EP

United Nations
Environment
Programme

UNEP(OCA)/MED WG.114/4
11 June 1996

Original: ENGLISH

MEDITERRANEAN ACTION PLAN

Meeting on the Preparation of Guidelines for the Management of Dredged Material

Valencia, 20-22 May 1996

# REPORT

## MEETING ON THE PREPARATION OF GUIDELINES FOR THE MANAGEMENT OF DREDGED MATERIAL

UNEP
Athens, 1996

# Table of Contents

## Introduction

1. During the 1993 Joint Meeting of the Scientific Committee and the Socio-Economic Committee, representatives from a number of countries stressed the general lack of experience in the management of dredged material in the Mediterranean, and asked the Secretariat to ensure that guidelines related to Annex I, Section B, of the 1976 Dumping Protocol be prepared and presented for approval (UNEP(OCA)/MED WG.66/8).

2. As a result, and in view of the lack of funds in the MAP budget for the organization of a meeting on the subject, the Secretariat contacted all Contracting Parties and asked if any country was in a position to offer to host, and financially contribute to, the organization of a Meeting to prepare the above guidelines. In the meantime, in June 1995, an amended text of the Dumping Protocol was adopted. The new text, which has not yet entered into force, specifically calls for the preparation and adoption of guidelines related to the dumping of dredged material (art.6).

3. At the Ninth Meeting of the Contracting Parties (Barcelona, June 1995), the Government of Spain offered to host the present meeting. The Secretariat felt that, although the new protocol was still not in force, the preparation, and possibly the adoption, of guidelines could even at this early stage form an important contribution for all Contracting Parties and could assist them in handling a problem which is very common in the Mediterranean.

## Participation

4. The Meeting on the Preparation of Guidelines for the Management of Dredged Material, hosted by the Government of Spain and the State Ports Organization, was held at the Instituto Portuario de Estudios y Cooperacion, in Valencia, Spain, from 20 to 22 May 1996.

5. All MED POL National Coordinators were invited to nominate an expert to represent their Government and attend the Meeting. In addition, a number of related Intergovernmental and Non-governmental organizations, Regional Activity Centres and UN Agencies were invited to attend the Meeting as Observers. As a result, twenty experts from fourteen countries, as well as two experts from non-governmental organizations attended the Meeting (see list of participants attached as Annex I).

## Agenda item 1: Opening of the Meeting

6. The Deputy Coordinator of MAP, Mr L. Jeftic, opened the Meeting and thanked the authorities of the Government of Spain and the Government of Valencia for hosting the Meeting, thereby providing an important contribution for the future implementation of the 1995 Dumping Protocol.

7. Mr Fernando Huet, President of the Ports Authority of Valencia, welcomed the participants and expressed his satisfaction at being able to host such an important meeting in Valencia.

8. H.E. Ms Gloria Arnandis, Director General for Environmental Quality of the Government of Valencia, briefly reviewed the main events which had marked the history of

the Mediterranean Action Plan, the Barcelona Convention and the Protocols from 1975 to 1995, when they were revised in Barcelona, thus initiating a new fundamental period for the protection of the Mediterranean Sea.

## Agenda item 2: Rules of Procedure

9. Mr Jeftic informed the Meeting that the rules of procedure for meetings and conferences of the Contracting Parties to the Convention for the Protection of the Mediterranean Sea against Pollution and its related protocols (UNEP/IG.43/6, Annex XI) applied *mutatis mutandis* to the Meeting.

## Agenda item 3: Election of Officers

10. The Meeting unanimously elected the following officers:

| | | |
|---|---|---|
| Chairman: | Mr Joaquin Ros | (Spain) |
| Vice-Chairmen: | Mr Munever Imamović | (Bosnia and Herzegovina) |
| | Mr Giovanni Guerrieri | (Italy) |
| | Mr Mounir Ferchichi | (Tunisia) |
| | Mr Abdel Mohsen Al-Mongy | (Egypt) |
| Rapporteur: | Ms Nurit Kress | (Israel) |

## Agenda item 4: Adoption of the Agenda and Organization of Work

11 The Meeting adopted the proposed agenda (see Annex II).

## Agenda item 5: Review of recent regional and global events related to the management of dredged material

12. Mr Jeftic briefly reviewed the major steps taken by MAP and its legal component since 1975. In particular, the Dumping Protocol adopted in 1976 was revised in Barcelona in 1995 and now presented a new approach. It no longer contained a black list and a grey list of substances but a "reverse" list indicating the only substances, including dredged material, which could possibly be dumped after a permit had been issued. He therefore welcomed the offer of Spain to host the Meeting, which represented a great contribution to the future implementation of the Protocol.

13. Mr Jeftic also briefly presented the data available to the Secretariat on the dumping of dredged material, which were included in reference document UNEP(OCA)MED WG.25/Inf.8.

14. He also reminded the participants of the recent adoption by the Contracting Parties of the revised Protocol against Pollution from Land-based Sources and Activities done in Syracuse in 1996. He stressed that the regional and national action plans, programmes and measures to be formulated as part of the implementation of the Protocol would now integrate all sectors of activity including dumping activities.

15. Mr Jeftic concluded by recalling that the assessment and prevention of pollution from dumping activities had been included in the Priority Fields of Activities adopted in Barcelona in 1995 and, therefore, the present meeting played an important role towards the implementation of the decisions of the Contracting Parties.

16. Mr Victor Escobar, Spanish expert, informed the participants of the last decisions and recommendations made by the London Convention with regard to the dumping of dredged material and, in particular, Resolution LC.52(18) and the Dredged Material Assessment Framework (DMAF) as a result of the Eighteenth Consultative Meeting of the London Convention held in December 1995 (see Annex III).

17. Mr J. Ros, Spanish expert, briefly described the relevant recent developments which had occurred at the OSPAR Convention and, in particular, the guidelines adopted in 1992 which had largely inspired those proposed at this Meeting.

18. In view of the very limited data and information available on the problems and procedures of Mediterranean countries, the Chairman solicited the participants to briefly present the situation in their respective countries.

19. The expert from Cyprus informed the Meeting that the Dumping Protocol and London Convention of 1972 had been ratified by National Legislation. By law, there was no enforcement of specific criteria for the dumping of dredged material. However, in case of dumping, a permit is required from the competent authority, the Ministry of Agriculture, Natural Resources and Environment, and the provisions of the Dumping Protocol and IMO guidelines are taken into consideration for the terms and conditions of the permit. According to a 1991 Decision of the Council of Ministers, all projects requiring an Environmental Impact Assessment are listed. As the construction or expansion of ports or marinas falls within this category, marine protection from dredging is also effected through the EIAs.

20. The expert from Lebanon informed the Meeting that his country had currently embarked on a Regional Environmental Assessment Plan as an integral part of sustainable development of the coastal zone.

21. In order to ensure that the needs of Southern Mediterranean countries are also reflected in the final report on the Guidelines, the expert from Lebanon also suggested that an annex be included, indicating the priorities which such countries should follow when faced with initial difficulties in implementing these Guidelines. Clear recommendations would help such countries to pass the relevant legislation.

22. The expert from Greece informed the Meeting that, prior to 1981, dredging activities in Greece were confronted by a common Ministerial Decree (1180/81) concerning Environmental Impact Assessment, which covered all public and private works. This Decree was amended in 1990 after the adoption of EEC Directive 337/85. In practice, no specific criteria or guidelines are applied but rather are tackled on a case by case basis. So far in Greece there have not been any large-scale dredging operations. Apart from the fact that the Mediterranean Sea has to be protected against pollution, there are some questions which still need to be answered. Over the last 25-30 years, international experience showed some scientific ambiguity still existed with regard to the magnitude of deleterious effects resulting from the dumping of dredged material. These environmental and water quality issues made it imperative that more knowledge be gained in order to resolve the problem. The uncertainty about the release of toxic substances and some

nutrients from sediments into the water column during disposal raised many serious questions about the potential impact on water quality resulting from such a practice. It was obvious that, if substantive environmental impact existed, these unknown effects needed to be further explored in order that alternatives or mitigation could be pursued. This meant that to follow the *"Guidelines for the management of dredged material"* was not just a matter of routine procedure.

23. The expert from Malta informed the Meeting that the Port of Valletta was dredged several years ago, and that there had not been any further significant dredging activity in Malta. However, recent monitoring showed that dredging and associated disposal in the vicinity of the coast had had a negative impact on molluscs, presumably as a result of TBT contamination from dry-docking activities in the port. He stated that there was no specific legislation or regulation on this matter, and that each individual case would be considered on its own merit under the Environmental Impact Assessment procedures which had recently been established under the Environmental Protection Act and the Planning Act. He also added that the recent construction in connection with a transhipment port was utilizing dredged material as infill behind wharves and jetties. Malta was currently generating a large amount of construction and excavation waste which was difficult to dispose of on land, and the possibility of utlizing this waste to cap previously dredged material was being investigated.

24. Mr A. Ruiz-Mateo, Spanish expert, presented a document (see Annex IV) which contained a summary of the *"Recommendations for the management of dredged material in the ports of Spain"*, a set of rules agreed on by the most significant authorities involved in dredging operations. He explained the source and content of these recommendations, placing emphasis on their most interesting additions to the guidelines of the Oslo and London Conventions, namely, the rules of characterization of dredged material and the setting of numerical quality criteria for the classification of sediments in categories associated with different management techniques.

25. The expert from Croatia stated that, taking into consideration the characteristics and configuration of the Croatian coastline, there was practically no need for beach nourishment. However, there were serious problems concerning significant civil engineering works and related dredging material disposal operations at sea. Legislation required that an Environmental Impact Assessment Study had to be carried out on the composition, quantity and characteristics of the dredged material, and that the predicted changes which could be induced by such operations had also to be investigated. The output of the study could serve as a basis for the drawing up of a document to be used when issuing permits for this type of activity (marinas, ports, jetties, etc.). He also considered that the draft *"Guidelines for the Management of Dredged Material"* was very well prepared and would be useful for the formulation of his country's legislation which was currently being drawn up in view of the growing interest in coastal development.

26. The expert from Bosnia and Herzegovina indicated his country's readiness to actively collaborate in all activities relating to the Mediterranean and, together with other countries in the region, to share in the responsibility for the protection of the Mediterranean against pollution, particularly the Adriatic Sea. He felt that the draft *"Guidelines for the Management of Dredged Material"* presented at the Meeting was well prepared and, after some necessary detailed modifications, could be adopted by the Meeting.

27. The expert from Israel informed the Meeting that in her country any dumping or discharge of wastes into the sea fell under the jurisdiction of the Ministry of Environment,

and required a permit. This permit is only issued after the performance of an environmental impact assessment. One of the obligatory conditions for the issue of such a permit was the performance of a monitoring programme at the disposal site. The Israeli shipyards, located at the harbours of Haifa and Kishon, requested a permit to dredge and dump approximately 1 million $m^3$ of sediments in order to deepen the harbour by about 2 metres. The harbour is located at the estuary of the Kishon river, which is known to be polluted. In the event of floods, contaminated sediments were flushed downstream and accumulated in the harbour. The degree of pollution decreased seaward. Therefore it was known that the area was not homogeneous as far as both the type of sediment and pollutant contents were concerned. Moreover, pollutant concentration decreased with the increase in the sediment depth. Previous research in the area identified the pollutants for concern to be crude oil and its degradation products and the metals Cd and Hg. No PCBs, pesticides or dioxins were detected. Therefore, sediment cores at 8 sampling stations were sampled and three slices analyzed for the above mentioned pollutants. Based on these results, the sediments were divided into three types, viz. (a) polluted sand and silt, (b) unpolluted sand and (c) unpolluted silt, and the following dumping strategy was used. Sediment of type (a) was dumped at a deep site (500 metres in depth), sediment of type (b) was dumped close to shore to nourish the nearshore environment with sand, and sediment type (c) was dumped at a depth of approximately 50 metres where natural sediment is silty.

28. The expert from Italy informed the Meeting that in his country a Law (Act of 10th. of May 1976, n.319) was in force which, in article nr.11, considers the possibility of disposing dredged materials into the sea. Regulations concerning this article were summarized in a Ministerial Decree which was published last January (see Annex V). This Decree is applied either to the dumping of dredged materials on seas, lakes, lagoons or salted ponds, to their mobilization in the case of cable and submarine piping installations, or to the reuse of dredged materials for beach nourishment.

The licence application should be submitted to the Ministry of Environment through the Director of the relevant Maritime Department, and should be accompanied by a technical report as well as by information regarding the characteristics of the materials to be dredged, the existing contamination levels and a description of the receiving site, for which an environmental impact survey shall be carried out.

According to Italian regulations, the permit for dumping into the sea will only be issued when the materials concerned are not classified in other regulations as toxic and noxious wastes, which contamination level could affect the production balance of biological resources or the amenities and swimming/bathing activities on beaches.

. The permits and licences are only issued by the Ministry of the Environment when the required conditions are met, and should include operational instructions to be followed by the Maritime Departments. The permits are issued for limited periods of time and, depending on the criteria, may be amended, suspended or revoked by the Ministry of Environment without the further right of appeal. An additional urgent procedure which is also foreseen, is for the Head of the Maritime Department to supply the Ministry with the necessary application forms detailing the site specification, the type of dredged materials, the quantity to be disposed of and, in particular, detailed rationale regarding the urgency conditions.

The selection of the dumping sites will be made in such a way so as to ensure that the disposal does not affect, even indirectly, protected areas and fragile ecosystems. Distance from the coast should be more than 3 miles, and depth should exceed 50 metres.

The proximity of the protected or sensitive areas should also be indicated if they are within a 10 mile radius. It should furthermore be ensured that the surface of the dumping site is sufficient in relation to the volume of material to be dumped.

The Decree also encompasses, as annexes, two outlines intended for the drafting of technical reports regarding the aim and type of the dredging project, dumping volume, dredging and dumping mode, physical, chemical and microbiological characteristics of dredging materials, identification and characterization of the dumping area, both in the case of sea dumping and use for beach nourishment and also for the installation of cables and submarine piping. In both cases, the sampling and analysis modalities of dredging materials is also detailed.

29. The expert from France presented the balance of the dredged material dumping carried out in 1992 within the area covered by the Oslo Convention and within French territorial waters (waters under French jurisdiction). He explained the methodology which, departing from a reference level corresponding to the contents in heavy metals considered as natural (geological background noise), allows for the differentiation of the dredging materials which could be considered as having a low environmental risk, the dredging materials that should be studied in order to determine whether they are susceptible to dumping, and those dredging materials for which dumping could be forbidden. This 'layered' approach is now being studied by the Oslo Convention. A first synthesis document collecting the approaches followed by the differrent contracting parties has been carried out and is at present being re-examined. He also briefly introduced a document presenting the current juridical framework enforced in France related to the dumping operations in ports (see Annex VI).

30. The expert from Tunisia advised the Meeting that in his country dredging operations should be the object of an environment impact survey, as per a Decree dated 13th of March 1991, such an environment impact survey being a precondition for any administrative permit. This study should be carried out by the project promoter and presented to the National Agency for Environment Protection (Agence Nationale de Protection de l'Environnement-ANPE) in order to be assessed. If ANPE 's decision is unfavourable, the project cannot be carried out. Nevertheless, problems arise during the assessment process of the impact surveys concerning dredging projects due to the absence of:

1. Criteria or standards, or rather specific pollution levels.

2. Guidelines or methodology concerning the sampling and analysis of dredging materials.

3. Criteria allowing the characterization, identification or selection of dumping sites.

4. Disposal measures in cases when dumping is not done.

5. Scheme to be followed for an efficient tracking during and after dredging operations at long, medium and short term.

He hoped that the guidelines and directives being the object of this meeting would allow for the clarification of some points, thus leading to better management of the dredging problems. Besides, he saw the need to recommend and foresee additional

meetings concerning the management of dredging materials, in order to be able to get deeper into the above mentioned 5 items.

31. The expert from Egypt stressed that there were no specific regulations in Egypt concerning the dumping of dredged sediments, and no records were available regarding the amount of sediments dredged along the Mediterranean shore of Egypt. Because of its touristic importance and, in particular, the existence of coral reefs, attention was recently focused on the dredging and dumping of material along the Red Sea shore. Sand nourishment and the dredging of lagoons in front of villages led to many negative impacts on the shoreline and the local environment. The environmental law of Egypt (Law No.4, 1994) was now under revision. He felt confident that his country could make use of these guidelines in the new law of environment for the management of dredged materials.

## Agenda item 6: Review of draft guidelines for the management of dredged material

32. Mr J. Ros, on behalf of the Spanish delegation who had prepared the draft guidelines, briefly introduced the working document UNEP(OCA)MED WG.114/3 *"Draft Guidelines for the Management of Dredged Material"*.

33. Mr Ros explained that the Draft Guidelines had been largely based on the corresponding guidelines adopted by the OSPAR Convention, and that the text had been specifically adapted for the Mediterranean by introducing the appropriate references to, and texts of, the 1995 Dumping Protocol.

34. The participants thanked the Spanish delegation for the excellent work, and stressed that the proposed text formed a solid base for the formulation, and subsequently the adoption, of Mediterranean Guidelines within the framework of the Dumping Protocol.

35. The Meeting embarked on a detailed review of the document, and several suggestions were made to ensure that it corresponded more favourably to the needs of the Mediterranean region.

36. Mr Ros, in view of the complexity of the subject and, accordingly, of the document, presented a scheme which identified the main steps to be taken in the management of dredged material. The Meeting found the scheme to be extremely clear and agreed to attach it to this report as Annex VII.

37. The expert from Greece, Mr A. Katsaounis, proposed a new structure for the Guidelines which, without modifying its basic content, aimed at making the document easier to read. The Meeting considered the proposal interesting, and agreed to attach it to this report as Annex VIII.

38. One participant stressed that it would be necessary to introduce the definition of "dredged material", while others stressed that the terminology used in the document was in some cases not precise enough to give a clear indication of the actions to be taken, especially in view of the still limited technical capabilities of some Southern Mediterranean countries.

39. During the discussion, it was also pointed out that it would be necessary to consider the future establishment of common criteria related to the issuing of dumping permits.

40. Concerning Part B of the document, the Meeting agreed to regroup all the parts of the document relevant to the "Impact Hypothesis" and to separate them from the part relating to monitoring.

Conclusions

41. The participants considered the new draft guidelines resulting from the discussions and attached as Annex IX to this report, to be an excellent starting point and asked the Secretariat to re-elaborate a new text with the assistance of experts. The new text will have to take into account the comments and suggestions presented during the present meeting, as well as the work carried out within the framework of the London Convention. The new proposed text will be presented to a second meeting of government-designated experts for approval and, subsequently, to the Contracting Parties for adoption.

42. In addition, the Meeting agreed that:

1. the Secretariat should collect all available information on existing criteria from other countries and regions, an disseminate them to all Parties;

2. the Secretariat should prepare a draft detailed technical annex on the monitoring of the sediment and of areas where dredging operations have been carried out;

3. the Secretariat should organize training activities on the management of dredged material; and

4. the Secretariat should collect information on the techniques used for toxicity tests and, in view of their complexity, organize relevant training courses.

Agenda item 7: Other business

43. The Spanish delegation informed the Meeting of the interest expressed by the OSPAR Convention on the outcome of the present meeting. As a result, the Meeting asked the Secretariat to inform the OSPAR Secretariat of the development of work on the preparation of the Guidelines for the management of dredged material and transmit the document to them when it has been finally approved.

Agenda item 8: Adoption of the report of the Meeting

44. The English and French versions of the Report were unanimously adopted by the Meeting.

Agenda item 9: Closure of the Meeting

45. Several participants expressed their gratitude to the Government of Spain for the excellent organization of the Meeting.

46. Mr Civili, MAP First Officer, also warmly thanked the Government of Spain for hosting and financially supporting the Meeting, and stressed the importance of its results for the future implementation of the revised Dumping Protocol.

47. The Chairman thanked the participants for their active participation and important contribution to the success of the Meeting, and declared the Meeting closed at 12.30 hours on 22 May 1996.

# ANNEX I

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# Annex II

## AGENDA

1. Opening of the Meeting

2. Rules of Procedure

3. Election of officers

4. Adoption of the Agenda and Organization of Work

5. Review of recent regional and global events related to the management of dredged material

6. Review of draft guidelines for the management of dredged material

7. Other business

8. Adoption of the report of the Meeting

9. Closure of the Meeting

# Annex III

## RESOLUTION LC.52(18)

## AND

## DREDGED MATERIAL ASSESSMENT FRAMEWORK

## (SECOND DRAFT)

ANNEX

# RESOLUTION LC.52(18)
# ON A DREDGED MATERIAL ASSESSMENT FRAMEWORK

THE EIGHTEENTH CONSULTATIVE MEETING,

1 RECALLING Article I of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (London Convention 1972), which provides that Contracting Parties shall individually and collectively promote the effective control of all sources of pollution of the marine environment;

2 RECOGNIZING the need for maintaining open shipping lanes and harbours for maritime transport and that undue burden should be avoided with regard to the interpretation and application of the provisions of the London Convention 1972;

3 RECOGNIZING ALSO that the major part of the sediments dredged from the waterways of the world is, by nature, similar to undisturbed sediments in inland waters, whereas a minor part is contaminated, mostly resulting from the emission of hazardous substances into internal waters, requiring application of major environmental constraints when depositing these sediments, and that problems will continue until such emissions are controlled at source;

4 RECALLING that the Tenth Consultative Meeting by resolution LDC.23(10) adopted Guidelines for the Application of the Annexes to the Disposal of Dredged Material with a view to assessing the suitability of dredged material for disposal at sea in accordance with the provisions of the London Convention 1972, and the agreement to review these Guidelines within five years time in light of experience gained by Contracting Parties, in particular with regard to the application of the terms "trace contaminants", "rapidly rendered harmless" and "special care" as defined for disposal of dredged material at sea;

5 NOTING the experience with these Guidelines as reported by Contracting Parties;

6 RECALLING that the Fifteenth Consultative Meeting instructed the Scientific Group to carry out a full review of the Guidelines and that it considered the Waste Assessment Framework, which it had adopted on a provisional basis, to be an appropriate starting point for this review;

7 CONSIDERING that the Guidelines for the Application of the Annexes to the Disposal of Dredged Material (resolution LDC.23(10)) had primarily focused on Annex III, Part A of the London Convention 1972, and that the review of these Guidelines would have to include, where appropriate to dredged material, a review of parts B and C of the Guidelines for the Implementation and Uniform Interpretation of Annex III to the London Dumping Convention as contained in resolution LDC.32(11);

8 NOTING the adoption of the Amendments to the Annexes to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972, Concerning Phasing out Sea Disposal of Industrial Waste and Concerning Disposal at Sea of Radioactive Wastes and Other Radioactive Matter, by resolutions LC.49(16) and LC.51(16) respectively, in particular with regard to the references contained therein to sea disposal of dredged material;

9 HAVING CONSIDERED the draft Dredged Material Assessment Framework prepared by the Scientific Group:

1. ADOPTS the Dredged Material Assessment Framework as set out at Annex hereto, thereby replacing the Guidelines for the Application of the Annexes to the Disposal of Dredged Material at Sea, as adopted by resolution LDC.23(10);

2. RESOLVES that Contracting Parties to the Convention when assessing the suitability of dredged material for disposal at sea shall take full account of the Dredged Material Assessment Framework;

3. AGREES to review the Dredged Material Assessment Framework within five years time in light of experience gained by Contracting Parties with it, and in light of relevant amendments to the London Convention 1972, adopted in accordance with resolution LC.48(16);

4. REQUESTS Contracting Parties to submit to the Organization for distribution to all Contracting Parties information on their experience gained with the Dredged Material Assessment Framework, including case studies;

5. CALLS UPON Contracting Parties to take all practicable steps at the source to prevent and reduce contamination of marine sediments.

