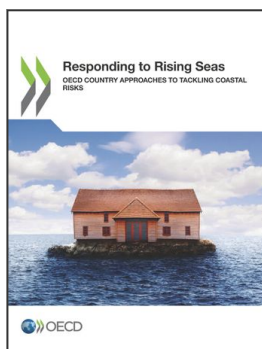
Current institutional arrangements, however, focus federal state interventions largely on hard protection measures, and a “security” approach underlies legislation shaping public decision making on coastal risk and adaptation to sea-level rise. As such, hard protection is likely to continue to be implemented where dikes already exist. Coastal protection planning is implemented through an ICZM concept, with an Advisory Council that convenes stakeholders at all levels, and thus provides space for consultation with coastal communities. An important component of these consultations is to increase awareness regarding rising risks due to SLR, and enable communities to avoid increasing exposure by developing in high-risk areas. Yet, local communities where no state CPCFD responsibilities prevail, located mainly but not only at the Baltic Sea, decide on, and partly (10%) fund, their own risk-reduction measures and safety standards. Such communities are unlikely to be able to address increasing coastal risk under SLR because protection is costly, and other collective measures such as retreat are, especially in the affected local communities, highly controversial.

As noted in Chapter 2, transformational change towards a consideration of a broader range of adaptation measures, and coastal adaptation pathways, is difficult due to local considerations, including short-term economic interests, and other public funding obligations that strain the budgets of municipalities, e.g. childcare provision. Nonetheless, mechanisms for local-level participation in federal planning should continue to be supported in concert with the ICZM concept and practice. Indeed, further support for the WSAs dedicated to coastal flood and erosion risk provide a potentially effective voice for local interests regarding coastal risk. A number of existing instruments, e.g. the committee on ICZM, formal environmental impact assessment procedures and a regional conference prior to Master Plan adoption, are available to local communities for participation. Support, and uptake of the mechanisms by which they can participate in, for example, Master Planning processes, in addition to other channels for accessing state support facilitates an integrated approach to coastal risk, particularly at the Baltic Sea. Such instruments may also facilitate a broader approach to adaptation, as local communities require adaptation solutions that can balance a number of interests, e.g. attractiveness for tourism, as well as flood safety and erosion, with investment costs that are often beyond their ability to fund themselves.

Finally, while coastal risk reduction is implemented by federal states in Germany, difficulty in raising sufficient funds for reducing coastal flood risk is likely to lead to an increasing financial burden on the national tax base. As SLR increases coastal risks in Germany, difficulty in raising funds for ongoing maintenance and repair of existing coastal defences could lead to the effectiveness of coastal protection dropping below current standards. This is, in turn, likely to lead to a growing burden on emergency management to deal with increasing frequency of flooding events and other ongoing impacts of rising seas, which in turn means increasing costs for the general tax base, especially if risks become uninsurable. Thus, achieving effective, efficient and equitable adaptation to SLR is in the interest of Germany's coastal populations as well as the country as whole.

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