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Developing Sustainable Coastal Protection- and Management Strategies for Schleswig-Holstein's Halligen Considering Climate Changes (ZukunftHallig)

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With an area of approximately 9.000 km^2, the depositional coastline of the Wadden Sea is one of the world's largest intertidal wetlands. In 2009, the Wadden Sea was added to UNESCO′s World Heritage List. Besides its ecological and historico-cultural relevancy, the Wadden Sea itself is an important element of coastal protection. Surrounded by the North Sea, the Wadden Sea includes 10 marsh islands called Halligen. These small islands are a natural phenomenon, which is unique worldwide. Although the Halligen are inhabited by around 300 residents, the Halligen have no dikes. Consequently, the Halligen are inundated up to 50 times a year. In order to protect themselves from these inundations, houses are built on dwelling mounds. Residents learned to cope with these extreme conditions, but as time goes by, the Halligens' shapes and conditions are gradually negatively affected, especially in consequence of rising sea levels.
According to MEEHL et al. (2007), sea level is predicted to increase by 30 cm to 100 cm by 2100. Among others, these changes are directly affecting the ability of disturbance regulation of the Wadden Sea while ocean currents and sediment fluxes are influenced and the Halligens' flooding frequency increases. Coastal ecosystems are known to be dynamic with a certain capacity of compensating changes in the Mean Sea Level (MSL) by non-linear feedback mechanisms. However, observations are indicating limits in this adaptability (KIRWAN et al. 2010).
Within the joint research project "ZukunftHallig", an interdisciplinary team of researchers is investigating the future development of the Halligen considering climate changes. The project aims for the development of new impulses to sustainable coastal protection- and management strategies, focusing on the preservation of the Halligen.
In particular, the hydrodynamic forcing of today and future conditions as well as morphological and sedimentological changes will be investigated. Therefore, local Sea levels and extreme water levels as well as their interaction are going to be analysed. For estimating the future sedimentation on the Halligen, analyses on both the duration and the depth of inundations and their correlation with sedimentological data is of particular interest.
Following a quantification of the current protection standard, a risk based hazard analysis will be conducted. This analysis serves as input for creating the above mentioned, sustainable coastal protection- and management strategies. Finally, the acceptance of these strategies among the residents will be elicited.
Due to the comprehensive work schedule, the study will be conducted for only three of the overall ten existing Halligen exemplarily. These are Langeneß, Nordstrandischmoor and Hooge.
The intention of the research project is to gain insights into the processes involved in the evolution of the Halligen, which is the basis for an effective and sustainable protection strategy.
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References:
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MEEHL, G. A., et al. (2007): Global climate projections, in Climate Change Fourth Assessment Report of the Intergovernmental Panel on Climate Change, edited by S. Solomon et al., pp. 747– 845, Cambridge Univ. Press, Cambridge, U. K.