

Timmendorfer Strand coastal flood defence strategy, Germany ^[1]

Image from Climate Adapt about this case study

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From 1999 to 2011, the municipality of Timmendorfer Strand in Germany developed and implemented a coastal flood defence strategy using a participatory process. In 1999, a first discussion about an integrated coastal flood defence concept for the community of Timmendorfer Strand started. It was agreed that the concept should be accepted by a large number of stakeholders. Therefore, an innovative method for active public participation including an analysis of social and economic parameters was used in the process of selecting the coastal flood defence measures to be applied. The selected defence measure was a new sheet pile wall integrated in the natural beach ridge. The realisation of the sheet pile wall was completed by 2011. The coastal defence measure was adjusted to the needs of a touristic beach city, e.g. the height allows the sea to be viewed from the beach promenade. Furthermore glazed retention walls were built close to cafes. The coastal defence measure was combined with architectural finishing and landscaping which included for example the reconstruction of the beach promenade.

Case Study Description

Challenges:

Timmendorfer Strand is located at the temperate zone of the Baltic Sea Region and large part of it lays no more than 3 meters above sea level. With respect to climate change, it is mainly threatened from impacts due to sea level rise and storm floods. From a coastal defence perspective, changes in mean and maximum water levels and sea condition caused by climate change are predominantly relevant. Both parameters (water level and sea conditions) are essential basis for the dimensioning of the coastal flood defences.

Since regional climate projections are scarce, the official master plan for coastal defence from the German Federal State Schleswig-Holstein uses IPCC projections combined with regional modelling aspects to generate statements about possible climate change impacts. Sea level and precipitation are expected to rise in the future causing increased hydrological loads on coastal defence measures.

The existing coastal flood defence structures were seen “rather critical”, since it was estimated that a breaching of the spits will occur with a water level of about 2.1 m above mean sea level. Results from the study undertaken by the coastal defence administration showed that Timmendorfer Strand was not enough protected against future flooding (based on increase of seal level rise in last 100 years, and future projections for the next 100 years by 40-60 cm). The fact that the last catastrophic storm surge happened about 130 years ago and that Timmendorfer relies on tourism (depending on broad, idle beaches) led to a sceptical view of the local population towards coastal flood defence. It became clear, that an appropriate coastal defence solution for the area could only be achieved with active participation and acceptance of the local population. Therefore a participatory coastal flood defence process was conducted.

Objectives:

Taking the described challenges (climate related threats and their intensification) into account and given that mean sea level rise in the region amounted to approximately 0.15 cm per year between 1900-2000, it became evident that the main coastal flood defence (which was a natural beach ridge with a maximum height of about 3.5 m above mean sea level) was insufficient to ensure the safety of the population and the economic assets at

Timmendorfer Strand. Hence as coastal ecosystems as well as the population and their property values were in threat of climate change effects, the objectives were:

- to increase risk awareness and communication
- to discuss appropriate solutions based on the communities values and needs with community members, and
- to renew the coastal flood defence structure.

Solutions:

The development of a coastal flood defence measure of Timmendorfer Strand and Scharbeutz was a participatory process. The work started already in 1999 and the last implementation on site was conducted in 2011. The definition of the coastal defence concept followed three steps: assessment of socio-economic values, sensitivity analysis, and an ideas competition.

Firstly, the socio-economic assessment revealed the potential damage in case of a flooding, which highlighted the need for improved coastal flood defence. Socio-economic parameters, like persons employed, tourist bed capacity, economic assets, or yearly gross value added were evaluated. Around 15% of the area is situated less than 3 m above mean sea level and therefore flood-prone. In the early years of the last decade, around 5,500 people lived in this area and capital assets amounting to 3,423 million were counted. This area was not enough protected by coastal defence and would have been flooded if an event like the one that took place in 1872 reoccurred. The 1872-event reached about 3 m above sea level and flooded the entire coastal lowlands of Timmendorfer Strand. The socio-economic assessment was the basis for the second step: a sensitivity analysis with the participatory approach. With a computer-aided model, possible future developments under different sea level rise scenarios were simulated at different stakeholder events. The focus of these meetings was the analysis of how different coastal flood defence measures would affect the community system. The results of this step then formed the basis of the third step: an “ideas competition”, where four engineering offices were asked to develop innovative ideas for coastal flood defence measures.

The agreed coastal flood defence measure was a sheet pile wall integrated in the natural beach ridge. This measure ensures defence of the area up to a storm flood with a water level of 2.50 m above mean sea level. A higher wall was not supported by the majority of the local stakeholders due to the expected consequences on tourism, which is the main economic sector in the community. Moreover, to improve local acceptance of the defence measures, glazed retention walls were built close to cafes, thus enabling the view of the sea.

