



Climate change impacts and human impacts on the Elbe estuary

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Estuaries have been key areas for the development of the modern economies. Since the period of industrialisation they have been increasingly shaped by human intervention: Harbour construction and enlargement, coastal protection and channel deepening have significantly altered the physical and ecological responses of estuaries to outside forcing. Future changes are to be expected. In this study, we examined the response of the Elbe estuarine ecosystem to projected or plausible changes of the physical forcing in the 100 years to come. Using the coupled physical-biological modelling framework of SCHISM-ECOSMO we conducted a series of scenario runs taking into account 1) moderate sea level rise, 2) strong sea level rise, 3) decreased river run-off, 4) increased river run-off, 5) channel deepening. Results show the ability of the estuarine ecosystem to conserve its general characteristics as a resonator to tides and a processor-filter of organic matter and nutrients. In the limnic part of the estuary however, the projected changes significantly affected water quality parameters such as oxygen concentration, plankton abundance and nutrient levels. Our conclusion is that projected changes will challenge future estuarine ecosystem management.