



Moving Sediment Management Forward

Dredged material management

Dredging is undertaken to maintain and develop human needs and objectives, like operation of ports and harbours, navigable waterways, reservoirs, etc. Both dredging and the fate of dredged material may affect the environment. Thus in any stage of a project besides its primary objectives environmental effects should be taken into account and minimised as possible.

For this the Working with Nature philosophy is a proper approach. Working with nature means to manage the dredged sediments within the system, or to see them as a resource rather than a waste. Thus dredged material management is an element of river basin sediment management.

World-wide examples exist to illustrate how dredged material can be managed to contribute to the achievement of environmental objectives or how it can otherwise be used beneficially. In 2009 PIANC, the world association for waterborne transport infrastructure, published a report "Dredged material as a resource - Options and constraints".

The report is based upon lessons learned from numerous case studies for using dredged sediments directly after dredging or with prior treatment to safeguard the necessary properties for the subsequent use. There are engineering uses as construction materials for isolation, flood and coastal protection or land improvement. Another category of uses of dredged material is aimed at environmental enhancement, and includes habitat creation and improvement, aquaculture, agricultural benefit or pit filling. Four of the case studies are briefly summarised below.

Contamination does not necessarily rule out the possibility of using the dredged material, as uses also depend on site-specific conditions and legislation. However, it should be noted that any treatment or handling will increase the costs. Reduction of emissions to water bodies through efficient source control is therefore essential for a sustainable long term strategy.

River Scheldt: Creation of a controlled flood area, Belgium

A new tidal dock constructed on the left bank of the river Scheldt required the dredging of the river by 0.5-1.0 m. The dredged sediment from this deepening project, which was of good quality, was used for the construction of dikes surrounding a controlled flood area. Such areas are intentionally flooded during high water periods to protect other areas from potentially damaging flooding. The controlled flood areas also create new wildlife habitats for birds and animals on land that had previously been used for agriculture.

Whilst the outcome of this initiative was successful, there were some difficulties with its implementation. Specifically, the project was constrained because in Flanders the regulations and permitting processes classify dredged material as 'waste'. For this material to be used as a building material it was required to meet quality guidelines for construction materials.

Fasiver: Beneficial use of dredged material, Belgium

The Fasiver project is a brownfield development project in which treated dredged material is used to prepare the site ready for construction. The project provides an example of win-win solution because it addresses three problems:

- The postponement of maintenance dredging in the area of Ghent due to a lack of suitable disposal/treatment sites,
- Difficulties finding a use of part of the Fasiver-site which was formerly used as a disposal site for industrial waste products (contaminated and abandoned sites),
- The acute shortage, in this region of Ghent, of available industrial areas for the expansion of high technology oriented businesses and small to medium companies.

The Fasiver project consists of a variety of different actions including:

- The remediation of the contaminated soil,
- The treatment, on site, of the contaminated dredged material,
- The use of the treated dredged material to prepare the site for building: the level of the site is raised by 5 m to facilitate the development of a new industrial area.

Wallasea: Wetland creation project, UK

In 1997 it was decided that an area of marine wetland, an internationally important bird area, which had been developed had to be compensated. The form of compensation would be by managed realignment, a process which involves the breaching of an existing seawall to allow tidal processes back into the old flood plain. After years of study and extensive public consultation, Wallasea in Essex was chosen as the preferred site. In order to achieve the necessary heights and configurations of wetlands, mudflat and saltmarsh it was necessary to raise the elevation of the land behind the old sea walls prior to breaching them. A new seawall was constructed inland of the old wall. Behind the new sea wall is a new freshwater habitat, and seaward is an area of salt marsh.

Harwich Haven Authority regularly dredges more material than can be relocated within the estuary and so had some excess material available which would otherwise have been disposed at sea.



Fig. 1: Air view of the wetlands

700,000 tonnes of fine dredged material were pumped ashore into a containment bund to the seaward of the new seawall. The dredged material used for salt-marsh creation was of suitable quality i.e. did not contain high levels of contaminants. The saltmarsh formed using this material is 45 metres wide and forms an integral part of the new seawall, providing a robust defence against flooding from the sea. The previous seawall was breached in six locations to allow the tide in and out. Behind the seawall and running parallel to it is a new freshwater habitat part of which has been landscaped to provide nesting habitat for birds such as avocet and redshank.

Humber Estuary: Maintenance dredging and sustainable relocation, UK

Several major port facilities are situated on the Humber Estuary in eastern England, resulting in over 40,000 shipping movements annually. With a macro tidal range, fast flows and high background suspended sediment content, the bed of the estuary is highly dynamic both in the short term and on longer time scales.

