OSPAR Guidelines for the Management of Dredged Material at Sea

(Agreement 2014-06)[1] [2]

[1] Replaces Agreement 2009-04. Update 2024.

[2] Agreement 2015-06 regarding interpretation of paragraphs 5.5 and 5.6 of the previous version of the OSPAR Guidelines for the Management of Dredged Material has become obsolete with the adoption of these revised Guidelines.

OSPAR Guidelines for the Management of Dredged Material

I. Glossary and Acronyms

These terms are defined for the purpose of these guidelines

Action levels	Guidance values used to trigger action
Action list	The Action List is a screening mechanism for assessing properties and constituents of dredged material. See for determinants Technical Annex I.
Anoxic	Without oxygen.
Anthropogenic	Originating from the activity of humans.
Beneficial use	Beneficial use is the preferred alternative to dumping at sea. Dredged sediments can be a resource for supporting coastal, estuarine, and riverine systems and can reduce sediment deficits or be a source of material used for construction or landfills. For the purpose of OSPAR Reporting, we use the headings – engineering, habitat restoration, shoreline nourishment and "other”, including remediation, confined disposal.
Benthic	Of, relating to, or occurring at the bottom of a body of water.
Best Available Techniques (BAT)	The latest stage of development (state of the art) of processes, of facilities or of methods of operation, which indicate the practical suitability of a particular measure for limiting discharges, emissions and waste. (Appendix 1 (2) of the OSPAR Convention 1992)
Best Environmental Practice (BEP)	The application of the most appropriate combination of environmental control measures and strategies. (Appendix 1 (6) of the OSPAR Convention 1992)
Bioaccumulation	Accumulation of environmental contaminants in living tissue.
Bioassay	Tests in which organisms are exposed to dredged materials to determine their effects or toxicity.
Biological testing	Testing via bioassays.
Biota	Living organisms.
Building with Nature	New approach to maritime infrastructure projects using the dynamics of the natural system as a starting point.
Capital dredging	Capital dredging includes geological material dredged from previously unexposed layers beneath the seabed and surface material from areas not recently dredged.

CEDA	Central Dredging Association, one of the three autonomous sister organisations, along with WEDA and EADA, that constitute WODA.
Clay	Sedimentary mineral particles 0.2 to 2.0 µm in size, usually with a negative charge (anion); the size and charge have profound implications for sediment chemistry and other physical interactions.
Contaminated dredged material	Dredged material not meeting national assessment criteria (e.g. exceeding upper action levels).
Confined disposal	Disposal in a structure planned and designed to contain dredged material and safely contain any released contaminants, preventing their re-entry into the aquatic environment.
Dredged material	Material arising from dredging operations.
Dredged material management	Is an overarching term describing a variety of handling methods of dredged materials including, inter alia: dumping (deliberate disposal), re-use, beneficial use, re-location, placement and treatment.
Eco-toxicological testing	Testing toxic effects of chemicals on biological organisms, e.g. using bioassays'
Fractions	Categories of sediments using grain size.
Gravel	Unconsolidated rock fragment > 2mm to < 63mm
Harbour	Harbours include enclosed and semi-enclosed docks, docks entrances, marinas, wharves and unloading jetties
Inert material of natural origin	Inert materials are those which do not cause pollution through leaching, physical or chemical weathering and/or biological activity. The type of inert material including the reason for its classification as inert should be indicated
Maintenance dredging	Maintenance dredging is the dredging required to maintain berths and navigation channels at advertised depth. It includes dredging of material from recent sedimentation processes in harbour or sea areas.
Oil	Total petroleum hydrocarbons (total oil and grease). C10 – C40
Σ PAH9	The sum of the concentration of nine polycyclic aromatic hydrocarbons; anthracene; benzo[a]anthracene; benzo[ghi]perylene; benzo[a]pyrene; chrysene; fluoranthene; indeno[1,2,3-cd]pyrene; pyrene; phenanthrene

Σ PAH16	The sum of the concentration of sixteen polycyclic aromatic hydrocarbons; acenaphthene, acenaphthylene, anthracene, benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]flouranthene, benzo[a]pyrene, benzo[ghi]perylene, chrysene, dibenz(ah)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene and pyrene.
Σ ICES 7 PCB	The sum of seven poly chlorinated biphenyl (PCB) congeners concentrations; CB 28; CB 52; CB 101; CB 118; CB 138; CB 153; and CB 180.
Permitting authority	The official department or agency that has the legal authority to permit or refuse disposal in the marine environment and to prosecute violations of regulations.
PIANC	Permanent International Association of Navigation Congress.
Practicable	Idea that a project, or scheme that can be realised, with the available resources and within the given constraints of cost and time.
Sand	Mineral particles > 63 µm and < 2 mm in size.
Sediment	Naturally occurring material that is produced through the processes of weathering and erosion of rocks, and is subsequently transported by the action of fluids such as wind, water, or ice, and/or by the force of gravity acting on the particle itself.
Silt	Mineral particles between 2.0 µm and 63 µm in size;
Solid waste	Any persistent, manufactured or processed solid material or items discarded, disposed of or abandoned in the marine and coastal environment
Toxic	Has lethal or debilitating effects when ingested or contacted externally, such as exposure to gill membranes during respiration or to skin.
Treatment	The processing of (contaminated) dredged material to reduce its quantity or to reduce the contamination.

1. Introduction

1.1 Dredging is essential to maintain navigation to, within and from ports and harbours and for the development of port facilities, as well as for remediation, flood management and to maintain the carrying capacity of marine and coastal systems. Much of the material removed during these necessary activities requires disposal at sea, if no alternative use can be found. Most of the material dredged from navigation channels within the OSPAR maritime area is either uncontaminated or only slightly contaminated by human activity (i.e. at, or close to, natural background levels). However, a small proportion of dredged material is contaminated to an extent that environmental constraints need to be applied when considering management options.

1.2 Dredged sediments are recognised as part of the natural sediment cycle. Therefore, one management option is to retain dredged material within the same aquatic sedimentary system from where it originated, if it is environmentally, technically, socially and economically feasible to do so. This has the benefits of maintaining the sediment cell and maintaining accretion/erosion processes and thus maintaining habitats (PeiPei, 2003; Townend and Whitehead, 2003).

General remarks

1.3 All assessments are on national basis and not dictated by OSPAR. However, with a view to evaluating the possibilities for harmonising or consolidating criteria for assessing dredged material Contracting Parties are requested to inform the OSPAR Commission of criteria adopted or revisions, as well as the scientific basis for the development and refinement of criteria for assessing dredged material.

Overview of Dredging Activities

1.4 Dredging is carried out for a variety of purposes, such as:

a. navigation:
   - Maintenance of navigation channels, berths
   - Capital (or new-work) for navigation;

b. to support infrastructure,
   - For coastal protection
   - Renewable energy development
   - Relocation of sediment for cables.
   - Port expansion.

c. for the purposes of ecosystem enhancement:
   - Environmental dredging to remove contaminated sediment;
   - Restoration dredging to restore or create environmental features or and
   - Dredging to support local and regional sediment processes.

2. Background and Scope

2.1 These Guidelines were adopted at the 2014 Meeting of OSPAR's Environmental Impacts of Human Activities Committee. Contracting Parties should take these guidelines into consideration in their authorisation or regulation procedures for dredged material.

2.2 These guidelines are designed to assist Contracting Parties in the management of dredged material in ways that will prevent and eliminate pollution in accordance with Annex II to the 1992 OSPAR Convention, and protect marine species and habitats in the OSPAR maritime area in accordance with Annex V. Dredged materials have been listed in Article 3.2 of Annex II as being permitted to be dumped at sea, as an exception from the general prohibition from dumping in Article 3 (2).

2.3 Any disposal into the maritime area of dredged materials, independently of whether it is considered as "dumping" or "placement" within the OSPAR Convention (cf. Article 1(f) and Article 1(g)(ii) respectively), should be assessed on a case-by-case basis in order to ensure that it complies with the objectives of the Convention, as outlined in these Guidelines.

2.4 The Guidelines address the management of dredged material in the maritime area subsequent to any dredging technique including hydrodynamic and side cast dredging. In addition to preventing and eliminating adverse effects the guidelines, where appropriate, seek to maintain or enhance the existing environmental conditions.

2.5 The guidelines are primarily a scientific and technical framework for assessing dredged material proposed for disposal at sea. While economic considerations are acknowledged, they are not dealt with in detail in these guidelines. This implies that the detailed procedures described in the guidelines will not be applicable in all national or local circumstances.

