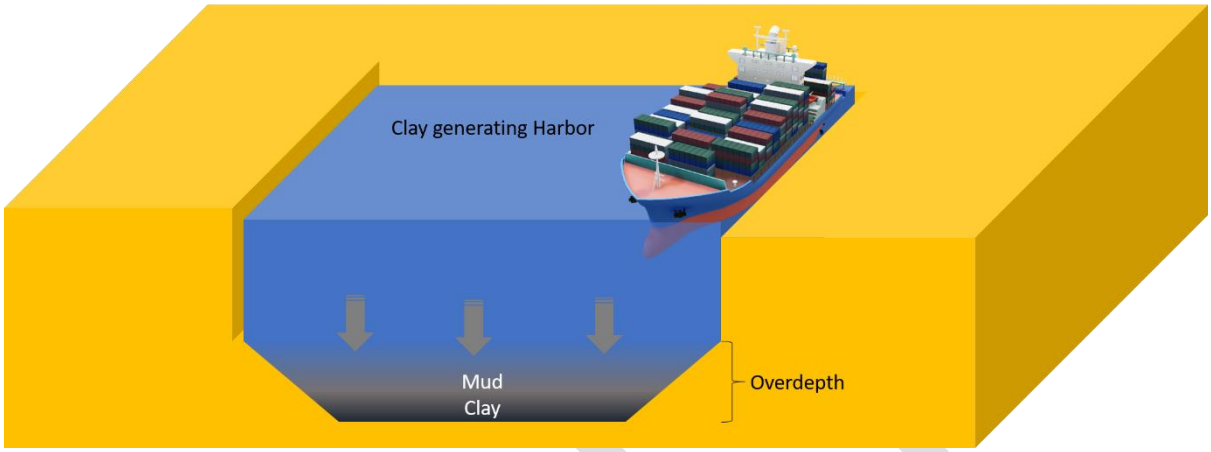
Seaward Solutions Clay Generating Harbor (Idea)



The Clay Generating Harbor is a harbor with over-depth, which allows for mud deposition and compaction without influencing shipping. Dredging frequencies can be reduced and the compacted mud is a first step in clay production.

By creating an over-depth in existing harbors suspended muds can deposit. The sedimentation in the harbor is determined by:
a) the water volume water which enters from the outside into the harbor (exchange);
b) the sediment concentration in the water entering;
c) the ratio between the current velocity inside and outside the harbor;
d) settling velocity of the suspended sediment;
e) the duration of the stay of the water in the harbor.

Especially the exchange rate of the water is of great importance for the sedimentation rates. In tidal situations it is determined by the tidal volume, exchange in the harbor mouth due to horizontal eddies and the exchange due to vertical eddies generated by density differences. Based on the study of the Termunterzijl harbor sedimentation of mud in the eastern part of the Dutch Wadden Sea can be estimated to be roughly 1 m^3/m^2y, or 360 kg/m^2y dry weight mud. Upon consolidation a layer of 0.3 m of clay remains (with a density of ca. 1200 kg/m^2). A typical time scale for such consolidation is months to years. If the harbor must be dredged once in 5 years, an over-depth of 4m would be needed and for 10 years an over-depth of ca. 7m.

Creating such an over-depth might be a good idea to produce clays on the spot thus reducing transport costs. Also, the formation of over-depth will produce sediments which might be marketed. However, several points will need further consideration:
1) how to avoid influx of too much sand?
2) how will creating over-depth influence stability of the harbor walls?
3) is the over-depth sufficient to avoid resuspension of muds by ship's propellors?

Literature

Eysink, W.D., 1988: Sedimentation in harbour basins. Small density differences may cause serious effects. 9th International Harbour Congress, Antwerp, Belgium, 20-24 July, 1988. Also publ. in: DELFT HYDRAULICS, Publ. No. 417, July 1989.

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