

Estuaries: the transition zones between land and water

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Estuaries are on a geological time scale ephemeral systems. As the transitional systems between land and sea they are influenced by both changes in the coastal sea, such as sea level rise, and changes in the catchment. Next to very high ecological values they are also of utmost importance for economic development. Indeed many of the largest cities are situated near estuaries as are the major seaports. This also leads to profound changes in estuaries.

In this presentation we consider the major changes in estuaries based on the Schelde estuary as a case study. Geomorphologic changes started long ago by embankments of high marshes leading to a huge loss of intertidal areas. Together with deepening of estuaries for navigational purposes this lead to major hydrodynamic changes: increasing high and decreasing low water levels, resulting in a larger tidal amplitude. The speed of the tidal wave increased as did the tidal asymmetry and the tidal pumping. These changes have major impacts on the geomorphology. The surface of high dynamic flats increases at the expense of the low dynamic (and more silty) ones. Sedimentation rates in tidal marshes are high enough to cope with the rising sea level but due to an increasing slope the stability of marshes decreases and all marshes in the estuary are eroding.

The hydrodynamic and geomorphological changes have profound consequences for the ecosystem. Decreasing silt levels reduce benthic biomass. Increasing depth and turbidity, increase the mixing/photoc depth ratio decreasing phytoplankton production. The suspended sediment concentrations are high and did increase significantly as the sediment load from the catchment increased by human activities. However, also the increasing tidal range has a significant impact on suspended solids. It is shown that an increase in tidal amplitude by one meter increase SS concentrations by a factor 10! From this it is clear that the sediment dynamics have a profound impact on the ecological functioning of the estuaries and that a coherent sediment management plan is needed which takes into account all the different aspects from the headwater to the coastal sea. Next to the structural impact of sediments, they play also a crucial role in the transport of pollutants. Some data on the pollution of tidal marshes will be shown and related to the dynamics of these habitats.