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Joint Meeting with IMO-LC/LP on Sharing the Best Practices on Implementation, Compliance and Enforcement related to Dumping Protocol

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Agenda item 5: Compendium of Best Environmental Practices for Implementation of Dumping Protocol

Compendium of Best Practices for Implementation of Dumping Protocol

Note by the Secretariat

The Dumping Protocol aims in Article 1 is to take all appropriate measures to prevent, abate and eliminate pollution to the fullest extent possible caused by dumping from ships and aircraft or incineration at sea in the Mediterranean. The 'Dumping Protocol' was adopted in 1976 and later amended in 1995. The latter amendments are not yet in force.

To achieve this aim, COP 20 (Tirana, Albania, 17-20 December 2017) mandated UNEP/MAP-MEDPOL Programme in Decision IG.23/12 to update the Guidelines on Management of Dredged Materials by considering the progress achieved and lessons learnt from national and regional applications. COP 21 (Napoli, Italy, 2-5 December 2019) requested MEDPOL in Decision IG.24/14 to facilitate and support the Contracting Parties' efforts for implementation of the Dumping Protocol Guidelines on dredged material, as well as to implement activities under bilateral cooperation.

To realize this mandate, UNEP/MAP-MEDPOL organized on 9-10 October 2019, the Regional Meeting on Best Practices on Enforcement and Compliance for Industrial Sectors. The Meeting recommended identifying and reinforcing implementation of techniques for monitoring of dumping activities. UNEP/MAP also signed on 9 October 2019 a Letter of Agreement with the International Maritime Organization (IMO) that hosts the Secretariat for the London Convention/ London Protocol (LC/LP).

In line with the recommendations of the Best Practices Meeting (9-10 October 2019), and with the view to fulfil its mandate, a "Compendium of Best Environmental Practices (BEP) for the Dumping Protocol" is presented in this document. The objective of this compendium is to mainstream regional and global good practices under the LC/LP, Baltic Marine Environment Protection Commission (HELCOM) and the Commission on Protecting and Conserving North-East Atlantic and its resources (OSPAR), as well as relevant information found in guidelines published by other international organizations, with a particular focus on management of dredged materials.

This compendium is prepared such as to supplement the updated Guidelines developed in 2017 on Management of Dredged Materials with practical examples and BEPs in four distinct areas: (a) Dredging and Dredged Material Disposal; (b) Issues requiring consideration prior to commencement of dredging operations; (c) Issues to address during Dredging and Disposal Operations; and (d) Issues to consider after Dredging and Disposal. Along with relevant guidelines published by UNEP/MAP and other international organizations, available publications and literature were examined to identify best practices which can be of benefit to the Contracting Parties of the Barcelona Convention in the implementation of the Dumping Protocol. Moreover, to facilitate this process, MEDPOL developed a questionnaire seeking good practices for implementation of the Dumping Protocol at national level which may constitute BEPs to be shared among the Contracting Parties. This compendium also includes a list of publications that can be referred to by the Contracting Parties for additional information on the suggested practices.

Finally, the compendium presents best environmental practices in dredging and disposal contextualized and streamlined in the overarching framework of Sustainable Development, while being aligned with Agenda 2030. This is achieved by aligning operations relevant to dredging and dumping at the national level with proposed BEPs in the Compendium, particularly during initial planning of phase of these operations. Hence, by applying the BEPs included in this document, the Contracting Parties to the Barcelona Convention will make a significant contribution to achieving sustainable outcomes for dredging and disposal in the framework of Agenda 2030.

This Joint Meeting on Sharing the Best Practices on Implementation, Compliance and Enforcement related to the Dumping Protocol is expected to discuss and approve this document, as well as recommend additional case studies/ BEPs on the national and regional levels, that can be appended to this compendium as appropriate.

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List of Abbreviations / Acronyms

AIS	Automatic Identification System
BAT	Best Available Techniques
BEP	Best Environmental Practice
COP	Conference of the Parties
CEDA	Central Dredging Association
EIA	Environmental Impact Assessment
ECHA	European Chemicals Agency
EPA	Environmental Protection Agency
EU	European Union
GESAMP	Joint Group of Experts on Scientific Aspects of Marine Environmental Protection
GES	Good Environmental Status
IMAP	Integrated Monitoring and Assessment Programme
LBS Protocol	Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources and Activities
LC/LP	London Convention and London Protocol
LSPC	List of Substances of Possible Concern
MAP	Mediterranean Action Plan
MEDPOL	Programme for the Assessment and Control of Marine Pollution in the Mediterranean Sea
MSFD	Marine Strategy Framework Directive
RSC	Regional Seas Conventions
UNEP	United Nations Environment Programme
WODA	Word Dredging Association

1. Introduction

1. Best Environmental Practices (BEP) [1] are defined as "the application of the most appropriate combination of environmental control measures and strategies." Best practices are understood to mean in general a method or technique that has been generally accepted as superior to any alternatives because it produces results that are superior to those achieved by other means. BEP also means finding and using the best ways of working to achieve objectives. It involves keeping up to date with the ways that successful businesses operate in a sector and measuring ways of working against those used by the market leaders. They are also used to maintain quality as an alternative to mandatory legislated standards and can be based on self-assessment.

2. This compendium endeavours to mainstream regional and global good practices under the LC/LP, Baltic Marine Environment Protection Commission (HELCOM) and the Commission on Protecting and Conserving North-East Atlantic and its resources (OSPAR), as well as other relevant information found in guidelines published by other international organizations. Moreover, MEDPOL developed a questionnaire (presented in Annex II) seeking good practices for implementation of the Dumping Protocol at national level. Thus, Contracting Parties of the Barcelona Convention would benefit from the globally recognized best environmental practices presented in this document with a particular focus on management of dredged materials and dredging operations in the Mediterranean.

3. UNEP/MAP-MEDPOL has developed two main guidelines: (i) the Updated Guidelines on Management of Dredged Materials; and (ii) the Guidelines for The Dumping of Inert Uncontaminated Geological Materials. This compendium is complementing these two guidelines by presenting more up-to-date information on practices pertinent to dredging operations and management of dredged material.

4. The objective of this compendium is to provide information on BEPs for dredging and dredged material disposal. Further information on these BEPs can be found in the references included at the end of this document. Additionally, the compendium provides in Annex I a "library" of available references of relevance to the Best Practices that Contracting Parties may wish to consult, as appropriate.

5. This compendium classifies BEPs in four main categories: (a) Dredging and Dredged Material Disposal; (b) Issues requiring consideration prior to commencement of any dredging operations; (c) Issues to address during Dredging and Disposal Operations; and (d) Issues to consider after Dredging and Disposal Operations.

6. The scope of this compendium is to cover all aspects of the operations involving both the dredging of dredged material from harbours, ports, navigation channels and infrastructure projects such as outfalls, cables and pipelines, as well as the disposal of dredged material at sea.

It is important to note that for many aspects of the issues addressed in this compendium, there are no standard BEPs for the management of dredging and dredged material disposal as the relevant circumstances can differ significantly from site to site, i.e., what is labelled as BEP at one location may <u>not</u> necessarily be a BEP at another location. Consequently, every case needs to be considered individually, and BEP solutions should be identified to address the particular conditions of each case.

7. Note that this BEP guidance is also generally applicable to the waste category "Inert Uncontaminated Geological Material."