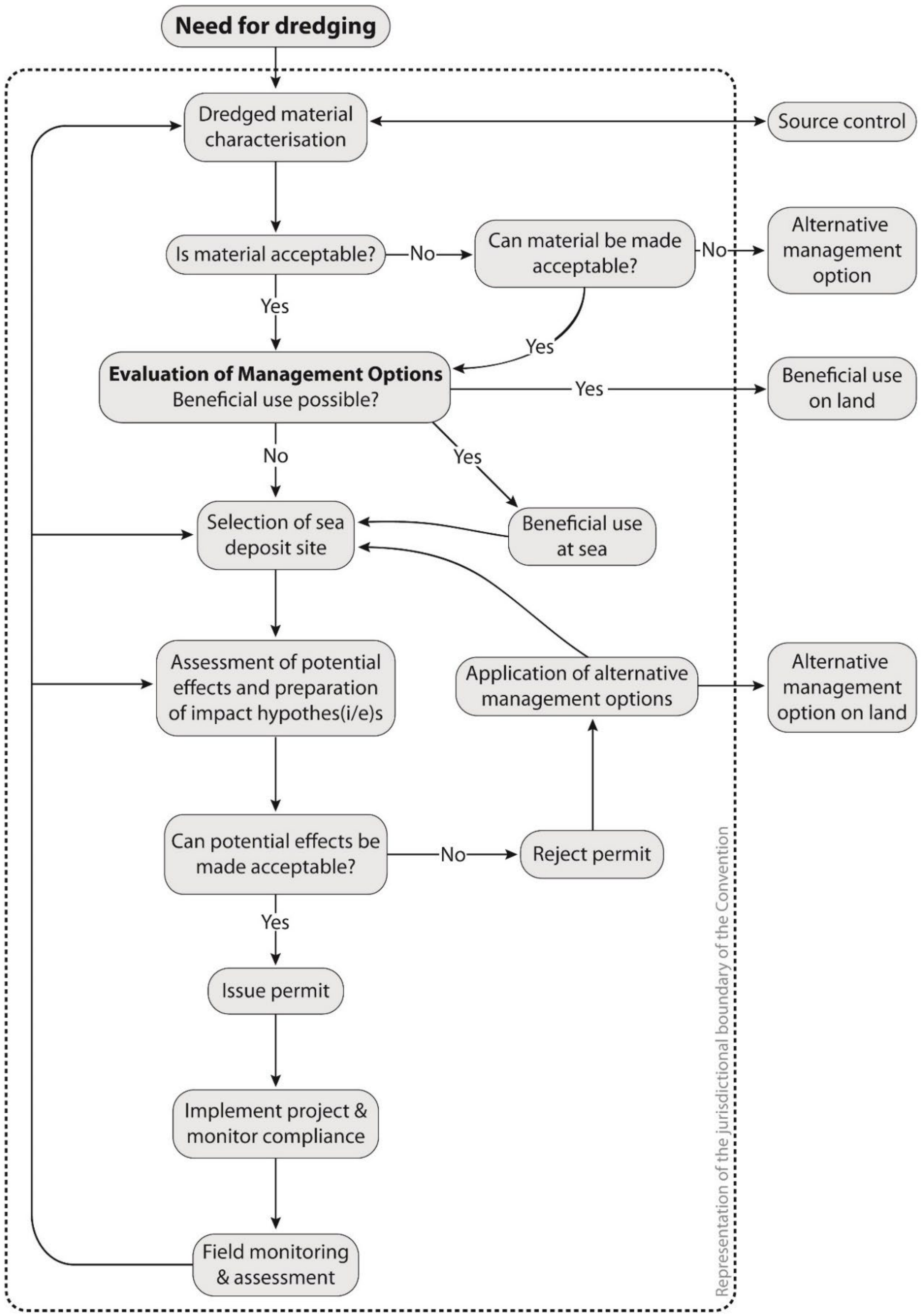
2.6 In the context of these guidelines, dredged material is deemed to be sediments with associated water, organic matter etc. removed from areas that are normally or regularly covered by water, using dredging or other excavation equipment.

2.7 It is recognised that both removal and disposal of dredged sediments may cause harm to the marine environment. Contracting Parties are therefore encouraged to exercise control over both dredging and dredged material management using a Best Environmental Practice (BEP) approach designed to minimise both the quantity of material that has to be dredged and dumped, and the impact of the dredging and disposal activities in the maritime area - see Technical Annex II. Contracting Parties are encouraged to develop local, regional and national dredged material management plans in order to minimise the possible impacts and maximising possible benefits from dredging and disposal. Advice on environmentally acceptable dredging techniques is available from a number of international organisations e.g. the Permanent International Association of Navigation Congresses (PIANC) and the Central Dredging Association (CEDA).

2.8 The schematic shown in Figure 1 presents the steps involved in the application of these Guidelines where important decisions should be made. In general, national authorities should use this schematic in an iterative manner to ensure that all steps receive appropriate consideration, including consideration of BAT and BEP, before a decision is made to issue or decline a permit.

2.9 As a significant number of the Contracting Parties are subject to European Union regulations, the Guidelines can be used as a tool to assist in the management of dredged material that is subject to current European Directives (e.g. Water Framework Directive 2000/60/EC, Marine Strategy Framework Directive 2008/56/EC, Natura 2000 areas under the Birds and Habitat Directives 2009/147/EC and 92/43/EEC). Also, the *Directive 2008/98/EC of the Parliament and of the Council of 19 November 2008 on waste*, (hereinafter the Waste Framework Directive), has been identified by Contracting Parties as having potential implications on the management of dredged material. Annex II attempts to offer clarifications regarding the relationship between the existing national interpretations in the application of the Waste Framework Directive to dredged material and the dredged material management guidelines shared in OSPAR maritime area.

Figure 1 Steps to be considered in assessing permits application for disposal at sea



3. Requirements of the 1992 OSPAR Convention [3]

3.1 Article 1(f)(i) of the 1992 OSPAR Convention, defines dumping as any deliberate disposal in the maritime area of wastes or other matter[4] from vessels or aircraft or from offshore installations, and that under Article 1(g)(ii) of the Convention, dumping does not include the placement of matter for a purpose other than the mere disposal thereof, provided that, if the placement is for a purpose other than for which the matter was originally designed or constructed, it is in accordance with the relevant provisions of the Convention.

3.2 Article 2.1a requires Contracting Parties to take all possible steps to prevent and eliminate pollution and to take the necessary measures to protect the maritime area against the adverse effects of human activities so as to safeguard human health and to conserve marine ecosystems and, when practicable, restore marine areas which have been adversely affected.

3.2 Article 4 requires Contracting Parties to take individually and jointly all possible steps to prevent and eliminate pollution by dumping or incineration of wastes or other matter in accordance with the provisions of the 1992 OSPAR Convention, in particular as provided for in Annex II.

3.3 With regard to the dumping of wastes or other matter at sea that are permitted under Article 3(2) of Annex II of the 1992 OSPAR Convention (which includes dredged material), Article 4 (1)(a) of Annex II requires Contracting Parties to ensure that no wastes or other matter listed in Article 3(2) shall be dumped without authorisation or regulation by their competent authorities. In addition, Article 4 (1)(b) of Annex II requires Contracting Parties to ensure that such authorisation or regulation is in accordance with the relevant applicable criteria, guidelines and procedures adopted by the Commission, in accordance with Article 6 of Annex II.

3.4 Articles 6, of Annex II states that, inter alia, it is the duty of the Commission to draw up and adopt criteria, guidelines and procedures relating to the dumping of wastes or other matter listed in Article 3(2) of Annex II, and to the placement of matter referred to in Article 5[5], of Annex II, with a view to preventing and eliminating pollution.

3.5 Furthermore, Article 4 (3) of Annex II requires Contracting Parties to keep and report to the Commission records of the nature and quantities of wastes or other matter dumped [at sea] in accordance with Article 4(1) of Annex II and the dates, places (i.e., locations) and methods of dumping used. To this end, OSPAR has agreed on reporting formats for the submission of data on dumping operations at sea.

3.6 Article 4(1)(c) of Annex II requires Contracting Parties to avoid situations in which the same dumping operation is authorised or regulated by more than one Contracting Party. In such cases, their competent authorities shall, as appropriate, consult before granting an authorisation or applying regulation.

3.7 Article 2 of Annex V to the OSPAR Convention, requires Contracting parties to take, individually and jointly, the necessary measures to protect the maritime area against the adverse effects of human activities so as to safeguard human health and to conserve marine ecosystems and, when practicable, restore marine

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[3] All Article or Annex references mentioned in this chapter refer to the 1992 OSPAR Convention as amended by the 1998 inclusion of Annex V and Appendix 3.

[4] The OSPAR Convention does not distinguish “wastes” from “other matter”, being the two terms defined in one definition “wastes or other matter” under Article 1(o) of the OSPAR Convention, as such deliberate disposal of “other matter” does not make it “waste”.

