

# Optimising flood protection measures by use of numerical modelling

## ISEFJORD, ROSKILDE AND HOLBAEK ESTUARIES

In the North Sea Region (NSR) estuaries are intensively used for a wide range of activities, such as industry, agriculture, fishery, recreation and tourism. NSR estuaries are also valuable habitats and ecosystems protected by European legislation. At the same time, the pressure from rising sea-levels and more intense storm-surges is already occurring and is expected to increase in the future.

The challenge for Danish estuaries (also called fjords) is therefore to sustainably and cost-effectively manage and adapt these estuaries to the changing hydrodynamic pressures while preserving or improving the functions of the estuarine system. Flood protection is also on the political agenda both locally, regionally and on a national level. However, flood defense systems on a regional level have not been systematically investigated and it is not straight forward due to the sensitivity of the areas.

### What's going on in Holbaek?

On the local level, the Holbæk Municipality is working on a model for risk mapping related to floodings in the municipality which shall lead to an update of the climate adaptation plan for the municipality. It has been the long-term wish of Holbæk Municipality to develop a risk contingency plan based on a model for flooding-risks coming from seawater, rainwater, rivers, streams and groundwater. The focus has been prioritized on seawater and rainwater, where rivers and streams are being included indirectly via existing flood maps. The work thus addresses water from three of the four sides.



However, the vision is larger: there are strong considerations for including socio-economic data into the model, with the purpose of also including these in prioritising the measures to implement as well as ecological modelling. However this is on a longer term level.

### Developing flood protection measures

As part of the IMMERSE project numerical models are used to investigate the effects of storm-surge protection measures in sensitive shallow tidal estuaries and how the storm-surge signal responds to the implemented measures. Sweco has set up a numerical model that is able to simulate major storm surge events as experienced in the area of Isefjord/Roskilde Fjord in Denmark.

Specific solutions have been tested in the model to find a suitable measure with respect to minimising the storm surge and thereby protecting personal values. Furthermore, numerical models are able to create presentations that can be understood by non-technical stakeholders, thereby increasing the knowledge level.

Together with the integration of non-technical stakeholders and political commitment, this project aims at improving development and accelerating the implementation of large-scale measures at NSR estuaries, leading to better accessible and more sustainable estuaries.