[1] See OSPAR Convention - https://www.ospar.org/convention/principles/bat-bep

2. Dredging and Dredged Material Disposal within a Sustainable Development Framework (Agenda 2030)

8. It is considered best practice to integrate dredging and dredged material disposal within an overarching sustainable development framework as set out by Laboyrie *et al.* (2018). They state that "the use of dredging to construct efficient and productive navigation infrastructure is directly connected to the United Nations Sustainable Development Goals SDGs 2, 6, 7, 8, 9, 10, 11, 14 and 15," noting that SDGs include dredging and port development within the term 'infrastructure'. The adoption of BEPs in all aspects of a dredging and disposal operation will make a significant contribution to achieving a sustainable outcome for a project in the framework of Agenda 2030. This is best illustrated further to the following points:

9. Laboyrie *et al.* (2018) set out three guiding principles of dredging for sustainability:

a) Comprehensive consideration and analysis of the social, environmental and economic costs and benefits of a project is used to guide the development of sustainable infrastructure.
b) Commitments to process improvements and innovation are used to conserve resources, maximise efficiency, increase productivity and extend the useful lifespan of assets and infrastructure.
c) Comprehensive stakeholder engagement and partnering are used to enhance project value.

10. Starting from these principles, Laboyrie *et al.* (2018) set out detailed guidance that can be considered best practice on:

a) Sustainability in project initiation, planning and design – in section 3 of the book covering the following issues:
   i. Sustainability and added value.
   ii. A holistic view on infrastructure development.
   iii. Design process for sustainable infrastructure.
   iv. Key enablers for successful sustainable infrastructure development.

b) Assessment and management of sustainability *(based on Environmental Impact Assessment)* – in section 4 of the book covering the following issues:
   i. Environmental Impact Assessment and added value.
   ii. Basics of the present EIA framework.
   iii. Methods for objective based assessment and management.
   iv. Key enablers for successful assessment and management.

11. Environmental and social benefits and economic cost coupled with innovative and resource efficient execution of operations as well as enhanced stakeholder involvement in dredging and disposal operations are the principal considerations that would lead to more sustainable dredging in the region.

3. Issues Requiring Consideration Prior to Commencement of Dredging Operations

12. Dredging is essential for the maintenance and development of waterways and ports as well as navigation, land reclamation, environmental and ecosystem improvement, drainage and flood management (Laboyrie *et al.*, 2018) and this is clearly recognized by Part A of the UNEP/MAP Dredged Material Guidelines. During these activities, large volumes of dredged sediments are removed that need appropriate management. Some important considerations that contribute to the implementation of best practices include:

a) Dredged material management should be based upon a holistic and systematic understanding of the ecosystem and natural processes (WODA, 2013).
b) When deciding on management options for dredged material, the sediments should be considered in the broader context of river basin, watershed, coastal and regional sediment systems (Bortone and Palumbo, 2007).
c) Dredged sediments are an essential component of natural sediment cycles and ecosystems. Therefore, the option to retain dredged sediments within the same aquatic system (sustainable relocation) should be considered first (CEDA, 2009).
d) Dredged material is a valuable natural resource, and therefore its use for beneficial purposes should be considered before disposal options (CEDA, 2010, 2019; WODA, 2013).
e) Most dredged material is, by its nature, clean or only slightly contaminated. Only a small proportion of sediments is contaminated to an extent which could lead to environmental impacts, increased costs for dredged material management and reduced opportunities for beneficial use.
f) No standard solutions exist for dredged material management as the relevant factors and conditions vary from site to site.

3.1 Improve Sediment Quality in Areas to be Dredged

13. In the 'Waste Prevention Audit' section of Annex 2 to the London Protocol, it is pointed out that "For dredged material, the goal of waste management should be to identify and control the sources of contamination. This should be achieved through implementation of waste prevention strategies and requires collaboration between the relevant local and national agencies involved with the control of point and non-point sources of pollution. Until this objective is met, the problems of contaminated dredged material may be addressed by using disposal management techniques at sea or on land". Thus, BEPs in this regard are that the authority or authorities responsible for regulating dredging and dredged material disposal regularly collaborate with the relevant local and national agencies involved with the control of point and non-point sources of pollution to minimise continuing pollution of the sediments in the areas likely to be dredged in ports, harbours etc. In the most extreme cases of contamination, this could require the environmental dredging of sediments for disposal or treatment on land so that, provided continuing pollution is minimised, future sediments requiring dredging will be acceptable for sea disposal.

3.2 Minimisation of the Amounts of Sediment that Require Dredging

14. Ports, marinas and other relevant authorities can help to minimise the volume of material that needs to be dredged by taking BEP actions to minimize siltation in their facilities. Examples are sand traps, sand bypassing and current deflecting walls. See PIANC (2008, 2015) for more details.

15. It is a BEP to utilise accurate positioning systems to position the dredger to ensure that only areas requiring dredging are actually dredged. In addition, it is a BEP to accurately position the dredging head/device itself to avoid over dredging.

16. The selection of appropriate dredging equipment is critical for ensuring that the desired sediment removal is achieved with minimal over dredging. Section 5.3 of Laboyrie *et al*. (2018) provides guidance on the main criteria which need to be considered in selecting a dredger where they state:

> "The process of selecting the best or optimal, dredger(s) for a specific project is quite complex. It requires a good understanding of the various boundary conditions of the project and the project site and a good understanding of the particulars of the various available types of equipment. Although such selection will consequently always be site-specific and project-specific, some general

selection criteria can be distinguished, as being technical, project-related, environmental and economic."

3.3 Environmental Effects of Dredging

17. While dredging operations are not explicitly regulated by the Barcelona Convention's Dumping Protocol as on operation as such, it is important to consider it carefully as:

a) Dredging itself can cause adverse environmental impacts in and around the dredging location, depending on the dredging equipment used; the characteristics of the sediment being dredged (physical, chemical and biological); and the environmental conditions hydrodynamics of the dredging location. These potential environmental effects are likely to be of concern for environmental managers responsible for water quality issues.
b) The type of dredging equipment used also has implications for the characteristics of the dredged material, particularly its physical characteristics, as presented for disposal, and consequently for the assessment of potential effects at a disposal site.

18. Consequently, the potentially significant environmental effects of dredging are recognised in Part A of the UNEP/MAP Updated Guidelines for the Management of Dredged Material (hereinafter referred to as the UNEP/MAP Dredged Material Guidelines) in paragraphs 4, 5 and 57. Paragraph 6 of the UNEP/MAP Dredged Material Guidelines also urge the Contracting Parties to exercise control over dredging operations in parallel with that exercised over dumping.

19. The environmental effects of dredging operations are a complex amalgam of interacting processes that depend on a number of factors. Laboyrie *et al*. (2018) state that "A framework is required to try to identify the most significant environmentally sensitive criteria which may be influenced by the dredging equipment and process". They provide such a process in section 5.6 of the book for a wide range of different types of dredging equipment. They also list the issues which, through experience, are known to be critical in assessing the environmental aspects of dredging operations.

