

Name of indicator	2.6 Seafloor exploitation index
Type of Indicator	Pressure indicator
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Description of the indicator	<p>Seafloor exploitation index measures the extent (area) of seabed that is impacted by direct physical anthropogenic disturbances. These disturbances can be divided as follows (Foden <i>et al.</i> 2011).</p> <ul style="list-style-type: none"> - Smothering: covering the seabed with a layer of material. This activity includes disposal of dredged material. - Obstruction: permanent structures fixed on the seabed. This activity includes pipelines, cables, wrecks, wind turbines, oil and gas platforms and other constructions. - Abrasion: scouring and ploughing of the seabed. Abrasion activities include benthic fishing using trawl gear, burying activity during cable laying. - Extraction: exploitation by removal of seabed resources. This activity includes dredging and aggregate extraction. <p>Seafloor exploitation index quantifies the spatial extent of these disturbances in regard to different seabed substrate types.</p>
Relationship of the indicator to marine biodiversity	Seafloor exploitation index is a pressure indicator that directly measures the extent of anthropogenic pressure on seabed. The negative effects of direct anthropogenic disturbances of seabed on marine benthic biodiversity have been shown in many studies, e.g. Dayton <i>et al.</i> 1995, Thrush <i>et al.</i> 2001, Simonini <i>et al.</i> 2005, Bolam <i>et al.</i> 2006.
Relevance of the indicator to different policy instruments	MSFD descriptor 6.
Relevance to commission decision criteria and indicator	1.6. Habitat condition
Method(s) for obtaining indicator values	In order to obtain the value of indicator, all relevant information on direct anthropogenic physical disturbances of seabed must be gathered in a georeferenced manner and compiled into a database of a geographical information system (GIS). The relevant georeferenced data include locations of seabed dredging and dumping of dredged material, bottom trawling fishery (VMS, Vessel Monitoring System), resource extraction (e.g. mining of sand and gravel), building and exploitation of marine constructions (cables, pipelines, windmills etc.). Data on direct anthropogenic disturbances can be acquired from different sources, for example authorities responsible for management of natural resources and environmental conservation, fisheries authorities, maritime and shipping authorities, companies involved in offshore development (pipelines, cables, windmills). The proportion of area of different seabed substrate types, which are directly affected by human activities, will be assessed by the means of overlay analysis in GIS (see Figure 1 for a schematic example of overlay analysis in GIS). The average proportion of directly impacted seabed over all substrate types serves as the overall index value in a given area.
Documentation of relationship between indicator and pressure	Not relevant: the indicator directly reflects anthropogenic pressure itself.
Geographical relevance of indicator	3. Baltic Sea wide
How Reference Conditions (target values/thresholds) for the indicator were obtained?	Conditions, in which direct anthropogenic disturbances to the seabed are totally lacking, could be considered as reference conditions. Specially dedicated research is needed in order to develop explicit determination of reference conditions.
Method for determining GES	Not available. Specially dedicated research is needed in order to develop methods for assessment of environmental status. Conceptually, the seabed exploitation must be on a level that enables long-term sustainability of natural biodiversity and ecosystem processes.
References	Bolam SG, Rees HL, Somerfield P, Smith R, Clarke KR, Warwick RM, Atkins M, Garnacho E. 2006. Ecological consequences of dredged material disposal in the marine environment: A holistic assessment of activities around the England and Wales coastline. Marine Pollution

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**Illustrative
material for
indicator
documentation**

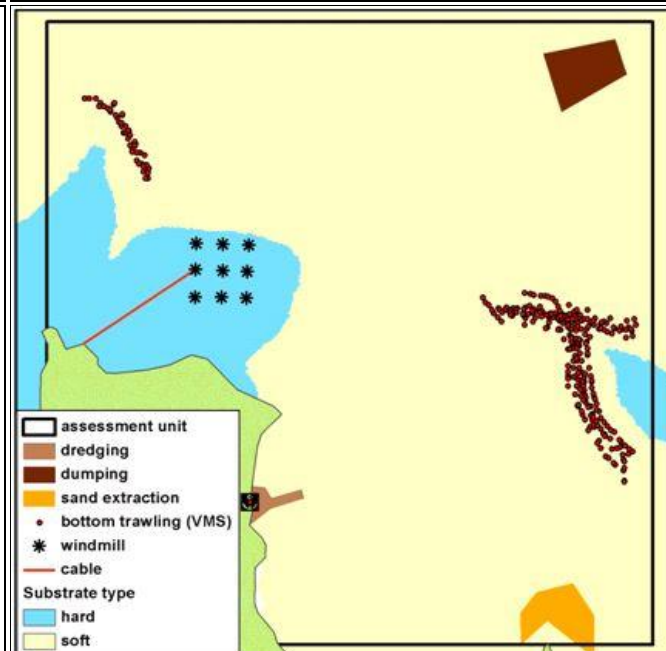


Figure 1. A schematic example of a geographical overlay analysis of direct anthropogenic seabed disturbances.