[5] Article 5 of Annex II states that no placement of matter in the maritime area for a purpose other than that for which it was originally designed or constructed shall take place without authorisation or regulation by the competent authority of the relevant Contracting Party. Such authorisation or regulation shall be in accordance with the relevant applicable criteria, guidelines and procedures adopted by the Commission in accordance with Article 6 of Annex II.

areas which have been adversely affected, as well as their obligation under the Convention on Biological Diversity of 5 June 1992 to develop strategies, plans or programmes for the conservation and sustainable use of biological diversity. Contracting Parties shall:

a. take the necessary measures to protect and conserve the ecosystems and the biological diversity of the maritime area, and to restore, where practicable, marine areas which have been adversely affected; and
b. cooperate in adopting programmes and measures for those purposes for the control of the human
activities identified by the application of the criteria in Appendix 3.

3.8 Appendix 3(1) describes the criteria to be used, taking into account regional differences, for identifying human activities for the purposes of Annex V[6] are:

a. the extent, intensity and duration of the human activity under consideration;
b. actual and potential adverse effects of the human activity on specific species, communities and habitats;
c. actual and potential adverse effects of the human activity on specific ecological processes;
d. irreversibility or durability of these effects.

4. Preliminary Considerations for Dredged Material Management

4.1 Marine sediments are not, in themselves, polluting substances. Rather, they can be a sink for contaminants that end up in our harbours and ports mainly from anthropogenic sources such as sewage discharges, marine traffic, industrial wastewater and historically poor environmental management.

4.2 Reducing adverse effects on the marine environment can be accomplished through the following three activities:

a. Controlling and reducing sources of contamination;
b. Maximising the use of dredged material for beneficial purposes;
c. Minimising the volumes of sediment that must be dredged by using improved Best Environmental Practices (BEP), as discussed in Technical Annex II.

4.3 High priority should be given to the identification of sources of contamination, as well as the reduction and prevention of further contamination of sediments from both point and diffuse sources. Successful implementation of prevention strategies will require collaboration among competent authorities with responsibility for the control of contaminant sources. Sources of contamination include from industrial and domestic discharges; storm water; surface runoff from urban, agricultural areas; sewage and wastewater treatment effluents; transport from upstream contaminated sediments; accidental pollution and extreme events such as flooding.

4.4 Competent authorities should provide consideration of relevant source control strategies for example the risks posed by contaminants and the relative contributions of the individual sources to these risks. They should also consider existing source control programmes and other regulations or legal requirements, and the use of best available techniques (BAT) and BEP as defined in Appendix 1 of the 1992 OSPAR Convention, inter alia, as regards the technical and economic feasibility. Consequences of not implementing source control should be assessed and evaluations of effectiveness of measures should be taken.

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[6] Appendix 3(2) states that these criteria are not necessarily exhaustive or of equal importance for the consideration of a particular activity.

4.5 In cases where control measures are not fully effective in reducing contamination and high levels of contamination persist then specific dredged material management options may be required, for example confined disposal facilities or treatment methods.

4.6 Sediment can be a valuable natural resource. Beneficial uses of dredged material (described in Chapter 7) should be pursued to the maximum extent practicable.

4.7 There is a need to minimise the release of contaminants to the environment and maximise the re-use of sediment for beneficial purposes. Progress towards more sustainable practice in respect to sediment management (including dredged material management) can be seen in initiatives such as *Building with Nature* (n.d.)) Working with Nature, (PIANC 2011).

4.8 In addition, attention needs to be given to ensuring that the quantities of material to be dredged are minimised as far as is practicable. Application of BEP (Technical Annex II) to dredging operations minimises the quantity of material to be dredged and disposed at sea thereby minimising the environmental impact (e.g., PIANC 2009 and CEDA 2010).

5. Dredged material sampling

5.1 Dredged material will require sampling and analysis (cf. Technical Annex I) to provide sufficient information for permitting purposes. Local conditions will dictate what information is relevant to a particular operation.

5.2 The location and depth of sampling should represent the horizontal and vertical extent of the area, and the quantity of material to be dredged. In many maintenance dredging campaigns, grab sampling will be sufficient. Sampling from dredged material within disposal vessels or barges is not advisable for permitting purposes.

5.3 Samples should provide a good spatial (surface) and vertical (depth) representation of the material to be dredged and should take account of the exchange characteristics of the area, i.e., more samples may be required in a low energy enclosed and semi-enclosed areas, and less in high energy environments such as open areas. The minimum number of separate sampling stations recommended to obtain representative results, assuming a reasonably uniform sediment distribution in the area to be dredged is as follows. The number of sample stations can also be determined on the basis of the size of the area to be dredged:

Dredged Area (m2)	**Number of Stations (locations)**
<10 000	1-3
10 000 - 50 000	4 – 8
50 000 - 100 000	9 – 10
>100 000	extra 5 per 100 000m^2

Where projected depth of dredging is significant, samples will be required at depth, usually by vibracore. The volume of the dredge material should be taken into consideration to determine the number of samples, as below.

Amount dredged (m^3)	**Number of Samples**
Up to 25 000	3
25 000 - 100 000	4 – 6
100 000 - 500 000	7 – 15
500 000 - 2 000 000	16 – 30
>2 000 000	extra 10 per million m^3

Contracting Parties are encouraged to use the Guidelines for the Sampling and Analysis of Dredged Material Intended for Disposal at Sea (IMO, 2005) to inform sampling regimes.

5.4 Normally, the samples from each sampling station and different depths in the sediment should be analysed separately. However, if previous analyses have shown that the sediment is clearly homogenous with respect to sediment texture and known contamination it is possible to analyse composite samples. OSPAR recommends no more than three adjacent sampling stations at a time be composited, and providing there are no distinctly different observable attributes (same colour, consistency, odour) in different sub samples. Care should be taken to ensure that the results allow derivation of valid mean contaminant values.

The original individual samples should be stored or preserved according to procedures in the JAMP Guidelines for Monitoring Contaminants in Sediments (OSPAR Agreement 2002-16) until the permitting procedure has been completed, in case further analyses are necessary.

Frequency of sampling

5.5 The period between sampling has been agreed as three years, but if the results of the analyses indicate that the material meets national assessment criteria (*e.g.* below lower action level), sampling in the same area may be reduced to every five years, provided that there are no material changes to the sediment (e.g. dredging) or new sources of contamination likely to lead to deterioration of the quality of the material in the meantime.

5.6 It may be possible, following assessment of the results of an initial full survey, to reduce either the number of sampling stations or the number of determinants and still provide sufficient information for permitting purposes.[7] If a reduced sampling programme does not confirm the earlier analyses, the full survey should be repeated. If the list of determinants is reduced, further analysis of the complete list of determinants is advisable every five years. The second and third sentence of this paragraph needs to be applied consistent with the provisions of the primary list of chemical determinants in Technical Annex I.

5.7 In areas where sediment chemistry has been shown to exceed action levels, i.e. demonstrates high levels of contamination, or where contamination can be expected, then analysis of all the relevant determinants should be frequent and linked to the permit renewal procedure.

6. Dredged material characterisation

6.1 Characterisation may consider physical, chemical and biological characteristics. A list of the requirements for the characterisation process should be developed on a project-specific basis. This data should be sufficient to assess the possible impacts as a basis for management decisions (e.g. PIANC 1996; 1998a and b). Guidance on the selection of determinants and methods of contaminant analysis, together with procedures to be used for normalisation and quality assurance purposes, will be found in the Technical Annexes.

6.2 If dredged material is so poorly characterised that proper assessment cannot be made of its potential impacts on human health and the environment, it shall not be disposed at sea.

Physical characterisation

6.3 The following information is required:

a. the quantity of material;

b. anticipated or actual loading rate of material at the disposal site;

c. grain size analysis (laser or sieving methods) or exceptionally on the basis of visual determination (*i.e*. clay/silt/sand/gravel/boulder).

Evaluation of the physical characteristics of sediments for disposal is necessary to determine potential impacts and the need for subsequent chemical and/or biological testing (cf. Technical Annex I for further guidance).

Chemical characterisation – add intro sentence to reflect basic chem characterisation

6.4 The substances that are considered of most concern for the marine environment are those with combined properties of persistence, toxicity and liability to bioaccumulate (PTB). Typically, the most important contaminants associated with dredged material include organotin compounds, heavy metals, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) and oils (OSPAR, 2014).

Details of the substances recommended to be determined are listed in Technical Annex I.

6.5 Additional chemical characterisation of the sediment may be required based on locally specific source of pollutants, listed in section 4.3.

6.6 Further information may also be useful in interpreting the results of chemical testing (cf. Technical Annex I).

Biological characterisation

6.7 If the potential impacts of the dredged material cannot be adequately assessed on the basis of the chemical and physical characterisation, Eco toxicological and/or biological testing may be conducted. Further detailed guidance on biological testing is provided in Technical Annex I.

6.8 Eco toxicological tests should incorporate species that are considered appropriately sensitive and representative to determine acute and/or chronic toxicity; Ecotox tests (or bioassays) may also determine the potential for bioaccumulation.