20. The potential physical impacts of a dredging project and its potential environmental effects are given in Table 1.

Table 1 – Potential Physical Impacts of a Dredging Project and their Environmental Effects (PIANC, 2009a)

Physical Change	Potential Environmental Effect	Examples of Impact
The presence of dredging equipment	User conflict	Obstacles to navigation and fishing activities, light at night
	Noise and vibration under water	Disruption of fish migration, disturbance to marine mammals
	Impact on water quality	Oil and fuel spillage
	Altered air quality	Exhaust emissions
	Ballast water	Invasive species
Sediment Removal	Altered benthic habitat	Net loss of habitat
	Mechanical removal of biota	Loss of valued organisms (e.g., prey resources)
	Hydraulic entrainment	Loss of individuals (e.g., sea turtles)
	Disturbed cultural resources	Archaeological remains
	Safety	Ordinance, pipelines, sulphide releases
Altered topography/bathymetry	Altered hydrodynamics and sedimentation	Erosion of intertidal flats

Physical Change	Potential Environmental Effect	Examples of Impact
	Altered hydrology and salinity regime	Changes to species distribution, e.g., wetland loss, movement of spawning grounds
Re-suspension of sediment matrix into water column	Release of particulate matter	Behavioural/physiological responses to increased suspended solids (e.g., physical abrasion, visual effects of plume), effect on water intake
	Release o light penetration	Behavioural/physiological responses to increased turbidity (e.g., loss of growth for eelgrass beds, reduction in primary productivity for phytoplankton)
	Release of nutrients	Behavioural/physiological responses to enrichment (e.g., algal blooms)
	Release of toxic chemicals	Behavioural/physiological responses to contaminants (e.g., bioaccumulation of metals in fish)
	Release of organic matter	Behavioural/physiological responses to dissolved oxygen depletion
	User conflicts	Aesthetics, diving, fishing
Sedimentation induced by dredged material placement	Smothering of biota, altered benthic habitat	Impact on fish spawning grounds, shellfish beds, submerged aquatic vegetation
	Morphological change	Change to geometry of system
Rock blasting	Shock waves	Physiological response

21. Further details of the BEPs for dredging are given in paragraphs 138 and 139 of the UNEP/MAP Dredged Material Guidelines. These provide reasonable coverage of the issues involved. On the other hand, for more detailed issues, there is a need to consider specific references to sections of relevant publications such as Bray (2008), Eisma (2005), Laboyrie *et. al (*2018), PIANC (2009a) and Vlasblom (2003) which provide detailed descriptions of the range of dredging equipment available and their uses, and the environmental effects and environmental mitigation measures which can constitute good examples to be followed. Also, there is a need to consider some additional types of dredging that are used, in particular varieties of hydrodynamic dredging (including water injection dredging and agitation dredging) and plough dredging (Birchenough and Howe, 2011; PIANC, 2013; Welp *et al.* 2017).

3.4 Dredged Material Characterisation

22. The guidance on dredged material characterisation in Part A of the UNEP/MAP Dredged Material Guidelines is largely consistent with best practices under other conventions such as the London Protocol, the OSPAR Convention and the Helsinki Convention at this time.

23. Note that the London Convention/London Protocol has developed guidelines on low cost, low technology assessment of dredged material (IMO, 2015) that may be useful for some Parties to the Barcelona Convention. In conducting regional workshops, a need was identified for a low-technology version of the waste assessment guidance for dredged material to focus on assessing dredging material for those countries where regulations are absent or at an early stage of development and where access to technical equipment and knowledge may be limited. The above-mentioned guidelines could be considered BEPs.

24. It is recommended that the tiered approach to testing is adopted as best practice to address the impact hypotheses in a cost-effective and consistent manner (USEPA/USACE, 2004). The tiered approach to testing consists of successive levels of investigation, each with increasing effort and

complexity. This approach generates the information necessary to evaluate the proposed disposal of dredged material. It provides for optimal use of resources by focusing the least effort on operations where the potential (or lack thereof) for unacceptable adverse impact is clear and expending the most effort on operations requiring more extensive investigation to determine the potential (or lack thereof) for impact. This approach is described in detail in Chapters 4 to 7 of USEPA/USACE (1991). It consists of:

a) Tier I - Review of Existing Information and Identification of Contaminants of Concern
b) Tier II - Water Column and Potential Bioaccumulation Analyses
c) Tier III - Toxicity and Bioaccumulation Testing.
d) Tier IV - Long Term Bioassays and Bioaccumulation Tests, Risk Evaluations and other case-specific testing/evaluations.

25. Quality assurance procedures for analyses of dredged material (physical, chemical and biological) are highly desirable to ensure reliable data. Such schemes can be at national, regional or international levels e.g., QUASIMEME (http://www.quasimeme.org/about) and USEPA (1995). Guidance on methods for sampling and storage of sediments and other matter can be found in IMO (2005) and USEPA (2001). These procedures and methods are all considered as BEPs.

26. Biological effects testing of sediments is in principle the most effective means of assessing the potential impacts of contaminants in sediments as they should integrate the effects of all the contaminants in sediments. However, biological effects tests can vary in their sensitivities to different classes of contaminants, so care needs to be taken in selecting appropriate tests. Also, biological effects testing is generally expensive; can be time consuming; and requires expertise that may not be available in all Contracting Parties. PIANC (2006a) provides guidance on biological effects testing for dredged material. This is an evolving field and should be watched for new cost-effective testing techniques becoming available that might become best practice. Note that in a recent paper by Heise *et al.* (2020), it is concluded that ecotoxicological testing is an opportunity for sediment management decision-making that warrants more attention and confidence in Europe. Therefore, Contacting Parties of Barcelona Convention may wish to consider and favour ecotoxicological testing, as appropriate.

27. Characterisation of sediments for beneficial uses may require additional considerations. Lee (1999) and Winfield and Lee (1999) provide useful guidance for this issue. In the absence of other specific guidance, these references can be considered as BEPs.

3.5 Consideration of Waste Management Options

28. Section C.4 of the Annex to the Barcelona Convention Dumping Protocol requires consideration of “The practical availability of alternative land-based methods of treatment, disposal or elimination or of treatment to render the matter less harmful for sea dumping.” A key element of such consideration is the ‘waste hierarchy.’ It should be noted however that this aspect has a number of slightly different formulations in different instruments and publications.

29. Part A of the UNEP/MAP Dredged Material Guidelines refers to the need to consider alternatives to dumping at sea in a number of places (paragraphs 7, 38, 39 and 58) with an extensive coverage of beneficial uses in section 6.3 paragraphs 65 to 99. The latter coverage is very good, although the Contracting Parties can enhance their knowledge by following links to relevant publications with useful examples, e.g., Brandon and Price (2007), CEDA (2010, 2019); Estes and McGrath (2014), Laboyrie et. al. (2018), MMO (2019), Olin-Estes (2000) Olin-Estes and Palermo (2000a), Olin-Estes and Palermo (2000b), PIANC (2009b), Spaine *et al.* (2001), USEPA (2004), Winfield and Lee (1999) and WODA (2013) and particularly websites that may have regularly updated information e.g.:

a) CEDA - Beneficial use of sediments: Case studies - https://dredging.org/resources/ceda-publications-online/beneficial-use-of-sediments-case-studies

b) ABPmer – OMREG a coastal habitat creation scheme database - https://www.omreg.net/
c) ABPmer – OMREG, Resources where case studies and other information can be downloaded - https://www.omreg.net/resources/
d) U.S. Army Corps of Engineers - Beneficial Uses of Dredged Sediment - https://budm.el.erdc.dren.mil/

30. In addition, the Contracting Parties could greatly benefit from a number of past and current EU projects that have investigated beneficial use of dredged material and their websites can be drawn upon:

a) PRISMA – Promoting Integrated Sediment Management - https://keep.eu/projects/14859/, http://archive.interreg4a-2mers.eu/approved_project_16132f505.pdf?id=16132
b) SETARMS – Sustainable Environmental Treatment and Reuse of Marine Sediment - https://www.setarms.org/en/
c) TIDE – Tidal River Development - https://www.tide-toolbox.eu/
d) CEAMaS – Civil Engineering Applications for Marine Sediments - https://www.brgm.eu/project/ceamas-civil-engineering-applications-marine-sediments
e) USAR - Using sediment as a resource - https://www.interreg2seas.eu/en/usar
f) SURICATES - Sediment Uses as Resources In Circular And Territorial Economies - https://www.nweurope.eu/projects/project-search/suricates-sediment-uses-as-resources-in-circular-and-territorial-economies/

3.6 Dredged Material Disposal Site Selection

31. Part A of the UNEP/MAP Dredged Material Guidelines appear to cover this process satisfactorily and can be considered best practice subject to reviewing them in the light of the forthcoming LC/LP guidance – see below.