ANNEX

# DREDGED MATERIAL ASSESSMENT FRAMEWORK

## 1 INTRODUCTION

1.1 Dredging is essential to maintain navigation in ports, harbours and inland waterways and for the development of port facilities. Much of the material removed during these necessary activities requires disposal at sea. The greater proportion of the total amount of material dredged world-wide is, by nature, similar to undisturbed sediments in inland and coastal waters. A smaller proportion of dredged material, however, is contaminated by human activity to an extent that major environmental constraints need to be applied when depositing these sediments.

1.2 Within the framework of the London Convention 1972, Contracting Parties have recognized that dredged material, due to its characteristics, can be managed separately from waste materials. In 1986, the Tenth Consultative Meeting adopted "Guidelines for the Application of the Annexes to the Disposal of Dredged Material" (resolution LDC.23(10)). It was agreed that the guidelines should be kept under regular review to take into account developments in dredging technology and improved understanding of the environmental consequences of disposal at sea.

1.3 The Dredged Material Assessment Framework (DMAF) is a generic guideline for decision makers in the field of management of dredged material. It is derived from the Waste Assessment Framework and sets out the basic practical, though not necessarily detailed considerations required for determining the conditions under which dredged material might (or might not) be deposited at sea.

## 2 EVALUATION OF NEED FOR DREDGING AND DISPOSAL

2.1 There are a number of dredging activities which may give rise to the need to relocate or dispose of sediments. These include:

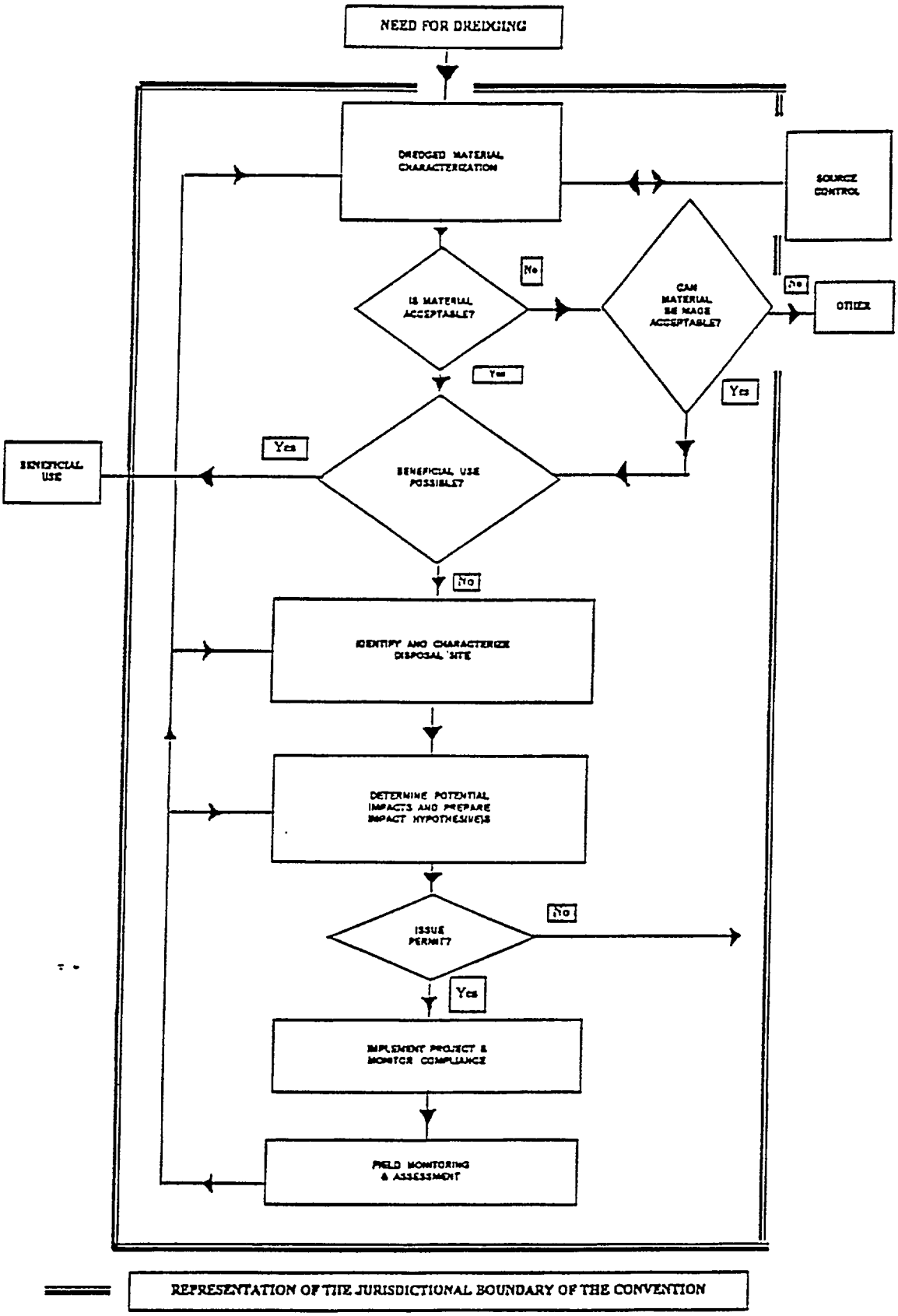
.1 **Capital dredging** - for navigation, to enlarge or deepen existing channel and port areas or to create new ones; and for engineering purposes: e.g., trenches for pipes, cables, immersed tube tunnels, removal of material unsuitable for foundations, removal of overburden for aggregate extractions;

.2 **Maintenance dredging** - to ensure that channels, berths or construction works are maintained at their designed dimensions; and

.3 **Clean-up dredging** - deliberate removal of contaminated material for human health and environmental protection purposes.

2.2 Before beginning a full assessment of the material and the disposal options the question should be asked "Is dredging necessary?". In the event of a subsequent full assessment indicating no acceptable options for disposal it will be necessary to re-address this question in a broader context.

DREDGED MATERIAL ASSESSMENT FRAMEWORK



## 3 DREDGED MATERIAL CHARACTERIZATION

### Physical characterization

3.1 Evaluation of the physical characteristics of sediments for disposal is necessary to determine potential environmental impact and the need for chemical and/or biological testing. The basic physical characteristics required are the amount of material, particle size distribution and specific gravity of solids.

### Exemptions from detailed characterization

3.2 Dredged material may be exempted from the full characterization requested in paragraphs 3.3 to 3.9 below if it meets one of the criteria listed below:

.1 dredged material is excavated from a site away from existing and historical sources of appreciable pollution, so as to provide reasonable assurance that the dredged material has not been contaminated, **or**

.2 dredged material is composed predominantly of sand, gravel and/or rock, **or**

.3 dredged material is composed of previously undisturbed geological materials.

Dredged material that does not meet one of these criteria will require a full characterization to assess its potential impact.

### Chemical characterization

3.3 Sufficient information for chemical characterization may be available from existing sources: in such cases new measurements may not be required of the potential impact of similar material at similar sites.

3.4 Considerations for additional chemical characterization of dredged material are as follows:

.1 major geochemical characteristics of the sediment including redox status;

.2 potential routes by which contaminants could reasonably have been introduced to the sediments;

.3 data from previous sediment chemical characterization and other tests of the material or other similar material in the vicinity, provided this information is still reliable;

.4 probability of contamination from agricultural and urban surface runoff;

.5 spills of contaminants in the area to be dredged;

.6 industrial and municipal waste discharges (past and present);

.7 source and prior use of dredged materials (e.g., beach nourishment); and

.8 substantial natural deposits of minerals and other natural substances.

3.5 Sampling of sediments from the proposed dredging site should represent the vertical and horizontal distribution and variability of properties of the materials to be dredged.

3.6 Further information may also be useful in interpreting the results of chemical testing, such as total organic carbon (TOC).

**Biological characterization**

3.7 If the potential impacts of the dredged material to be dumped cannot be assessed on the basis of the chemical and physical characterization and available biological information, biological testing should be conducted.

3.8 It is important to ascertain whether an adequate scientific basis exists on the characteristics and composition of the material to be dumped and on the potential impacts on marine life and human health. In this context, it is important to consider information about species known to occur in the area of the disposal site and the effects of the material to be dumped and of its constituents on organisms.

3.9 Biological tests should incorporate species that are considered appropriately sensitive and representative and should determine, where appropriate:

.1 acute toxicity;

.2 chronic toxicity such as long-term sub-lethal effects, covering an entire life cycle;

.3 the potential for bioaccumulation; and

.4 the potential for tainting.

Action List

3.10 The following is a screening mechanism for assessing properties and constituents of dredged material with a set of criteria for specific substances similar to that developed in the Waste Assessment Framework. These should reflect experience gained with published scientific research relating to the potential effects on human health or the marine environment. An Action List should be devised as a trigger mechanism for dredged material management decisions, including the identification and development of source control measures as described in paragraphs 3.13 to 3.15 below.

3.11 Action List levels[1] should be developed on a national or regional basis and might be set on the basis of concentration limits, biological responses, environmental quality standards, flux considerations or other reference values.

3.12 An Action List may include an upper and lower level giving these possible actions:

.1 material which contains specified contaminants, or which causes biological responses, in excess of the relevant upper levels should generally be considered unsuitable for disposal at sea;

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[1] The Action List should, as a minimum, address the substances as currently contained in Annexes I and II to the Convention.

.2 material which contains specified contaminants, or which causes biological responses, below the relevant lower levels should generally be considered of little environmental concern for disposal at sea; and

.3 material of intermediate quality should require more detailed assessment before suitability for disposal at sea can be determined.

**Contaminant Source Evaluation and Control**

3.13 Contamination of estuarine and coastal marine sediments both as a consequence of historical and present day inputs presents a continuing problem for the management of dredged material. High priority should be given to the identification of sources, reduction and prevention of further contamination of sediments and should address both point and diffuse sources. Successful implementation of prevention strategies will require collaboration among agencies with responsibility for the control of point and diffuse sources of contamination.

3.14 In developing and implementing the source control strategy, appropriate agencies should take into account:

.1 the continuing need for dredging;

.2 the hazards posed by contaminants and the relative contributions of the individual sources to these hazards;

.3 existing source control programmes and other regulations or legal requirements;

.4 technical and economic feasibility;

.5 the evaluation of the effectiveness of measures taken; and

.6 consequences of not implementing contaminant reduction.

3.15 In cases where there has been historical contamination or where control measures are not fully effective in reducing contamination to acceptable levels, disposal management techniques, including the use of containment or treatment methods may be required.

## 4 EVALUATION OF DISPOSAL OPTIONS

4.1 The results of the physical/chemical/biological characterization will indicate whether the dredged material, in principle, is suitable for disposal at sea. Where sea disposal is identified as an acceptable option it is nonetheless important, recognizing the potential value of dredged material as a resource, to consider the availability of beneficial uses.

### Beneficial Uses

4.2 There is a wide variety of beneficial uses depending on the physical and chemical characteristics of the material. Generally, a characterization carried out in accordance with chapter 3 of this Framework will be sufficient to match a material to possible uses such as:

.1 **Engineered uses** - land creation and improvement, beach nourishment, offshore berms, capping material and fill:

.2 **Agricultural and product uses** - aquaculture, construction material, liners; and

.3 **Environmental enhancement** - restoration and establishment of wetlands, upland habitats, nesting islands, and fisheries.

The technical aspects of beneficial uses are well-established and described in the literature.

### Management Options

4.3 Where the characteristics of the dredged material are such that its disposal would not meet the requirements of the 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, or harm living resources, damage amenities or interfere with legitimate uses of the sea.

4.4 Treatment, such as separation of contaminated fractions, may make the material suitable for a beneficial use and should be considered before opting for sea disposal. Disposal management techniques may include placement on or burial in the sea floor followed by clean sediment capping, utilization of geochemical interactions and transformations of substances in dredged material when combined with sea water or bottom sediment, selection of special sites such as abiotic zones, or methods of containing dredged material in a stable manner.

## 5 SEA DISPOSAL SITE SELECTION[2]

5.1 The selection of a site for sea disposal involves not only considerations of an environmental nature but also economic and operational feasibility.

5.2 For the evaluation of a sea disposal site information should be obtained on the following, as appropriate:

.1 the physical, geochemical and biological characteristics of the sea-bed (e.g., topography, redox status, benthic biota);

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

.3 proximity to:

.1 areas of natural beauty or significant cultural or historical importance;

.2 areas of special scientific or biological importance such as sanctuaries and critical habitats;

.3 recreational areas;

.4 subsistence, commercial and sport fishing areas;

.5 finfish and shellfish spawning, recruitment and nursery areas;

.6 migration routes of marine organisms;

.7 shipping lanes;

.8 military exclusion zones;

.9 engineering uses of the sea such as mining, undersea cables, water intakes, energy conversion sites, etc.

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

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2 Matters related to criteria for selection of sea disposal sites are addressed by the London Convention 1972 and are currently contained in Annex III thereto. These criteria should be considered in conjunction with this Framework.

5.3 The information on the characteristics of the sea disposal site referred to above is required to determine the probable fate and effects of the dumped material. The physical conditions in the vicinity of the sea disposal site will determine the transport and fate of the dredged material. The physico-chemical conditions 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 of sea disposal to marine resources and amenities will, in turn, define the nature of the effects that are to be expected. Careful evaluation will then permit prediction of the consequences of dumping if it is authorized. It will also permit determination of environmental processes that may dominate the transport of material away from the sea disposal site. The influence of these processes may be reduced through the imposition of permit conditions.

5.4 In some cases, dumping can augment existing effects attributable to inputs of contaminants to coastal areas through land runoff and discharge, resource exploitation and maritime transport. These existing stresses on biological communities should be considered as part of the assessment of potential impacts caused by dumping. The proposed method of dumping and potential future uses of resources and amenities in the marine receiving area should also be taken into account.

## 6 ASSESSMENT OF POTENTIAL EFFECTS

6.1 Assessment of potential effects should lead to a concise statement of the expected consequences of the disposal option (i.e., the 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.

6.2 This assessment comprises a summary of the potential effects on human health, living resources, amenities and other legitimate uses of the sea. It should define the nature, temporal and spatial scales and duration of expected impacts based on reasonably conservative assumptions.

6.3 For a retentive site, where the material deposited will remain within the vicinity of the site, the assessment should delineate the area that will be substantially altered by the presence of the deposited 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 recolonization should be projected after disposal operations have been completed as well as the likelihood that recolonization 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.

6.4 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 disposal operation (i.e., the near-field) and the severity of associated changes in that immediate receiving environment. It should 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.

## 7 PERMIT ISSUE

7.1 If sea disposal is the selected option, then a permit authorizing sea disposal must be issued in advance. In granting a permit, the immediate impact of dredged material occurring within the boundaries of the disposal site such as alterations to the local, physical, chemical and biological environment is accepted by the permitting authority. Notwithstanding these consequences, the conditions under which a permit for sea disposal is issued should be such that environmental change beyond the boundaries of the disposal site are as far below the limits of allowable environmental change as practicable. The disposal operation should be permitted subject to conditions which further ensure that environmental disturbance and detriment are minimized and benefits maximized.

7.2 The permit is an important tool for managing sea disposal of dredged material and will contain the terms and conditions under which sea disposal may take place as well as provide a framework for assessing and ensuring compliance.

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

.1 only those materials which have been characterized and found acceptable for sea disposal, based on the assessment of potential effects, are dumped;

.2 the material is disposed of at the selected disposal site;

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

.4 any monitoring requirements are fulfilled and the results reported to the permitting authority.

7.4 Sufficient surveillance of sea disposal operations should assure the licensing authority that the permit conditions are met.

## 8 MONITORING

8.1 Monitoring in relation to disposal of dredged material is defined as measurements of compliance with permit requirements and of the condition and changes in condition of the receiving area to assess the Impact Hypothesis upon which the issue of a disposal permit was approved.

### Specification of Baseline Conditions

8.2 It may usually be assumed that suitable specifications of existing (pre-disposal) conditions in the receiving area are already contained in the application for disposal. If the specification of such conditions is inadequate to permit the formulation of an Impact Hypothesis, additional information will be required by the licensing authority before any final decision on the permit application is made.

**Post-Operational Monitoring**

8.3 The Impact Hypothesis forms the basis for defining post-operational monitoring. 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:

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

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

.3 how should the data be managed and interpreted?

8.4 The permitting authority is encouraged to take account of relevant research information in the design and modification of monitoring programmes. The measurements can be divided into two types - those within the zone of predicted impact and those outside.

8.5 Measurements should be designed to determine two things:

.1 whether the zone of impact differs from that projected; and

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

The first of these questions can be answered by designing a sequence of measurements in space and time that circumscribe the projected zone of impact to ensure that the projected spatial scale of change is not exceeded. The second question can be answered by the acquisition of measurements that provide information on the extent of change that occurs outside the zone of impact after the disposal operation. Frequently, this latter suite of measurements will only be able to be based on a null hypothesis - that no significant change can be detected.

**Feedback**

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

.1 modify or terminate the field monitoring programme;

.2 modify or revoke the permit; and

.3 refine the basis on which applications to dump dredged material at sea are assessed.

# Annex IV

## RECOMMENDATIONS FOR THE MANAGEMENT OF DREDGED MATERIAL IN THE PORTS OF SPAIN

# RECOMMENDATIONS FOR THE MANAGEMENT OF DREDGED MATERIAL IN THE PORTS OF SPAIN

## -SUMMARY-

### Introduction

The CEDEX (Center for Studies and Experimentation on Public Works)[1] with the collaboration of the Spanish Institute of Oceanography[2] has prepared a document entitled "Recomendations for the management of dredged material in the ports of Spain" (RMDM), which is intended to be a legislative rule for the whole country in the next future. In May 1994, it has been approved by the following authorities to be applied in their respective domains of responsability:

- "Ports of the State" Public Corporation
- General Secretariat for Marine Fishing, Ministry of Agriculture Fisheries and Food
- General Directorate for Merchant Navy, Ministry of Public Works, Transport and Environment
- General Directorate for Coasts, Ministry of Public Works, Transport and Environmment
- General Directorate for Environmental Policy, Ministry of Public Works, Transport and Environment

The significance of these authorities results in that, as a matter of fact, more than 95% of dredged material is already being managed according to the contents of the above Recommendations.

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[1] In Spanish, "Centro de Estudios y Experimentación de Obras Públicas'.

[2] In Spanish, "Instituto Español de Oceanografía".

**Sources.**

The main sources for the redaction of the RMDM have been:

- Ports and Merchant Navy Act (1992)
- Guidelines for the management of dredged material (Oslo Commission)(1993)
- Guidelines for the application of the annexes to the disposal of dredged material (London Dumping Convention, 10th Consultative Meeting, 1986))

Other sources include:

- Information presented by several countries to the 20th SACSA Meeting (1993).
- "Aquatic Pollution and Dredging in the European Community" published by the Association of Dutch Dredging Contractors.
- "Beneficial Uses of Dredged Material" (Report of PIANC Working Group 19) (1986).
- "Seaworthy, Derivation of micropollutant risk levels for the North Sea and Wadden Sea" (Report of the Ministry of Housing, Physical Planning and Environment of The Netherlands).
- "Background concentrations of natural compounds" (Report of the Ministry of Housing, Physical Planning and Environment of The Netherlands).
- Fourth Report of the Group *Co-ordinating Sea Disposal Monitoring* (Ministry of Agriculture, Fisheries and Food, Directorate of Fisheries Research, Great Britain).
- "Monitoring and Surveillance of Non-Radioactive Contaminants in the Aquatic Environment and Activities Regulating the Disposal of Wastes at Sea, 1990 (Report of Ministry of Agriculture, Fisheries and Food, Directorate of Fisheries Research, Great Britain)
- "Manual for the Application of the Oslo and Helsinki Guidelines for the Disposal of Dredged Material in the Federal Water and Navigation Administration", from the German Federal Ministry of Transport (in German) (1992).
- "Inventory of Dredging Works in Spain, 1975-1990" and annual up-to date revisions for 1991, 1992 and 1993. (Reports of CEDEX, in Spanish).

and a number of studies on sediment quality both within ports and along the shore in Spain.

**Contents**

The RMDM describe the procedure to reach the most appropiate option for the disposal of dredged rmaterial, the studies needed to follow it and the contents of the documents to apply for any permit for dumping into the sea. A flow-chart of the procedure is attached as annex I.

Comparing with the guidelines of Oslo and London Conventions, the most interesting additions are the rules for characterization of dredged material and the setting of numerical quality criteria that allow clasification of sediments in categories associated with different management techniques . In the following, these additions will be described .

**Rules for characterization of sediment to be dredged when exemption is not applicable.**

Sediments with less than 10% of fine fraction ( grain size less than 63 μm) are exempted of characterization in the absence of appreciable pollution sources. There is a close contact between "Ports of State" and the General Directorate for Coasts in order to take advantage of most of this material for beach nourishment, since Spanish Goverment spends annually more than 150 millions of ECUs for restoration of beaches.

The number of sampling stations ($N$) depends on the area of the zone to be dredged ($x$, $m^2$) , as:

$$N = \sqrt{x}/25$$

with $N \geq 4$.

If the layer to be dredged is quite thick (say > 50 cm) a percentage of the samples must be taken from the whole thickness (box corer, vibrocorer or annular boring). In these cases, also a sample from the surface must be taken (van Veen sampler or similar) because the upper 25 cm of the cores are supposed to be altered and are eliminated. Usually samples are taken from every 25 cm of the core down to a depth where sediments are not contaminated, but there are some minor differences in the requirements for certain speciat cases.