6.9 Assessment of habitat communities and populations may be conducted in parallel with chemical and physical characterisation, *e.g.* a triad approach. It is important to determine if biological valuable habitats are present within the dredging area and to have adequate scientific information on the biological characteristics and composition of the material to be disposed in order to estimate potential impacts on marine environment and human health.

Exemptions from detailed characterisation

6.10 Dredged material may be exempted from testing if there is reason to believe it has not been subject to contamination.

a. in the absence of appreciable past and present pollution sources; and
b. it is composed of previously undisturbed geological material or is composed almost exclusively of sand, gravel, boulders or rock; and

c. when the quantity of dredged material from operations does not exceed 10 000 tonnes per year.

Exemptions granted under 6.10a should be supported by site specific information, while exemptions granted under 6.10b should be supported by particle size data.

Dredged material not meeting all of these requirements will need stepwise characterisation to assess its potential impact (*i.e.* see paragraphs 6.5-6.9).

OSPAR Lists

6.11 The OSPAR List of primary and secondary chemicals is a screening mechanism for assessing properties and constituents of dredged material (see for determinants Technical Annex I). It is used for dredged material management decisions.

Action/maximum/guidance Levels

6.12 Action/maximum/guidance levels are criteria for assessing dredged material that are used as assessment criteria to trigger action. These levels should be developed on a national or regional basis and can be set on the basis of concentration limits, biological responses, environmental quality standards or other reference values. They should be derived from studies of sediments that have similar geochemical properties to those dredged and/or to those of the receiving system. Thus, depending upon natural variation in sediment geochemistry, it may be necessary to develop individual sets of criteria for locations in which dredging or disposal are conducted.

6.13 Lower and upper action levels should be developed, e.g.:

a. Upper action levels – the limit above which dredged material is considered unsuitable for normal disposal at sea but may be suitable for other management options, see paragraphs 7.4 – 7.6 below;

b. Material below the upper level but exceeding the lower level requires more detailed assessment before suitability for disposal at sea can be determined. This may involve additional chemistry, ecotoxicity tests, delineation of the dredge area or additional evidence or consideration such as physical size distribution, final end use of the material to apply the weight of evidence approach.

c. Lower action levels – the limit below which dredged material is generally considered of little environmental concern for disposal at sea.

6.14 Action levels should be established at least for determinants on the Primary List in Technical Annex I.

6.15 If, as an option of least detriment, dredged material is disposed at sea when one or more criteria (both physical and chemical (Tier I and II)) exceed the upper level, a Contracting Party should:

a. where appropriate, identify and develop source control measures with a view to meeting the criteria - see paragraphs 4.3 – 4.5 above;

b. utilise management techniques, including but not limited to confined disposal or treatment methods where allowed, to mitigate the impact of the dumping operation on the marine environment see paragraphs 7.4 - 7.5 below; and

c. report the exceedance of the upper action level to the Secretariat, including the reason for permitting the disposal, together with any alternative options considered, in accordance with the format for the annual report.

7. Dredged material management options

7.1 There is a wide variety of management options for dredged material depending on the physical and chemical characteristics of the material such as beneficial use, unrestricted open-water disposal, confined aquatic disposal or confined disposal facilities. In some cases, the best option may be to leave the material in-situ.

Options for material assessed to be uncontaminated

7.2 Generally, characterisation carried out in accordance with these Guidelines will be sufficient to determine possible management options in water and at the shoreline. Examples include:

a. Retaining sediment within the natural sediment system to support sediment-based habitats, shorelines, and infrastructure, including

   i. Habitat Restoration and Development using dredged material for enhancement or restoration of natural habitat associated with wetlands, other near-shore habitats, coastal features, offshore reefs, fisheries enhancement, etc.

   ii. Beach Nourishment using dredged material (primarily sandy material) to restore and maintain beaches.

   iii. Shoreline Stabilization and Protection through the deposit of dredged material with the intent of maintaining or creating erosion protection, dike field maintenance, berm or levee construction, and erosion control.

b. Disposal at sea (see Chapter 8)

c. Engineering uses (e.g. as capping material, for construction or land reclamation).

7.3 Additional information about beneficial uses of dredged material, including case studies, can be found at the Central European Dredging Association's (CEDA) website (http://www.dredging.org). PIANC (2009) provides technical information on the assessment of options for beneficial use and recommendations on how to overcome constraints based on "lessons learned" from numerous cases studies in different situations in various countries.

Options for material assessed to be contaminated

7.4 The practical availability of means of disposal, other than at sea, should be considered in the light of a comparative risk assessment involving both dumping and the alternatives.

7.5 Where the characteristics of the dredged material are such that conventional disposal at sea would not meet the requirements of the 1992 OSPAR Convention, treatment or other management options should be considered. These options can be used to reduce or control impacts to a level that will not constitute an unacceptable risk to human health, living resources, amenities or interfere with other legitimate uses of the sea.

7.6 Treatment, such as separation of contaminated fractions, may make the material suitable for beneficial use or disposal at sea. However, some Contracting Parties do not allow treated material to be disposed in the marine environment, including on the intertidal, if the material has had its physical characteristics altered. Such factors should be considered in the assessment process. Disposal management techniques to reduce or control impacts may include separation of the contaminated material such that the material that is not considered to be contaminated, may be dredged and disposed, or used beneficially. The contaminated material may be left in situ or dredged and disposed using contained methods e.g., closed bucket dredger and within construction. In certain environments, contaminated material may be disposed or buried on the sea floor followed by clean sediment capping, to contain the contaminated material. Figure 2 below demonstrates options for dealing with contaminated sediment.

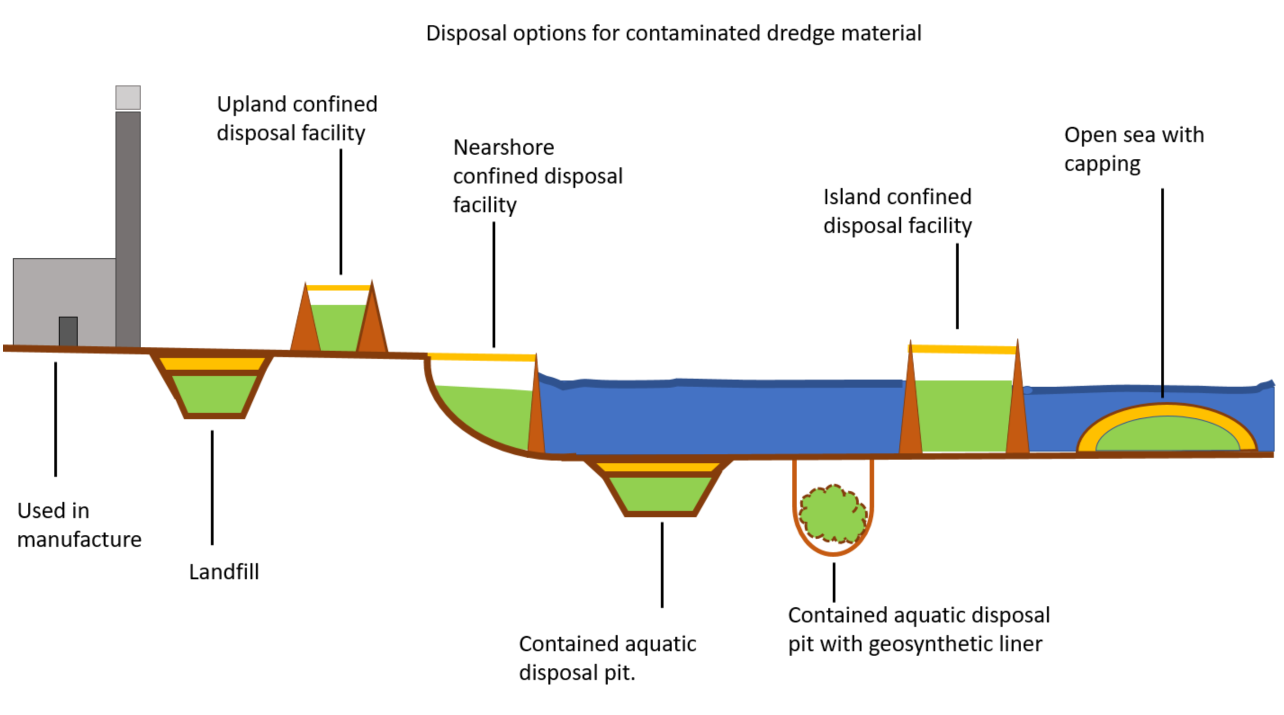

Figure 2 Disposal options for contaminated dredged material

Advice on dealing with contaminated dredged material is available from PIANC and CEDA (see references).