32. The LC/LP are currently in the process of preparing new guidance on this subject titled ‘Guidance for Selecting Sites for Sea Disposal and for Developing Site Management and Monitoring Plans’ that should be completed in due course. Currently, the draft report is available as document LC/SG 42/2/2 for the March 2019 meeting of the LC/LP Scientific Groups on the IMODOCS website at: https://webaccounts.imo.org/Common/WebLogin.aspx? The final version of this document is most likely to be the BEP for the selection of and assessment of potential new dredged material disposal sites. It should therefore be considered whether it meets the needs for the Parties to the Barcelona Convention as it stands or whether an amended version for the Mediterranean would be needed to take account of local circumstances.

33. The draft LC/LP guidance has a 7-step process:
a) Assessment of need for disposal site.
b) Assessment of the characteristics of wastes to be disposed.
c) Identification of candidate sites.
d) Physical, chemical, and biological characterisation of sites.
e) Evaluation of potential impacts at sites.
f) Comparison of impacts at sites and site selection.
g) Preparation of a Site Management and Monitoring Plan for use during and after disposal.

3.7 Assessment of Potential Effects

34. While Part A of the UNEP/MAP Dredged Material Guidelines generally covers this issue fairly adequately, apart from the "Impact Hypothesis" issue (see below), the text could be better structured as there is no section that explicitly addresses the ‘assessment of potential effects’. Relevant text is found within section 4 ‘Decision-making process’ and section 6.7 ‘General considerations and

conditions' of Part A of the Guidelines that effectively covers both 'assessment of potential effects' and "permits." It would be preferable to clearly separate these issues.

35. The following text would provide a sound basis for establishing best practice for the assessment of effects, including:

a) A concise statement of the expected consequences of the sea or land disposal options, i.e., the "Impact Hypothesis", that provides a basis for deciding whether to approve or reject the proposed disposal option and for defining environmental monitoring requirements.
b) Integrating information on waste characteristics, conditions at the proposed dumpsite(s), fluxes, and proposed disposal techniques and specifying the potential effects on human health, living resources, amenities and other legitimate uses of the sea.
c) An analysis of each disposal option should be considered in the light of a comparative assessment of human health risks, environmental costs, hazards, (including accidents), economics and exclusion of future uses.
d) If adequate information is not available to determine the likely effects of the proposed disposal option, then this option should not be considered further.
e) If the interpretation of the comparative assessment shows the dumping option to be less preferable, a permit for dumping should not be given.
f) Each assessment should conclude with a statement supporting a decision to issue or refuse a permit for dumping.

36. While the "Impact Hypothesis" is briefly mentioned in paragraphs 25, 36 and 95 of the UNEP/MAP Dredged Material Guidelines, its main description is in part B of these Guidelines, specifically in paragraphs 148 to 160 in relation to forming the basis for defining a field monitoring programme. The Contracting Parties of Barcelona Convention must not omit the primary purpose of the "Impact Hypothesis" as indicated in the first bullet in the paragraph above e.g., "Assessment of potential effects should lead to a concise statement of the expected consequences of the deposit option (i.e. the Impact Hypothesis). Its purpose is to provide a basis for deciding whether to approve or reject the proposed deposit option and for defining environmental monitoring requirements.[2] However, some references to examples and case studies would be beneficial (see below).

37. Impact hypotheses can of three different types:

Type	**Examples**
Operational	Does the extent of dispersion from the disposal site exceed that predicted?
	Can the disposal site receive the required amount?
Environmental	Do suspended solids levels exceed critical levels for fish?
	Do the changes degrade the overall health/quality of the environment?
Effects on users/uses	Does the depth of accumulation of material at the disposal site cause concern for navigation?

38. Guidance on the development of impact hypotheses, as well as examples and case studies including information on the measurements to assess the impact hypotheses, can be found in section 3 of Environment Canada (1998) and section 5 of MEMG (2003). An example from the latter is provided in the box below.

[2] See Paragraph 9 of OSPAR (2014)

Box - Example of Impact Hypotheses for a yacht marina requiring maintenance dredging (MEMG, 2003)

Impact Hypotheses

- There will be transient damage to commercial shell-fisheries from physical impact, but no longer term loss of condition of shellfish.
- That the small size of dredging operation limits seabed degradation to transient local effects.
- That there will be no detectable deposition of mud film on amenity beaches.

3.8 Permit Conditions

39. Part A of the UNEP/MAP Dredged Material Guidelines does not explicitly cover the issue of permit conditions. Annex 2 to the London Protocol has the following text on this issue:

40. "Permits should contain conditions including:
    a) the types and sources of materials to be dumped.
    b) the location of the dumping site(s).
    c) the method of dumping.
    d) the monitoring and reporting requirements.
    e) limitations on dumping activities to protect sensitive resources, amenities and other uses of the sea."

41. There is currently no BEP guidance for permit conditions. There is some guidance available on limitations on dumping activities to protect sensitive resources, amenities and other uses of the sea developed by the United States Army Corps of Engineers. Note that they term these limitations as "environmental windows" – see Dickerson *et al*. (1998), LaSalle *et al*. (1991) and Reine *et al.* (1998). In addition, there is a report from the United States National Academies of Science, Engineering and Medicine that describes a process for setting, managing, and monitoring environmental windows for dredging projects (US NASEM, 2002). These documents would both assist in the application of BEPs for permit conditions limiting dredging and dumping activities to protect sensitive resources, amenities and other uses of the sea and could be drawn upon to produce a BEP for permit conditions.

4. During Dredging and Disposal Operations

4.1 Field Monitoring of Dredging Operations

42. The necessity for field monitoring of dredging operations will depend on the outcome of the assessment of potential effects of dredging and any impact hypotheses that might result from that assessment. Many dredging operations take place without any monitoring being required. The main marine environmental concerns that may require monitoring are most commonly:

    a) Turbidity due to sediment put into suspension in the water column.
    b) Contaminants associated with the sediment put into suspension in the water column that may affect water quality and impact biota.
    c) Dissolved oxygen that may be depressed by reaction with organic material in the suspended sediment and might impact on biota.
    d) Underwater noise.