The characterization of the samples is carried out in two tiers that roughly speaking, are devoted to physical (Tier 1) and chemical (Tier II) analysis.

Tier I includes grain size fractions (full granulometry is advised), concentration of solids (mass of solids per unit volume of "in situ" sediment), Total Organic Carbon (of fraction with grain size less than 2 mm) and, in certain cases , bacteriology.

As a result of these analyses, a part of the previously unknown material may be exempted of further characterization.

Tier II includes a primary and a secondary group of determinands as in technical annex 1 of the Oslo Comission Guidelines, except that analysis must be carried out on the fine fraction (< 63 μm). The primary group include Hg, Cd, Pb, Cu, Zn, Ni, Cr and the sum of IUPAC PCB congeners 28, 52, 101, 118, 138, 153 y 180. Analyses of this determinands are mandatory in all cases.

A sort of Tier III based on bioassays is mentioned in the RMDM but, at present, it is not operative because of lack ot both qualified laboratories and agreed methodologies.

Generally, the results of these analyses are valid for two years, but in certain cases (maintenance dredging, dredging works lasting more than scheduled, etc) the number of samples and/or parameters may be reduced.

## Assesment

The total amount of sediment to be dredged is divided in several parts (usually two or three) that will be managed in different ways. For each of these parts, a weighted mean concentration is calculated for each parameter with the formula:

$$C^* = \frac{\sum C_i p_{Fi} M_i}{\sum p_{Fi} M_i}$$

where $C_i$ is the result of the analysis, $p_{Fi}$ is the percentage of fine fraction and $M_i$ is the mass of solids in the volume represented by sample #i.

The assesment of each part is made by comparison with Action Levels 1 and 2, which for the moment have been set up as indicated in the following table:

| | **Action Level 1** | **Action Level 2** |
|---|---|---|
| Mercury (Hg) | 0,6 | 3,0 |
| Cadmium (Cd) | 1,0 | 5,0 |
| Lead (Pb) | 120 | 600 |
| Copper (Cu) | 100 | 400 |
| Zinc (Zn) | 500 | 3000 |
| Chromium (Cr) | 200 | 1000 |
| Arsenic (As) | 80 | 200 |
| Nickel (Ni) | 100 | 400 |
| Σ 7 PCB's (1) | 0,03 | 0,1 |

(1) Sum of congeners IUPAC No 28, 52, 101, 118, 138, 151 and 180.

These concentrations are referred to fine fractions ( < 63 μm) and are expressed in mg/Kg of dry matter.

Paragraph 5 of the RMDM says that before year 2000, new Actios Levels 1 and 2 will be set up based on the results of a number of studies, most of them already going, related to:

- Background levels in Spanish coastal sediments
- Antropogenic load in dredged material
- Normalization techniques
- Validation of bioassay methodologies
- Bioavailability of contaminants in material dredged from different places.

## Categories and management techniques

When concentration $C^*$ for all parameters in the above table are below Action Level

1, the material is classified as Category I and is allowed to be dumped into the sea paying attention only to mechanical effects during dumping operation. A standard permit is needed.

When concentrations $C^*$ for at least one parameter is greater than Action Level 1 and all of them are lower than Action Level 2 the material is classified as Category II. In this case it still may be dumped into the sea, but now it is neccesary to carry out a careful study of the effects, to mitigate the impact of the dumping operation, to prepare an impact hypothesis and to set up a monitoring programme to verify limited adverse effects. A special permit is needed.

Finally, if concentration $C^*$ for at least one parameter is greater than Action Level 2, the material is classified as Category III and must be separated from marine water or adequately treated. In the first case, the isolating properties of the containment may be "soft" (avoid the loss of fine material) or "hard" (avoid the leakage of lixiviates), corresponding respectively to subcategory IIIa (concentration $C^*$ lower than 8 times Action Level 2) and subcategory IIIb (greater than that).

**Productive uses of dredged material**

It is mandatory to consider alternatives of productive uses for dredged material included in categories I and II. Some of the alternatives included in the RMDM are:

- Creation of reclamation areas
- Beach nourishment
- Coastal defences by creation of bars, protection of slopes, etc.
- Creation or improvement of wetlands
- Inland improvement of terrain
- Supply of aggregate for construction
- Protection and improvement of habitats for wild life

**Selection of dumping site**

Local available information (fishing grounds, fish hatcheries, tourism, charts of the bottoms, navigation paths,etc.) will allow a preselection of posible zones for dumping sites. Special consideration will be given to zones already used as such.

The most significant effects to be expected are those on benthic communities (mainly sesil epifauna) due to burial and uptake of contaminants. Because of that, the RMDM include the following issues as a minimum for the contents of biological studies for dumping site selection:

- Information on fishing grounds, spawning or breeding zones, prairies of marine phanerogams, rock or coral zones.
- Physical caracterization of the sediments.
- Biological survey of the botton including determination of biomass per unit surface area, diversity and visual inspection either by scientific diving or by recording cameras on board of remotely operated vehicles.

When turbidity sensible zones exist in the surroundings, a study on transport and dispersion of the fraction which remains in suspension must be undertaken.

The RMDM also contains some measures to minimise the biological impact of dumping dredged material.

**Revision of RMDM**

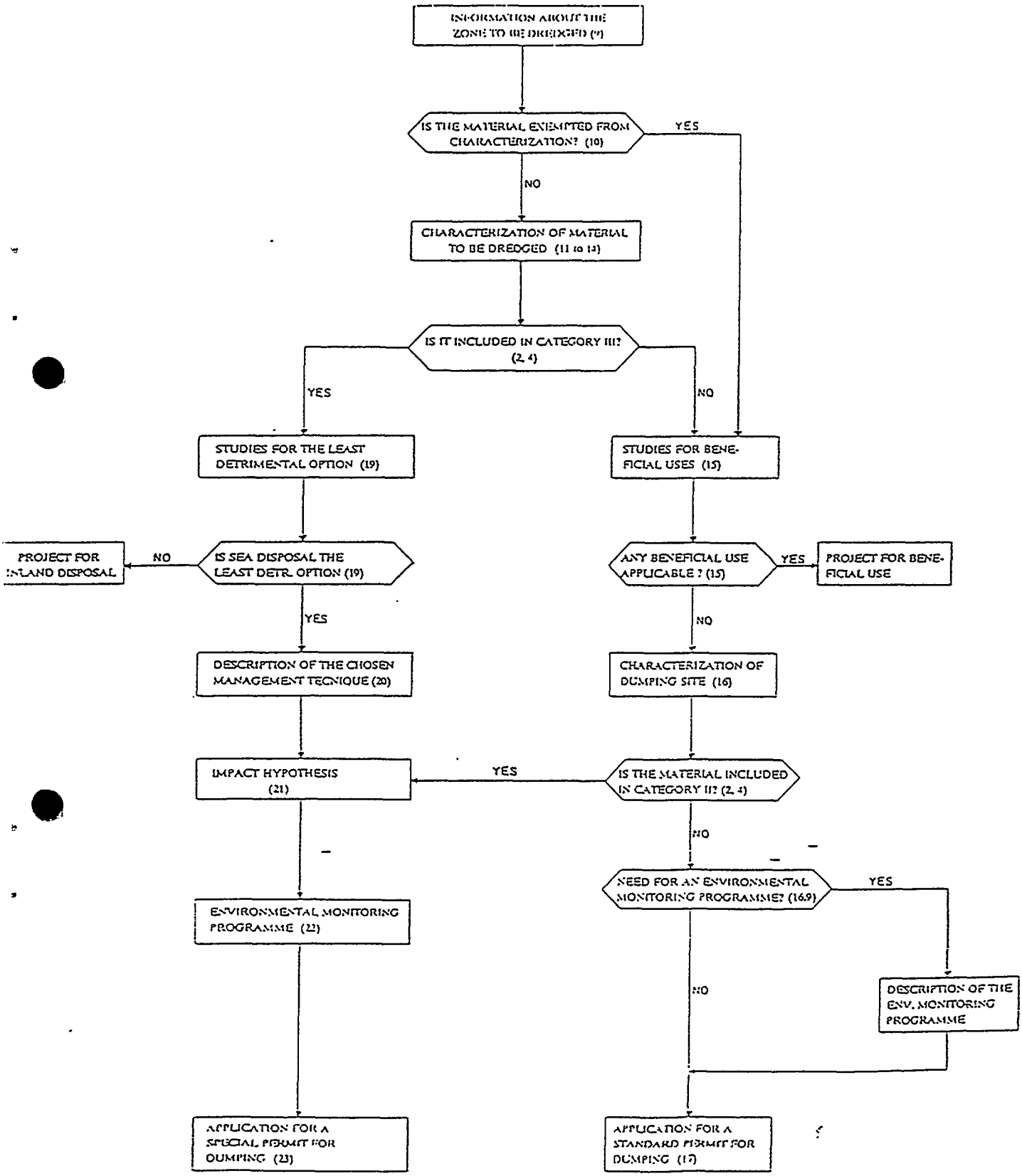
The same authorities that approved the RMDM agreed to re-examine the document in two years time in order to check possible problems in implementation and to make additions and modifications where neccesary.

Meanwhile, in December 1995 the London Convention has approved a resolution on "Dredged material assesment framework (DMAF)" which replace the above mentioned Guidelines of 1986. Fortunately, the DMAF regulations are rather close to those of the Oslo Commission Guidelines which was other of the main sources for the RMDM. So, it is not neccesary to modify the latter document for implementation of the DMAF.

The present Meeting of Experts within the Mediterranean Action Plan coincide with the end of the two years period. Hopefully, the conclusions of this Meeting will contribute to improve the new version of the RMDM.

# ANNEX I

## PROCEDURE FOR MANAGEMENT OF DREDGED MATERIAL




- Numbers refer to paragraphs in the RMDM.

# Annex V

## MINISTERIAL DECREE DATED 24 JANUARY 1996

## (PUBLISHED IN THE OFFICIAL ITALIAN GOVERNMENT GAZETTE)

## MINISTERO DELL'AMBIENTE

DECRETO 24 gennaio 1996.

**Direttive inerenti le attività istruttorie per il rilascio delle autorizzazioni di cui all'art. 11 della legge 10 maggio 1976, n. 319, e successive modifiche ed integrazioni, relative allo scarico nelle acque del mare o in ambienti ad esso contigui, di materiali provenienti da escavo di fondali di ambienti marini o salmastri o di terreni litoranei emersi, nonché da ogni altra movimentazione di sedimenti in ambiente marino.**

### IL MINISTRO DELL'AMBIENTE

Vista la legge 8 luglio 1986, n. 349;

Visto l'art. 2, comma 1, lettera *a)*, della legge 8 luglio 1986, n. 349;

Visto l'art. 11, commi 3, 4, 5 e 6, della legge 10 maggio 1976, n. 319, come sostituito dall'art. 14 della legge 24 dicembre 1979, n. 650, e modificato dall'art. 18 della legge 31 dicembre 1982, n. 979, e successivamente modificato dall'art. 4 della legge 8 luglio 1986, n. 349;

Vista la legge 25 gennaio 1979, n. 30, di ratifica ed esecuzione della Convenzione per la salvaguardia del Mar Mediterraneo dall'inquinamento, con due protocolli e relativi allegati, adottati a Barcellona il 16 febbraio 1976;

Visti gli articoli 1, ultimo comma, e 2 nonché gli articoli 25, 26, 27, comma 2, lettera *a)*, della legge 31 dicembre 1982, n. 979;

Vista la legge 5 marzo 1985, n. 127, di ratifica ed esecuzione del Protocollo relativo alle aree specialmente protette del Mediterraneo, aperto alla firma a Ginevra il 3 aprile 1982 [in specie, gli articoli 3 e 7, comma 1, lettera *b)*, del Protocollo medesimo];

Vista la legge 14 luglio 1965, n. 963;

Vista la legge 17 febbraio 1982, n. 41;

Vista la delibera del Comitato dei Ministri per la tutela delle acque dall'inquinamento del 26 luglio 1978;

Vista la delibera del Comitato interministeriale per la tutela delle acque dall'inquinamento del 26 novembre 1980;

Vista la delibera del Comitato interministeriale per la tutela delle acque dall'inquinamento del 27 agosto 1984;

Vista la delibera del Comitato interministeriale per la tutela delle acque dall'inquinamento del 7 gennaio 1986;

Visto il decreto del Ministro dell'ambiente 16 giugno 1994, n. 527: «Regolamento concernente disposizioni di attuazione degli articoli 2 e 4 della legge 7 agosto 1990, n. 241, riguardanti i termini ed i responsabili dei procedimenti»;

Ritenuta la necessità di procedere ad una revisione delle prescrizioni contenute nella sopracitata delibera del Comitato interministeriale per la tutela delle acque dall'inquinamento del 26 novembre 1980 e di acquisire istruttorie standardizzate e complete al fine di uniformare la trattazione delle istanze di autorizzazione allo scarico in mare, o in ambienti ad esso contigui di materiali provenienti da dragaggi di fondali di ambienti marini o salmastri o da dragaggi di terreni litoranei emersi;

Visto il comma 21 dell'art. 1 della legge 24 dicembre 1993, n. 537, che ha soppresso il suddetto Comitato;

Decreta:

Art. 1.

Le attività istruttorie per il rilascio dell'autorizzazione allo scarico deliberato nelle acque del mare o in ambienti ad esso contigui di materiali provenienti da dragaggi di fondali di ambienti marini o salmastri o da dragaggi di terreni litoranei emersi, devono essere condotte in conformità alle disposizioni riportate negli allegati *A*, *B/1* e *B/2* che costituiscono parte integrante del presente decreto.

Art. 2.

La delibera del Comitato interministeriale per la tutela delle acque dall'inquinamento del 26 novembre 1980 è abrogata.

Il presente decreto sarà pubblicato nella *Gazzetta Ufficiale* della Repubblica italiana.

Roma, 24 gennaio 1996

*Il Ministro:* BARATTA

ALLEGATO A

1. Ambito di applicazione

Le disposizioni del presente decreto si applicano allo scarico deliberato nelle acque del mare o in ambienti ad esso contigui quali spiaggie, lagune e stagni salmastri e terrapieni costieri, di sedimenti provenienti da dragaggi di fondali di ambienti marini o salmastri o da dragaggi di terreni litoranei emersi.

Le presenti disposizioni si applicano altresì a tutte le movimentazioni di sedimenti in ambito marino, quali ad esempio, quelle connesse alla posa di cavi e condotte sottomarine.

2. Scarichi non autorizzabili

E' vietato lo scarico in mare di:

- materiali di dragaggio classificabili come rifiuti tossico nocivi ai sensi della Delibera del Comitato Interministeriale, ex art.5 del D.P.R. 915/82, 27 luglio 1984;
- materiali di dragaggio che contengano i componenti specificati negli Allegati I e II alla Legge 25 gennaio 1979, n. 30, con particolare riferimento a quelli sottoelencati ai seguenti punti da 1 a 10, in quantità, concentrazione o stato chimico fisico tali da poter compromettere l'equilibrio produttivo delle risorse biologiche interessanti la pesca o l'acquacultura o la fruizione delle spiaggie e la balneazione o modificare in senso negativo le qualità organolettiche ed igienico

sanitarie delle produzioni ittiche o alterare significativamente l'equilibrio ecosistemico esistente:

1) sostanze organo-alogenate;

2) mercurio e suoi composti;

3) cadmio e suoi composti;

4) antimonio, arsenico, berillio, cromo, nichel, piombo, rame, selenio, vanadio, zinco e loro composti;

5) cianuri e fluoruri;

6) petrolio grezzo ed idrocarburi derivati;

7) pesticidi e loro isomeri e sottoprodotti diversi da quelli classificati al punto 1);

8) composti organostannici

9) rifiuti ed altre materie fortemente, mediamente e debolmente radioattive come definite dall'Agenzia Internazionale dell'Energia Atomica (I.A.E.A.);

10) microrganismi potenzialmente nocivi.

3. Scarichi autorizzabili

Fatti salvi i divieti di cui al precedente punto 2 e subordinatamente all'esito favorevole delle procedure istruttorie di seguito indicate può essere consentito, dietro esplicita autorizzazione, lo scarico a mare di materiali di dragaggio, quando ne sia dimostrata l'impossibilità di deposizione o utilizzo a terra con minori rischi ambientali.

4. Domanda di autorizzazione

La domanda di autorizzazione per le attività di cui al punto 1 relative ai materiali di cui al precedente punto 3 deve essere presentata al Ministero dell'Ambiente - Servizio per la tutela delle acque, la disciplina dei rifiuti, il risanamento del suolo e la prevenzione dell'inquinamento di natura fisica (di seguito denominato Servizio A.R.S.), per

il tramite del Capo del Compartimento Marittimo nel cui ambito avvengono le operazioni di escavo di cui al presente Decreto, sentito il Capo del Compartimento Marittimo nella cui giurisdizione ricade la zona di scarico, nel caso in cui questa sia ubicata in Compartimento diverso da quello da cui provengono i materiali da scaricare.

Tale istanza dovrà essere avanzata:

- nel caso di dragaggi portuali, dagli aventi titolo al mantenimento/ripristino dell'operatività del porto e/o degli accosti,
- nel caso di posa di cavi e condotte sottomarine dal titolare dell'intervento per il quale si rende necessaria la posa medesima.
- nel caso di ripascimento di litorali, dal Sindaco del Comune del sito nel quale ha luogo il ripascimento.

L'istanza deve essere corredata delle informazioni indicate nelle schede tecniche riportate negli allegati B/1 o B/2.

Nel caso di utilizzo dei materiali di dragaggio per ripascimento di litorali, dovrà essere acquisito, ai fini del rilascio dell'autorizzazione, anche il parere del competente ufficio del Genio Civile Opere Marittime nonchè quello delle competenti Amministrazioni locali del sito di ripascimento.

5. Attività istruttoria

L'istruttoria e' destinata ad acquisire e conseguentemente valutare i dati relativi alla caratterizzazione chimica, fisica e microbiologica del materiale di dragaggio, alla individuazione e caratterizzazione della zona di discarica ed ogni altro elemento necessario a garantire la compatibilità dello scarico con la tutela dell'ambiente marino, delle coste e del demanio marittimo nonche' la

sicurezza della navigazione ed ogni altro uso legittimo del mare.

L'individuazione dell'area di scarico dei materiali di dragaggio è effettuata anche tenendo conto del Piano operativo triennale di cui al comma 10 dell'art.5 della Legge 28 gennaio 1994, n.84 predisposto dall'Autorità portuale, fatti salvi in ogni caso i divieti di cui al successivo punto 9 del presente Allegato A.

L'istruttoria è avviata dal Capo del Compartimento marittimo, sulla base delle istanze pervenute. Espletate le necessarie verifiche istruttorie di propria competenza, lo stesso sottopone al Ministero dell'Ambiente Servizio A.R.S. la proposta relativa al provvedimento di autorizzazione corredata della documentazione raccolta.

Il Ministero dell'Ambiente, nell'esame delle istanze trasmesse, ed in particolare nella valutazione, sulla base delle sopraindicate caratterizzazioni, degli aspetti ambientali connessi, può avvalersi dei seguenti Organismi: Istituto di Ricerca sulle Acque del Consiglio Nazionale delle Ricerche, Laboratorio Centrale di Idrobiologia del Ministero delle Risorse Agricole, Alimentari e Forestali, Istituto Centrale per la Ricerca Scientifica e Tecnologica Applicata al Mare del Ministero dell'Ambiente, Istituto Superiore di Sanita', Agenzia Nazionale di Protezione dell'Ambiente.

6. Autorizzazione

L'autorizzazione allo scarico in mare e' rilasciata dal Ministero dell'Ambiente ai sensi dell'art. 4 della legge 8 luglio 1986, n. 349, su proposta del Capo del Compartimento marittimo competente.

Il decreto di autorizzazione allo scarico provvede ad indicare gli eventuali controlli, da effettuarsi a spese

del titolare dell'autorizzazione stessa, diretti ad accertare il rispetto delle prescrizioni disposte al fine di garantire la compatibilità dello scarico dei materiali con la tutela dell'ambiente.

L'autorizzazione è rilasciata nei termini temporali di cui al decreto 16 giugno 1994, n.527 come modificato dall'avviso di rettifica pubblicato sulla G.U. - serie generale - n. 256 del 2 novembre 1994.

L'autorizzazione può essere modificata sospesa o revocata a giudizio insindacabile del Ministero dell'Ambiente, sulla base di una adeguata e circostanziale motivazione quale l'inosservanza delle prescrizioni del decreto di autorizzazione e comunque in tutti i casi in cui risulti obiettivamente non garantita la compatibilità delle operazioni svolte dal titolare dell'autorizzazione con la tutela dell'ambiente marino e/o dei suoi usi legittimi.

In questi casi ed ove sussistano condizioni indilazionabili di emergenza, il Capo del Compartimento Marittimo competente può procedere autonomamente alla sospensione a tempo indeterminato dell'autorizzazione, dandone immediata e motivata comunicazione al Ministero dell'Ambiente - Servizio A.R.S. - il quale provvede, se del caso, con successive disposizioni, a prescrivere la revoca della sospensione o/e la modifica dell'autorizzazione, ovvero la revoca definitiva della stessa.

7. Procedura d'urgenza

Nel caso di materiali provenienti da dragaggi da effettuarsi con urgenza per il ripristino del passo marittimo di accesso al porto, ostruito in tutto o in parte a seguito di mareggiate, il Capo del Compartimento trasmette al Ministero dell'Ambiente Sevizio A.R.S. la richiesta di autorizzazione

corredata delle informazioni di seguito indicate avanzando la formale proposta per il rilascio dell'autorizzazione:

- coordinate e planimetria della zona di scarico, nell'ambito di aree idonee preventivamente individuate;
- quantitativo dei materiali da scaricare;
- tempi di esecuzione dell'intervento;
- planimetria della zona di escavo;
- notizie riguardanti eventuali incidenti occorsi nell'area che abbiano determinato inquinamento dei sedimenti e relative determinazioni analitiche effettuate sui sedimenti stessi;
- dichiarazione del Capo del Compartimento marittimo attestante l'effettivo sussistere delle sopraindicate ragioni di urgenza.

8. Vigilanza e controlli

Il coordinamento delle funzioni di vigilanza e controllo di cui al punto 6 del presente Allegato A è assicurato dal Capo del Compartimento marittimo competente.

