Sediment and Dredged Material Management
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Relevance and Objectives

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1. Scope of the Dutch German Exchange (DGE)

The Netherlands and Germany have large river systems such as Danube, Rhine, Meuse, Elbe, Weser and Ems, which have important hydrological and shipping functions and where dredging is essential. In case of the rivers Rhine, Meuse and Ems both countries have a common interest in the sound management of its sediment because their river basins lie in both countries. Finally both Germany and The Netherlands have large (sea) harbours such as Hamburg, Bremen/Bremerhaven, Rotterdam and Delfzijl, which receive large amounts of sediment both from the sea by tidal processes and from upstream areas by rivers. Therefore, both countries are equally subject to the cross-national (European) dimensions of dredging described in para. 5.

Against this background the competent governmental authorities in The Netherlands and Germany have started a Dutch-German Exchange on Dredged Material (DGE) in the year 1999 (see Annex 1A). This DGE was started as an informal bilateral platform for exchanging knowledge, information and experiences in the field of sediment management. Since its start, several meetings were organized, in which subjects such as legislation, risk assessment and sediment treatment were discussed. The results of these discussions have been put down in thematic reports. The DGE has thus achieved an increased understanding of management of dredged material both on policy level (national) and practical (project) level.

The current objectives of DGE comprise:
- **continue existing exchange of information;**
- **enhance co-operation on specific issues;**
- **develop joint strategies on dredged material destinations.**

Though development of joint (assessment) methods and (environmental) standards is regarded as useful, such activities are best addressed in other international frameworks.

This paper describes briefly the understanding of sediment/dredged material management and its basic requirements, as developed within DGE. Further details can be found in the DGE reports (see Annex 2). Thus, DGE aims to assist discussions in the field of sediment/dredged material management in relevant multilateral international and European frameworks (see Annex 1B).

2. Sediments within Water Management

Water management is an area of growing importance in many countries, due to increasing human demands on water, combined with climate change. This is clearly recognized by the European Water Framework Directive, the implementation of which presently takes large

efforts in many countries. Whereas water management focuses primarily on storage, control and transport of the liquid phase, the solid phase is not less important. Dynamics of erosion and sedimentation determine boundaries of water bodies, both vertically and horizontally. Moreover, the quality of sediments determine the ecological potential of water systems. **Water management, therefore, should fully include the management of sediments.**

Conversely, an economically and environmentally sound sediment management has to take into account that sediments are an essential natural part of water systems and cannot be taken out unrestrictedly without consequences for the morphological and ecological balance of the aquatic environment. Therefore, when sediments are removed the first option to be considered is the relocation or aquatic re-use of sediments within the water system – provided this can be done in an environmentally sound manner.

There is no doubt that a sustainable sediment management starts at a river basin scale which is a large challenge for all parties involved. It is necessary to understand how sediment quality and quantity affects a whole river system in order to develop strategies in maintaining and constructing waters for human purposes. Whereas clearly pollution control at the source is the long-term strategy and progress made in this area over the last two decades is impressive, large volumes of contaminated sediment are still present in rivers and new contamination occurs due to diffuse sources. **Sediment management, as an integral part of river basin management, will need to deal with such issues in the years to come.**

3. Need for dredging

The need for management of sediments is highest in areas where pressures of "water system use" (including pollution) are high: densely populated, industrialised areas with intensive shipping. The management method used most widely is removal of sediment – that is: *dredging*. The material removed is commonly referred to as *dredged material*. For the maintenance of waters and waterways dredged material consist of sediments only. Consequently dredged material and sediments are synonyms in this case. Sediment *management*, however, also comprises measures within a river basin that go beyond dredging – such as erosion control or beneficial use.

Both in Germany and in the Netherlands human pressure on water systems are high and so is the need for dredging. The national volumes of dredged material amount to about 50 and 35 million m³/year, respectively. These huge amounts emerge from:

- Maintenance works: maintaining depth for shipping or drainage;
- Construction works: infrastructure and redesign for flood defence or recreation;
- Construction material supply: sand and gravel extraction;
- Remedial (environmental clean-up) works: removing hotspots of sediment pollution.

Dredging in coastal waters mainly takes place for the maintenance and construction of waters for navigational purposes.

4. Cost of dredging

Apart from dredging for shipping, which is the main reason for dredging, dredging is expected to be increasingly pressed by public interests, such as environmental protection, water supply, drainage and flood defence. As a consequence, authorities pay a large part of dredging cost – in conjunction with port authorities. Total cost is composed of cost for dredging activities, for transport and, where applicable, for treatment and/or disposal.