4.1.1 Turbidity

43. Turbidity is a well-known issue for dredging and is very case specific as indicated in section 3.3 above. There do not appear to be any explicit BEPs for monitoring turbidity, but there is a number of publications that could be collectively considered to represent BEP. These are mainly from the US Army Corps of Engineers that has produced many reports on the monitoring and assessment of turbidity due to dredging operation including Borrowman (2006), Clarke and Wilber (2000),

Francingues and Palermo (2005), Germano and Cary (2005), Johnson and Parchure (2000), Reine *et al.* (2002), Thackston and Palermo (2000), Tubman and Corson (2000), Wilber *et al.* (2005). CEDA has also produced a number of useful papers on turbidity related to dredging (CEDA, 2011a, 2020). Laboyrie *et al.* (2018) also provides useful guidance on the monitoring of turbidity due to dredging in section 8.3.3.

4.1.2 Contaminants

44. Where the level of contaminants in sediments to be dredged raises concerns for potential adverse effects on water quality and biota, monitoring of those contaminants around the area being dredged may well be required. The best practices for such monitoring are well established. The dredging of contaminated sediments needs particular care and the publications by Bridges *et al.* (2008) and Palermo *et al.* (2008) provide the best information on this subject. In those circumstances, risk assessment of the dredging operations is critical and the publications by Moore *et al.* (1998), PIANC (2006b) and PIANC (2019) provide useful guidance.

4.1.3 Dissolved oxygen

45. Where there are concerns about potential depression of dissolved oxygen levels due to dredging operations, monitoring may be necessary. Continuous monitoring equipment for this is available and can be installed on buoys or fixed structures to ensure appropriate coverage around the dredging operation.

4.1.4 Underwater Noise

46. This is a relatively recent issue of concern. While there does not appear to be an explicit BEP for measuring noise from dredging operations, there is a good practice guide for measuring underwater noise (Robinson *et al.*, 2014). In addition, there are a number of guidance documents on measuring underwater noise from dredging. The US Army Corps of Engineers has produced a number of publications on the underwater noise generated by each of the main types of dredging equipment (Dickerson *et al.* 2001; McQueen *et al.*, 2019; Reine *et al.* 2012a, 2012b; 2014; Suedal et al., 2019), as have CEDA and WODA (CEDA, 2011b; Thomsen *et al.*, 2013). These publications are probably the state of the art currently.

47. The noise level produced by a dredger undertaking dredging activities is in line with what is expected for a cargo ship travelling at moderate speed according to de Robertis and Handegard (2013) and Robinson *et al.* (2011). However, dredging gravel or coarser material would generate higher sound levels. A monitoring programme on underwater sound from a large range of size of trailer suction hopper dredgers (2,000 – 22,000 m^3) during the reclamation works for the Port of Rotterdam found that for all frequencies, the noise level of dredging and dumping was less than that of transit of the vessels (Heinis, 2013).

4.2 Environmental Mitigation Measures

48. There are environmental mitigation measures that can be utilized to minimize or negate potential negative effects due to dredging. Laboyrie et al. (2018) cover these under issues the following headings:

a) Mitigation by dredging process management.
   i. Process control to reduce the environmental turbidity impact during dredging.
   ii. Turbidity mitigating measures at the dredging site e.g. silt curtains.
b) Mitigation of underwater sound management.
c) Mitigation through developments in emission abatement technology.
d) Mitigation of dredger presence effects.

49. PIANC (2009a) provides a process for the selection and evaluation of management practices that describe how to identify specific practices that address risks associated with a given project. It states: “Once identified, potentially appropriate management practices are then screened and ranked according to their effectiveness, logistical feasibility and potential cost. An outline method is presented for deriving a Best Management Practice (BMP). Following a structured approach of this type should ultimately result in a more technically defensible project with reduced environmental impact, balanced cost effectiveness, and increased transparency to the stakeholders”.

4.3 Compliance Monitoring

Compliance monitoring is used to establish whether the dumping permit conditions have been respected and consequently have, as intended, prevented adverse effects on the receiving area as a consequence of dumping. This can also take place after the operations have been completed.

50. Compliance monitoring is not mentioned in the Dumping Protocol and is only mentioned once in paragraph 142 of Part B of the UNEP/MAP Dredged Material Guidelines without any details. Best practices for compliance monitoring would include:

a) Inspection of records at permit holder’s offices to check records related to activities covered by permits.
b) Inspection of disposal vessels to check logbook records to establish that permit conditions have been complied with.
c) Inspectors being present on the vessels during dredging and their subsequent voyages to disposal sites.
d) Coastguard or other agencies vessels or aircraft observing vessel’s dredging and/or dumping activities.
e) Use of automatic recorders on the vessel (“Black Boxes”).
f) Monitoring of vessels’ Automatic Identification System (AIS) data.

51. Note that the London Convention/London Protocol has developed guidance for low cost, low technology compliance monitoring (IMO, 2017) that may be useful for some Parties. In its guidance document, the LC/LP provide practical information about using low-technology and low-cost approaches that are useful for monitoring compliance with permit conditions associated with marine disposal of waste materials or other matter. The primary audiences for this guidance are countries that are in the early stages of developing waste assessment and monitoring actions in concert with permit programs for disposal of wastes and other matter into marine waters.

4.4 Enforcement

52. Enforcement activities can occur both during and after dredging and disposal operations. Best practices for enforcement when infringements of permit conditions are found would include:

a) Amendment of permit conditions.
b) Permanent or temporary revocation of permits.
c) Administrative sanctions e.g., fines.
d) Legal proceedings to prosecute for breaches of permit conditions.

53. Much will depend on national legal systems and approaches to enforcement that may vary significantly across Contracting Parties.

5. Issues After Dredging and Disposal Operations

5.1 Field Monitoring of Dredged Material Disposal Sites

Field Monitoring of Dredged Material Disposal Sites is used to:

- *Verify that the assumptions made during the permit review and site selection process were correct and sufficient to protect the environment and human health.*
- *Improve the basis on which permit applications are assessed by improving knowledge of the field effects of major discharges which cannot be directly estimated by a laboratory evaluation or from the literature; and*
- *Provide the necessary evidence to demonstrate that within the framework of the Protocol, the monitoring measures applied are sufficient to ensure that the dispersive and assimilative capacities of the marine environment are not exceeded, and so dumping operations do not cause damage to the environment and deteriorate GES.*

54. Field monitoring of dredged material disposal sites is generally carried out after disposal operations are completed. However, there are occasions when some monitoring may be carried out while disposal operations are occurring, e.g., to monitor effects on water quality or to monitor the shallowing of the site resulting from the disposal of bulky dredged material such as rocks and heavy clays.

55. The Dumping Protocol does not mention field monitoring, but this is covered in Part B of the UNEP/MAP Dredged Material Guidelines. The rationale for monitoring in the Guidelines (paragraph 142) does not explicitly cover the first bullet point in above, although the last bullet does partly cover this point. Other than the latter point, the general guidance on field monitoring would seem consistent with best practice.

56. Note that the London Convention/London Protocol has developed guidance for low-cost, low technology field monitoring for the assessment of the effects of disposal in marine waters of dredged material or inert, inorganic, geological material (IMO, 2016) that may be useful for some Parties. The objective of the guidance document is to provide practical information about using low technology and low-cost tools that are useful for monitoring of possible environmental impacts associated with marine disposal of either dredged material or inert, inorganic geological materials. The primary audiences for this guidance are countries that are in the early stages of developing waste assessment and monitoring actions in concert with permit programs for disposal of wastes and other matter into marine waters. These guidelines could be considered BEP for such countries.