The high natural suspended sediment concentrations mean that substantial maintenance dredging is needed at a number of locations within the estuary. Maintenance dredging is a practice that has been existence for over 200 years. All dredged locations, particularly the finer sediments from the docks, contain some contaminants. On occasions some metals have exceeded the lowest threshold for acceptance for placement in the marine environment. However, for the most part the contamination levels have been similar to or lower than background concentrations sampled from non-dredged areas within the estuary.

The whole Humber Estuary (subtidal and intertidal) including the navigation channels has been designated as an area of nature conservation importance under the EU Habitats and Birds Directives. One of the listed features is the estuary status: this effectively means that the structure and functioning of the estuary is protected. Scientists believe that sediment is being lost from the estuary naturally, and that this is hindering the ability of the mudflats and saltmarsh to raise in line with sea level rise. This is causing deterioration in the status of these habitats and reducing the favourable condition of the estuary as a whole. If maintenance dredged material is removed from the system this effect would be exacerbated.

A number of licensed dredged material deposit grounds have therefore been identified in the Humber Estuary. The Estuary has a high background sediment load so deposited material is generally dispersed into the background suspended sediment load over a single tidal cycle. As a consequence the dredged material can be released as close as possible to the location where it was dredged - maintaining the sediment in the system so that it can continue to carry out its natural morphological functions. The practice is therefore one of sustainable relocation as it keeps the sediment within the system.

Utilization of contaminated dredged sediments in the Baltic Sea region

In the Baltic Sea Regional SMOCS project (Sustainable Management of Contaminated Sediments) the problem of sustainable management of contaminated sediments was addressed. Future development of port access and infrastructure will be vital to handle increased volumes of freight. Improved solutions for new and existing quay structures and pavements will be needed. In this context, dredged sediments – both clean and contaminated - should be regarded as a resource.

An example is provided for the Port of Gävle in Sweden, where a large dredging project resulted in about 600,000 m³ of contaminated sediments being used to create a new port area applying the stabilization / solidification treatment method, see Fig. 2. The method allowed significant reductions both in costs and in the use of non-renewable natural resources. The solution also has less impact on climate change and offered a reduction in

energy use compared to land disposal. The works have been performed based upon the developed guideline in STABCON.

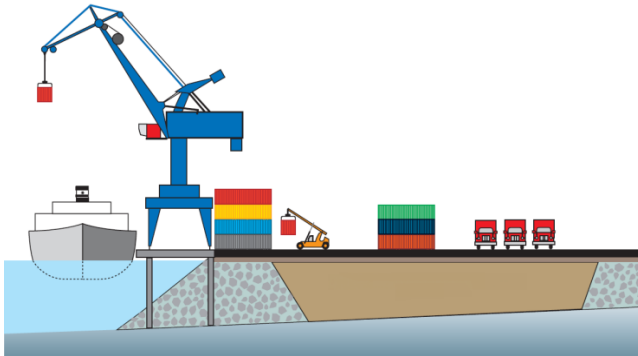


Fig. 2: The stabilization/solidification technology has been further developed and verified as one potential technology to utilize dredged sediments, example from Port of Gävle.

The examples highlight a range of dredged material management options. Some of the solutions identified are intended to deal mainly with local problems; others contribute to solving River Basin level issues. These examples demonstrate:

- the importance of seeing sediment as a potential resource rather than a waste product; of understanding both the potential benefits and any constraints on use; of engaging with stakeholders; and of matching supply with demand,
- the vital role of source control measures to reduce sediment contamination, and
- that, with innovation, beneficial uses can be identified not only for clean sediments but also for contaminated dredged material

Links

PIANC - International Navigation Association

www.pianc.org

PIANC report "Dredged material as a resource - Options and constraints"

www.pianc.org/downloads/envicom/WG%20104%20Flyer.pdf

<http://books.google.de/books?id=ZHEenPNjZnsC&pg=PP1&lpg=PP1&dq=pianc+%22Dredged+material+as+a+resource+-+Options+and+constraints%22&source=bl&ots=omgQ1v6f4v&sig=zcoL1p288KulrC2hA7bEdOKZiGs&hl=de&sa=X&ei=4nwfU6SIDYa0tAa75oDIBA&ved=0CE0Q6AEwBA#v=onepage&q=pianc%20%22Dredged%20material%20as%20a%20resource%20-%20Options%20and%20constraints%22&f=false>

SMOCS - Sustainable Management of Contaminated Sediments www.smocs.eu

STABCON - Stabilisation / Solidification of contaminated sediments and dredged materials

www.stabcon.com

Disclaimer

This document has been prepared by the SedNet coregroup as showcase for the brochure "Moving Sediment Management Forward – The Four SedNet Messages", see www.sednet.org
SedNet shall not be held liable for improper or incorrect use of the data described or information contained on these pages.

June 2014