A large part of the dredged material can be relocated within the (water) system in suitable locations. For larger waters, relocation in water is often possible and for smaller waters, placement can occur on (agricultural) floodplain soils nearby. However, if relocation is undesirable or impossible for environmental, morphological or spatial reasons, alternative options are employed such as beneficial use, treatment and confined disposal. Although only a relatively small but significant part is contaminated, the absolute quantities are considerable, and so are cost for transport, treatment and disposal.

Whether or not dredged material can be relocated within the (water) system depends on soil-, water-, waste- and nature conservation regulations with regard to sediment quality. Sometimes, the material can directly be used beneficially elsewhere. More often, such use requires prior treatment in order to meet (environmental) standards for construction materials. Often such treatment is restricted for technical or economical reasons, dredged material has to be disposed, either at landfills or dedicated sub-aquatic disposal facilities. In order to prevent seepage of contamination to (ground)water, environmental standards need to be met – requiring (costly) technical control measures.

All in all, the pathway of dredged material is to follow and the resulting **overall expenditure for dredging depends to a large extent on a range of environmental standards** in the areas of (ground)water protection, soil protection, nature conservation, waste and construction materials.

5. Cross-national (European) dimensions

At first sight, dredging activities may seem to be predominantly a local or regional affair, (environmental) standardisation being only a *national* issue. However, even though dredged material flows are confined within regional or national borders, dredging has a number of cross-national (European) dimensions.

Economic sectors

First of all, some of the interests served by sediment management regard economic sectors that operate in an international competitive environment: marine/inland shipping and (marine) harbours. An open market for these sectors implies that different regulations leading to differences in cost for maintaining shipping depth (and hence of market rates / tariffs) are undesirable.

River basins
Most rivers and seas have more than one riparian state. When standards vary from one state to the other, dredging or disposal activities allowed in one state may give rise to unacceptable sediment pollution in a neighbouring state.

EU regulation
EU member states need to comply with a wide variety of EU environmental regulations in the area of water quality and waste management that have a bearing on dredged material transport, use and disposal. As these provisions have rarely been designed particularly for dredged material, Member States continuously face interpretation questions – the answers to which may vary from one occasion to the other - having high potential impact on relocation, transport or disposal options.

6. Recommendations for further international work

1. From the above analysis of the needs for dredging, the cost and the international dimensions, it follows that sediment (dredged material) management of today and tomorrow needs:
   a. a good **understanding** of sediment quality and quantity on a river basin scale;
   b. a good **understanding** of technically feasible options for treatment and upland disposal of contaminated sediments (dredged material);
   c. clear and comprehensive **scientific tools** for environmental risk assessment;
   d. a clear and comprehensive **regulatory framework**, including e.g. criteria for aquatic relocation and disposal of sediments (dredged material).

2. Because of the strong relation of sediments/dredged material to water management within river basins, **sediment management should be addressed in the implementation of the European Water Framework Directive**, leading to a common understanding and scientific tools in this area (see 1.a-c, above)**.** Furthermore, existing and forthcoming regulations in the area of waste management, groundwater and soil management (Soil Strategy) should take into account the outcome of discussions within WFD and vice versa, thus achieving a clearer and more comprehensive regulatory framework (see 1.d, above).

3. The European Water Framework Directive aims to improve the ecological status of waters (where necessary) on a river basin scale including the coastal zone. Therefore it is likely that a large share of measures will relate to sources of water pollution. Reduction of emissions, discharges and losses will inherently improve sediment quality as well. Conversely, in some areas contaminated sediment may in itself be a source of pollution or a handicap to ecological quality. **The implementation of the European Water Framework Directive may therefore help to reduce contamination to such levels that relocation of sediment within the same water system can take place without special restrictions.**

ANNEX 1A: PARTICIPANTS IN DGE

The parties that participate in the Dutch-German Exchange on Dredged Material are various ministries, government agencies and institutions and port authorities.

- Dutch Ministry of Housing, Spatial Planning and the Environment (VROM)
- Dutch Ministry of Transport and Water Management
- Dutch Aquatic Sediment Expert Centre
- Port of Rotterdam (for the communities of Dutch cities)
- German Federal Ministry for the Environment, Nature
- Conservation und Nuclear Safety, Bonn
- German Federal Ministry of Transport, Building and Housing
- German Federal Environmental Agency
- German Federal Institute of Hydrology
- Free and Hanseatic City of Hamburg
- Free Hanseatic City of Bremen (incl. University)
- Ministry of the Environment of Lower Saxony
- Port Authority Emden of Lower Saxony
- Ministry for the Environment of North-Rhine Westphalia

