

Sustainable disposal of dredged material?

An analysis of the Belgian situation

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Introduction: To counter the degradation of marine ecosystems, a variety of legislative measurements are being developed in Europe (e.g. Marine Strategy Framework Directive [MSFD]). The policy behind this is to protect and restore Europe's oceans and seas and to ensure that human activities are performed in a sustainable way. Currently, the influence of a human activity is mainly evaluated by best professional judgment [1]. To avoid a subjective debate, the sustainability of those activities has to be scientifically evaluated from an ecological and socio-economic point of view.

In this study, we illustrate a protocol to assess the environmental impact of 'dredged material disposal', based on the monitoring of this activity in the Belgian Part of the North Sea (BPNS). The dredged material disposal may have effects on the water surface, in the water column and on the seabed [2]. To ensure that this activity does not hamper the ecological goals of the area, it is advisable to test the observed patterns against the Good Environmental Status (GES) criteria [3, 4]. A stepwise plan is proposed to come to such an evaluation, which is illustrated with data in this study.

Methods: , The impact of the disposal of dredged material in the BPNS is continuously monitored, regularly reported (2 year cycle), and taken into account when granting permits. Substantial dredging activities take place in the navigation channels and harbours throughout the year. The dredged material, which consists mainly of mud, is disposed at 5 designated areas. The monitoring focuses on turbidity; morphology (bottom topography), chemistry (sediment, biota) and ecology (benthic community).

Results: The first step in the evaluation process was the identification of relevant MSFD descriptors, criteria and GES indicators in relation to the activity [4]. Secondly, we looked at the thresholds and the filling in of the indicators based on the collected data, and we defined gaps. Finally, we estimated the possible effect of the activity on GES. The monitoring data indicated that the sediment plumes at

disposal sites result in an increase of the SPM concentration and locally in the formation of high concentrated mud suspensions. Chemical monitoring data indicated that chemical contaminants can be released in the water and sediment through disposal. For the BPNS, however, the concentrations of heavy metals, PCBs and pesticides only slightly differed between control and impact sites and were mostly below the GES thresholds. Biological analyses indicated that disposal activities can result either in habitat modifications at certain sites and smothering of the benthic life (e.g. disposal site Br&W S1) (benthic indicator below GES), or in a slight increase of benthic diversity when muddy sediments are deposited in a naturally more sandy area, by favouring 'mud loving' opportunistic species. Despite the fact that only some of the relevant MSFD indicators (mainly chemical thresholds, benthic indicators) could be assessed based on the current collected data, this stepwise plan shows the potential to contribute to an objective evaluation of dredged material disposal. Due to the fact that the MSFD evaluation will partly be based on the impact evaluation of human activities, it is worthwhile to adopt such assessment plans in the future.

Discussion: Research at dredge disposal sites indicates both local and radiating effects on the ecosystem [2]., Evaluating the impact of dredged material disposal on the ecosystem is necessary in the framework of marine environmental legislation (MSFD). On a European level, the harmonisation of this assessment will be a challenge.

References: [1] Van Hoey et al. (2013) *Ecol. Indicators* 25:266-278 ; [2] Bolam and Rees (2003) *Environ. Manage.* 32:171-188; [3] Van Hoey et al. (2010) *Mar. Pollut. Bull.* 60:2187-2196; [4] Belgian State (2012) *Determination of Good Environmental Status and establishment of Environmental Targets for the Belgian marine waters – Directive 2008/56/EC*, 30pp.