57. There are some additional benefits of monitoring as indicated by Environment Canada, (1998) including:

a) Monitoring plays a critical role in reviewing the overall adequacy of controls. The information compiled nationally or regionally provides the basis to assess whether the regulations, guidelines and permit conditions are adequate to protect the marine environment and human health.
b) Experience gained with monitoring may assist researchers involved in developing better monitoring tools or used to refine the monitoring programme on specific environmental, health or public concerns.
c) Monitoring can also uncover gaps in our understanding of impacts, particularly in the area of cause and effect relationships.

58. Paragraph 143 of Part B of the UNEP/MAP Dredged Material Guidelines as currently framed implies that the purpose of monitoring dredged material disposal sites is just to determine contaminant levels. On the other hand, surely there is clear need to ensure consistency with paragraph 144 that refers to the Ecological Objectives under the UNEP/MAP under IMAP. It would appear that Ecological Objectives 9 and 10, and in particular Common Indicators 17, 18, 20, and 23, will always be relevant considerations for monitoring dredged material disposal sites. Ecological Objectives 5, 8 and 11 may also be relevant depending on local circumstances.

59. As monitoring is expensive, it is generally accepted that monitoring programmes need to be carried out in a resource-efficient manner with clearly defined objectives, with measurements that can meet those objectives and that the results are reviewed at regular intervals in relation to the objectives.

60. Where there are multiple disposal sites in use, it is recommended that to aid with determining which disposal sites should be selected for sampling in any one year, an approach that classifies a number of possible issues or environmental concerns that may be associated with dredged material disposal into a risk-based framework should be used as in Birchenough *et al*. (2010). The issues that pertain to each disposal site, and where these lie within the framework (i.e., their perceived environmental risk) depict where that site lies in priority. This ultimately determines whether that site is considered for sampling during a particular year. The aim of such an approach is to increase the transparency of the decision-making process regarding selection of disposal sites for monitoring, i.e., establishes a model for site-specific decisions regarding sampling. Table 1 in the paper sets out the definitions, qualifying criteria and level of monitoring appropriate for each of the three tiers in the dredged material disposal site classification framework and the outline of those tiers is tabulated below in Table 2:

Table 2 – Tier levels of assessment and monitoring and assessment (Birchenough et al. (2010)

Tier Level	Level of Assessment	Monitoring Approach
1	**High**. Sites that have the potential to pose a high-level risk to the surrounding environment and local amenities.	• Physical (sediments, possibly acoustics or coastal processes • Chemical (suite of contaminants) • Biological (macrofauna)
2	**Moderate**. Potential to pose a low / moderate level of risk to the immediate surrounding environment and local amenities. Many ‘typical’ sites fall within this class and therefore sampling provides an opportunity to increase our general scientific knowledge of the impacts of dredging disposal	• Physical (possibly acoustics) • Chemical (specific contaminants) • Possibly biological (macrofauna)
3	**Low**. Potentially pose only a minimal risk to the surrounding environment and local amenities and are of no value as representative disposal sites due to the infrequency of use	Specific to concerns at the site. Sometimes just chemical, or an acoustic survey, rarely biological

61. It is recommended that a tiered approach to monitoring is adopted as best practice to address the impact hypotheses in a cost-effective and consistent fashion (Environment Canada, 1998). As noted previously, the tiered approach to monitoring consists of successive levels of investigation, each with increasing effort, complexity and cost. This approach generates the information necessary to evaluate the proposed effects of the disposal of dredged material. It provides for optimal use of resources by focusing the least effort on operations where the potential (or lack thereof) for unacceptable adverse impact is clear and expending the most effort on operations requiring more extensive investigation to determine the potential (or lack thereof) for impact.

62. Consequently, it is necessary to carefully plan and design monitoring programmes to meet those aims. It is recommended that a clear procedure be adopted for determining the monitoring

requirements for a dredged material disposal site that the impact hypotheses will feed into e.g., as in section 4 of Environment Canada (1998) and section 3 of MEMG (2003). The latter reference sets out tables to:

> "…standardise the data collection and evaluation process. They also assist in identifying information not available, and which may need to be found at some later stage. It is recognised that the more information available the better informed any decision will be, but it is not intended that all tables should be fully completed before a decision is taken. The collection of data is followed by an evaluation of the various data types and inter-comparison between data sets. A scoring system has not been used but instead the procedure allows informed decision at the different stages."

63. A flow diagram was prepared to assist users in completing the tables in MEMG (2003) as shown in
Figure 1. Such an approach could be adapted for the purposes of Part B of the UNEP/MAP Dredged Material Guidelines.

64. The methodologies and techniques for the assessment and monitoring of adverse impacts of dumping activities is covered in a separate guiding document titled "Common Methodologies and Techniques for Assessment and Monitoring", developed by UNEP/MAP.