I controlli sono effettuati dagli Organismi tecnici pubblici competenti (U.S.L. o, ove già operative, la Agenzie Regionali per L'Ambiente). In caso di dichiarata o accertata impossibilità operativa da parte di tali strutture pubbliche, i predetti controlli possono essere effettuati da Istituti scientifici pubblici specializzati. I risultati analitici con relativo parere debbono essere trasmessi al Capo del Compartimento Marittimo e da questo a sua volta, in originale, al Ministero dell'Ambiente - Servizio A.R.S. unitamente alle informazioni relative agli esiti della vigilanza e dei controlli come sopra effettuati.

9. Scarico in aree protette e sensibili

La zona di scarico non può ricadere nelle aree protette o sensibili così come di seguito definite.

Aree protette:

- aree archeologiche marine di cui alla legge 1 giugno 1939 n.1089 e all'art.1 della legge 8 agosto 1985, n.431;
- zone marine di tutela biologica di cui al D.P.R. 2 ottobre 1968, n.1639, di attuazione della legge 14 luglio 1965, n.963;
- zone marine di ripopolamento di cui all'art.17 della legge 17 febbraio 1982, n.41;
- zone marine e costiere elencate all'art.31 della legge 31 dicembre 1982, n.979, così come perimetrate, in via provvisoria, dall'allegato alla circolare n.2 del 31 gennaio 1987 del Ministro della Marina Mercantile nonchè quelle istituite ai sensi dell'art.18 della legge 6 dicembre 1991, n.394;
- aree protette territoriali costiere (parchi e riserve naturali, nazionali e regionali) individuate o istituite in forza della legge 6 dicembre 1991, n. 394 ovvero da leggi statali o regionali o comunque vincolate da altri provvedimenti amministrativi attuativi.

Aree sensibili:

- la fascia delle 3 miglia marine dalla linea di costa o dal limite delle aree protette indicate nel comma 1; per le riserve naturali marine tale limite sara' quello definitivo indicato nel decreto istitutivo o da eventuali provvedimenti di salvaguardia;
- praterie di fanerogame marine, ovunque ubicate.

La scelta delle zone di scarico dovrà comunque essere effettuata in modo che lo scarico stesso avvenga a distanza tale da non influenzare, anche indirettamente:

- aree protette;
- ecosistemi fragili (es. formazioni di fanerogame marine, zone lagunari) e specie protette;
- uso protetto delle risorse marine (balneazione, maricoltura, pesca).

Salvo che nei casi di opere di ripascimento o di altre opere specificamente autorizzate, la scelta della zona di scarico in mare dovrà inoltre essere effettuata nel rispetto delle seguenti condizioni:

- distanza dalla costa non inferiore a 3 miglia;
- profondità dei fondali non inferiore a 50 metri (fatta eccezione per l'Alto e Medio Adriatico);
- superficie dell'area di scarico sufficientemente estesa in rapporto alla quantità dei materiali da scaricare.

Dovrà altresì essere evitata la scelta di zone all'interno di ambienti costieri parzialmente confinati o di areali marini per i quali sussistano manifestazioni evidenti di compromissione ambientale.

In prossimità di grandi complessi portuali dovrà essere individuata più di una zona di scarico al fine di poter disporre di una alternativa in caso di "saturazione" del sito prescelto.

Nel caso di operazioni di posa di condotte e cavi che comportino l'attraversamento di aree sensibili, dovranno essere valutate le opportune ipotesi alternative di modifica del tracciato e, qualora questa non fosse possibile, dovranno essere previsti i necessari interventi atti a minimizzare gli effetti di disturbo ed a ottimizzare i controlli ambientali. In caso di necessità, il provvedimento

di autorizzazione potrà prevedere il ripristino dei siti alterati.

10. Regime transitorio

Le autorizzazioni regolarmente concesse per le operazioni di cui al punto 1) in corso di esecuzione alla data di entrata in vigore del presente Decreto si intendono confermate.

Per i progetti concernenti le operazioni di cui al punto 1), per i quali, alla data di pubblicazione del presente decreto, sia stata inoltrata, dalla competente Capitaneria di porto, istanza di autorizzazione di scarico a mare dei materiali dalle stesse derivanti, varranno le prescrizioni della Delibera C.I.T.A.I. 26 novembre 1980.

ALLEGATO B/1

**MATERIALI DI DRAGAGGIO PORTUALE**
**SCARICO A MARE O UTILIZZO PER RIPASCIMENTO DI LITORALI**
**RELAZIONE TECNICA DESCRITTIVA DELL'OPERA MARITTIMA E DEI LAVORI DI DRAGAGGIO E SCARICO**

1) FINALITA' DELL'OPERA E DEI LAVORI

2) TIPOLOGIA DEL SETTORE DI INTERVENTO:

Indicare con opportune descrizioni anche planimetriche:

- il tipo di ambiente (portuale, estuariale, lagunare, litoraneo etc) nel cui ambito è ubicato il settore di intervento;
- l'ubicazione e le caratteristiche di eventuali fonti di emissioni di rifiuti che possono aver influito e/o influire sulle qualità fisiche, chimiche o microbiologiche dei fondali oggetto dei lavori;
- le superfici, le quote ed i volumi di dragaggio con specifica delle quote parti riferentesi a depositi di imbonimento eventualmente presenti.

3) VOLUME DEL MATERIALE DA SCARICARE

Indicare il volume ed il tonnellaggio del materiale da scaricare.

4) MODALITA' DI ESECUZIONE DEI LAVORI DI DRAGAGGIO

Indicare i sistemi e ratei di escavazione, tempi totali di esecuzione dei lavori

5) MODALITA' DI SCARICO

Indicare il vettore di trasporto dei materiali destinati allo scarico, la relativa capacità di carico, le modalità ed i tempi richiesti per ogni singolo scarico.

6) FREQUENZA E TEMPI OPERATIVI DELLO SCARICO

Indicare la frequenza, giornaliera e/o settimanale degli scarichi, la loro durata complessiva ed il presumibile periodo di svolgimento.

**CARATTERISTICHE DEI MATERIALI DESTINATI ALLO SCARICO**

La caratterizzazione fisica, chimica e microbiologica dei materiali dovrà fare riferimento ai parametri ed alle modalità esecutive di seguito indicate:

1) **CARATTERISTICHE FISICHE:** descrittiva dell'aspetto macroscopico dei materiali (colore, odore, eventuale presenza di concrezioni o altri materiali grossolani); granulometra (scala Wentworth); % umidità; peso specifico.

2) **CARATTERISTICHE CHIMICHE:** contenuto in mercurio, cadmio, piombo, arsenico, cromo totale, rame, nichel, zinco, idrocarburi totali, idrocarburi policiclici aromatici (IPA), policlorobifenili (PCB), pesticidi organoclorurati, sostanza organica totale, azoto totale, fosforo totale, alluminio. Oltre ai componenti sopraindicati per i quali la caratterizzazione chimica dei materiali è resa obbligatoria, la stessa dovrà essere estesa anche agli altri componenti elencati al punto 2 dell'allegato A al presente Decreto, quando se ne possa presumere la presenza nei materiali medesimi, a causa dell'esistenza di specifiche fonti di emissioni che possono aver contaminato significativamente l'area di escavazione.

3) **CARATTERISTICHE MICROBIOLOGICHE** coliformi totali, coliformi fecali, streptococchi fecali, salmonelle, spore di clostridi solfito riduttori e nel caso di materiali destinati al ripascimento di litorali, enterovirus e miceti.

4) **PRELIEVO ED ANALISI DEI MATERIALI**

I prelievi dei campioni dovranno essere condotti in modo da consentire, con le successive analisi, una caratterizzazione rappresentativa in senso sia orizzontale che verticale dell'intera volumetria da sottoporre a dragaggio.

I campionamenti dovranno essere effettuati sotto la direzione di un tecnico della struttura preposta

all'esecuzione delle analisi, il quale dovrà redigere apposito Processo Verbale, da allegare alla documentazione tecnica dell'istruttoria, corredato da planimetria dell'area di escavo sulla quale siano evidenziati i punti di campionamento.

All'area da sottoporre a dragaggio verrà sovrapposta una griglia a maglie quadrate di 100 metri di lato (10.000 metri quadri di superficie). All'interno di ciascuna maglia denominata "area unitaria", saranno individuati due punti di campionamento, ubicati in modo tale da essere sufficientemente distanti tra loro e dagli altri punti delle maglie circostanti.

Le eventuali aree residue, risultanti dal frazionamento in lotti da 10.000 metri quadri, andranno trattate:

- se superiori a 5.000 mq, come se ciascuna fosse un'area unitaria (e pertanto prelevando due campioni);
- se inferiori a 5.000 mq, prelevando un solo campione.

Nei casi in cui la richiesta di autorizzazione allo scarico in mare sia relativa a superfici di escavo inferiori a 10.000 metri quadri, dovranno essere comunque individuati almeno due punti di campionamento non ravvicinati.

La tecnica di campionamento da utilizzare è quella del carotaggio.

Per ciascuno dei punti di campionamento, individuati secondo le procedure sopra specificate, sarà effettuato un carotaggio dalla superficie del sedimento alla quota più profonda dello strato da dragare. Da ciascuna carota così prelevata saranno sezionati:

a) per carote di lunghezza fino a 1,5 metri, gli strati relativi ai 20 cm. di superficie ed ai 20 di fondo;

b) per carote di lunghezza superiore a 1,5 metri e fino a 2 metri, gli strati relativi ai 20 cm. di superficie, ai 20 cm intermedi ed ai 20 cm. di fondo.

Per i casi in cui lo spessore del sedimento da dragare sia superiore a due metri, oltre ai campioni indicati al punto b), verrà prelevata una sezione, sempre di 20 cm., rappresentativa dello strato sottostante i 2 metri.

Per ogni "area unitaria", verrà preparato un campione medio, rappresentativo di ciascuna delle quote campionate, ottenuto mescolando i campioni elementari di corrispondente profondità provenienti dalle carote raccolte, come sopra indicato.

I campioni medi, così preparati, dovranno essere suddivisi in due aliquote, ciascuna delle quali di quantità sufficiente per l'esecuzione di tutte le analisi richieste.

Un'aliquota sarà utilizzata direttamente per le analisi, mentre l'altra dovrà essere conservata, a cura del laboratorio preposto alle analisi, in surgelatore a -18 °C, fino al completamento dell'istruttoria da parte del Ministero dell'Ambiente. Il Ministero stesso, se del caso, potrà richiedere l'effettuazione di ulteriori analisi sui campioni tenuti di riserva.

Le analisi per la caratterizzazione dei materiali dovranno essere effettuate dagli Organismi tecnici pubblici competenti (U.S.L. o, ove già operative, la 'Agenzie Regionali per L'Ambiente).

I risultati delle analisi chimiche dovranno sempre essere espressi in termini di contenuto dello specifico componente per peso di sostanza secca (mg/kg s.s.).

I risultati delle analisi microbiologiche dovranno essere espressi in numero di unità formanti colonia per grammo di sostanza secca (UFC/g. s.s.) o numero più probabile per grammo di sostanza secca (MPN/g s.s.).

I risultati delle analisi dovranno essere riportati su certificati rilasciati dai Laboratori che le effettuano ed essere allegati all'istruttoria in originale.

Per l'esecuzione delle analisi chimiche e microbiologiche si consiglia l'adozione delle metodiche riportate nel quaderno IRSA n. 64. Qualora si utilizzino metodiche diverse le stesse dovranno essere indicate. Dovranno altresì essere indicati i relativi limiti di rilevabilità della metodica e la percentuale di recupero rispetto a materiali standard certificati.

**5. INDIVIDUAZIONE E CARATTERIZZAZIONE DELLA ZONA DI SCARICO**

L'individuazione della zona di scarico deve essere effettuata in conformità con i criteri di cui al punto 9. dell'Allegato A al presente Decreto.

La localizzazione della zona di scarico dovrà essere fornita mediante i seguenti parametri:

- coordinate geografiche dei vertici, se di forma poligonale, oppure del centro più la misura del raggio, se circolare;
- distanza dalla costa e profondità.

La zona di scarico dovrà essere riportata su carta nautica 1:100.000 indicando inoltre, per un raggio di 10 miglia nautiche, l'eventuale presenza di aree protette o sensibili, o di zone destinate a maricoltura, pesca, o altri usi (cavi, ancoraggi, coltivazione idrocarburi ecc.)

CARATTERIZZAZIONE DELL'AREA DI DISCARICA

Per una idonea caratterizzazione della zona di scarico dovranno essere acquisiti i seguenti elementi conoscitivi:

- regime correntometrico superficiale e di fondo, regime termico e alino stagionale nella colonna d'acqua;
- regime sedimentologico dell'area.
- granulometria dei sedimenti superficiali (scala di Wentworth);

- caratteristiche chimiche dei sedimenti superficiali con particolare riferimento ai parametri presi in esame nella caratterizzazione del materiale di escavo;
- caratteristiche delle comunità bentoniche con riferimento alle biocenosi esistenti;
- principali popolazioni ittiche esistenti e mestieri di pesca esercitati nel sito;
- eventuali dati sul livello di trofia e di qualità ambientale del sito.

Le indagini per l'identificazione della zona di scarico dovranno essere effettuate e comunque convalidate da un Istituto scientifico pubblico specializzato che rilascierà formale parere di idoneità della zona prescelta per il recepimento dei materiali di scarico.

In caso di utilizzo dei materiali di dragaggio per ripascimento di litorali dovranno essere forniti i seguenti elementi in ordine alle caratteristiche delle spiaggie e/o dei sedimenti costieri interessati dal ripascimento medesimo:

- coordinate geografiche;
- caratteristiche granulometriche (scala Wentworth);
- caratteristiche chimiche con particolare riferimento ai parametri presi in esame nella caratterizzazione del materiale di escavo;
- caratteristiche microbiologiche: coliformi totali, coliformi fecali, streptococchi fecali, salmonelle, enterovirus e miceti.
- valori dei parametri di cui al D.P.R. 470/82 per tutte le stazioni di campionamento ricadenti nell'area oggetto del ripascimento.

ALLEGATO B/2

**INTERVENTI COMPORTANTI MOVIMENTAZIONE DI MATERIALI IN AMBITO MARINO (POSA DI CAVI E CONDOTTE, COSTRUZIONE DI MOLI ETC)**

**RELAZIONE TECNICA DESCRITTIVA DELL'OPERA MARITTIMA E DEI LAVORI DI ESCAVO E SCARICO:**

**1) FINALITA' DELL'OPERA E DEI LAVORI**

Indicare la finalità dell'opera nell'ambito della quale è prevista la movimentazione in ambito marino dei materiali oggetto della richiesta di autorizzazione.

**2) TIPOLOGIA DEL SETTORE DI INTERVENTO:**

Indicare con opportune descrizioni, anche planimetriche:

- il tipo di ambiente (portuale, estuariale, lagunare, litoraneo, etc.) nel cui ambito è ubicato il settore di intervento;
- l'ubicazione e le caratteristiche di eventuali fonti di emissioni di rifiuti che possono aver influito e/o influire sulle qualità fisico-chimiche e/o microbiologiche dei fondali oggetto dei lavori;
- le superfici, le quote ed i volumi di escavazione.

**3) MODALITA' DI ESECUZIONE DEI LAVORI DI ESCAVO**

Indicare:

- i sistemi e ratei di escavazione ed i tempi di esecuzione dei lavori;
- le profondità di escavo, la larghezza e la lunghezza in metri della trincea da realizzare;
- le coordinate geografiche dei punti che individuano il tracciato;
- l'eventuale impiego, nel corso dei lavori di scavo, di lubrificanti, fluidi idraulici, additivi e le relative caratteristiche chimiche e tossicologiche.

**4) CARATTERIZZAZIONE DELLA ZONA DI INTERVENTO:**

Fornire una descrizione delle comunità fito-zoobentoniche esistenti nell'area di intervento, con l'identificazione

delle biocenosi più importanti, con particolare riferimento alla eventuale presenza di praterie di fanerogame marine.
Detta descrizione dovrà essere corredata da una mappa, in scala 1:10.000 o altra scala opportuna, descrittiva della localizzazione delle suddette biocenosi. La caratterizzazione dell'area dovrà essere altresì corredata, per il tratto del tracciato compreso tra la costa e la batimetrica di 50 metri e comunque per quello compreso entro le tre miglia dalla costa, da riprese filmate effettuate lungo la direttrice del tracciato e nell'area contigua suscettibile di essere interessata direttamente o indirettamente dall'escavo e dalla ricollocazione del materiale da esso risultante.
Qualora si preveda di scaricare, anche in parte, il materiale di risulta dell'escavo in altra zona di mare diversa da quella dell'escavo stesso, tale zona dovrà essere individuata e caratterizzata secondo quanto stabilito al punto 5 dell'Allegato B/1.

5) CARATTERIZZAZIONE DEI MATERIALI DI RISULTA DELL'ESCAVO
I materiali da movimentare dovranno essere caratterizzati sotto l'aspetto fisico, chimico e microbiologico mediante i parametri e le modalità di seguito indicate.
1) CARATTERISTICHE FISICHE: descrittiva dell'aspetto macroscopico (colore, odore, eventuale presenza di concrezioni o altri materiali grossolani); analisi granulometria (scala Wentworth); % umidità; peso specifico,
2) CARATTERISTICHE CHIMICHE: contenuto in mercurio, cadmio, piombo, arsenico, cromo totale, rame, nichel, zinco, idrocarburi totali, idrocarburi policiclici aromatici (IPA), policlorobifenili (PCB), pesticidi organoclorurati, sostanza organica totale, azoto totale, fosforo totale, alluminio.

Oltre ai componenti sopraindicati per i quali la caratterizzazione chimica dei materiali è resa obbligatoria, la stessa dovrà essere estesa anche agli altri componenti elencati al punto 2 dell'allegato A al presente Decreto, quando se ne possa presumere la presenza nei materiali medesimi, a causa dell'esistenza di specifiche fonti di emissioni che possono aver contaminato significativamente l'area di escavazione.

La caratterizzazione chimica dei materiali potrà essere omessa qualora il contenuto in sabbia o in componenti di granulometria superiore a 2 mm superi il 90% .

CARATTERISTICHE MICROBIOLOGICHE: coliformi totali, coliformi fecali, streptococchi fecali.

Per l'esecuzione delle analisi chimiche si consiglia l'adozione delle metodiche riportate nel quaderno IRSA n. 64. Qualora si utilizzassero metodiche diverse le stesse dovranno essere indicate. Dovranno altresì essere indicati i relativi limiti di rilevabilità della metodica e la percentuale di recupero rispetto a materiali standard certificati. I risultati delle analisi chimiche dovranno sempre essere espressi in termini di contenuto dello specifico componente per peso di sostanza secca (mg/kg s.s.).

I risultati delle analisi microbiologiche dovranno essere espressi in numero di unità formanti colonia per grammo di sostanza secca (UFC/g. s.s.) o numero più probabile per grammo di sostanza secca (MPN/g s.s.).

Le analisi per la caratterizzazione dei materiali dovranno essere effettuate dagli Organismi tecnici pubblici competenti (U.S.L. o, ove già operative, la Agenzie Regionali per L'Ambiente) o da Istituti scientifici pubblici specializzati.

I risultati delle analisi devono essere riportati su certificati rilasciati dai Laboratori e devono essere allegati all'istruttoria in originale.
Qualora per il ricoprimento della trincea e la protezione del manufatto venga utilizzato materiale da cava dovrà essere presentata idonea documentazione che ne attesti qualità e provenienza.

**6) MODALITA' DI PRELIEVO PER LA CARATTERIZZAZIONE DEI MATERIALI DI RISULTA DELL'ESCAVO E DELLA ZONA DI INTERVENTO**

Ai fini della caratterizzazione analitica dei materiali i campioni devono essere prelevati nello strato superficiale dei sedimenti lungo la direttrice del tracciato con una frequenza di prelievo di un campione ogni 200 metri sino a 1000 metri di distanza dalla costa per un numero minimo di cinque campioni. Per il tratto successivo sino a tre miglia dalla costa, dovranno essere prelevati ulteriori cinque campioni. Per i tratti successivi sino a completamento del tracciato la frequenza di prelievo varierà a seconda della tipologia del substrato e della variabilità delle biocenosi, in modo tale da ottenere una rappresentazione significativa delle caratteristiche dell'area. Per i tratti successivi all'isobata dei 200 metri sarà sufficiente fornire una descrizione delle caratteristiche generali dei sedimenti dell'area.
Nel caso di posa di cavi, in cui le operazioni di affossamento e ricoprimento del cavo avvengano in maniera simultanea e con l'utilizzo di tecniche di escavazione che minimizzano la dispersione dei sedimenti nell'ambiente circostante, la frequenza del campionamento lungo il tracciato può essere ridotta del 50%.
Nel caso di operazioni che interessino aree portuali o comunque zone in cui sia ipotizzabile un significativo

livello di inquinamento e che comportino lo scarico, anche solo parziale, dei materiali in zona diversa da quella dell'escavo, il campionamento dovrà essere essere svolto con le modalità di seguito indicate.

Per ciascuno dei punti di campionamento, dovrà essere effettuato un carotaggio dalla superficie del sedimento alla quota più profonda dello strato da dragare. Da ciascuna carota così prelevata saranno sezionati:

a) per carote di lunghezza fino a 1,5 metri, gli strati relativi ai 20 cm. di superficie ed ai 20 cm. di fondo;

b) per carote di lunghezza superiore a 1,5 metri e fino a 2 metri, gli strati relativi ai 20 cm. di superficie, ai 20 cm intermedi ed ai 20 cm. di fondo.

Per i casi in cui lo spessore del sedimento da dragare sia superiore a due metri, oltre ai campioni indicati al punto b) verrà prelevata una sezione, sempre di 20 cm., rappresentativa dello strato sottostante i 2 metri.

Tutti i campionamenti dovranno essere effettuati sotto la direzione di un tecnico della struttura preposta all'esecuzione delle analisi, il quale dovrà redigere apposito Processo Verbale, da allegare alla documentazione tecnica dell'istruttoria, corredato da planimetria dell'area di escavo sulla quale siano evidenziati i punti di campionamento.

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# Annex VI

## CADRE LEGISLATIF ET REGLEMENTAIRE DU

## DRAGAGE DES PORTS FRANCAIS

# CADRE LEGISLATIF ET REGLEMENTAIRE DU DRAGAGE DES PORTS FRANÇAIS

Jean-Marie MASSIN (Ministère de l'Environnement - Direction de l'Eau)

## I. INTRODUCTION

Le dragage constitue une pratique fort ancienne, apparue vraisemblablement à la fin du 16ème siècle, à laquelle tous les ports dont les chenaux d'accès ou les bassins sont soumis à des phénomènes d'envasement sont contraints de faire appel pour assurer le libre accès aux installations portuaires et la sécurité de la navigation. Il constitue généralement un préalable à la réalisation de nouveaux aménagements portuaires. Ces activités (travaux d'entretien ou travaux neufs) génèrent de très grandes quantités de déblais qui doivent être éliminés.

