

Sand sourcing from dredge disposal grounds for nature-based solutions

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Introduction:

In view of climate change, nature-based solutions (NBS) gain interest for coastal safety as human benefits (e.g. coastal protection, recreation) are combined with biodiversity conservation. However, NBS require a lot of sand, while the global demand for aggregates has already increased to a point that much more sand is being extracted than is naturally replenished. On top of that, sand reserves in the North Sea are rapidly depleting and the limited high-quality sand is mainly used for beach nourishments and as a basic raw material for construction. (Re)use of natural sand in more efficient and beneficial ways or replacement with viable alternatives have been identified as key strategies for continued supply of sand (Recommendation 8: Promote resource efficiency & circularity; UNEP 2022). Yet the capacity of alternative sand (composition, grain size, origin) to build NBS and to provide ecosystem services (ES) by coastal protection structures, such as dune-for-dike, has not been explored. In the Belgian part of the North Sea, suitable secondary sands are being sought in disposal grounds of dredged material.

Methods:

In March 2023, a geological and geophysical campaign was conducted to investigate sand quality and quantity of two dumping sites off the Belgian coast and more offshore. 11 undisturbed vibrocores up to 2 m in length and 96 mm in diameter were taken. High-resolution multibeam echosounder (MBES Kongsberg EM2040) and parametric echosounder (PES Innomar SES Quattro) data were acquired simultaneously, resulting in an acoustic image of the shallow subsurface, i.e. from the seabed to ± 10 m below the seafloor in dm resolution.

Vibrocores were split and prepared for photographic line scanning of the sediment surface at 50 μm resolution, and for Multi-Sensor Core Logging (MSCL) of downcore geophysical properties at 1 cm interval (i.e. gamma density, magnetic susceptibility and spectrophotometer reflectance). Subsamples were taken from each vibrocore for sediment analyses of organic matter, calcium carbonate and grain size.

Results:

First geological and geophysical results on the quality and quantity of sand in dredge disposal grounds are expected in summer 2023.

Discussion:

Beneficial use of dredged material is of interest to many stakeholders to safeguard volumes of high-quality sand for high-end purposes (e.g. for construction) and to sustain extraction activities on the longer term. Its potential to act as an alternative sand source depends on (1) the nature (properties, heterogeneity) and suitability of the sand compared to the characteristics of primary sand of the extraction sectors; (2) the expected quantities; and combined (3) the feasibility and usefulness of the sand for building NBS. Furthermore, better sediment management of dredged material will facilitate the reuse of this resource.

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References:

[1] UNEP (2022). Sand and sustainability: 10 strategic recommendations to avert a crisis. GRID-Geneva, United Nations Environment Programme, Geneva, Switzerland.