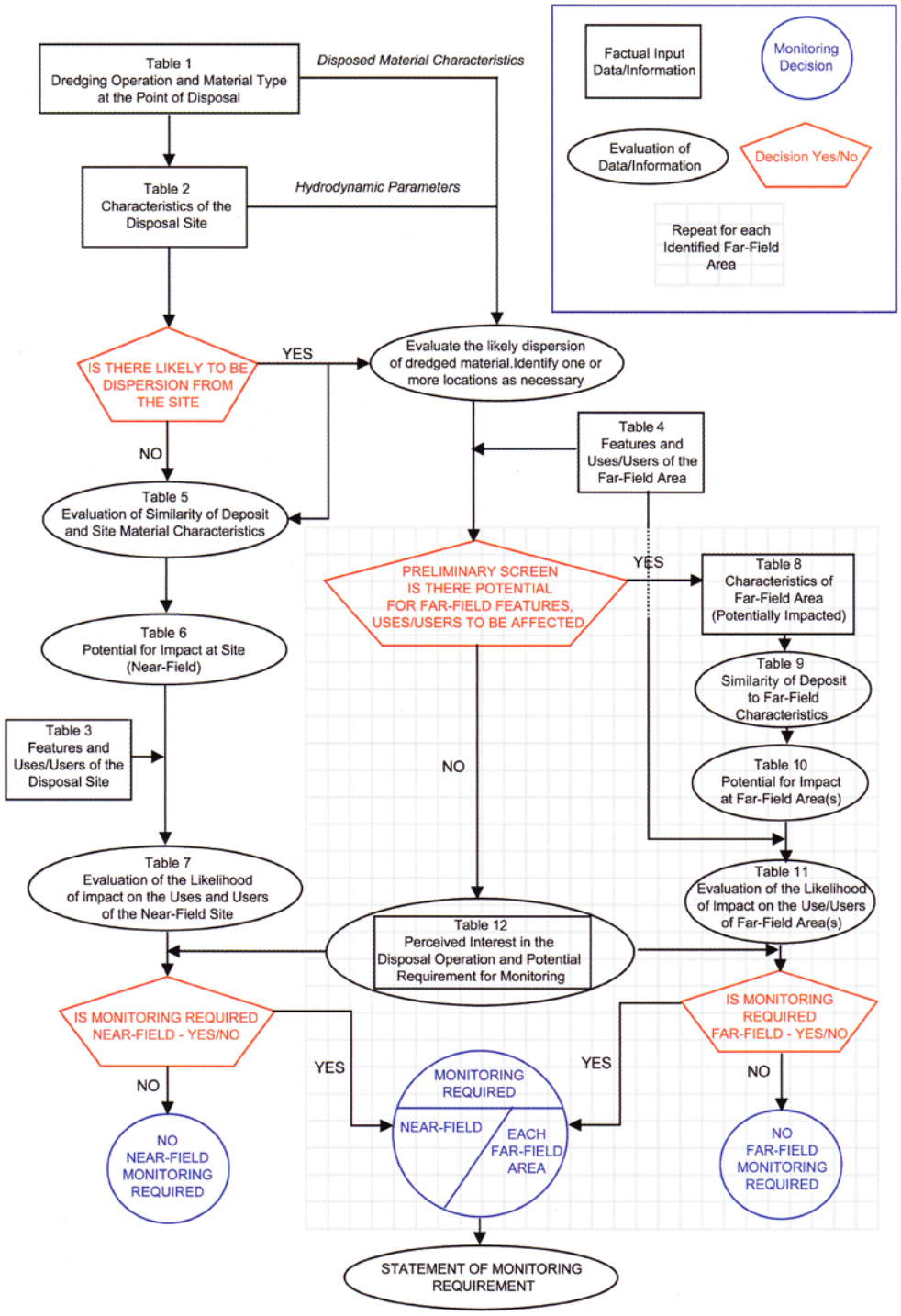

Figure 1. Procedure to determine monitoring requirements for dredging operations and the disposal of dredge material at sea

6. Assessment of current practices in Mediterranean and BEPs in the world

65. UNEP/MAP-MEDPOL prepared a questionnaire to identify regional and global best practices on implementation of the Guidelines for Dredged Materials Disposal. The questionnaire seeks data and information on the current implementation of best practice in: (i) assessment of wastes or other matter that may be considered for dumping including compliance, enforcement and monitoring; and (ii) application of innovative technologies at national level. The questionnaire is presented in Annex II to the present document.

66. The Contracting Parties were requested to identify what they consider to be best practices implemented at the national level when answering this questionnaire.

67. The questionnaire was also disseminated to UN agencies, regional conventions, in order to provide their input where appropriate.

68. Eleven Contracting Parties responded to the questionnaire providing information on their current implementation practices in the fields of assessment of dredged material, field monitoring, enforcement and compliance monitoring.[3]

69. UNEP/MAP-MEDPOL mapped the gaps and linkages between current practices identified in the questionnaires and BEPs proposed in this compendium document as explained below.

Observed similarities between current practices and documented BEP:

- The vast majority of Contracting Parties do use dredged material beneficially at least some of the time.
- Most of the Contracting Parties used toxicity bioassays and/or biomarkers in assessing the biological properties of dredged material.
- Almost all Parties had Action Levels for dredged material.
- Less than half of the Parties used toxicity testing to determine the acceptability or otherwise of dredged material for sea disposal when it exceeded upper threshold values.
- When dredged material cannot be dumped at sea; unconfined due to contamination or for any other reason, half of the Contracting Parties excluded contaminated material from sea disposal while one third allowed sea disposal under some conditions after testing e.g., toxicity testing.
- Overall, almost all of the Parties appeared to implement satisfactory procedures for the selection and assessment of potential new dredged material disposal sites.
- Almost all Parties stated that their permits can have conditions restricting the timing of dredging and/or the disposal of dredged material at sea.
- Most Parties permits do have conditions requiring the implementation of mitigation measures during and/or after dredging and/or dumping operations.
- Almost all Parties' permits have conditions requiring field monitoring of the environmental effects of dredging activities.
- Most Parties either inspect permit holder's offices to check records; inspect the vessels in docks/harbours; or monitor their track to disposal sites through AIS data.
- Regarding field monitoring, most Parties carry out comprehensive monitoring of the characteristics water, sediment as well as biology.
- The use of airborne drones and satellite imagery for monitoring turbidity and the use of silt curtains/bubble curtains to minimise the spread of turbidity by some Parties is best practice.

[3] As of 25 January 2021

Key differences between current practices and documented BEPs and Recommendations:

- Most of the Contracting Parties do not appear to have a requirement for applicants to demonstrate that they have minimised the volume of material that requires to be dredged.
- Less than half of the Contracting Parties did not request information from permit applicants about the potential presence of marine litter (including plastics/microplastics) in the sediment material proposed to be dredged. This would appear to be an issue where improvements can be made relatively easily to achieve best practice.
- About one third of the Contracting Parties did not have an agreed procedure/best practice for the selection and assessment of potential new dredged material disposal sites. The compendium provides examples of best practices, more particularly the upcoming LC/LP guidance should be helpful for those Parties to develop such a procedure/best practice.
- Very few Contacting Parties have a national procedure for issuing dumping permits under Article 9 of the Dumping Protocol i.e., “in a critical situation of an exceptional nature. This is an obvious area for needed improvement if the 1995 Dumping Protocol is to come into effect.
- Half of the Contracting Parties indicated that their permits have conditions requiring dredging vessels to use gratings/grids or other devices to trap large items of marine litter/debris. Given the current concerns with marine litter and the ready availability of gratings/grids for at least some types of dredging (particularly mechanical dredging), this should be an area where all national authorities would be able to adopt such permit conditions relatively easily.
- Regarding field monitoring, very few Contracting Parties indicated that they execute field monitoring. One Party out of eleven appears to have monitored the water column for a range of parameters which would not constitute the best practice for the time being.
- Less than half of the Contracting Parties undertake observation and analysis of marine litter (macro and/or micro litter) at dredged material disposal sites. Where monitoring takes place, it should be fairly straightforward to include observations of macro-litter (including plastics) on the seabed. Monitoring for micro-plastics is more complex as it involves extracting the micro-plastics from sediments before any identification or quantification can take place.
- Regarding prioritising which disposal sites require monitoring and on what frequency, in general there does not appear to be a decision process for prioritising which disposal sites require monitoring.

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Annex I
Library for available information of relevance for Best Practices for the Dumping Protocol

Additional Sources of Information Relevant to the Compendium

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2. Websites

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Annex II

Questionnaire to identify regional and global best practices on implementation of Guidelines for Dredged Materials Disposal

Contracting Party:

Contact details:

Full Name:

Position/Role:

Organisation/Institution :

E-mail :

Tel :

Mobile :

****

Notes:

1. Note that the separate guidance document provides information to assist with completing the questionnaire.
2. Where multiple options are available, please select the appropriate one(s).
3. As the purpose of the questionnaire is to identify regional and global best practices on implementation of Guidelines for Dredged Materials Disposal, please identify what you consider to be best practices when answering the questions.
4. For any bodies who do not issue permits for disposal at sea and are responding to the questionnaire e.g. UN agencies, regional conventions, please just respond to questions where you are able to provide information on best practices that you are aware of.
5. Please do not hesitate to contact Erol Cavus, Pollution Officer (UNEP/MAP-MEDPOL), if you have any questions.
6. Please fill in the questionnaire and return to Erol Cavus, erol.cavus@un.org and nathalie.gomez@un.org no later than **10 January 2021**

A. Assessment of wastes or other matter that may be considered for dumping

Consideration of Waste Management Options

Q.1 During the permit applications for the disposal of dredged material at sea, do you require applicants to demonstrate that they have minimised the volume of material that requires to be dredged?

☐Yes
☐No

If 'Yes', please indicate how the permitting authority judges that this has been done satisfactorily.

Q.2 Is dredged material used beneficially (i.e. other than disposal at sea) in your country - as covered in paragraphs 65-99 of Part A of the UNEP/MAP Updated Guidelines for the Management of Dredged Material?