## I. GENERALITES

### I.1. TYPES DE PORTS

Les activités de dragage menées par la France touchent de fait deux types de ports : d'une part les ports d'estuaires (Bordeaux, Nantes / Saint-Nazaire, Rouen) où les dragages concernent essentiellement les chenaux d'accès (chenaux extérieurs où la dynamique sédimentaire est essentiellement maritime et chenaux intérieurs où les processus sédimentaires sont principalement liés à la dynamique estuarienne) et les souilles au pied des quais et, d'autre part, les ports de mer où les dragages intéressent surtout les bassins portuaires et, à un degré moindre, les passes d'entrée.

### I.2 VOLUME DES SÉDIMENTS DRAGUÉS

Plus de 30 millions de tonnes de sédiments sont, en moyenne, dragués annuellement du fait des dragages d'entretien.

Par rapport aux pays riverains de l'Atlantique du Nord-Est, la France se situe en 3ème position après la Belgique et l'Allemagne et précède de peu le Royaume-Uni et les Pays-Bas (Données 1992).

### I.3. NATURE DES SÉDIMENTS DRAGUÉS.

Selon qu'elles touchent des ports d'estuaires ou des ports de mer, des chenaux d'accès ou des bassins portuaires, les opérations de dragage mettent en jeu des sédiments de nature variée.

**En domaine estuarien**, d'une manière générale, les sédiments sont essentiellement formés de sables dans les chenaux extérieurs et des vases dans les chenaux intérieurs (cas de la Loire et de la Gironde). La Seine fait exception dans la mesure où les sédiments dragués sont surtout composés de sables fins, les vases n'apparaissant qu'à l'extrémité aval du chenal (elles y représentent 30% environ des sédiments). Quant aux bassins portuaires, la sédimentation y est

en quasi totalité vaseuse et essentiellement liée à la décantation d'apports en suspension provenant des activités industrielles, portuaires et, dans une moindre mesure, urbaines.

**Dans les ports de mer**, si les passes d'entrée sont caractérisées par la présence de sables dont les origines sont liées à la dynamique sédimentaire marine, dans les avant-ports et les bassins portuaires, les sédiments sont de nature vaseuse.

Les vases représentent 75 % de l'ensemble des sédiments dragués par les ports français (ports d'estuaires ou ports maritimes). Elles constituent 80 % des sédiments dragués dans les ports d'estuaires. En volume, on peut évaluer à environ 1 million de m3/an les quantités de vases draguées dans les bassins portuaires.

Bassins estuariens et maritimes se distinguent toutefois par la répartition dans le temps des taux de sédimentation. En milieu estuarien, ceux-ci sont sont principalement liés à la position du système bouchon vaseux - crême de vase et ont donc un caractère saisonnier très marqué (en relation avec les débits fluviaux). Dans le domaine maritime, ces fluctuations saisonnières sont moins marquées, la sédimentation étant cependant, généralement, plus intense en hiver qu'en été.

### I.4 DEVENIR DES MATÉRIAUX DE DRAGAGES

**Dans les ports de mer**, la quasi totalité des déblais de dragages est "transportée" c'est-à-dire acheminée vers des zones de rejet où leur élimination est effectuée par clapage. Plus rarement, les déblais sont refoulés, voire stockés, à terre.

**Dans les ports d'estuaires**, selon les ports, de 35 à 67 % des opérations de dragage sont effectués par surverse, le reste donnant lieu à "transport" et clapage des sédiments dragués.

## III. CONVENTIONS ET ACCORDS INTERNATIONAUX

Sur le plan international, les dispositions qui régissent l'élimination des matériaux de dragage résultent, dans une très large mesure, des résultats des travaux menés au sein des Conventions portant sur les immersions, soit, sur le plan mondial, de la Convention de Londres du 29 décembre 1972 sur la prévention de la pollution des mers résultant de l'immersion des déchets et, sur le plan régional, de la Convention d'Oslo du 15 février 1972 pour la prévention de la pollution des mers par les opérations d'immersion et de la Convention de Barcelone du 16 février 1976.

### III.1. CHAMP DES CONVENTIONS

#### III.1.1. PORTEE GEOGRAPHIQUE

Toutes les Conventions actuellement en vigueur et traitant spécifiquement des immersions (Conv. Oslo, 1972 ; Conv. Londres, 1972 ; Conv. Barcelone, 1976, Prot. Immersion) ne couvrent que les eaux situées au-delà des lignes de base servant à mesurer la mer territoriale.

Aux termes des amendements - non encore entrés en vigueur - apportés le 10 juin 1995 à la Convention de Barcelone ainsi qu'au protocole "Immersion" annexé à ladite Convention, le

champ d'application du protocole précité pourrait être étendu aux eaux intérieures. Ce pas a d'ores et déjà été franchi avec la **Convention de Paris du 22 septembre 1992** pour la protection du milieu marin de l'Atlantique du Nord-Est - non encore entrée en vigueur - qui, devant se substituer à la Convention d'Oslo de 1972, après ratification par l'ensemble des Etats signataires, couvre de son champ les eaux intérieures c'est-à-dire les eaux en deçà de la ligne de base servant à mesurer la largeur de la mer territoriale et s'étendant, dans le cas des cours d'eau, jusqu'à la "limite des eaux douces", ce terme servant à désigner dans un cours d'eau l'endroit où à marée basse et en période de faible débit d'eau le degré de salinité augmente sensiblement.

### III.1.2. ACTIVITES COUVERTES

Bien que chaque convention traitant des "immersions" présente une définition différente de ce terme, on entend généralement par "immersion" le déversement délibéré dans la mer de substances ou de matériaux à partir (ou au moyen) de navires, aéronefs, engins flottants, plates-formes fixes ou flottantes ou autres ouvrages placés en mer. Les opérations de clapage répondent à cette définition.

### III.1.3. ACTIVITÉS NON COUVERTES

**a) Rejets par conduite sur le littoral**

Au regard de ce qui précède, ne sont donc pas considérés comme des immersions les rejets de matériaux effectués directement par conduite sur le littoral.

**b) Cas des dragages par surverse et par agitation**

La question du dragage par surverse[1] ou par agitation[2] figure depuis plusieurs années à l'ordre du jour des travaux de la Convention d'Oslo de 1972.

- **Surverse**

La pratique de la surverse répond souvent à une nécessité. Dans bien des cas, elle permet de compléter les actions de dragage "classiques" et d'obtenir ainsi les côtes souhaitées des fonds. Les surverses (incluant les dragages à l'américaine) concernent en quasi totalité les ports estuariens où, d'une part, se pose le problème des distances de transport des matériaux dragués et, où, d'autre part, les conditions hydrodynamiques sont généralement telles que la dispersion des sédiments s'effectue dans de bonnes conditions. Sur la période 1986-1990, ce type de dragage a représenté, en moyenne, 37% des quantités totales draguées (Rouen : 15 % ; Nantes : 64 % ; Bordeaux : 33 %), soit 5,6 millions de tonnes par an, correspondant à 9,2 millions de m3 d'une mixture de densité de référence 1,40.

Dans les ports de mer (le Havre, Boulogne, Calais, Dunkerque, la Rochelle - la Pallice), les surverses ont, en général, peu de raisons d'être : les bassins portuaires constituent des pièges

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[1] Pratique qui consiste, lorsque le puits de la drague est plein, à continuer le dragage et à laisser déborder la mixture. L'objectif est d'augmenter la quantité de sédiments déposés dans le puits mais cette pratique est aussi utilisée pour faire du dragage à l'américaine, pratique qui consister à rejeter directement hors de la drague la mixture draguée (avec ou sans bras).

[2] Pratique qui consiste à remettre en suspension les matériaux par des sollicitations mécaniques ou hydrauliques.

où la surverse serait inopportune, les chenaux d'accès à dominante sableuse ou la surverse n'apporterait pas, le plus souvent, d'amélioration significative.

**Ne répondant pas à la définition des immersions, ces techniques de dragage sont jusqu'à ce jour exclues du champ des Conventions traitant des immersions.**

Il ressort cependant d'une enquête effectuée par les Pays-Bas auprès de l'ensemble des parties contractantes à cette Convention afin d'appréhender la réalité et l'importance de ces pratiques, que leurs effets sur l'environnement sont comparables à ceux engendrés par les techniques de dragages classiques. Notamment les processus de dispersion conduisent une augmentation de la teneur des eaux en matières en suspension (MES) et en nutriments ainsi qu'à une remise en suspension des polluants susceptibles de se trouver dans les sédiments dragués. Il y a lieu cependant de considérer que les lignes directrices de la Convention d'Oslo leur sont applicables.

Il y a lieu toutefois de remarquer que les surverses ne représentent que quelques % de la masse totale en jeu dans la dynamique estuarienne (principalement concernée par ces problèmes) et qu'il convient de relativiser l'importance des surverses.

- **Dragage par agitation**

Les parties contractantes à la Convention d'Oslo sont restées cependant divisées sur l'opportunité d'introduire les techniques de dragage par agitation dans le champ de la Convention, compte tenu notamment des incertitudes qui demeurent sur l'impact de cette technique sur les milieux naturels. Il a été estimé que certains éléments contenus dans ces lignes directrices s'appliquent à cette technique de dragage.

Il a donc été convenu que ce point serait inscrit à l'ordre du jour des prochaines réunion des instances compétentes de la Convention d'Oslo.

## III.2. DISPOSITIONS GENERALES REGISSANT LES IMMERSIONS

### III.2.1. DISPOSITIONS EXISTANTES

#### a) Principe général d'interdiction

Aux termes des Conventions de Londres (art. IV 1. a.) et d'Oslo (art. 5) ou du protocole Immersion (art. 4) annexé à la Convention de Barcelone, est interdite l'immersion de tout déchet ou de toute autre matière contenant une ou plusieurs des substances qui, en raison de leur caractère de toxicité, de persistance et de bioaccumulation, figurent en annexe I à ces conventions (liste noire).

Sont ainsi, *a priori*, interdits à l'immersion, au titre des Conventions d'Oslo et de Barcelone précitées, les composés organo-halogénés (à l'exclusion de ceux qui ne sont pas toxiques ou qui se transforment rapidement dans la mer en substances biologiquement inoffensives), le mercure et le cadmium et leurs composés. La Convention de Londres ainsi que le Protocole Immersion annexé à la Convention de Barcelone étendent cette interdiction au pétrole brut et aux hydrocarbures (fioul, carburant diesel lourd et huiles de graissage, fluides hydrauliques).

#### b) Dérogation au principe d'interdiction

L'interdiction d'immersion ne s'applique pas aux déche ts et autres matières, tels que les déblais de dragages, qui contiennent les différentes substances visées à l'annexe I à l'état de "contaminants en traces" (Conv. Londres, 1972, annexe 1. 9 - Conv. Oslo, 1972, art. 8 2) - Conv. Barcelone, 1976, annexe I - B).

**c) Déblais de dragages autorisées à l'immersion**

Peuvent être immergées les matériaux (déblais de dragages) contenant des quantités jugées "notables" (Conv. de Londres, ann. II) ou "importantes" (Conv. d'Oslo, art. 6) ou plus simplement "nécessitant des précautions spéciales" (Conv. Barcelone, Prot. Immersion, ann. II) d'arsenic, de plomb, de cuivre, de zinc (et leurs composés), de composés organo-siliciés (toxiques et persistants), de cyanures, de fluorures et de pesticides (autres que ceux relevant de l'annexe 1) ne présentant pas les caractéristiques motivant leur inscription à l'annexe 1 (ann. II, Conv. Oslo, 1972; ann. II, Conv. Londres, 1972 ; ann. II, Conv. Barcelone, 1976) ainsi que les déchets de faible et de moyenne radioactivité (ann. II, Conv. Londres, 1972 ; ann. II, Conv. Barcelone, 1976).

Sont ainsi considérées comme notables ou importantes les concentrations suivantes :

— 0,05% ou plus (en poids) pour les pesticides et leurs produits dérivés non couverts par l'annexe I, ainsi que le plomb et les sous-produits du plomb;

— 0,1% ou plus (en poids) pour toutes les autres substances,

Peuvent enfin être immergées sans précaution particulière toutes les substances ne répondant pas aux caractéristiques motivant leur inscription dans les annexes I et II des Conventions précitées.

**III.2.2. DISPOSITIONS DEVANT ENTRER EN VIGUEUR**

**a) Convention de Barcelone**

Les amendements apportés au protocole Immersion de la Convention de Barcelone par la conférence des plénipotentiaires réunie à Barcelone en juin 1995, non encore en vigueur, ont profondément modifié le paysage dans la mesure où les annexes I (substances interdites à l'immersion) et II ( substances dont l'immersion est autorisée moyennant précautions spéciales) ont été supprimées (seule demeure l'annexe III relative aux facteurs devant être pris en considération pour établir les critères régissant la délivrance des autorisations) et où l'immersion des matériaux de dragages n'est plus assujettie qu'à un "examen attentif de tous les facteurs énumérés à l'annexe dudit protocole ou de critères, lignes directrices ou procédures adoptés par la réunion des parties contractantes" (Prot. Immersion, art. 6, al. 1er).

Sont ainsi prises en compte les caractéristiques et la composition de la matière, les caractéristiques du lieu d'immersion et la méthode de dépôt ainsi que les effets éventuels sur la faune, la flore, les autres utilisations de la mer, etc.

**b) Convention de Paris de 1992**

Dans le même esprit, la Convention de Paris du 22 septembre 1992 stipule que ne sont pas visés par le principe d'interdiction d'immersion qui constitue le fondement de cet instrument les

matériaux de dragages (Conv., ann. II, art. 3 2. (a)) ainsi que "les matières inertes d'origine naturelle, constituées par du matériau géologique solide n'ayant pas subi de traitement chimique et dont les constituants chimiques ne risquent pas d'être libérés dans le milieu marin" (Conv. ann. II, art. 3 2. (b)).

En tout état de cause, l'immersion ne peut être effectuée que dans la mesure où celle-ci est conforme aux critères, lignes directrices et procédures pertinentes et applicables adoptées par les parties contractantes (Conv., ann. II, art. 4 (b)).

## III. 3. PERMIS D'IMMERSION

### III.3.1. PRINCIPE

Toute substance dont l'immersion est envisagée doit faire l'objet d'un permis délivré par les autorités nationales compétentes.

### III.3.2. NOTIFICATION

Toute délivrance de permis d'immersion doit faire l'objet d'une notification aux instances compétentes des conventions internationales. Cette notification obéit à une procédure commune à l'ensemble des parties contractantes.

### III.3.3. TYPE DE PERMIS

#### a) Permis spécifique

Au titre des Conventions de Londres de 1972 (art. IV 1. b.), d'Oslo de 1972 (art. 6) ainsi que du Protocole Immersion annexé à la Convention de Barcelone de 1976 (art. 5), l'immersion de matériaux de dragage est subordonnée à l'octroi d'un "permis spécifique". Ce principe a été repris par le Protocole Immersion de la Convention de Barcelone, tel qu'amendé par la conférence des plénipotentiaires tenue à Barcelone en juin 1995, sous l'appellation de "permis spécial" (Conv., Prot. Immersion, art. 5).

Font également l'objet d'un permis spécifique les substances qui, bien que non toxiques par nature, pourraient devenir nocives en raison des quantités immergées ou diminuer sensiblement les agréments.

#### b) Permis spécifique dérogatoire au principe d'interdiction

Dans le cas où les teneurs des déblais en substances relevant de l'annexe I des Conventions précitées dépassent le seuil répondant au critère de "polluants en traces" et où il ne peut être démontré que ces substances "se transforment dans la mer en substances biologiquement inoffensives", il peut être dérogé au principe d'interdiction pour autant qu'une étude approfondie des moyens de destruction ou d'élimination ait démontré leur inadéquation et que, partant, l'élimination en mer reste la seule option envisageable (Conv. Oslo, 1972, § 3-b, annexe III). L'immersion fait alors l'objet d'un permis spécifique.

Dans un tel cas, toutes mesures pratiques (méthodes de confinement ou de traitement par exemple) doivent être prises afin de réduire l'impact de l'opération d'immersion sur le milieu marin.

**c) Permis général**

L'immersion de toute autre substance est subordonnées à la délivrance préalable à l'immersion d'un "permis général" (Conv. Londres, 1972, art. VI 1. b. ; Conv. Oslo, 1972, art. 7 ; Conv. Barcelone, 1976, art. 6, Prot. Immersion ).

Au titre de la Convention de Londres du 13 novembre 1972, une partie contractante peut également, sous réserve des dispositions énumérées à l'annexe III de ladite Convention, **délivrer** un permis général au profit de matériaux de dragage qui contiennent les substances (arsenic, plomb, cuivre, zinc et leurs composés, cynaures et fluorures, pesticides et leurs dérivés non visés par l'annexe I de la Convention précitée) énumérées au paragraphe 1-a de l'annexe II de ladite Convention, à des teneurs inférieures aux quantités dites "importantes" dont il a été fait état précédemment:

**Remarque** : Toute référence à la délivrance d'un permis général a disparu du Protocole Immersion annexe à la Convention de Barcelone, tel qu'amendé en juin 1995.

### III.3.4. Dispositions régissant la délivrance des permis

**a) Caractéristiques des matériaux immergés**

Aux termes de l'article 7 de la Convention d'Oslo de 1972, de l'article 7 de la Convention de Barcelone de 1976 (Prot. Immersion) et de l'article IV-2 de la Convention de Londres du 13 novembre 1972, permis généraux et permis spéciaux ne peuvent être délivrés qu'au regard de critères prenant en compte notamment les caractéristiques et la composition de la matière (quantités devant être immergées, propriétés physiques, persistance, toxicité, etc.) (Conv. précitées, annexe III).

**b) Critères environnementaux**

Doivent être également prises en compte les caractéristiques du lieu d'immersion, la méthode de dépôt, les effet éventuels sur la faune et la flore marines, les zones d'agrément (turbidité, odeur désagréable, décoloration; écume) et l'impact sur les autres utilisations de la mer.

## III.4. LES LIGNES DIRECTRICES DES CONVENTIONS D'OSLO ET DE LONDRES

### III.4.1. Problématique

La relative complexité des dispositions faisant intervenir les concepts de "contaminants en traces", "quantités importantes" ou "quantités significatives", les difficultés rencontrées pour la mise en oeuvre des dispositions de l'annexe II de la Convention de Londres du 13 novembre 1972 et de l'annexe II de la Convention d'Oslo du 15 février 1972, initialement conçues pour l'immersion de déchets industriels ou d'effluents urbains, le souhait exprimé à différentes reprises par les instances compétentes de la convention d'Oslo (et de Londres) de disposer de

données fiables et comparables entre elles sur les apports de polluants dans les eaux de la convention ont conduit les parties contractantes aux Conventions précitées à rechercher une position commune en matière de mise en oeuvre des procédures de délivrance des permis d'immersion.

### III.4.2. Lignes directrices de la Convention d'Oslo

Les "Lignes directrices sur l'élimination des déblais de dragages" complétées par les "Lignes directrices sur les dosages à effectuer sur les matériaux de dragages et les sédiments marins dans le cadre du programme conjoint de contrôle et de surveillance continus" adoptées en mars 1986 suivies, en juin 1993, par les "Lignes directrices de la Commission d'Oslo sur la gestion des activités de dragages" en milieux marins ou estuariens répondent à ces préoccupations.

### III.4.3. Lignes directrices de la Convention de Londres

A une approche plus globale répond le "cadre pour l'évaluation des déblais de dragage" adopté par les parties contractantes à la Convention de Londres de 1972 (Résolution LC.52(18) du 8 décembre 1995) qui se substitue aux "directives relatives à l'application des annexes au rejet des déblais de dragage" adoptées en 1986 par la résolution LDC.23(10).

### III.4.4. Dispositions prévues par les lignes directrices de la Convention d'Oslo

#### a) Dispositions de caractère général

Conçues pour faciliter le travail des parties contractantes dans la gestion des activités de dragages, Les lignes directrices adoptées par les parties contractantes à la Convention d'Oslo de 1972 portent spécifiquement sur l'élimination des matériaux de dragage par dépôt ou immersion dans les eaux marines et estuariennes. Elles comportent deux parties : la première traite de l'évaluation et de la gestion de l'élimination des matériaux de dragages; la seconde donne des indications sur la conception et la réalisation de la surveillance des zones d'élimination marines et estuariennes. Elles définissent notamment les conditions dans lesquelles doivent s'effectuer, sur les sites de dragages, les prélèvements d'échantillons et les analyses de sédiments.

#### b) Exemptions

Les lignes directrices reconnaissent que sont exemptés de toute obligation d'analyse et, partant de tout contrôle, moyennant cependant le respect des dispositions prévues concernant la protection du milieu :

— les matériaux de dragages dits "naturels" composés essentiellement de sables, de gravier ou de roche, extraits de zones soumises à forts courants ou à de fortes houles (cours d'eau au lit fortement chargé en sédiments ou zones côtières où barres et chenaux sont doués d'une certaine mobilité) ;

— les matériaux de dragage destinés à nourrir ou à restaurer les plages, surtout composés de sable, de gravier ou de coquilles et dont la granulométrie est compatible avec le matériau constituant les sites de rejet ;

— en l'absence de sources appréciables de pollution, les matériaux de dragage qui, en quantités, ne dépassent pas 10.000 tonnes par an et proviennent de petites opérations de dragages isolées et uniques (dragage de petits ports de plaisance ou de pêche).

Peuvent être également exemptées des quantités plus importantes de déblais dans la mesure où le matériau dont on envisage le dragage et l'élimination en mer est éloigné de toute source connue, existante et historique de pollution.

### c) Transcription des directives sur le plan national

Le contexte particulier dans lequel se déroulent les négociations internationales - toute décision, prise au niveau international, ne peut résulter que d'un consensus, d'une côte moyenne entre des positions fortement tranchées, voire opposées - a conduit la France à adopter une position de prudence à l'égard de ces directives et à proposer que celles-ci soient, en ce qui la concerne, mises à l'épreuve pendant une durée minimale d'une année.

