

Recipes for restoring natural turbidity in estuaries

Thijs van Kessel, Bas van Maren and Han Winterwerp

Deltares, Sea and Coastal Systems, Postbox 177, 2600 MH Delft, The Netherlands
E-mail: thijs.vankessel@deltares.nl

Estuaries around the world experience an increase in turbidity levels due to human interference such as channel deepening, land reclamation, port extension, maintenance dredging etc. Sometimes these effects are minor, but sometimes these effects are major. In some estuaries (e.g. Ems, Loire) a shift to hyper turbid conditions is observed and fluid mud layers are formed which did not occur prior to interventions.

This contribution first discusses the steering factors for turbidity such as (residual) transport, sinks and sources and the influence of physical, chemical and biological processes hereon. These factors result in a wide range of turbidity levels in natural estuaries as demonstrated from observations and numerical modelling. On top of this human interference also plays a role, which is hard to identify from observations only as - typical for estuaries in populated areas - there may be a long history of different types of interventions, all with their own response time scale. Numerical models help to identify cause and effect with regard to these interventions in addition to the large natural variability of turbidity in estuaries.

Subsequently, these insights are used:

- to propose criteria to evaluate how much turbidity levels do deviate from natural (pre-anthropogenic) conditions and
- if turbidity levels do significantly deviate from natural conditions, to identify what are the main contributing factors.

Based on these insights applied to the Scheldt and Ems estuaries as examples, potentially effective measures to bring turbidity levels back to normal are proposed. The challenge is to propose effective measures that both fit within the natural estuarine dynamics and are economically feasible, which will greatly enhance their acceptance and likelihood of implementation.