☐Yes
☐No
☒Sometimes

If 'Yes' or 'Sometimes', please briefly list the types of uses and the approximate annual quantities involved.

Dredged Material Characterisation

Q.3 Which biological properties and effects of dredged material (as in Tier III of Appendix 1 of the Updated Guidelines for the Management of Dredged Material), form part of the assessment of dredged material characteristics prior to dumping? (Multiple answers available)

☐Toxicity bioassays
☐Biomarkers
☐Microcosm experiments
☐Mesocosm experiments

Other biological properties, please explain

Q.4 Do you request information from permit applicants about the potential presence of marine litter including plastics/microplastics in the sediment material proposed to be dredged?

☐Yes
☐No
☐Sometimes

If 'Yes' or 'Sometimes', please indicate how this is done:

Action Levels

Q.5 Do your permits or regulations contain action levels for dredged material like those shown in Appendix 2 of the Updated Guidelines for the Management of Dredged Material?

☐Yes

☐No

Q.6 When national action levels are exceeded, how do you decide whether dumping should be permitted or not?

Q.7 If the dredged material cannot be dumped at sea unconfined due to contamination or other reasons, which management/mitigation techniques are employed?

☐At sea -

☐On land –

Briefly explain:

Selection of existing dredged material disposal (dumping) sites for new or repeat permits

Q.8 What criteria are used to select an existing dredged material disposal site for new or repeat permits where two or more disposal sites are practically available e.g. issues as in paragraphs 100-122 of the Updated Guidelines for the Management of Dredged Material? (Multiple answers available)

☐Physical impact

☐Chemical impact

☐Bacteriological impact

☐Biological impact

☐Economic impact

Others, please specify:

Selection of and assessment of potential new dredged material disposal (dumping) sites

Q.9 Do you have an agreed procedure/best practice for the selection and assessment of potential new dredged material disposal sites?

☐Yes

☐No

☐Under Development

If 'Yes' or 'Under Development', please provide details of the agreed procedure/best practice document.

Q.10 In the absence of an agreed procedure/best practice for the selection and assessment of potential new dredged material disposal sites, what baseline surveys and assessments would usually be carried out for selecting a new dredged material disposal site?

Q.11 What national and local authorities or other organisations would normally be consulted during the process for the selection and assessment of potential new dredged material disposal sites?

Permits

Q.12 Which of the following dredging techniques are covered by the permits?

☐ Side-casting

☐ Hydrodynamic/agitation/water injection

☐Others

☐None

If ‘Others’, please detail what techniques are covered.

Q.13 Are there any controls on dredging activities by other national or local authorities or other organisations?

☐Yes

☐No

☐Sometimes

If ’Yes’ or ‘Sometimes’, please provide details of the type of controls and other relevant national or local authorities involved.

Q.14 Do you have national procedures for issuing dumping permits under Article 9 of the Dumping Protocol i.e. “in a critical situation of an exceptional nature”?

☐Yes

☐No

If ‘Yes’, please provide examples of such permits issued in the last 5 years.

Permit conditions

Q.15 Can permits have conditions restricting the timing of dredging and/or the disposal of dredged material at sea for any reasons?

☐Yes

☐No

If ‘Yes’, please provide details of the types of permit conditions involved.

Q.16 Do permits have conditions requiring dredging vessels to have gratings/grids or other devices to trap large items of marine litter/debris?

☐Yes

☐No

If ‘Yes’, please provide examples of the types of permit conditions.

Q.17 Do permits have conditions requiring the implementation of mitigation measures during and/or after dredging and/or dumping operations:

☐Yes

☐No

☐Sometimes

If ’Yes’ or ‘Sometimes’, please provide examples of such conditions included in permits.

Q.18 Do permits have conditions requiring the field monitoring of the environmental effects of dredging activities?

☐Yes

☐No

☐Sometimes

If ’Yes’ or ‘Sometimes’, please provide examples of the typical monitoring requirements.

Compliance monitoring - Used to establish whether the dumping permit conditions have been respected and consequently have, as intended, prevented adverse effects on the receiving area as a consequence of dumping

Q.19 Are permit holders offices visited by inspectors to check records related to activities covered by permits?

☐Yes

☐No

☐Sometimes

Q.20 Are disposal vessels inspected/monitored to ensure compliance with permit conditions, and how?

☐Yes

☐No

☐Sometimes

If ’Yes’, is that inspection/monitoring carried out by:(select one or more options below)

☐Inspectors visiting vessels in docks/harbours to scrutinise vessel logbooks?

☒Inspectors being present on the vessels throughout their voyages to disposal sites?

☐Coastguard or other agencies vessels observing vessels dredging and/or dumping activities?

☐Automatic recorders on the vessel (“Black Boxes”)

☐Monitoring of vessel Automatic Identification System (AIS) data

Others, please explain:

Field monitoring

Used to:

- *to improve the basis on which permit applications are assessed by improving knowledge of the field effects of major discharges which cannot be directly estimated by a laboratory evaluation or from the literature.*
- *to provide the necessary evidence to demonstrate that within the framework of the Protocol the monitoring measures applied are sufficient to ensure that the dispersive and assimilative capacities of the marine environment are not exceeded, and so dumping operations do not cause damage to the environment and deteriorate GES.*

Q.21 Who does the monitoring of the dredged material disposal sites and at what frequency?

	No		Every 6 Months	Annually	Occasionally
By the permitting authority or their agents?	☐		☐	☐	☐
By permit holders or their agents?	☐		☐	☐	☐

Q.22 As monitoring conditions are expensive, it is generally accepted that monitoring programmes need to be carried out in a resource-effective manner with clearly defined objectives, with measurements that can meet those objectives and that the results are reviewed at regular intervals in relation to the objectives. Do your monitoring programmes follow such an approach?

☐Yes

☐No

Q.23 How are decisions made about prioritising which disposal sites require monitoring and on what frequency?

Q.24 If monitoring is carried out, please provide details of the typical monitoring activities carried out at dredged material disposal sites:

Q.25 Do these monitoring activities include the observation and analysis of marine litter (Macro and /or Micro Litter) at dredged material disposal sites?

☐Yes

☐No

☐Sometimes

If 'Yes' or 'Sometimes', please provide details of the types of litter found and their suspected sources.

Enforcement

Q.26 What measures/sanctions are available to the regulatory authorities when infringements of permit conditions are detected? Please select all that apply.

☒Administrative –
☐Legal –
☐Other –

Explain briefly

B. Innovative technologies:

Application of innovative technologies in dredging operations

Q.27 Are you aware of the application of innovative technologies in dredging operations in your country?

☐Yes
☐No

If 'Yes', please provide details of those innovative technologies.

Application of innovative technologies for pollution prevention relevant to dredged material activities

Q.28 Are you aware of the application of innovative technologies for pollution prevention relevant to dredging and dredged material activities in your country?

☐Yes
☐No

If 'Yes', please provide details of those innovative technologies.

Application of innovative technologies for monitoring of dumping of dredged material activities

Q.29 Are you aware of the application of innovative technologies for the monitoring the dumping of dredged material in your country?

☐Yes
☐No

If 'Yes', please provide details of those innovative technologies.

C. General

Q.30 Please describe any challenges you face during the selection of disposal sites, permitting, monitoring of dredged material etc.

Q.31 Is there any additional information you wish to submit?