8. Disposal at sea site selection

8.1 The selection of a site for disposal at sea involves environmental consideration and also economic and operational (e.g., accessibility for vessels) feasibility. Site selection should try to ensure that the disposal of dredged material does not interfere with, or devalue, legitimate commercial and economic uses of the marine environment nor produce undesirable effects on vulnerable marine ecosystems or species and habitats on the OSPAR List of Threatened and/or Declining Species and Habitats (OSPAR Agreement 2008-6) or within the network of Marine Protected Areas (OSPAR Recommendation 2003/3, as amended by OSPAR Recommendation 2010/2). To enable reporting required annually by OSPAR, all sites used for receiving dredged sediment, whether for 'dumping' or beneficial use, require a disposal site to be designated. The process for selecting a disposal site (whether for disposal or beneficial use) is predominantly the same. Where there are differences, these are highlighted in the guidelines.

8.2 Site information, as appropriate, may be assessed on:

a. the physical, chemical and biological characteristics of the seabed (e.g., topography, sediment dynamics, benthic organisms, sediment chemistry);

b. the physical, chemical and biological characteristics of the water column (e.g., hydrodynamics, dissolved oxygen, pelagic species);

c. proximity to any other valid use of the area[8]:

d. the capacity of the site, taking into account:

i. hydrography;

[8] Such as: areas of natural, cultural or historical importance; areas of specific scientific or biological importance (*e.g.* Marine Protected Areas); recreational areas; subsistence, commercial and sport fishing areas; spawning, recruitment and nursery areas; migration routes of marine organisms; shipping lanes; military exercise zones; past munitions dump sites; engineering uses of the sea such as undersea cables, pipelines, wind farms; areas of mineral resources (*e.g.* sand and gravel extraction areas);

ii. the estimated reduction in water depth due to the dredged material.

iii. the anticipated loading rates per day, week, month, or year;

e. and for beneficial use sites, the likelihood of the site developing beneficially, as intended.

Such information can be obtained from existing sources, complemented by field work where necessary.

8.3 Information on the characteristics of the site is used to determine the probable fate and effects of the disposal material. The hydrographic conditions in the vicinity of the site will determine the transport and fate of the dredged material. The physico-chemical parameters can be used to assess the mobility and bioavailability of the chemical constituents of the material. The nature and distribution of the biological community and the proximity of the site to marine resources and amenities will, in turn, define the nature of the effects that are to be expected. These effects may be minimised through permit conditions (see also Chapter 10: permit or regulation by other means).

8.4 Existing stresses on biological communities, such as inputs of contaminants to coastal areas through land runoff and discharge, from the atmosphere, resource exploitation and maritime transport, should be considered as part of the assessment. As should the recognition that through the act of dredging and disposal, contaminants may be resuspended which otherwise may have remained in-situ thus creating a source of contaminant release. The proposed method of disposal and potential future uses of resources and amenities in the marine receiving area should also be taken into account.

8.5 Information from baseline and monitoring studies at already established sites will be important in the evaluation of any new activity at the same site or nearby.

8.7 For the dredged material which is acceptable for disposal at sea or for beneficial use, the sediments at the receiving location(s), should be of similar characteristics, if possible.

9. Assessment of potential effects

9.1 Some materials should not be disposed in a manner or at a location which may lead to interference with protected species and habitats, fishing, shipping, amenities or other (beneficial) uses of the marine environment.

Disposal sites

9.2 Newly designated sites require assessment of potential effects. This should lead to a concise statement of the expected consequences of the disposal option (*i.e*. an Impact Hypothesis). Its purpose is to provide a basis for deciding whether to approve or reject the proposed disposal option and for defining environmental monitoring requirements.

9.3 This assessment should integrate information on the characteristics of the dredged material and the conditions of the proposed site. It should comprise a summary of the potential effects on human health, living resources, amenities and other legitimate uses of the sea and should define the nature, temporal and spatial scales and duration of expected impacts based on worst case assumptions.

9.4 In order to develop the hypothesis, it may be necessary to conduct a baseline survey which describes not only the environmental characteristics, including its variability. It may be helpful to develop sediment transport, hydrodynamic and other models, to determine possible effects of disposal of the dredged material on the site.

9.5 For a retentive site, the assessment should delineate the area that will be substantially altered by the presence of the material and what the severity of these alterations might be. At the extreme, this may include an assumption that the immediate receiving area is entirely smothered. In such a case, the likely timescale of recovery or re-colonisation should be projected after operations have been completed as well as the likelihood that re-colonisation will be similar to, or different from, the existing benthic community structure. The assessment should specify the likelihood and scale of residual impacts outside the primary zone.

9.6 In the case of a dispersive site, the assessment should include a definition of the area likely to be altered in the shorter term by the proposed operation (i.e., the near-field) and the severity of associated changes in that immediate receiving environment. It may also specify the likely extent of long-term transport of material from this area and what this flux represents in relation to existing transport fluxes in the area, thereby permitting a statement regarding the likely scale and severity of effects in the long-term and far-field.

9.7 When assessing the potential impacts of disposal of dredged material the specific requirements of relevant EU-regulations and other Directives have to be considered: EU-Habitats Directive (92/43/EC), EU-Birds Directive (2009/147/EC), EU-Water Framework Directives (2000/60/EC), EU-Marine Strategy Framework Directive (2008/56/EC), Convention on Biological Diversity etc.

Nature of the impact

9.8 All dredged materials have a physical impact at the point of disposal. This impact includes covering of the seabed and local increases in suspended solids levels. Physical impact may also result from the subsequent transport, particularly of the finer fractions, by wave and tidal action and residual current movements.

9.9 Biological consequences of these physical impacts include smothering of benthic organisms, plants and macroalgae in the disposal area and potentially in the surrounding area. Physical impacts can also interfere with the migration and spawning of fish (or crustaceans). Guidance is given in Technical Annex II.

9.10 The toxicological and bioaccumulation effects of dredged material constituents should be assessed. Disposal of sediments with low levels of contamination is not without environmental risk and requires consideration of the fate and effects of dredged material and its constituents. Substances in dredged material may undergo physical, chemical and biochemical changes within the marine environment and these changes should be considered in the light of the eventual fate and potential effects of the material.

9.11 In relatively enclosed waters, such as some estuarine, archipelagic and fjordic situations, sediments with a high chemical or biological oxygen demand (*e.g.* organic carbon-rich) could adversely affect the oxygen regime of the receiving environment while sediments with high levels of nutrients could significantly affect the nutrient flux.

9.12 An important consequence of the physical presence of disposal of dredged material activities is interference with fishery activities and in some instances with navigation and or recreation.

9.13 Special consideration should be given to dredged material containing significant amounts of oil or other substances that may float following re-suspension in the water column. This may be done on a case-by-case basis to reflect local conditions.

10. Permit or regulation by other means

10.1 If disposal at sea is the selected option, then a permit or regulation by other means (which is in compliance with these guidelines) authorising disposal at sea must be issued in advance.

a. The permit is an important tool for managing disposal at sea of dredged material and will contain the terms and conditions under which disposal at sea may take place as well as provide a framework for assessing and ensuring compliance. In granting a permit, the immediate impact of dredged material occurring within the boundaries of the site such as alterations to the local, physical, chemical and biological environment is accepted by the permitting or supervising authority. Notwithstanding these consequences, the conditions under which a permit for disposal at sea is issued should be such that environmental change beyond the boundaries of the disposal site are minimised. Where predicted impacts of the operation are greater than negligible, the operation should be permitted to reduce environmental disturbance and negative effects and to maximise benefits. Measures applied should be using BEP or BET as well as considering any spatial and or temporal to minims negative effects of either the dredging or the disposal. e.g., a clam shell should be used to reduce the release of contaminated sediments into the water column, dredging to be done under dry conditions to minimise the concentration of suspended solids in the water column, disposal should be evenly spread over the dredge area to prevent mounding, dredging should not take place during the period XX/XX to XX/XX prevent interference to migratory fish.

b. Regulation by other means. Possibly add examples – e.g. N (notifications)L, SE (exemptions) & UK (harbour authority permissions) etc

10.2 Permit conditions should be drafted in plain and unambiguous language and will be designed to ensure that:

a. only those materials which have been characterised or considered exempted from detailed characterisation according to paragraph 6.3, and found acceptable for disposal at sea, based on the impact assessment, are disposed;

b. bulky harbour debris such as wooden beams, scrap metal, pieces of cable etc. contained within the dredged material should be separated on board before disposal and managed on land according to MARPOL Annex XX;

c. the material is placed/dumped at the selected site;

d. any necessary management techniques identified during the impact analysis are carried out; and

e. any monitoring requirements are fulfilled and the results reported to the permitting or supervising authority.

10.4 A permit to dispose dredged material that is assessed to be contaminated according to national assessment criteria should be refused unless the permitting authority determines that appropriate opportunities exist to reuse, recycle or treat the material without undue risks to human health or the environment.

11. Monitoring

11.1 The London Convention Dredged Material Assessment Framework Guidelines define monitoring as compliance or surveillance monitoring:

I. Measurements of compliance with permit requirements, (compliance monitoring);

II. Measurements of the condition and changes in condition of the receiving area to assess the adequacy of the Impact Hypothesis upon which the issue of a disposal permit was approved (validation or surveillance monitoring).