Au regard des observations formulées à l'égard des directives par les principaux ports français procédant à des opérations d'immersion de déblais de dragages au terme d'une année, les dispositions prévues ont été traduites, pour l'essentiel, sur le plan interne, par une circulaire signée conjointement par le ministère chargé de l'Environnement et le ministère délégué chargé de la mer et portant sur la Méthodologie relative au prélèvement et l'analyse des déblais de dragages sur laquelle s'appuient désormais les ports. Les différences avec notamment les lignes directrices établies par la convention d'Oslo sont certes minimes mais elles illustrent néanmoins la difficulté qu'il peut y avoir pour un pays à se couler dans un moule commun alors que chaque port est doté d'une individualité propre où interviennent des données économiques, politiques et environnementales.

## III.4.5. Dispositions prévues par le cadre pour l'évaluation des déblais de dragages de la Convention de Londres

a) Dispositions à caractère général

Le cadre pour l'évaluation des déblais de dragages de la Convention de Londres de 1972 définit, mais non nécessairement de manière détaillée, les éléments pratiques de base devant être pris en compte pour déterminer les conditions dans lesquelles des déblais de dragages pourraient (ou non) être déposés en mer. Sont ainsi notamment considérés les caractéristiques physiques/chimiques/biologiques des déblais de dragages, les modes de valorisation éventuellement existants, les critères d'ordre écologique, économique ou pratique liés au choix du site d'immersion ainsi que les conséquences probables de l'option d'élimination retenue (l'hypothèse d'impact).

Il arrête en outre, en fonction de teneurs limites, de réactions biologiques, de normes de qualité de l'environnement, de critères de flux ou d'autres valeurs de référence, un mécanisme de déclenchement de décisions, applicable à l'échelon national ou régional, qui repose sur l'existence de trois niveaux :

— un niveau inférieur correspondant à des déblais généralement considérés comme présentant peu de danger pour l'environnement ;

— un niveau supérieur correspondant à des déblais qui devrfaient généralement être considérés comme ne se prêtant pas à une évacuation en mer ;

— entre ces deux niveaux, un niveau correspondant à des déblais qui devraient faire l'objet d'une évaluation plus approfondie avant que l'on puisse déterminer s'ils se prêtent ou non à une évacuation en mer.

b) Exemptions

Sont considérés comme susceptibles d'être exemptés du processus de caractérisation physique/chimique/biologique (mais non des autres procédures décisionnelles) les déblais de dragages extraits d'un lieu situé à l'écart des sources existantes et historiques de toute pollution appréciable, ou essentiellement composés de sable, gravier ou roche, ou composés de matériaux géologiques jusqu'alors intacts.

## III.5. SURVEILLANCE DES SITES D'IMMERSION

### III.5.1. Objectifs

La surveillance des sites d'immersion - essentiellement des fonds marins - constitue le dernier volet des mesures préconisées tant par les directives de la Convention d'Oslo de 1972 que par le cadre pour l'évaluation des déblais de dragages de la Convention de Londres de 1972. Elle a notamment pour objet de vérifier que les prescriptions dont sont assortis les permis d'immersion (voir 530-9) sont respectées, de déterminer l'état initial de la zone réceptrice et les modifications subies du fait de l'immersion.

### III.5.2. Moyens

Pour pouvoir définir ces objectifs, les directives de la Convention d'Oslo du 15 février 1972 (voir 530-19) ainsi que le cadre d'évaluation des déblais de dragages adopté par la Convention de Londres du 13 novembre 1972 ont prévu que les parties contractantantes développent des "hypothèses d'impact" décrivant les effets potentiels sur la santé de l'homme, sur la vie marine, sur les agréments et autres utilisations légitimes de la mer, ces conséquences pouvant être décrites en termes d'habitats, de processus, d'espèces, de communautés et d'utilisations affectées par l'élimination.

# IV. RÉGLEMENTATIONS CONCERNANT LES ACTIVITÉS DE DRAGAGES :

## IV.1. ENGAGEMENT DE TRAVAUX DE DRAGAGES

### IV.1.1. PERTINENCE DE LA LÉGISLATION INSTALLATIONS CLASSÉES

**Le décret n° 94-485 du 9 juin 1994** modifiant le décret n° 77-1133 du 21 septembre 1977 pris pour l'application de la loi n° 76-663 du 19 juillet 1976 relative aux installations classées pour la protection de l'environnement inscrit les exploitations de carrières à la nomenclature des installations classées pour la protection de l'environnement, sous la rubrique 2510.

Sont à ce titre assimilées à des exploitations de carrières certaines opérations de dragages effectuées dans les cours d'eau (y compris les estuaires) et les voies navigables. Dans la mesure où il s'agit de dragages d'entretien et où les produits extraits sont **susceptibles de donner lieu à une commercialisation**, l'opération d'extraction n'échappe pas à l'obligation d'obtenir une autorisation au titre de la rubrique 2510 de la nomenclature installations classées.

Dans cet esprit, sont exclus de la nomenclature les dragages d'entretien dont les matériaux extraits ne sont pas utilisés en tant que matériaux de carrières (il faut entendre par là ne sont pas valorisés, voire commercialisés).

Echappent de même à la nomenclature installations classées :

- les dragages effectués en mer dont les immersions relèvent de la loi du 7 juillet 1976) ;
- les dragages qui portent sur des quantités de sédiments extraites inférieures ou égales à 2.000 tonnes ;
- les dragages qui présentent un caractère d'urgence (par exemple à la suite de circonstances météorologiques exceptionnelles) et qui sont destinés à assurer le libre écoulement des eaux.

### IV.1.2. APPLICATION DE LA LOI SUR L'EAU

Au titre du décret n° 93-743 du 29 mars 1993 relatif à la nomenclature des opérations soumises à autorisation ou à déclaration en application de l'article 10 de la loi n° 92-3 sur l'eau, relèvent de la rubrique 3.4.0. de la nomenclature "Eau" les opérations de dragage en mer qui se traduisent par un volume de sédiments retiré au cours d'une année :

- égal ou supérieur à 100.000 m3 (régime d'autorisation) ;
- supérieur à 20.000 m3 mais inférieur à 100.000 m3 (régime de la déclaration).

Sont exclus de la nomenclature les opérations de dragages concernant le simple entretien des ports, chenaux, etc.

De même relèvent du régime d'autorisation ou de déclaration les opérations de curage ou de dragage des voies navigables, autres que le rétablissement des caractéristiques des chenaux de navigation, lorsque le rapport entre la section à draguer et la section mouillée correspondant aux plus basses eaux est supérieur à 10 % (A) ou supérieur à 5% mais inférieur à 10 % (D).

## IV.2. RÉGLEMENTATION APPLICABLE AUX IMMERSIONS DE MATÉRIAUX DE DRAGAGES

### IV.2.1. CADRE LÉGISLATIF

Toute opération d'immersion effectuée à partir d'un port français relève de la loi n° 76-599 du 7 juillet 1976 (J.O. 8 juill.) relative à la prévention et à la répression de la pollution marine par les opérations d'immersion et du décret n°82-842 du 29 septembre 1982 (J.O. 3 oct.) pris pour son application.

Cette législation opère un distinguo entre déchets de type industriel et déblais de dragages qui repose, pour l'essentiel sur le constat que les ports ne sont en aucune façon "producteurs" de déchets au même titre qu'un industriel qui contrôle étroitement ses procédés de fabrication et qui, généralement, est réputé connaître la composition chimique exacte de ces déchets ainsi que les processus industriels, physiques ou chimiques, qui leur ont donné naissance.

Un décret fixant les conditions dans lesquelles seraient effectuées les immersions de déblais de dragages provenant de ports militaires est actuellement en cours d'élaboration.

### IV.2.2. AUTORISATION D'IMMERSION

Le décret du 29 septembre 1982 reprend les dispositions prévues par les conventions internationales en ce qui concerne les interdictions et les dérogations au principe d'interdiction.

**L'immersion de matériaux de dragages est en outre interdite :**

— dans les zones qui sont définies par arrêté interministériel en vue de préserver les intérêts mentionnés à l'annexe III des conventions applicables au cas d'espèce et les intérêts de la défense nationale ou des télécommunications ;

— dans les eaux territoriales ou intérieures maritimes françaises si les déblais ont été embarqués dans un port étranger.

### IV.2.3. TYPE DE PERMIS D'IMMERSION

En conformité avec les dispositions prévues par les conventions internationales, l'autorisation peut revêtir, selon la nature des matériaux devant être immergés, la forme d'un permis spécifique ou d'un permis général (D. n° 82-842, 29 sept. 1982, art. 3, JO 3 oct.). .

### IV.2.4. DUREE DU PERMIS

Aux termes de l'article 20 du décret n° 82-842 du 29 septembre 1982, le permis spécifique peut être délivré pour une durée maximale de cinq ans et renouvelé par périodes de même durée.

La durée de validité du permis général peut être supérieure à 2 ans.

### IV.2.5. DOSSIER DE DEMANDE DE PERMIS D'IMMERSION

#### a) Principe

A l'appui de toute demande d'autorisation d'immersion de matériaux de dragage doit être joint un dossier de demande de permis dont la composition est fixée par arrêté interministériel. L'article 48 du décret du 29 février 1982 dispose à cet égard que "trois ans après la publication dudit arrêté, aucune immersion de déblais de dragage ne pourra être effectuée sans un permis délivré conformément aux dispositions prévues par le décret". Il est en outre précisé que "les demandes de permis devront être présentées au plus tard 2 ans après la publication de cet arrêté". Ce dernier n'est jamais paru.

#### b) Autorités compétentes

Le dossier de demande d'autorisation d'immersion est adressé au préfet du département territorialement concerné par les opérations de dragage ou, si l'opération de dragage doit être effectuée à l'intérieur de la circonscription d'un port autonome, au préfet du département où est situé le port principal englobé dans la circonscription du port autonome (D. n° 82-842 du 29 sept. 1982, art. 21).

#### c). Instruction du dossier de demande d'autorisation d'immersion : l'enquête publique

- **Principe**

Si une des zones d'immersions proposées est située dans les eaux territoriales ou intérieures maritimes françaises, le préfet du ou des départements intéressés, sur proposition du service maritime, ouvre une enquête publique dont la durée ne peut être inférieure à quinze jours.

Cette enquête a lieu dans les communes littorales que le préfet estime les plus directement intéressées par les opérations d'immersion et, dans tous les cas, dans les communes littorales dont le rivage est situé à moins de trois milles de la limite de la zone d'immersion (D. n° 82-842 du 29 sept. 1982, art 8 et 22).

- **Contenu du dossier d'enquête publique**

Outre les informations relatives à l'identité du pétitionnaire, aux caractéristiques des matériaux devant être immergés, à la situation géographique de la zone d'immersion, aux conditions techniques dans lesquelles s'effectuera l'opération etc., le dossier d'enquête publique doit porter sur les effets prévisibles sur la faune et la flore marines ainsi que sur les activités qui s'exercent en mer ou sur le littoral. Il doit également apporter la justification du recours au procédé de l'immersion comme moyen d'élimination des déblais.

### IV.2.6. CONTENU DU PERMIS

Le permis fixe les prescriptions auxquelles sont soumises les opérations d'immersion.

### IV.2.7. DELIVRANCE DU PERMIS

Le préfet de département est l'autorité habilitée à délivrer un permis d'immersion de matériaux de dragage, après accord du préfet maritime et consultation obligatoire, outre de ce dernier, du directeur des affaires maritimes, du chef du service maritime, du directeur des télécommunications des réseaux extérieurs et s'il y a lieu, du ou des directeurs des ports autonomes intéressés, compte tenu de la zone dans laquelle les opérations de dragage doivent être réalisées et de la (ou des) zones(s) d'immersion envisagée(s).

### IV.2.8. SUSPENSION D'UN PERMIS D'IMMERSION

#### a) Procédure

Aux termes de l'article 24 du décret du 29 septembre 1982, si les opérations d'immersion font apparaître des inconvénients graves, le préfet peut suspendre le permis par arrêté motivé. Cette mesure ne peut excéder une durée d'un mois, excepté si une procédure de modification ou de suppression du permis est engagée.

#### b) Garantie de continuité du service public

Si la suspension du permis est de nature à compromettre la continuité du service public portuaire en entravant les opérations de maintien des profondeurs, le préfet peut, à la demande du titulaire du permis suspendu, autoriser l'utilisation provisoire d'une zone d'immersion définie par un autre permis en cours de validité (le cas échéant en recourant à des dispositions prises à titre dérogatoire).

En l'absence de zone d'immersion couverte par un permis en cours de validité et susceptible d'être utilisée dans des conditions techniques et économiques acceptables, le préfet peut délivrer un permis provisoire d'immersion. Ce permis fait l'objet d'un arrêté motivé, ne nécessite pas d'enquête publique, mais requiert l'accord du préfet maritime. La durée de validité de l'autorisation ou du permis provisoire est limité à la durée de la procédure de modification ou de suppression engagée et ne peut, en aucun cas, excéder 6 mois.

### IV.2.9. SUPPPRESSION DU PERMIS D'IMMERSION

Le préfet qui a délivré un permis d'immersion de matériaux de dragages peut engager, soit de sa propre initiative, soit à la demande du titulaire du permis, une procédure de suppression de ce permis.

### IV.2.10 MODIFICATION DU PERMIS D'IMMERSION

Le préfet qui a délivré un permis d'immersion de matériaux de dragages peut engager, soit de sa propre initiative, soit à la demande du titulaire du permis, une procédure de modification de ce permis.

Il n'y a lieu à enquête publique que si la modification envisagée tend à déplacer, étendre ou instituer une zone d'immersion dans les eaux intérieures ou risque d'aggraver de façon notable les inconvénients susceptibles de résulter des opérations d'immersion (D. 29 sept. 1982, art. 25).

# V. MISE EN OEUVRE DES DISPOSITIONS RELATIVES AUX IMMERSIONS DE DÉBLAIS DE DRAGAGES

## V.1. STRUCTURES : LE GROUPE DE TRAVAIL GEODE

Créé en novembre 1990 par décision conjointe du ministère de l'Equipement et des transports (Direction des ports et de la navigation maritimes) et du ministère de l'Environnement (Direction de l'Eau), présidé par le directeur de l'aménagement et de l'environnement du port de Nantes St. Nazaire, ce groupe de réflexion s'est fixé pour principal objectif d'assurer, sur le plan technique, le suivi des travaux engagés dans le cadre des conventions internationales (Conventions de Londres, d'Oslo et de Barcelone)et, corrélativement, d'apporter à l'administration les éléments d'information lui permettant d'arrêter la position devant être défendue par la France au sein de ces instances.

Il réunit à cet effet, aux côtés des deux administrations à l'origine de sa création, le ministère de la Défense (direction de l'administration générale - direction centrale des travaux immobiliers et maritime et Marine nationale), un représentant des différents ports autonomes (Dunkerque, Le Havre, Rouen, Nantes / Saint-Nazaire, Bordeaux et Marseille) ainsi qu'un représentant des ports d'intérêt national de Boulogne-sur-mer / Calais et de La Rochelle. L'expertise scientifique est fournie par deux experts indépendants appartenant respectivement à l'Institut français de recherches pour l'exploitation de la mer (IFREMER) et au Centre national de la recherche scientifique (CNRS).

Il constitue à cet égard un forum privilégié permettant à l'administration de tenir informé les milieux portuaires des développements que connaissent les instances internationales compétentes.

Au regard de la mission qui lui a été confiée, le groupe GEODE a été conduit, depuis sa création, à aborder la question des dragages sous trois aspects complémentaires :

— procéder à un examen critique des orientations et procédures (notamment des lignes directrices) proposées par les instances compétentes des conventions d'Oslo et de Londres;

— préciser la stratégie devant présider aux opérations de dragages et d'immersions de déblais de dragages ;

— évaluer l'impact des opérations de dragages sur les milieux naturels.

Les moyens financiers nécessaires au fonctionnement du groupe et destinés à couvrir les dépenses de missions et d'études ont fait l'objet d'un fonds dont les contributions sont apportées par l'Etat (Direction des ports et de la navigation maritimes, ministère de la Défense), à hauteur de 52%, et les cinq ports autonomes (48%) dans les proportions de leur part respective au groupement d'intérêt économique (GIE) "Dragages ports"[3].

[3] En 1979, par arrêté ministériel du 30 octobre 1979, a été créé "Dragages-Port", groupement d'intérêt économique (GIE) constitué par l'Etat (51%) et les ports autonomes de Dunkerque, du Havre, de Rouen, de Nantes Saint-Nazaire, de Bordeaux et de Marseille. Les dragues au nombre de 24 sont louées coques nues aux ports autonomes et aux ports d'Etat (Dieppe, Caen, La Rochelle-Rochefort, Bayonne, Boulogne-sur-mer / Calais et Sète).

## V.2. NORMES DE REJETS

### V.2.1. NOTION DE NORMES DE REJETS

Nous avons vu précédemment que tant les Conventions de Londres et d'Oslo de 1972 que la Convention de Barcelone (Protocole Immersion) de 1976 associent aux immersions les notions de "contaminants en traces" (dérogation à l'interdiction d'immersion frappant les matériaux contenant des substances de l'annexe I) ou de "quantités notables" (Conv. de Londres, ann. II) ou "importantes" (Conv. d'Oslo, art. 6) (immersions autorisées moyennant des précautions spéciales).

Aucun accord n'ayant pu se faire, jusqu'à ce jour, sur le plan international, sur une définition commune de la notion de "contaminants en traces" et, partant sur des normes permettant, de manière objective, de décider de l'opportunité de recourir à l'immersion, chaque Etat, partie contractante aux conventions précitées, dispose en la matière d'un libre arbitre.

Il est évident qu'une telle approche qui prend en compte non seulement les données environnementales mais également les spécificités économiques (activités portuaires) et politiques (plus ou moins grande sensibilité aux partis dits écologiques), est susceptible d'introduire des distorsions d'ordre économique entre ports relevant de réglementations différentes et, partant, effectuant des opérations de dragages ne répondant pas aux mêmes critères.

### V.2.2. MÉTHODOLOGIE

A l'initiative du groupe de travail GEODE évoqué précédemment, une réflexion a donc été menée afin que la France puisse présenter dans les enceintes internationales compétentes, pour chacun des éléments métalliques majeurs (Hg, Cd, As, Pb, Cr, Cu, Zn et Ni) ainsi que pour les PCB, des niveaux de référence et des valeurs plafonds permettant de situer de manière objective la qualité des matériaux à draguer et de décider en conséquence de l'opportunité de procéder à une immersion de déblais de dragages ou de recourir à une autre technique d'élimination.

Il a été procédé à cet effet à la saisie et au traitement statistique de près de 750 fiches d'analyses de sédiments - dont 60% environ en provenance des grands ports et 40% des ports de plaisance et de divers ports secondaires - portant sur la période 1986-1993 et se rapportant à l'ensemble des côtes françaises. Si l'on tient compte du fait que chaque fiche concerne un total théorique de 22 paramètres (isotopes radioactifs exclus), près de 16.000 données devraient être en principe rassemblées. De fait, compte tenu des lacunes d'analyses, on peut considérer que la banque est constituée de 14.000 données.

### V.2.3. VALEURS RETENUES

#### a) Métaux lourds

Deux niveaux de référence ont été définis de façon provisoire (Tableau 1):

— un premier niveau (niveau 1) comprenant les valeurs au-dessous desquelles l'immersion serait autorisée sans étude particulière ;

— un second niveau (niveau 2) correspondant aux teneurs au-delà desquelles l'immersion serait susceptible d'être interdite sous réserve que cette interdiction soit le moins dommageable pour l'environnement.

Entre ces deux niveaux, une étude plus approfondie pourrait être nécessaire.

| | Bruit de fond | Médiane | Niveau 1 (2 md) | Niveau 2 (4 md) |
|---|---|---|---|---|
| Mercure | 0,2 | 0,2 | 0,4 | 0,8 |
| Cadmium | 0,5 | 0,6 | 1,2 | 2,4 |
| Arsenic | 4,4 | 12,5 | 25,0 | 50,0 |
| Plomb | 47,0 | 50,0 | 100,0 | 200,0 |
| Chrome | 45,0 | 45,0 | 90,0 | 180,0 |
| Cuivre | 35,0 | 22,5 | 45,0 | 90,0 |
| Zinc | 115,0 | 138,0 | 276,0 | 552,0 |
| Nickel | 20,0 | 18,5 | 37,0 | 74,0 |

Normes relatives aux métaux lourds
(données 1986 et 1990, valeurs en $mg.kg^{-1}$ de sédiment sec)

**b) PCB**

Concernant les PCB, il a été considéré :

— qu'il n'existait pas de bruit de fond géologique tel que défini pour les métaux. Les PCB étant des substances anthropiques, leur teneur naturelle doit être considérée comme égale à zéro ;

— que la valeur plafond au-delà de laquelle l'immersion doit être formellement interdite (niveau 2) pouvait être calculée en considérant que la contamination des sédiments dragués doit garantir la consommabilité des poissons vivant au-dessous des dépôts.

En prenant comme hypothèse de travail que le seuil admissible pour la consommation est de 10 $mg.kg^{-1}$ sec, que le facteur d'accumulation sédiments/ organismes est égal à 1 et compte tenu de l'introduction d'un facteur correctif de 0,1, ce niveau 2 peut être considéré comme égal à [10 mg/kg x 1 x 0,1 = 1 mg. PCB par kg de sédiment sec].

Par homologie avec les métaux pour lesquels le niveau 1 est égal à la moitié de la valeur du niveau 2, on peut donc estimer que le niveau 1 est égal à 0,5 mg de PCB total par kilogramme de sédiment sec (ou 0,05 mg de CB 153, 138 ou 0,25 mg de CB 180, 118, 52, 28 par kilogramme de sédiment sec).

Ces normes provisoires ont été transmises à l'approbation du ministère chargé des ports maritimes et du ministère de l'Environnement afin qu'elles soient validées et communiquées officiellement aux instances internationales compétentes.

| PCB | Niveau 1 | Niveau 2 |
|---|---|---|
| CB 28 | 0,025 | 0,05 |
| 52 | 0,025 | 0,05 |
| 118 | 0,025 | 0,05 |
| 180 | 0,025 | 0,05 |
| 138 | 0,050 | 0,10 |
| 153 | 0,050 | 0,10 |

Normes relatives aux PCB : valeurs des niveaux 1 et 2
(en $mg.kg^{-1}$ de sédiment sec)

### V.2.4 DÉVELOPPEMENTS PRÉVUS

Ces valeurs ne tenant compte ni du caractère toxique ni de la biodisponibilité de chaque élément, il a été retenu que celles correspondant au niveau 2 (relatives notamment au mercure, au cadmium et aux PCB) seraient revues en fonction des données écotoxicologiques nouvelles.

C'est à cette fin que la direction de l'Environnement et de l'aménagement littoral de l'IFREMER a engagé en 1993 une étude visant à déterminer la toxicité intrinséque des sédiments dragués à partir de tests de laboratoires sublétaux et à évaluer *in situ* l'impact des immersions sur la faune des principales zones de dépôt des sédiments dragués.

