

How the tides changed in the Schelde-estuary under influence of natural changes and human interference

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The Schelde-estuary has a length of 160 km and is characterized by a macro-tidal regime, ebb and flood currents, a longitudinal salinity gradient and important sediment transports, leading to important morphological changes. Over the past centuries several human interferences have taken place in and along the estuary: starting with important poldering of areas along the estuary, dike-building, cutting-off of several bends, dredging works to guarantee the port accessibility and sand extraction for commercial reasons. Beside these human activities sea level change occurred and has caused changes in the morphology of the estuary and thus the tidal penetration in the estuary. The tidal range increases from the mouth of the estuary towards up-estuary. At the start of the 20th century, this maximum was located near Antwerp (KM80), while at the end of the 20th century this maximum has increased and is located more up-estuary (Tielrode, KM100). More up-estuary the tidal range decreases, due to the smaller depth resulting in more damping.

At Antwerpen, the yearly averaged high water levels increase gradually, while the low water levels show a rather sudden drop in the 1970's. For the high water level both sea-level-rise and the 18,6-year nodal cycle are found to be important in the changes of the water levels. These factors also influence the low water level, although the drop in the 1970's is related to the combination of different human interventions.

Over the past years, research projects have tried to estimate the individual importance of each activity in the changes of water levels. State-of-the-art numerical models were used to quantify the effect. Until now, it wasn't feasible to explain the changes in water level by adding the effect of individual activities. It is assumed that the effect of morphological changes (natural or activity-induced), is responsible for changes in tidal penetration.