11.2 The effects of dredged material deposit are likely to be similar in many areas, and it would be very difficult to justify (on scientific or economic grounds) monitoring all sites. It is therefore more appropriate, and cost effective, to concentrate on detailed investigations at a few carefully chosen sites (e.g. those subject to large inputs of dredged material, high risk to environmental deterioration) to obtain a better understanding of processes and effects.

11.4 The Impact Hypothesis forms the basis for defining the monitoring programme. The measurement programme should be designed to ascertain that changes in the receiving environment are within those predicted. In designing a monitoring programme the following questions must be answered:

a. what testable hypotheses can be derived from the Impact Hypothesis?

b. what measurements (e.g. type, location, frequency, performance requirements) are required to test these hypotheses?

c. what should be the temporal and spatial scale of measurements?

d. how should the data be managed and interpreted?

11.5 The permitting body is encouraged to take account of relevant research information in the design, modification and if appropriate cessation of monitoring programmes. Measurements should be designed to determine:

a. whether the zone of impact differs from that predicted;

b. whether the extent of change outside the zone of impact is within the scale predicted

c. spatial and/or temporal change of the marine environment, in the case of older sites without impact hypotheses. Temporal and spatial measurements facilitate comparison of the predicted and actual impacts of the operations both within and outside of the predicted zone of impact to determine the significance of any change.

11.6 Information gained from field monitoring, (or other related research studies) can be used to:

a. modify or terminate the field monitoring programme;

b. modify or revoke the permit; and

c. refine the basis on which applications to deposit dredged material at sea are assessed.

11.7 Concise statements of monitoring activities should be prepared. Reports should detail the measurements made, results obtained and how these data relate to the monitoring objectives. The frequency of monitoring and reporting will depend upon the scale of deposit activity and the intensity of monitoring.

11.8 To fulfil Compliance Monitoring obligations, permitting bodies require vessel logs to verify vessel activity, therefore vessels should be equipped with accurate positioning. Ships' records and automatic monitoring and display devices (e.g. black-boxes), where these have been fitted, will be inspected to ensure that disposal is taking place at the specified disposal site. Vessels and operations are inspected regularly to ensure that the conditions of the disposal permit are being complied with and that the crew are aware of their responsibilities under the permit.

12. Reporting

12.1 Reporting of permits issued and amounts of dredged material, deposited together with the associated contaminants, is required according to the 1992 OSPAR Convention - see paragraph 3.4 above. The characterisation process is designed to provide information for permitting purposes. However, it will also provide some information on the contribution of dredged material to total inputs and, at the present time, it is considered the only approach available for this purpose

12.2 Together with contaminant data, information on the methods of determination and on quality assurance of analyses of deposited material should be provided as requested in the Reporting Format (Agreement 2018-02). Contracting Parties should submit data using the latest adopted version of the OSPAR Reporting Format (currently Agreement 2018-02).

12.3 Contracting Parties should also inform the Secretariat of their monitoring activities and submit reports when they are available.

Annex I[9]

Clarifications regarding the relationship between the existing national interpretations in the application of the Waste Framework Directive to dredged materials and the dredged material management guidelines shared in OSPAR region

1. There are different approaches between Contracting Parties to regard “dredged material” generally as “waste” or only under certain circumstances, depending on the national interpretation of the Waste Framework Directive when dealing with dredged material.

2. The OSPAR Convention does not contain a definition as such of the term “dredged material” and however the general rule of interpretation of treaties as set out in Article 31(1) of the Vienna Convention[10], states that *“A treaty should be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose”*. In this context, the purpose of the OSPAR Convention as established in Article 2(1)(a) is for OSPAR Contracting Parties, to take all possible steps “*to prevent and eliminate pollution”* and the necessary measures *“to protect the maritime area against the adverse effects of human activities so as to safeguard human health and to conserve marine ecosystems and, where practical, restore marine areas which have been adversely affected”.*

3. Under Article 1(f)(i) of the OSPAR Convention, “dumping” is defined as *“any deliberate disposal in the maritime area of wastes or other matter”* from vessels or aircraft or from offshore installations, and that under Article 1(g)(ii) of the Convention, “dumping” does not include *“the placement of matter for a purpose other than the mere disposal thereof, provided that, if the placement is for a purpose other than for which the matter was originally designed or constructed, it is in accordance with the relevant provisions of the Convention”.*

4. The category of “wastes or other matter” in the 1992 OSPAR Convention was adopted well before the adoption of the EU Waste Framework Directive, which defines “waste” as *“any substance or object which the holder discards or intends or is required to discard”* (Article 3(1)). When the expression “other matter” was forged, it covered items which were not considered to be “wastes” at that time, in order to avoid the loophole in the dumping regime that the label of matter as “non-wastes” could have created.

5. The OSPAR Convention does not distinguish “wastes” from “other matter”, being the two terms defined in one definition “wastes or other matter” under Article 1(o) of the OSPAR Convention, consequently the deliberate disposal of “other matter” does not make it “waste”. Consequently, dredged material is “wastes or other matter”, the dumping of which is subject to authorisation or regulation.

9 Previous Annex II as the Glossary was previously Annex I.

10 Vienna Convention on the Law of the Treaties between States and International Organisations or between International Organisations 1986.

6. Re-use (e.g., beneficial use) is one amongst other management options for dredged materials that could be considered by criteria, guidelines or procedures.

7. Despite the use of different terminology, the Waste Framework Directive[11]/London Convention and its Protocol[12]/ OSPAR Convention have the same purpose and objective, that is the protection of the marine environment and human health, but the definitions may differ.

8. As such, despite these different interpretations on how the Directive may apply to dredged material there is a shared management framework in the OSPAR region provided by the Guidelines presented in this document.

9. Consequently, the present Guidelines are applicable to the existing approaches undertaken by the Contracting Parties and summarised below[13]:

(i) Dredged material is regarded as wastes or other matter, irrespective of the quality, and national waste legislation is applied.

(ii) Dredged material is excluded from the scope of the Directive if it is proven that the sediments are non-hazardous (exemption in Article 2.3 of the Waste Framework Directive). Article 2.3 requires the Member State to prove the non-hazardousness of the dredged sediments, not being demanded to apply the Directive in cases complying with the mentioned requirement. Therefore, Contracting Parties need to develop a consistent methodology that assures the non-hazardousness of the sediments. If it is determined to be hazardous by this methodology, the material must not be exempted and hazardousness related to the Waste Framework Directive has to be checked.

(iii) The regulation is principally based on water legislation as long as it is proven that it is non-hazardous which is defined also within the scope of water legislation. If it is determined to be hazardous related to water legislation, then it is generally regarded as waste and hazardousness related to the Waste Framework Directive has to be checked.

(iv) Dredged material is regarded as a resource for the aquatic systems, quality is determined and if it meets the criteria, national water legislation can be applied for the recovery of waste or other matter. This approach allows the Member State to have legislation in place for the recovery of waste or other matter. If the Waste Framework Directive directly applies to the management of dredged material, the Directive allows for the recovery and re-use of wastes, as defined in Annex II of the Waste Framework Directive. For those activities listed Member States may exempt dredged material from permit requirements (Article 24). Article 25 then states that the Member State then shall lay down general rules specifying conditions and methods used. Starting point for this point of view is that sediments (dredged material) are an important resource for aquatic systems**.**

(v) Dredged materials are excluded from the scope of the Waste Framework Directive if they are not managed on land.

For more clarification, the present Guidelines apply to:

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11 Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on wastes and repealing certain Directives.

12 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 and 1996 Protocol thereto.

13 It is not the aim of the document to reflect a unique position but to show the existent diversity which is not in contradiction with the aims of the OSPAR Convention and in particular of this document.

(a) dredged sediments not considered excluded from the scope of the Waste Framework Directive by the competent authority but classified as non-hazardous waste accordingly to it.

(b) dredged sediments considered excluded from the scope of the Waste Framework Directive by the competent authority under Article 2.3 of the Waste Framework Directive (proved to be non-hazardous sediments),

(c) dredged sediments not considered as waste according to national interpretation of this term and therefore consequently regulated by national and European water legislation.

Annex II[14]

Background information and supplementary literature to the OSPAR Guidelines for the Management of Dredged Material

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CEDA, 2012: Position Paper: Climate Change Adaptation as it Affects the Dredging Community.

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PIANC, 1996. Handling and Treatment of Contaminated Dredged Material from Ports and Inland Waterways, Report of Working Group No. 17 of the Permanent Technical Committee 1 - Supplement to PIANC Bulletin No. 89.

PIANC, 1997. Dredged Material Management Guide. Special Report of the Permanent Environmental Commission – Supplement to Bulletin no.96.

PIANC 1998: Management of Aquatic Disposal of Dredged Material.- Report EnviCom WG 1; Brussels.