## VI RÈGLEMENTATION APPLICABLE AUX OPÉRATIONS DE DRAGAGES NON SUIVIES D'UNE IMMERSION DES DÉBLAIS.

Les rejets de déblais de dragages effectués directement dans le milieu marin sans le recours de navires ou de barges ne relèvent pas des dispositions de la loi du 7 juillet 1976.

Pour les rejets effectués à l'aide d'une canalisation fixe ou mobile, leurs sont opposables les dispositions prévues par le décret n° 93-743 du 29 mars 1993 relatif à la nomenclature des opérations soumises à autorisation ou à déclaration pris en application de l'article 10 de la loi n°92-3 du 3 janvier 1992 sur l'eau.

Sont ainsi soumis à autorisation ou à déclaration les rejets en mer qui se traduisent, en flux de pollution nette, par les apports ci-après (Tableau 3).

| FLUX DE POLLUTION BRUTE, À MOINS D'1 KM D'UNE ZONE SENSIBLE | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | MES > 90 kg.j | DCO | 240 kg.j | D | MES 20 < < 90 kg.j | DCO | 60 à 240 kg.j |
| | | Composés organohalogénés | 50 g.j | | | Composés organohalogénés | 15 à 50 g.j |
| | | Métaux et métalloïdes | 250 g.j | | | Métaux et métalloïdes | 60 à 250 g.j |
| | | Hydrocarbures | 1 kg.j | | | Hydrocarbures | 100 à 1.000 g.j |

| FLUX DE POLLUTION NETTE | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | MES<br>> 20 kg.j | DCO | 120 kg.j | D | MES<br>5 < < 20 kg.j | DCO | 30 à 120 kg.j |
| | | Composés organohalogénés | 500 g.j | | | Composés organohalogénés | 100 à 500 g.j |
| | | Métaux et métalloïdes | 1 kg.j | | | Métaux et métalloïdes | 100 à 1.000 g.j |
| | | Hydrocarbures | 5 kg.j | | | Hydrocarbures | 1,5 à 5 kg.j |

## VII. RÉGLEMENTATION APPLICABLE AU STOCKAGE A TERRE DES DÉBLAIS DE DRAGAGES FORTEMENT POLLUÉS

Sur le plan de la règlementation, si les immersions de déblais de dragages pas ou peu contaminés sont bien appréhendées, il n'en est pas de même de l'élimination des déblais très fortement pollués dont l'immersion se trouve interdite et dont le stockage à terre dans des conditions acceptables pour l'environnement constitue la seule solution envisageable.

Cette technique qui ne représente qu'une très faible part des quantités draguées a été utilisée en diverses occasions :

— réalisation de terre plein (essentiellement à partir de matériaux sableux). Citons, à cet égard, les remblais d'accès au pont de Normandie, le parc de stockage des conteneurs du Verdon réalisé par remblaiement hydraulique (matériau sableux) avec compactage dynamique, des plates-formes pour l'implantation d'activités industrielles ou autres effectuées par refoulement hydraulique de sable ;

— renforcement du banc de Bilho en Loire par 10 millions de m3 (surtout sableux) lors des travaux d'aménagement de 1980 de la zone de Montoir-Donges ;

— création de zones paysagères (le port de Rouen a ainsi traité une chambre de dépôt en créant, après consolidation, un arboretum).

La législation s'avère, à cet égard, inadaptée.

En effet, le stockage à terre de déblais de dragages ne saurait relever de la législation sur les installations classées et, partant, de la nomenclature. Les rubriques 167 et 322 relatives respectivement aux installations d'élimination de déchets industriels provenant d'installations classées et au stockage et au traitement d'ordures ménagères et autres résidus urbains sont inappropriées dans la mesure où les déchets concernés ne sont pas d'origine industrielle ou urbaine et ne proviennent pas d'installations classées.

Au titre de la loi du 15 juillet 1975 modifiée relative à l'élimination des déchets et à la récupération des matériaux est prévu (art. 10 et 10-1) l'établissement de plans d'élimination des déchets autres que les déchets ménagers et assimilés. Ces plans sont élaborés essentiellement à l'échelon régional ou interrégional. Les déblais de dragages pourraient être inclus dans ces plans de telle sorte que leur élimination trouve une solution efficace. Ils faciliteraient un ensemble coordonné d'installations d'élimination satisfaisante de déblais

## EN CONCLUSION

Les opérations de dragages et, plus particulièrement, la question de l'élimination des déblais fortement pollués sont une constante de toutes les négociations qui se déroulent sur le plan international, que ce soit dans le cadre de la Convention de Barcelone - rappelons qu'un séminaire devrait avoir lieu sur ce thème - ou celui de la Convention d'Oslo de 1972 (ou de la Convention de Paris de 1992 qui lui succédera).

C'est à cette préoccupation que répond notamment l'application du concept de meilleure pratique environnementale à la gestion des déblais de dragages.

# Annex VII

## DREDGED MATERIAL MANAGEMENT OUTLINE

# DREDGED MATERIAL MANAGEMENT OUTLINE

1. INFORMATION ABOUT DREDGING AREA

2. SHORT CHARACTERIZATION OF THE MATERIALS

3. EXEMPTED MATERIALS → NO → PAG.2
   ↓ YES
4. ALTERNATIVE USAGES → YES
   ↓
5. DISPOSAL AREA CHARACTERIZATION
   ↓
6. IMPACT HYPOTHESIS

   YES ↙ ↘ NO

7. PERMIT

   ALTERNATIVE AREAS
   ↓
   IMPACT HYPOTHESIS → NO
   ↓ YES
   PERMIT

# DREDGED MATERIAL MANAGEMENT OUTLINE

1. NON EXEMPTED MATERIALS

2. PHYSICAL AND CHEMICAL ANALYSIS

3. DISPOSAL AREA CHARACTERIZATION

4. CRITERIA FULFILMENT (SEDIMENTS. AREAS)
   - YES
   - NO (PAG.3)

5. ALTERNATIVE USAGES → YES
   - ↓ NO

6. IMPACT HYPOTHESIS
   - ↓ YES

7. B.E.P. → NO
   - ↓ YES

8. PERMIT
   - ↓

9. SIMPLE MONITORING PROGRAMME

# DREDGED MATERIAL MANAGEMENT OUTLINE

1. NON FULFILMENT OF THE CRITERIA

2. DETERMINATION OF TOXICITY, PERSISTANCE AND BIOACCUMULATION

3. ALTERNATIVE USAGES ⟶ YES

4. IMPACT HYPOTHESIS

5. B.E.P. ⟶ LAND DISPOSAL
   YES NO
   ↓

6. DISPOSAL PERMIT

7. MONITORING PROGRAMME

# Annex VIII

## GUIDELINES FOR THE MANAGEMENT OF DREDGED MATERIAL

## PROPOSED STRUCTURE

# GUIDELINES FOR THE MANAGEMENT OF DREDGED MATERIAL

**Preface**
**Introduction**
**Requirements of the Dumping Protocol**
**Conditions under which permits for dumping of dredged material may be issued.**

## A. CHARACTERISTICS AND COMPOSITION OF DREDGED MATERIAL

### 1. Characteristics

For all dredged material to be disposed of at sea the following infor mation should be obtained

1.1. Amount
Gross wet tonnage requested

1.2. Composition
- a. Chemical (metals, nutrients etc)
- b. Biological (viruses, bacterial etc)
- c. Geological (sand, gravel, rock etc)

1.3. Properties
- a. Toxicity
- b. Persistence
- c. Accumulation

1.4. Physical, chemical and biological changes of the material after release

1.5. Probability of production of taints .....

### 2. Samping and analysis

2.1. Sampling
- a. Number of stations
- b. Frequency of sampling

2.2. Analysis
Presented in Technical Annex

## B. CHARACTERISTICS OF DUMPING SITE AND METHODS OF DEPOSIT

**1. Characteristics**
**2. Sampling and analysis**

## C. GENERAL CONSIDERATIONS AND CONDITIONS

## D. MONITORING DREDGED MATERIAL DISPOSAL OPERATIONS

# Annex IX

## GUIDELINES ON THE MANAGEMENT OF DREDGED MATERIAL

(SECOND DRAFT)

## TABLE OF CONTENTS

## Preface

These draft guidelines, prepared by Spanish experts on behalf of MAP, are designed to assist the Contracting Parties in the future implementation of the Protocol for the Prevention of Pollution of the Mediterranean Sea by Dumping from Ships and Aircrafts or Incineration at Sea, hereinafter referred to as " the Protocol", in the management of dredged material; the Protocol was signed by 16 Contracting Parties in 1995 and is not yet in force. These guidelines are adapted from those of the Oslo Commission and it is implicit that general considerations and detailed procedures described in the guidelines may not be applicable in all national or local circumstances.

## Introduction

These guidelines are designed to assist Contracting Parties in the management of dredged material in a way that will prevent pollution of the marine environment. In accordance with Article 6.2 of the Protocol, the guidelines specifically address the disposal of dredged material by deposition or dumping in marine and estuarine waters.

It should be recognized that both removal and disposal of dredged sediments may cause harm to the marine environment. Consequently, Contracting Parties are encouraged to exercise control over dredging operations as well as disposal using a Best Environmental Practice (BEP) approach to minimize the quantity of material that has to be dredged and to minimize the impact of the dredging and disposal activities in the maritime area. Advice on environmentally acceptable dredging techniques is available from a number of international organizations including the Permanent International Association of Navigation Congresses (PIANC) 1986: Disposal of Dredged Material at Sea (LDC/SG9/2/1).

The Guidelines are presented in two parts. Part A deals with the assessment and management of dredged material disposal, while part B provides guidance on the design and conduct of monitoring of marine and estuarine disposal sites. In this context, it should be noted that, for each permitted dredging operation, regulatory agencies should conclude their assessment with a concise Impact Hypothesis (see Part B, paragraphs 5-11). This Impact Hypothesis will provide the principal basis for the design of post-operational monitoring activities.

The Guidelines commence with a summary of those Articles and Annexes to the 1995 Dumping Protocol which relate to the control of dredging activities followed by guidance on the conditions under which permits might be issued. Sections 3, 5 and 6 address the relevant considerations of the Annex III of the Protocol under the headings of dredged material characteristics (Annex, Section A), characteristics of the dumping site and methods of deposit (Annex, Section B) and general considerations and conditions (Annex, Section C). Section 4 provides additional guidance on the sampling and analysis of dredged material.

# PART A

# ASSESSMENT AND MANAGEMENT OF DREDGED MATERIAL

## 1. REQUIREMENTS OF THE DUMPING PROTOCOL

1.1 In accordance with Article 4 of the Protocol, the dumping of dredged material may be authorized under some conditions.

1.2 Contracting Parties are required under Article 5 to issue a permit prior to dumping.

1.3 Furthermore, in accordance with Article 6, the permit referred to in Article 5 shall be issued only after careful consideration of the factors set forth in the Annex of the Protocol. Article 6.2 establish the Contracting Parties shall draw up and adopt criteria, guidelines and procedures for the dumping of wastes or other matter listed in Article 4.2 so as to prevent, abate and eliminate pollution.

1.4 These Guidelines for the Management of Dredged Material, which include advice on dredged material sampling and analysis, have been prepared for the purpose of providing guidance to the Contracting Parties on:

a) the fulfillment of their obligations to issue permits for the dumping of dredged material in accordance with the provisions of the Protocol;

b) the provision of reliable data on the input of contaminants to Protocol waters by the dumping of dredged material.

## 2. CONDITIONS UNDER WHICH PERMITS FOR DUMPING OF DREDGED MATERIAL MAY BE ISSUED

2.1 In order to define the conditions under which permits for dumping of dredged material may be issued, Contracting Parties should develop criteria on a national basis, which meet the provisions of Articles 4, 5, and 6 of the Protocol.

2.2 These criteria may be described in terms of:

a) chemical characteristics and/or biological effects (e.g. Sediment quality criteria);

b) reference data linked to particular methods of disposal or disposal sites;

c) specific environmental effects that are considered undesirable outside designated disposal sites;

d) the contribution of disposal to local contaminant fluxes.

2.3 Criteria should be derived from studies of sediments that have similar geochemical properties to those from the ones to be 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 each area in which dredging or disposal is conducted.

2.4 In the event that the criteria and the associated regulatory limits cannot be met, a Contracting Party should not issue a permit unless a detailed consideration of the Annex Section C, indicates that sea disposal is, nonetheless, the option of least detriment. If such a conclusion is drawn, a Contracting Party should:

a) provide for the realization of a source-reduction programme where there is a source to reduce, with a view to meeting the established criteria;

b) take all practical steps to mitigate the impact of the dumping operation on the marine and estuarine environment including, for example, the use of containment or treatment methods;

c) prepare a detailed impact hypothesis;

d) initiate monitoring designated to verify any predicted adverse effects of the dumping;

e) issue a specific permit.

When it is unlikely that disposal management techniques will alleviate the harmful effects of contaminated materials (see Section 7), containment and/or treatment technologies may be used to avert environmental damage. In such cases, selective dredging or separation of the more contaminated fractions (e.g. by use of hydrocyclones) may be employed to minimize the quantities of material for which such measures are required.

2.5 With a view to evaluating the possibilities for harmonizing or consolidating criteria referred to in 2.1-2.4 above, including any sediment quality criteria, Contracting Parties are requested to inform the Organization of the criteria adopted, as well as the scientific basis for the development of these criteria.

2.6 An important element of these guidelines for the management of dredging activities is the preparation of an impact hypothesis for each marine disposal operation. In concluding their assessments of the environmental implications of these operations, prior to the issue of a permit, Contracting Parties should formulate: impact hypotheses in accordance with the guidance provided in Part B, paragraphs 6 - 9.

## 3. ASSESSMENT OF THE CHARACTERISTICS AND COMPOSITION OF DREDGED MATERIAL

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a) Amount and composition
b) Amount of substances and materials to be deposited per day (per week, per month)
c) Form in which it is presented for dumping, i.e. whether as a solid, sludge or liquid

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3.1 For all dredged material to be disposed of at sea the following information should be obtained:

- gross wet tonnage requested
- method of dredging
- preliminary determination of sediment characteristics

3.2 In order to assess the capacity of the area for receiving dredged material both the total amount of material and the anticipated or actual loading rate at the disposal site should be taken into consideration.

3.3 In the absence of appreciable pollution sources which may affect the marine environment, dredged material may be exempted from the testing referred to in paragraphs 3.5 and 3.8 of these Guidelines if it meets one of the criteria listed below; in such cases the provisions of the Annex Sections B and C (see sections 5 and 6 below) should be taken into account:

a) dredged material is composed almost exclusively of sand, gravel or rock; such materials are frequently found in areas of high current or wave energy such as streams with large bed loads or coastal areas with shifting bars and channels;

b) dredged material is for beach nourishment or restoration and is composed predominantly of sand, gravel, or shell with particle sizes compatible with material on the receiving beaches; and

c) dredged material not exceeding 10 000 tons per year from small, isolated and single dredging operations may be exempted only where this can be supported by existing local information on sediment quality.

In the case of capital dredging projects, national authorities should take account of the nature of the material to be disposed of to sea in exempting part of the material from the provisions of these guidelines relating to sampling and analysis. On the other hand, capital dredging removed from areas which may include contaminated sediments should be subject to characterization in accordance with these guidelines, notably paragraph 3.5.

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d) Properties: physical (e.g. solubility and specific gravity), chemical and biochemical (e.g. oxygen demand, nutrients) and biological (e.g. presence of viruses, bacteria, yeasts, parasites).

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3.4 For dredged material that does not meet the exemptions in paragraph 3.3, further information will be needed to fully assess the impact. Information may be available from existing sources, for example from field observations on the impact of similar material at similar sites or from previous test data on similar material tested not more than five years previously, and knowledge of local discharges or other sources of pollution, supported by a selective analysis.

3.5 Chemical characterization will be necessary as a first step to estimate gross loading of contaminants, especially for new arisings of dredged material. The requirements for the elements and compounds to be analyzed are set out in Chapter 4.

e) Toxicity
f) Persistence
g) Accumulation in biological materials or sediments

3.6 The purpose of testing under this section is to establish whether the disposal at sea of dredged material containing contaminants might cause undesirable effects, especially the possibility of chronic or acute toxic effects on marine organisms or human health, whether or not arising from their bioaccumulation in marine organisms and especially in food species.

3.7 The following biological test procedures might not be necessary if the previous characterization of the material and of the receiving area allows an assessment of the environmental impact. If, however, the previous analysis of the material shows the presence of contaminants in considerable quantities or of substances whose biological effects are not understood, and if there is concern for antagonistic or synergistic effects of more than one substance, or if there is any doubt as to the exact composition or properties of the material, it is necessary to carry out suitable biological test procedures. These procedures may include the following:

- acute toxicity tests;
- chronic toxicity tests capable of evaluating long-term sub-lethal effects, such as bioassays covering an entire life cycle; and
- tests to determine the potential for bioaccumulation of the substance of concern.

h) Physical, chemical and biochemical changes of the waste after release

3.8 Substances in dredged material may undergo physical, chemical and biochemical changes when entering the marine environment. The susceptibility of dredged material to such changes should be considered in the light of the eventual fate and potential effects of the dredged material. This may be reflected in the Impact Hypothesis and also in a monitoring programme.

i) Probability of production of taints or other changes reducing marketability of resources (fish, shellfish, etc.)

3.9 Proper dump site selection rather than a testing application is recommended. Site selection to minimize impact on commercial or recreational fishery areas is a major consideration in resource protection and is covered in greater detail in Section C of the Annex to the Protocol. (Further guidance for the application of Section C of the Annex is given in section 6 below).

## 4. GUIDELINES ON DREDGED MATERIAL SAMPLING AND ANALYSIS

Sampling for the purpose of issuing a dumping permit

4.1 For dredged material which requires detailed analysis (i.e. which is not exempted under the Guidelines in paragraph 3.3), the following guidelines indicate how sufficient analytical information may be obtained for permitting purposes. Judgment and knowledge of local conditions will be essential in the application of these guidelines to any particular operation (see § 4.10).

4.2 An in situ survey of the area to be dredged should be carried out. The distribution and depth of sampling should reflect the size of the area to be dredged, the amount to be dredged and the expected variability in the horizontal and vertical distribution of contaminants. Core samples should be taken where the depth of dredging and expected vertical distribution of contaminants warrant; otherwise a grab sample is considered appropriate. Sampling from barges is not advisable.

4.3 The number of sampling stations should be adjusted according to the exchange characteristics and the size of the area to be dredged, e.g. less for open areas and more for enclosed and semi-enclosed areas.

4.4 Normally, the samples form each location should be analyzed separately. However, if the sediment is clearly homogeneous with respect to sediment features (grain size fractions and organic matter) and expected level of contamination, it may be possible to composite samples from adjacent locations, two or more at a time, provided care has been taken to ensure that the results give a justified mean value for the contaminants. The original samples should be retained until the permitting procedure has been completed, should the results indicate that further analysis is necessary.

Sampling in the case of renewal of dumping permits

4.5 If a survey indicates that the material is essentially clean and no new events have taken place, surveys need not be repeated more frequently than once every 3 years.

4.6 It may be possible on the basis of the initial survey to reduce either the number of sampling stations or the number of parameters while still providing sufficient information to confirm the initial analysis for permitting purposes. If such a reduced sampling programme does not confirm the earlier analysis, the full survey should be repeated. If the list of parameters for repetitive measurement is reduced, a further analysis of the complete list is advisable at 3 year intervals.

4.7 In areas where there is a tendency for sediments to show high levels of contamination, or where contaminant distribution changes rapidly in response to varying environmental factors, analysis of the relevant contaminants should be frequent and linked to the permit renewal procedure.

Provision of Input Data

4.8 The sampling scheme described above provides information for permitting purposes. However, the scheme should at the same time provide a suitable basis for the estimation of total inputs and, for the time being, can be considered the most accurate approach available

for this purpose. In this context, it is assumed that materials exempted from analysis represent insignificant inputs of contaminants and therefore it is not necessary to calculate or to report contaminant loads.

Determinants and methods

4.9 Analysis should normally be carried out on the whole sample but material greater than 2 mm grain size should be excluded. It will also be necessary, in order to allow assessment of data on contaminant levels in terms of their likely impact, to provide information on:

- weight of solid material per unit of volume of dredged material
- grain size fractions (% sand, silt, clay)
- total organic carbon (TOC) below 2 mm.

4.10 In those cases where analysis is required, analysis should be mandatory for substances listed in Technical Annex 1. With respect to organochlorines, PCBs should be analyzed in non-exempted sediments because they remain a significant environmental contaminant. Other organohalogens should also be measured if they are likely to be present on a result of local inputs.

4.11 In addition, the permitting authority should carefully consider specific local inputs including the likelihood of contamination e.g. by arsenic, oils, PAH and triorganotins. The authority should make provision for the analysis of these substances as necessary.

4.12 Further guidance on the selection of determinants and methods of contaminant analysis in localized circumstances, and on procedures to be used for normalization and quality assessment purposes, will be found in the Technical Annexes to these guidelines as adopted, and updated periodically, by the Contracting Parties.

## 5. CHARACTERISTICS OF DUMPING SITE AND METHOD OF DEPOSIT

5.1 Matters relating to dump site selection criteria are addressed in greater detail in studies prepared by GESAMP[1] (Reports and Studies No. 16: Scientific Criteria for the Selection of Waste Disposal Sites at Sea, IMO 1982) and by ICES[2] (Ninth Annual Report of the Oslo Commission, Annex 6).

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a) Geographical position, depth and distance from coast
b) Location in relation to living resources in adult or juvenile phases
c) Location in relation to amenity areas

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[1] IMO/FAO/UNESCO/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection

[2] International Council for the Exploration of the Sea.

5.2 Basic site characterization information to be considered by national authorities at a very early stage of assessment of a new site should include the co-ordinates of the dumping area (latitude, longitude), as well as its location with regard to:

- distance to nearest coastline
- recreational areas
- spawning and nursery areas
- known migration routes of fish or marine mammals
- sport and commercial fishing areas
- aquaculture areas
- areas of natural beauty or significant cultural or historical importance
- areas of special scientific, biological or ecological importance
- shipping lanes
- military exclusion zones
- engineering uses of seafloor (e.g. potential or ongoing seabed mining, undersea cables, desalination or energy conversion sites).

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d) Methods of packing, if any
e) Initial dilution achieved by proposed method of release

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5.3 For dredged materials, the only data to be considered under this item should include information on:

- disposal method (e.g. hopper discharge; discharge through pipes)
- dredging method (e.g. hydraulic or mechanical).