Importance and relevance of the adaptation:

OTHER_POL_OBJ;

Additional Details

Stakeholder engagement:

Initiated by the Schleswig-Holstein State Ministry for the Rural Areas, State Regional Planning, Agriculture and Tourism (MLR, now MELUR) in 1999, the measure took over 10 years to its finalization in 2011. The main outstanding aspect of the implementation of the coastal flood defence strategy in Timmendorfer Strand is the participatory approach. During the participatory approach, nine working groups meetings and two public meetings were held. At the nine working groups meetings more than 50 local stakeholders (coastal protection authority, fishermen, tourism representatives, local residents and community authorities) participated. The focus of these meetings was the analysis of how different coastal flood defence measures would affect the community with the assumption of increasing risks of flooding due to climate change. Thematically these nine meetings were split in two steps. The first step included five meetings, where the “system” Timmendorfer Strand was defined by the participants. Variables were collected and relationships between these variables were disclosed. The second step, including four meetings, was aimed at specific aspects concerning sustainable solutions in coastal defence measures. For example, it was discussed how flood defence measures affect key variables (elaborated in step 1) in Timmendorfer Strand. As results of this approach, the participants supported the results of the sensitivity analysis. They also agreed upon being further involvement in the process of the implementation of the coastal

flood defence measure. The coastal defence administration valued this approach very positive, because the participants recognized the long-term risk for the coastal area, they accepted responsibility, and they “evolved from sceptics to advocates of an integrated coastal defence concept”.

During the participation process different versions of the finally proposed coastal flood defence measure were discussed (especially differing in the height of the wall). The compromise to build a wall but lower than the one proposed by the regional government (of federal state of Schleswig-Holstein) was found together with the stakeholder and citizens; lower height enables tourists and citizens to still walk behind the wall and see the sea. The participative process had a strong component of awareness rising and avowal of proposed coastal flood defence measures.

For the cost-benefit analyses of the measures a limited number of local stakeholders were interviewed. Some of them are part of the local parliament or active members of the community and were interviewed to gather information on the perceptions on effects after implementation of the measure. Other contacted local stakeholders are restaurant owners who were interviewed to gather data on changes of restaurant incomes. Furthermore, the local tourism office and the city council were also contacted.

Success and limiting factors:

Since the initiative to this process was coming from the authorities (top-down approach), the citizens of Timmendorfer Strand were not involved in initiating the participatory process. But because of their fears of the defence measure (sheet pile wall) regarding the attractiveness for tourists (tourism is the most important economic sector in the municipality), they had to be convinced, that coastal defence is necessary. So, a key success factor was that the authorities took a very inclusive approach and developed measures which fitted the values of the community. Another key success factor was that the Timmendorfer Strand community was able to finance parts of the additional costs which made the adopted solution adjusted to the needs of a touristic city, e.g. the glazed retention walls.

The relative low numbers of participants (25) per meeting could be seen as a limiting factor, but as those participants had wider duties in the community they can be seen as multipliers and thus representatives of the wider public of the community of Timmendorfer Strand.

Budget, funding and additional benefits:

Costs and benefits of the implementation of coastal flood defence were quantified as far as possible for two scenarios. Minimum scenario referred to a sea level rise of 0.30 m and an according increased frequency of flood events; maximum scenario shows a sea level rise of 0.50 m and the following increase in flood events.

Estimated costs include investment and maintenance costs of the coastal flood defence measure and cost related to the architecture finishing and landscaping project. Following benefits were considered in the analysis: avoided flooding, change of recreational function and tourism due to finishing and landscaping project, change of number of travellers to community, change of property values and qualitative assessment of change of turnover of restaurant owners.

The implemented measure was compared to a business-as-usual scenario, with no implementation of the coastal defence interventions and of the finishing and landscaping project. The two different estimated scenarios differ in the impacts of the climate change, change of property value, additional tourism and maintenance costs. For both scenarios, the estimated benefits exceed the costs of the measure: net present value ranges between 92 and 220 million euro. The estimated benefits are between 4 and 8 times higher than the estimated costs (benefit-cost ratio). The investment-upfront costs are the major type of costs with 30 million euro (for both scenarios) and the main type of benefits is avoided damages by storm surges (71.5 million euro for the minimum and 170 million for the maximum scenario in the period 2011-2100). Also the additional tourism shows substantial benefits, ranging between 45 and 72 million euro (for the period 2011-2100). The undertaken sensitive analysis showed that for all scenarios and all discount rates used benefits are higher than costs. The net present value is positive and the benefit-cost ratio is higher than one.

A further cost-benefit analysis was the change of turnover of restaurants analysed. The existing beach promenade was improved which means that there are more possibilities for outside seating, and additional wind protection realized. The data on change of turnover was elaborated by interviews with restaurants in Niendorf which is a district of Timmendorfer Strand. The answers ranged from no major changes to an increase of turnover of 5 per cent.

The investment costs were covered mainly by the regional government of Schleswig-Holstein which is responsible of coastal protection for this area. Furthermore, the community covered a certain share of the costs. Also EU funding via Cohesion Policy was used (especially for the landscape and finishing project). From the total of 30 million of euro, 31% (9.5 million euro) were covered by the community.

Legal aspects:

Authorities in Germany have the “legal obligation” to protect settled coastlines. For Timmendorfer Strand, the municipality was responsible for flood defence; the regional coastal defence administration only acted as advisor and contributed to the costs.

Implementation time:

Discussion about an integrated coastal flood defence concept for the community of Timmendorfer Strand started in 1999. The completion of the project was in 2011.

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Websites:

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