

Quality dredging and policy: environmental risk assessment for heavy metals

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Introduction:

Due to the EU Water Directive extra attention is paid to quality dredging in order to reduce the transport of nutrients to the water, with the end goal to improve the water quality. If high concentrations of (micro)-pollutants and nutrients will have a negative impact on water-quality is strongly dependent on the transport of these compounds from sediment to water. This transport or 'flux' is expressed in (kg/m²/day) or in words: the mass of the contaminant or nutrient that is released per surface area per day from the sediment into the water.

Nowadays all policies are directed to total concentrations of contaminants and nutrients. Scientific research shows that contaminants and nutrients bound to sediment do not lead to environmental risks and are not a threat to water-quality. Only the freely dissolved and the not-tightly bound, bioavailable, fraction of contaminants and nutrients leads to a negative impact of environmental quality.

Background

In The Netherlands in the 'soil-covenant' (Convenant bodem en ondergrond, 2016) (a contract between government and water-board authorities) it is agreed that all location of the category C list should be dealt with. This agreement is especially directed to sediment with too high concentrations. In 2016 the provinces received budget to remediate the contaminations.

With the National Dutch Environmental law, to be implemented in the coming years, it is expected that areal approaches will be stimulated. The legislation for large scale applications for soil and sediment in surface water (like deep pits) first steps are already made, whereas other measures are in progress.

It is expected that a more integrated approach for contaminations and nutrients will be implemented in which the re-use of sediment in 'nature based solutions' will contribute in the sustainable functioning of water systems.

The usefulness and necessity of quality dredging is discussed by showing two cases, in which both Dutch policy and environmental risks are considered.

Waterway polluted by heavy metals

Waterway 'De Vaart' has been classified as surface waterbody under the EU Water Framework Directive (WFD). Water quality measurements have detected high levels of metal concentrations. In order to determine if the contaminated sediment really contributes to this exceedance, an environmental risk assessment was performed. Sediment cores were taken and examined in separate layers. For each layer fluxes were quantified and a recovery plan has been made. In the period of January till March 2017 over 11.000 cubic meters of contaminated sediment will be removed and circa 2,5 hectares of sediment will be covered by a thin sand layer of 0,3 meters.

Mercury pollution in Wormer

As a result of industrial activities in the 17th and 18th century heavy metals (copper, lead and mercury) have accumulated in the sediment of Wormer- and Jisperveld. In this case high levels of mercury might pose risk for humans after fish consumption and threat water quality. Sediment cores were taken and each layer has been examined thoroughly. A chemical characterization was made by sequential extraction methods to examine the mobility of mercury and phosphorus.

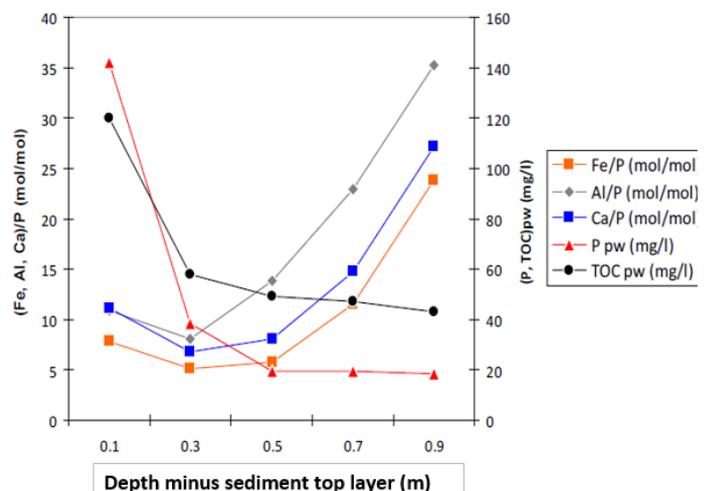


Fig. 1: Results sequential extraction to determine phosphorus mobility.