PIANC, 2002: Environmental Guidelines for Marine, Near shore, and Inland confined Disposal Facilities (CDF's) for Contaminated Dredged Material.- Report EnviCom WG 5; Brussels.

PIANC,2006: Generic Biological Assessment Guidance for Dredging and Disposal.- Report of EnviCom WG 8; Brussels.

[14] Previous Annex II as Glossary was Annex I.

PIANC, 2006: Environmental risk assessment in dredging and dredged material disposal.- Report of EnviCom WG 10; Brussels.

PIANC, 2009: Dredging Management Practices for the Environment.-Report no.100, EnviCom WG 13; Brussels.

PIANC, 2009: Dredged Material as a Resource" .- Report no.104, EnviCom WG 14; Brussels.

PIANC, 2009: Long term management of Confined disposal facilities.- Report no.109, EnviCom WG 11; Brussels.

PIANC & UNEP,2010: Environmental Aspects of Dredging and Port Construction Around Coral Reefs.- Report no.108, EnviCom WG 15; Brussels.

PIANC, last update: 2011: Position Paper: Working with Nature philosophy.

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Townend, I. and Whitehead, P., 2003. A preliminary net sediment budget for the Humber Estuary. Science of the total environment, 314, pp.755-767.

USACE/EPA/CE, 1992, Revised 2004. Evaluating Environmental Effects of Dredged Material Management Alternatives - A Technical Framework, EPA 842-B-92-008.

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Analytical Requirements for Dredged Material Assessment

1. This Technical Annex covers the analytical requirements necessary to implement paragraphs 6.5-6.10 of the OSPAR Guidelines for the Management of Dredged Material.

2. A tiered approach to testing is recommended. At each tier it will be necessary to determine whether sufficient information exists to allow a management decision to be taken or whether further testing is required.

3. As a preliminary to the tiered testing scheme, information required under section 6.4 of the Guidelines will be available. In the absence of appreciable pollution sources and if the visual determination of sediment characteristics leads to the conclusion that the dredged material meets one of the exemption criteria under paragraph 6.3 of the Guidelines, then the material will not require further testing. However, if all or part of the dredged material is being considered for beneficial uses, then in order to evaluate these uses, it will be necessary, to determine at least some of the physical properties of the material indicated in Tier I.

4. The sequence of assessment is:

- assessment of physical properties (Tier I)
- assessment of chemical properties (Tier II)
- assessment of biological properties and effects (Tier III)

A pool of supplementary information, determined by local circumstances may be used to augment each tier (cf. section 6.6 of the Guidelines).

5. To allow full assessment on chemical properties, it is strongly advised to report metadata such as the method of analysis, method of normalisation and parameters that allow normalisation such as total organic carbon content and full grain size analysis data. Analysis should be carried out on the whole sediment (< 2mm) or where this is not possible on a fine-grained fraction. If analysis is carried out in a fine-grained fraction, the results should be appropriately converted to whole sediment (< 2 mm) concentrations for establishing total loads of the dredged material. Additional information (e.g. as regards storage and pre-treatment of samples, analytical procedures, analytical quality assurance) can be obtained in the JAMP Guidelines for Monitoring Contaminants in Sediments (Agreement 2002/16).

6. The physical composition of samples, and therefore the chemical and biological properties, can be strongly influenced by the choice of sampling sites, the method of sampling and the handling of samples. These possible influences should be taken into account when evaluating data.

Tier I: Physical properties

Physical analyses are important because they help to indicate how the sediment may behave during dredging and disposal operations and indicate the need for subsequent chemical and/or biological testing.

Determinant	Indicating
• grain size analysis (by laser or sieving methods) • percent solids (dry matter)	• Cohesiveness, settling velocity/resuspension potential, contaminant accumulation potential
• density/specific gravity	• Consolidation of placed material, volume *in situ* vs. after disposal

When dredged material is being considered for beneficial uses, it will usually also be necessary to carry out the specific analytical tests required by the regulations for each use, to have available details of the engineering/geological properties of the material e.g. permeability, settling characteristics, plasticity and mineralogy.

Tier II: Chemical properties

Primary List

As a minimum requirement, national action levels should be established for the primary list above.

The following trace metals and organic contaminants should be determined in all cases:

Cadmium (Cd)	Copper (Cu)	Mercury (Hg)	Zinc (Zn)
Chromium (Cr)	Lead (Pb)	Nickel (Ni)	Arsenic (As)
Petroleum hydrocarbons (TPH)	Polychlorinated biphenyl (PCB) congeners - IUPAC nos 28, 52, 101, 118, 138, 153 and 180 (ICES 7).	Polycyclic aromatic hydrocarbons (PAHs): ΣPAH9. The sum of the following PAHs: anthracene; benzo[a]anthracene; benzo[ghi]perylene; benzo[a]pyrene; chrysene; fluoranthene; indeno[1,2,3-cd]pyrene; pyrene; phenanthrene.	Tri-Butyl tin (TBT) compounds and their degradation products
Total organic carbon. (Potential accumulation of organic associated contaminants)			

However, the determination of PCBs, PAHs and Tri-Butyl tin compounds and its degradation products will not be necessary in circumstances where the sediments are very unlikely to be contaminated with these substances. The relevant circumstances are:

a) sufficient information from previous investigations indicating the absence of contamination is available (cf. §§ 5.5 - 5.7 in the OSPAR Guidelines for the Management of dredged Material); or

b)
- there are no known significant sources (point or diffuse) of contamination or historic inputs; and
- the fraction of sediment < 63 µm is less than 10%; and
- the content of total organic carbon is less than 1%.

Secondary List

Based upon local information of sources of contamination (point sources or diffuse sources) or historic inputs, other determinants may require analysis, for instance:

Other chlorobiphenyls	organophosphorus pesticides	PBDE:BDE28, BDE47, BDE66, BDE85, BDE99, BDE100, BDE153, BDE154, BDE183, BDE209
Organochlorine pesticides	other organotin compounds	other anti-fouling agents
Polychlorinated dibenzodioxins (PCDDs)/polychlorinated dibenzofurans (PCDFs)	Polycyclic aromatic hydrocarbons (PAHs): ΣPAH16 naphthalene (NAP), acenaphthylene (ACY), acenaphthene (ACE), fluorene (FLU), phenanthrene (PHEN), anthracene (ANTH), fluoranthene (FLTH), pyrene (PYR), benzo[a]anthracene (B[a]A), chrysene (CHRY), benzo[b]fluoranthene (B[b]F), benzo[k]fluoranthene (B[k]F), benzo[a]pyrene (B[a]P), benzo[g,h,i]perylene (B[ghi]P), indeno[1,2,3-c,d]pyrene (IND), and dibenz[a,h]anthracene (D[ah]A).	PFOS/PFAS

In deciding which individual organic contaminants to determine, reference should be made to existing priority substance lists, such as those prepared by OSPAR[15] and the EU[16].

15 OSPAR List of Chemicals for Priority Action (Update 2023-2024); OSPAR Agreement 2004-12

16 Water framework directive. DIRECTIVE 2013/39/UE amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy. Decision No. 2455/2001/EC of the European Parliament and of the Council of 20 November 2001 establishing the list of priority substances in the field of water policy and amending Directive 2000/60/EC The daughter directive to WFD on chemical compounds: Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequent repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council.

Normalisation

Normalisation is defined here as a procedure to correct contaminant concentrations for the influence of the natural variability in sediment composition (grain size, organic matter and mineralogy). Most natural and anthropogenic substances (metals and organic contaminants) show a much higher affinity to fine particulate matter compared to the coarse fraction. Constituents such as organic matter and clay minerals contribute to the affinity to contaminants in this fine material. Fine material (inorganic and organic) and associated contaminants are preferentially deposited in areas of low hydrodynamic energy, while in areas of higher energy, fine particulate matter is mixed with coarser sediment particles. To perform meaningful comparisons of the contaminant levels in sediments of variable granulometry and texture within individual areas, among areas or over time, a normalisation is needed.

When analysing the whole sediment (*i.e.* < 2mm fraction) for spatial distribution surveys, the resulting maps give a direct reflection of the sea bed sediments. However, in areas with varying grain size distributions, a map of contaminant concentrations will be closely related to the distribution of fine-grained sediments, and any effects of other sources of contaminants, for example anthropogenic sources, will be at least partly obscured by grain size differences. Also in temporal trend monitoring, differences in grain size distribution can obscure trends. If samples used for a spatial survey consist predominantly of fine material, the influence of grain size distribution is of minor importance and may probably be neglected.

It is recommended that normalised values of contaminants should be used to enable a more reliable comparison of contaminant concentrations in dredged material with those in sediments at disposal or reference sites. Action levels should reflect the normalisation methods used. The normalisation procedure used within a regulatory authority should be consistent to ensure effective comparisons.