ANNEX 1B: RELEVANT MULTILATERAL INTERNATIONAL FRAMEWORKS

- international **river commissions**, like ICPR for the river Rhine and ICPE for river Elbe;
- international commissions for the protection of the **marine environment** (like OSPAR for the North-East-Atlantic and HELCOM for the Baltic Sea);
- international organisations dealing with **navigation and dredging** (like PIANC, CEDA);
- the European Sediment research Network **(SedNet)**, which was established in order to help to structure and facilitate an European approach on environmentally, socially and economically viable practices of sediment management on a river basin scale
- the implementation process of the **Water Framework Directive** to give guidance on how the demands from the EU-WFD for environmentally and economically sound management of dredged material and sediments on a river basin scale could be met;
- the European working group on Soil Contamination which is being established recently under the Advisory Forum on the **European Soil Thematic Strategy;**
- further legislative development within the **European waste legislation** particularly when treatment and upland disposal of sediments and dredged material is required.

ANNEX 2 DGE PRODUCT LIST

DGE produces thematic guidance documents in the field of dredged material management based on the experiences in The Netherlands and Germany. Each document covers a specific subject providing for a comparison between the situation in both countries and an outlook.

Available documents

- **DGE Part I: Dredged Material and Legislation** (April 2003)
  Part I has the character of a stepping-stone for all other documents because it contains an up-to-date survey about relevant definitions and the legislative situation of dredged material management in both countries against the European background. It can be concluded that the present regulatory framework for management and handling of dredged material is extremely complex. Depending on the dredging objective and the destination of the dredged material, different (parts of) international conventions, European and national laws and regulations apply, e.g. for water, soil, waste and environment. Furthermore, current developments on the European level (Water, Waste and Soil Framework Directives) are likely to have further influence on national legislation and sediment/dredged material management**.** In general it is concluded that there is a need for a more appropriate and less complex regulatory framework for the handling of sediments and dredged material in both countries.

- **DGE Part II: Treatment and Confined Disposal of Dredged Material** (Sept. 2002)
  The document gives an overview of the state of development in Germany and The Netherlands of large-scale treatment, beneficial use and confined disposal technologies that are applicable to dredged material. The current situations and policies with respect to treatment and confined disposal in Germany and The Netherlands are described. Fact sheets and case studies in an annex to the report give more detailed information on the subjects. Gaps and discrepancies in existing guidelines or directives and legislation are identified in the document.

Forthcoming documents

Within the framework of the Dutch-German Exchange on Dredged Material the following activities on themes related to dredging, dredged material and sediment will be employed in the near future. The selection of the forthcoming documents is oriented to the pressing needs of sediment and dredged material management now and in future. Demands from the Water Framework Directive and International Conventions for the protection of the marine environment enforce the use of biological methods for sediment and dredged material management. The combination of chemical and biological assessment is the challenge for the near future.

- **Chemical Criteria**
  In the past a vast number of chemical thresholds for different environmental compartments (soil, sediment, water, fauna, etc.) were determined for various regulations in Germany and The Netherlands. The specific destination of the dredged material is determining the applicable parameters and thresholds. The progressing European legislation has set up new demands (e.g. priority substances in the European Water Framework Directive, thresholds for different landfill categories in the European Landfill Directive, thresholds within national soil legislation) which influence dredged material management of today and in future significantly. Furthermore the questions of new substances being introduced into the environment and which of them need be considered for sediment/dredged material management in the future are of importance. At this moment, there are differences between countries and specific regulations within each country which are not expected to be harmonised on a European level. DGE aims to give a survey and recommendation of the use of chemical parameters and thresholds for the handling of dredged material and sediments in Germany and The Netherlands by comparing the situation in both countries.

- **Ecotoxicology/risk assessment**
  In the recent past a major change in investigating and assessing the environmental risk of sediments and dredged material has started. The use of ecotoxicological methods (like bioassays) play the decisive role in this change. Currently, various bioassays for marine and freshwater organisms are in use and under development. Bioassays are becoming more and more crucial in decision making frameworks for sediment remediation and the handling of dredged material. DGE aims to compare the current situations in Germany and The Netherlands with respect to the use and development of bioassays and ecotoxicological risk assessment as a whole. DGE intends
  - to provide practice-oriented information on bioassays and
  - to come to recommendations for the use of bioassays now and in the near future.

  Joined research activities support these goals.

- **Ecology**
  The possible impact of dredged material handling on the animal communities in the aquatic environment (sediment and water) is an important aspect of ecological (risk) assessment. DGE aims to compare the current tools and procedures in Germany and The Netherlands particularly regarding the impact of dredged material management on fauna which is an in situ indicator of ecological changes in waters. Great emphasis is put on macrozoobenthos, as this is the group of organisms with most direct effects caused by dredging and relocation/disposal.