In order to be in the position to anticipate the effects of contaminants adsorbed on sediment particles on deposit or filter feeders it is important to have information on the contaminant concentration of the relevant fine fraction (*e.g*. less than 63 µm or 20 µm), additional to full grain size data. Contracting Parties can analyse the fine fraction e.g. less than 63 µm or 20 µm fractions if the effects of contaminants on deposit is relevant for the specific case.

Analytical and Normalisation Techniques

Reference should be made to the Technical Annexes 5 of the CEMP Guidelines for Monitoring Contaminants in Sediments (Agreement 2002-16 – revised in 2018 , see http://www.ospar.org/documents?d=32743) and ISO/EN methods for recommended analytical techniques.

Tier III: Biological properties and effects

In some cases, the physical and chemical properties described above may not provide a direct measure of the biological impact. Moreover, they may not adequately identify all physical disturbances and all sediment-associated constituents present in the dredged material. If the impacts of dredge material disposal cannot be adequately assessed on the basis of the chemical and physical characterisation, biological measurements should be carried out. [17]

The selection of an appropriate suite of biological test methods will depend on the particular questions to be addressed, the level of contamination at the dredging site and the degree to which the available methods have been standardised and validated.

To enable the assessment of the test results, an assessment strategy should be developed with regard to granting a permit authorising disposal at sea. The extrapolation of test results on individual species to a higher

[17] Currently, biological measurements are regularly used only by a small number of Contracting Parties. Other Contracting Parties use these infrequently as an additional line of evidence in decision making.

level of biological organisation (population, community) is still very difficult and requires good knowledge of assemblages that typically occur at the sites of interest.

1. Toxicity bioassays:

    - The primary purpose of toxicity bioassays is to provide direct measures of the effects of all sediment constituents acting together, taking into account their bioavailability. For ranking and classifying the acute toxicity of harbour sediment prior to maintenance dredging, short-term bioassays may often suffice as screening tools.

- To evaluate the effects of the dredged material, acute bioassays can be performed with pore water, an elutriate or the whole sediment. In general, a set of 2-4 bioassays is recommended with organisms from different taxonomic groups (e.g. crustaceans, molluscs, polychaetes, bacteria, echinoderms);

    - In most bioassays, survival of the test species is used as an endpoint. Chronic bioassays with sub-lethal endpoint (growth, reproduction etc) covering a significant portion of the test species life cycle may provide a more accurate prediction of potential impact of dredging operations. However, standard test procedures are still under development;

      The outcome of sediment bioassays can be unduly influenced by factors other than sediment-associated chemicals. Confounding factors like ammonia, hydrogen sulphide, grain size, oxygen concentration and pH should therefore be determined during the bioassay.

    - Guidance on the selection of appropriate test organisms, use and interpretation of sediment bioassays is given by e.g. USACE/EPA (1991/1994) and CEDA & IADC (2008) while guidance on sampling of sediments for toxicological testing is given by e.g. ASTM (1994) or PIANC (2006).

2. Biomarkers:

   Biomarkers may provide early warning of more subtle (biochemical) effects at low and sustained levels of contamination. Most biomarkers are still under development but some are already applicable for routine application on dredged material (e.g. one which measures the presence of dioxin-like compounds - Murk *et al.*, 1997) or organisms collected in the field (e.g. DNA strand/breaks in flat fish).

3. Microcosm experiments:

   There are short-term microcosm tests available to measure the toxicant tolerance of the community e.g. Pollution Induced Community Tolerance (PICT) (Gustavson and Wangberg, 1995).

4. Mesocosm experiment:

   In order to investigate long-term effects, experiments with dredged material in mesocosms can be performed, for instance to study the effects of PAHs in flatfish pathology. Because of the costs and time involved these experiments are not applicable in the process of authorising permits but are useful in cases where the extrapolation of laboratory testing to field condition is complicated environmental conditions are very variable and hinder the identification of toxic effects as such. The results of these experiments would be then available for future permitting decisions.

5. Other biological properties:

   Where considered appropriate, other biological measurements can be applied in order to determine e.g. the potential for bioaccumulation and for tainting.

Supplementary information

The need for supplementary information should only be required for those dredging works which, for example due to their large volume, their analytical complexity or their proximity to particularly sensitive areas, may raise doubts about their effects on the marine environment and their proper management.). Consideration should also be given to chemical or biochemical changes that contaminants may undergo when disposed at sea.

Contracting Parties may also consider developing standard methodologies for the use of passive sampling techniques at dumpsites in an effort to develop standard methodologies.

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Best Environmental Practice (BEP)

Introduction

This Technical Annex was prepared bearing in mind that, although the guidelines strictly only apply to the disposal of dredged material, Contracting Parties are encouraged also to exercise control over dredging operations.

This Technical Annex has as its aim to provide guidance to national regulatory authorities, operators of dredging vessels and port authorities on how to minimise the effects on the environment of dredging and disposal operations. Careful assessment and planning of dredging operations are necessary to minimise the impacts on marine species, habitats and other users/uses.

The items given as BEP under the different headings of this Technical Annex are given as examples. Their applicability will generally vary according to the particular circumstances of each operation and it is clear that different approaches may then be appropriate. More detailed information on dredging techniques and processes can be found in CEDA & IADC (2008).

The headings for the different BEP, can be summarised as:

1. Optimise the quantities for disposal
2. Minimise the effects caused by the disposal of dredged material
3. Minimise the impacts of dredging
4. Improve sediment quality

Each of these headings is expanded further below.

Optimise the quantities for disposal

Optimising the quantities for dredging can be further divided into:

i) Minimise the need for dredging:
   a. In fluid mud areas this requires an evaluation of the physico- chemical properties of the sediment. Additionally, this may require for example continuous underway measurement of sediment density by using a nuclear transmission gauge or measurement of shear forces.
   b. In areas with sandy waves, selective dredging of sand waves and other mobile structures should be employed.
   c. For use of hydraulic engineering, structures should be used to reduce sedimentation.
   d. Monitor of dredge depths using accurate positioning systems e.g., echosounders or swath/ multibeam systems.

ii) Optimise dredging operations and management:
   a. Monitoring of dredge depths using accurate positioning systems e.g., echosounders or swath/ multibeam systems.
   b. On-line visualisation of updated bathymetric charts, including topographic data, coastlines, disposal areas, dredge position, dredge head position as well as tidal information.
   c. Evaluate the dredged tracks/profiles/zones, dredging intensity chart, and in the case of muddy material, sand and gravel: establish optimum overflow time by analysis of load diagrams.

iii) Improve the dredging process:

a. Continuous online measurements and presentation of area, heading, speed of dredgers and position, mixture velocity concentration, hopper fill.
b. Use selective dredging operations to separate out sediment type (trailer suction for fluid material) and contaminated material (closed bucket).

Minimise the effects caused by the disposal of dredged material

i) If material is to be used as backfill, then the backfill operations should return the interital area to its original profile to ensure the seabed is returned to a similar state as soon as possible after works to promote recovery.
ii) Avoid sensitive time periods e.g., spawning or migratory periods for certain fish species, or overwintering birds on mudflats (i.e. rainbowing of sediments on mudflats).
iii) Avoid areas of sensitive or ecologically important habitats (or conversely, feed areas of erosion etc), through;
   a. Ensuring the disposal of material is during out particular tides,
   b. Ensuring disposal sites are bounded by coordinates and if necessary, apply a buffer.
iv) Ensure that all material is passed through e.g., a grid screen no larger than 30cm to minimise the amount of man-made materials disposed of at sea,
v) To avoid shoaling, ensuring material is distributed evenly over the disposal site, which could include stating a maximum depth reduction,
vi) Monitoring of the disposal site to ensure depths are not reduced to levels which could cause navigational risk.
vii) Monitoring of the deposit site and the surroundings in case (significant) adverse effects could not be entirely ruled out, and adapt operations accordingly.

Minimise the impacts of dredging

i) To decrease turbidity impacts:
   a. Use of excavation tools/ dredger heads which minimise turbidity e.g. closed bucket for dredging and pipeline for disposal
   b. Use of silt screens
   c. Minimise overflow through recirculation of overflow water
   d. Minimise plumes from overfill or barge
   e. Minimise the release of contaminants or high SCC

ii) To minimise oxygen depletion:
   a. Avoid periods when dredging induced turbidity will lead to unacceptable reductions in oxygen levels due to high temperatures, or
   b. Avoid periods sensitive to life stages of receptors e.g., spawning areas.

iii) To decrease contaminant release
   a. Exclude areas that are at high risk of elevated contaminants from disposal to sea
   b. Ensure any areas that contain elevated levels of contaminants are dredged with appropriate dredgers e.g., closed bucket to avoid increases in suspended sediments and thus increase in contaminant release.

Improve sediment quality

i) Improve physical aspects of dredged material through:
   a. E.g., increase sediment density by physical means such as vibration
   b. Use of hydro cyclones for the separation of granulometric fractions.