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f) Dispersal, horizontal transport and vertical mixing characteristics
g) Existence and effects of current and previous discharges and dumping in the area (including accumulative effects)

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5.4 For the evaluation of dispersal characteristics, data should be obtained, as appropriate, on the following:

- water depths (maximum, minimum, mean)
- water stratification in various seasons and weather conditions (depth and seasonal variation of pycnocline)
- tidal period, orientation of tidal ellipse, velocities of minor and major axis
- mean surface drift (net): direction, velocity
- mean bottom drift (net): direction, velocity
- storm (wave) induced bottom currents (velocities)
- wind and wave characteristics, average number of storm days per year
- concentration and composition of suspended solids.

5.5 The basic assessment of a site, either a new or an existing one, shall include the consideration of possible effects that might arise by the increase of certain constituents or by interaction (e.g. synergistic effects) with other substances introduced in the area, either by

other dumpings or by river input and discharges from coastal areas, by exploitation areas and maritime transport, as well as through the atmosphere. The existing stress on biological communities as a result of such activities should be evaluated before any new or additional disposal operations are established. The possible future uses of the sea area should be kept under consideration.

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

## 6. GENERAL CONSIDERATIONS AND CONDITIONS

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a) Interference with shipping, fishing, recreation, mineral extraction, desalination, fish and shellfish culture, areas of special scientific importance and other legitimate uses of the sea

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NATURE OF THE IMPACT OF DREDGED MATERIAL DISPOSAL

6.1 Particular attention should be given to dredged material containing oil or substances that have a tendency to float following re-suspension in the water column. Such materials should not be dumped in a manner or at a location which may lead to interferences with fishing, shipping, amenities or other beneficial uses of the marine environment.

6.2 The disposal of dredged material should not interfere with, or devalue, legitimate commercial and economic uses of the marine environment. The selection of disposal sites should take into account the nature and extent of both commercial and recreational fishing and aquaculture as well as the spawning, nursery and feeding areas that sustain them.

6.3 In selecting disposal or dumping sites, the habitats of rare, vulnerable or endangered species should be avoided. The preservation of the biological diversity should also be taken into account.

6.4 Besides toxicological effects and bioaccumulation of the constituents of the dredged material, other potential impacts on marine life should be considered, such as modification of behaviour, nutrient enrichment, oxygen depletion, turbidity, modification of the sediment composition and blanketing of the sea floor.

6.5 All dredged materials, whether or not contaminated, have a significant physical impact at the point of disposal. This impact includes covering of the seabed (and smothering of benthic organisms) and local enhancement of suspended solids levels. Physical impact may also result from the onward transport particularly in finer fractions, by wave and tidal action and residual current movements. In relatively enclosed waters, such as some estuarine situations, oxygen-consuming sediments (e.g. organic carbon-rich) could adversely affect the oxygen regime of receiving systems.

6.6 Biological consequences of these physical impacts include smothering of benthic organisms in the dumping area. Disposal may in certain special circumstances interfere with migration of fish (e.g. the impact of high turbidity on salmonids in estuarine areas) or of crustacea (e.g. if deposition occurred in the coastal migration path of crabs).

6.7 An important consequence of the physical presence of dredged material disposal activities is interference with fishery activities and, in some instances, with navigation and recreation. The former relates to both smothering of areas potentially used for fisheries and interference with fixed fishing gear; shoaling following dumping can lead to navigational hazards and clay or silt deposition may be a nuisance in recreational areas. These problems can be aggravated if the spoil is contaminated with bulky harbour debris such as wooden beams, scrap metal, pieces of cable etc.

Approaches to management

6.8 This section deals only with management techniques to minimize the physical effects of dredged material disposal. Measures to control the contamination of dredged materials are covered in other sections of these Guidelines.

6.9 The key to management lies in careful site selection (see section 5) and assessment of conflict between marine resources and activities. These notes are intended to supplement these considerations.

6.10 In most cases, blanketing of an area of seabed is accepted as a environmental cost of disposal. To avoid excessive use of the seabed, the number of sites should be limited as far as possible and each site should be used to the maximum extent possible without interfering with navigation. Once deposition stops, hydrodynamic forces will re-sort the nature of the sediments and re-colonization takes place.

[6.11 Effects can be reduced by ensuring as far as possible that the sediments in the dredged material and receiving area are similar. Locally, biological impact may be further reduced if the deposition area is naturally subject to physical disturbance. Where this is not possible, consideration should be given where clean, fine materials are concerned to a deliberately dispersive method of disposal to reduce blanketing on a small site.]

6.12 With capital and maintenance dredgings, the material may be different in character to the sediments at the receiving site and re-colonization may be affected. Where bulky material such as rock and clay material is deposited, there may be interference with fishing activity, even in the long term. It may prove possible to use capital materials in the construction of artificial reefs for fishery or recreational purposes or for habitat creation; in this case, advice from ecologists or fishery biologists is essential.

6.13 The infilling of depressions, deliberate capping or contained disposal of dredged material deposits may be used in certain circumstances to avoid interferences with fishery or other legitimate activities.

6.14 Temporal restrictions on dumping activities may be appropriate (e.g. tidal and seasonal restrictions). Interference with fish or crustacea migration or spawning or with seasonal fishery activity may be avoided by timing restrictions on disposal activity. Trench digging and refilling activities may also interfere with migratory patterns; similar controls are appropriate. In

mitigating the impact of disposal within estuaries on migrating fish, silt screens have been used to reduce the suspended solids levels, but these have proved hard to manage effectively.

6.15 Where appropriate, disposal vessels should be equipped with accurate positioning systems. Disposal vessels and operations should be 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. Where rubbish is a problem, it may be necessary to specify that the disposal vessel (or dredger) is fitted with a grid to facilitate removal for disposal (or recovery) on land, rather than being dumped at sea. Ships' records and automatic monitoring and display devices (e.g. black-boxes), where these have been fitted, should be inspected to ensure that disposal is taking place at the specified disposal site.

6.16 Monitoring is an essential component of management action (see Part B).

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b) In applying these principles, 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, will be taken into consideration

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6.17 In the special case of dredged material, sea disposal is often an acceptable disposal option, though opportunities should be taken to encourage the productive use of dredged material for, for example, marsh creation, beach nourishment, land reclamation or use in aggregates.

6.18 For contaminated dredged materials, consideration should be given to the use of special methods to mitigate their impact, in particular with respect to contaminant inputs. In extreme cases of contamination, alternative methods of treatment or land disposal may be necessary, taking into account the best environmental practice.

6.19 If the foregoing analysis shows a land alternative to be the best environmental practice, a permit for sea disposal should not be given.

## 7. DISPOSAL MANAGEMENT TECHNIQUES

7.1 Ultimately, the problems of contaminated dredged material disposal can be solved effectively only by implementing programmes and measures for the progressive elimination of input of pollutants to waters from which dredged materials are taken. Until this objective is met and for cases where there is historical contamination, the problems of contaminated dredged material may be addressed by using disposal management techniques.

7.2 "Disposal management techniques" refers to actions and processes through which the impact of persistent and potentially toxic substances contained in dredged material may be reduced to, or controlled at, a level which does not constitute a hazard to human health, harm to living resources and marine life, damage to amenities or interference with other legitimate uses of the sea. In this context they may, in certain circumstances, constitute additional methods by which dredged material containing organohalogens or many other toxic substances

may be rendered biologically harmless and which may constitute "special care" in the disposal of dredged material containing substances listed in Technical Annex 1.

[7.3 Relevant techniques include the utilization of natural physical, chemical and biological processes as they affect dredged material in the sea; for organic material these may include physical, chemical or biochemical degradation and/or transformation that results in the material becoming non-persistent, non-toxic and/or non-biologically available. Beyond the considerations of Sections B and C of the annex to the Protocol, disposal management techniques may include burial on or in the sea floor followed by clean sediment capping, utilization of geochemical interactions and transformations of substances in dredged material when combined with sea water or bottom sediment, selection of special sites such as in abiotic zones, or methods of containing of the material in a stable manner (including on artificial islands).]

7.4 Utilization of such techniques must be carried out in full conformity with other Annex to the Protocol considerations, such as comparative assessment of alternative disposal options, and these Guidelines should always be associated with post-disposal monitoring to assess the effectiveness of the techniques and the need for any follow-up management action.

# PART B

# MONITORING OF DREDGED MATERIAL DISPOSAL OPERATIONS

Definition

[1. In the context of assessing and regulating environmental and human health impacts of dredged material disposal operations monitoring is the repeated measurement of a contaminant or an effect whether direct or indirect in the marine environment.]

Objectives

2. Monitoring of dredged material disposal operations is generally undertaken for the following reasons:

i) to establish whether licensing conditions have, as intended, prevented adverse effects on the receiving area as a consequence of dumping;
ii) to improve the basis on which license applications are assessed by improving knowledge of field effects from large discharges which are not readily estimated by laboratory or literature assessment;
iii) to provide the necessary evidence to demonstrate within the framework of the Protocol that the control measures applied are sufficient to ensure that the dispersive and assimilative abilities of the marine environment are not exceeded, so causing environmental damage.

3. The purposes of monitoring are to determine contaminant levels in organisms, the biological effects and consequences for the marine environment due to the dumping of dredged material and, ultimately, to allow managers to control exposures of the organisms of concern to dredged materials and associated contaminants.

Strategy

4. Monitoring operations are expensive for they require considerable resources both at sea and in subsequent working up of samples. In order to approach the monitoring programme in a resource-effective manner, it is essential that the programme should have clearly defined objectives, that measurements made can meet those objectives, and that the results be reviewed at regular intervals in relation to those objectives. The monitoring scheme should then be continued, reviewed or even terminated, as appropriate.

Impact Hypothesis

5. In order to establish such objectives, it is first necessary to derive an Impact Hypothesis describing predicted effects on the physical, chemical and biological environment.

6. An Impact Hypothesis should integrate information on the characteristics of the dredged material and proposed disposal site conditions. The aim is to provide a concise scientific analysis of the potential effects on human health, living resources, marine life, amenities and other legitimate uses of the sea. It should encompass both the temporal and spatial scales of potential effects.

7. The preliminary evaluation should be as comprehensive as possible. The primary areas of potential impact should be identified and are those considered to have the most serious consequences for human health and the environment. Alterations to the physical environment, risks to human health, devaluation of marine resources, and interference with other legitimate uses of the sea are often seen as priorities in this regard.

8. The expected consequences of disposal (targets) could be described in terms of habitats, processes, species, communities and uses affected. The precise nature of the change, response, or interference (effect) predicted could then be described. The target and the effect together could be described (quantified) in sufficient detail so that there would be no doubt as to the parameters to be measured during post-operational monitoring. In the latter context, it might be essential to determine "where" and "when" the impacts can be expected.

9. In order to develop this hypothesis, it may be necessary to conduct a baseline survey which describes not only the environmental characteristics, but also the variability of the environment. It may be helpful to develop sediment transport, hydrodynamic and other models, to determine possible effects of disposal. Then, before any programme is drawn up and any measurements are made, the following questions should be addressed:

i) what exactly should be measured;
ii) what is the purpose of monitoring a particular variable, contaminant or biological effect;
iii) in what compartment or at which locations can measurements most effectively be made;
iv) for how long should the measurements continue to be made to meet the originally defined aim;
v) what should be the temporal and spatial scale of measurements made to test the hypothesis.

10. It is recommended that the choice of contaminants to be monitored should depend primarily on the ultimate purposes of monitoring. One should certainly not have to monitor regularly for all contaminants at all sites and it should not be necessary to use more than one substrate or effect to meet each aim.

11. A major requirement is to develop criteria describing the specific environmental effects of dredging that should be prevented outside designated dredging and disposal areas (see Part A, section 2).

Monitoring

12. The disposal of dredged material has its primary impact at the seabed. Thus although a consideration of water column effects cannot be discounted in the early stages of monitoring planning, it is often possible to restrict subsequent monitoring to the seabed.

13. Where it is considered that effects will be largely physical, monitoring may be based on remote methods such as sidescan sonar to identify changes in the character of the seabed and bathymetric techniques (e.g. echosounding) to identify areas of dredged material accumulation. Both of these techniques will require a certain amount of sediment sampling to establish ground-truth. In addition, multispectral scanning can be used for monitoring dispersion of suspended material (plumes, etc.).

14. Tracer tests may also prove useful in following the dispersal of the dredged material and assess any minor accumulation of material not detected by bathymetric surveys.

15. When a contaminated dredged material is deposited, it may be necessary to measure its chemical components to ensure that unacceptable accumulation of these components does not occur.

16. Where either physical or chemical effects at the seabed are expected, it will be necessary to examine the benthic community structure in areas where the dredged material disperses. In the case of chemical effects it may also be necessary to examine the chemical quality of the biota (including fish).

17. In order to assess the impact it will be necessary to compare the physical, chemical or biological quality of the affected areas with reference sites located away from dredged material dispersal pathways. Such areas can be identified during the early stages of the impact assessment.

18. The spatial extent of sampling will need to take into account the size of the area designated for dumping, any areas of possible short dumping, the mobility of the dumped dredged material and water movements which will determine the direction and extent of sediment transport. It may be possible to limit sampling within the disposal site itself as effects in this area are accepted and their definition in detail may be unnecessary. However, some sampling should be carried out to aid the identification of the type of effect which may be expected in other areas and for scientific rigour.

19. The frequency of survey will depend on a number of factors. Where a disposal operation has been going on for several years it may be possible to establish the effect at a steady state of input and repeated surveys would only be necessary if changes are made to the operation (quantities or type of dredged material deposited, method of disposal etc.).

20. If it were decided to monitor the recovery of an area which was no longer used for dredged material disposal, more frequent measurement might be needed.

21. Since the effects of dredged material disposal are likely to be similar in many areas, there appears to be little justification for monitoring all sites, particularly those receiving small quantities of dredged material. It would be more effective to carry out more detailed investigations at a few carefully chosen sites (e.g. those subject to large inputs of dredged material) to increase understanding of effects and processes.

22. 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 reporting will depend upon the scale of disposal activity and the intensity of monitoring. Contracting Parties should inform the Secretariat of their monitoring activities and submit reports when they are available.

# TECHNICAL SUPPLEMENTS TO THE GUIDELINES FOR THE MANAGEMENT OF DREDGED MATERIAL

TECHNICAL ANNEX 1

## Analytical Requirements for Dredged Material Assessment

1. This Annex amplifies the analytical requirements set out in paragraphs 4.9 - 4.12 of the 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 3.1 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 the dredged material meets one of the exemption criteria under paragraph 3.3 of the Guidelines then the material will not require further testing.

4. The sequence of tiers is as follows:

- assessment of physical properties;
- assessment of chemical properties;
- assessment of biological properties and effects.

A pool of supplementary information, determined by local circumstances may be used to augment each tier.

5. It is important that the assessment procedure must at each stage take account of the method of analysis.

**Tier I : PHYSICAL PROPERTIES.**

It is strongly recommended that the following determinations are carried out:

- grain size (% sand, silt, clay);
- percent solids (dry matter);
- density/specific gravity;
- organic matter (as total organic carbon).

## Tier II : CHEMICAL PROPERTIES

Primary group determinants:

In all cases when chemical analysis is required the concentrations of the following trace metals should be determined:

| | | | |
|---|---|---|---|
| Cadmium (Cd) | Copper (Cu) | Mercury (Hg) | Zinc (Zn) |
| Chromium (Cr) | Lead (Pb) | Nickel (Ni) | |

In addition the concentrations of the following polychlorinated biphenyl (PCB) congeners should be determined:

IUPAC nos 28, 52, 101, 118, 138, 153 and 180.

Analysis should be carried out on the whole sediment (< 2mm).

The determination of PCBs will not be necessary when:

- there are no known sources (point or diffuse) of contamination or historic inputs;
- the sediments are predominantly coarse; and
- the levels of total organic carbon are low.

Secondary group determinants:

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

arsenic; other chlorobiphenyls (IUPAC Nos 18, 31, 44, 66/95, 110, 149, 187 and 170); organophosphorus pesticides; polycyclic aromatic hydrocarbons (PAHS) oil; organochlorine pesticides; tri-organotincompounds; polychlorinated dibenzodioxins (PCDDs)/polychlorinated dibenzofurans (PCDFs).

## Tier III : BIOLOGICAL PROPERTIES AND EFFECTS

No guidance is offered at this stage

## SUPPLEMENTARY INFORMATION

The need for this information will be determined by local circumstance and may form an essential part of the management decision. Appropriate data might include : redox potential, sediment oxygen demand, total nitrogen, total phosphorus, iron, manganese, mineralogical information or parameters for normalizing trace metal data (eg aluminium, lithium, scandium - see Technical Annex 2).

TECHNICAL ANNEX 2

**Normalization techniques for studies on the spatial distribution of contaminants***

1. Introduction

Normalization in this discussion is defined as a procedure to compensate for the influence of natural processes on the measured variability of the concentration of contaminants in sediments. Most contaminants (metals, pesticides, hydrocarbons) show high affinity to particulate matter and are, consequently, enriched in bottom sediments of estuaries and coastal areas. In practice, natural and anthropogenic substances entering the marine system are subjected to a variety of biogeochemical processes. As a result, they become associated with fine-grained suspended solids and colloidal organic and inorganic particles. The ultimate fate of these substances is determined, to a large extent, by particulate dynamics. They therefore tend to accumulate in areas of low hydrodynamic energy, where fine material is preferentially deposited. In areas of higher energy, these substances are "diluted" by coarser sediments of natural origin and low contaminant content.

It is obvious that the grain size is one of the most important factors controlling the distribution of natural and anthropogenic components in the sediments. It is, therefore, essential to normalize for the effects of grain size in order to provide a basis for meaningful comparisons of the occurrence of substances in sediments of various granulometry and texture within individual areas or among areas. Excess levels, above normalized background values, could then be used to establish sediment quality.

For any study of sediments, a basic amount of information on their physical and chemical characteristics is required before an assessment can be made on the presence or absence of anomalous contaminant concentrations. The concentration at which contamination can be detected depends on the sampling strategy and the number of physical and chemical variables that are determined in individual samples.

The various granulometric and geochemical approaches used for the normalization of trace elements data as well as the identification of contaminated sediments in estuarine and coastal sediments has been extensively reviewed by Loring (1988). Two normalization approaches widely used in oceanography and in atmospheric sciences have been selected here. The first is purely physical and consists of characterizing the sediment by measuring its content of fine material. The second approach is chemical in nature and is based on the fact that the small size fraction is usually rich in clay minerals, iron and manganese oxi-hydroxides and organic matter. Furthermore, these components often exhibit a high affinity for organic and inorganic contaminants and are responsible for their enrichment in the fine fraction. Chemical parameters (e.g., Al, Sc, Li) representative of these components may thus be used to characterize the small size fraction under natural conditions.

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* Extract from the 1989 ACMP Report (Section 14).ICES Coop.Res.Rep.167,pp68-76

It is strongly suggested that several parameters be used in the evaluation of the quality of sediments. The types of information that can be gained by the utilization of these various parameters are often complementary and extremely useful considering the complexity and diversity of situations encountered in the sedimentary environment. Furthermore, measurements of the normalizing parameters selected here are rather simple and inexpensive.

This report presents general guidelines for sample preparation, analytical procedures, and interpretation of physical and chemical parameters used for the normalization of geochemical data. Its purpose is to demonstrate how to collect sufficient data to normalize for the grain-size effect and to allow detection, at various levels, of anomalous concentrations of contaminants within estuarine and coastal sediments.

## 2. Sampling Strategy

Ideally, a sampling strategy should be based on a knowledge of the source of contaminants, the transport pathways of suspended matter and the rates of accumulation of sediments in the region of interest. However, existing data are often too limited to define the ideal sampling scheme. Since contaminants concentrate mainly in the fine fraction, sampling priority should be given to areas containing fine material that usually correspond to zones of deposition.

The high variability in the physical, chemical and biological properties of sediments implies that an evaluation of sediment quality in a given area must be based on a sufficient number of samples. This number can be evaluated by an appropriate statistical analysis of the variance within and between samples. To test the representativity of a single sediment specimen at a given locality, several samples at one or two stations should be taken.

The methodology of sampling and analysis should follow the recommendations outlined in the "Guidelines for the Use of Sediments as a Monitoring Tool for Contaminants in the Marine Environment" (ICES 1987). In most cases, the uppermost layer of sediments collected with a tightly closing grab sampler (Level I in the Guidelines) is sufficient to provide the information concerning the contamination of the sediments of a given area compared to sediments of uncontaminated locations or other reference material.

Another significant advantage of using sediments as monitoring devices is that they have recorded the historical evolution of the composition of the suspended matter deposited in the area of interest. Under favourable conditions, the degree of contamination may be estimated by comparison of surface sediments with deeper samples, taken below the biological mixing zone. The concentrations of trace elements in the deeper sediment may represent the natural background level in the area in question and can be defined as baseline values. This approach requires sampling with a box-corer or a gravity corer (Levels II and III in the Guidelines).

## 3. Analytical Procedures

Typical analytical procedures to be followed are outlined in Table 1. The number of steps that are selected will depend on the nature and extent of the investigation.

### 3.1 Grain size fractionation

It is recommended that at least the amount of material <63 $\mu$m, corresponding to the sand/silt classification limit, be determined. The sieving of the sample at 63 $\mu$m is, however, often not sufficient, especially when sediments are predominantly fine grained. In such cases, it is better

to normalize with lower size thresholds since the contaminants are mainly concentrated in the fraction <20 $\mu$m, and even more specifically in the clay fraction (<2 $\mu$m). It is thus proposed that a determination be made, on a sub-sample, of the weight fraction <20 $\mu$m and that <2 $\mu$m with the aid of a sedimentation pipette or by elutriation. Several laboratories are already reporting their results relative to the content of fine fractions of various sizes and these results may be useful for comparison among areas.

### 3.2 Analysis of contaminants

It is essential to analyze the total content of contaminants in sediments if quality assessment is the goal of the study, and it is thus recommended that the unfractionated sample (<2 mm) be analyzed in its entirety. The total content of elements can be determined either by non-destructive methods, such as X-ray fluorescence or neutron activation, or by a complete digestion of the sediments (involving the use of hydrofluoric acid (HF)) followed by methods such as atomic absorption spectrophotometry or emission spectroscopy. In the same way, organic contaminants should be extracted with the appropriate organic solvent from the total sediment.

An individual size fraction of the total sediment may be used for subsequent analysis, if required, to determine the absolute concentrations of contaminants in that fraction, providing that its contribution to the total is kept in perspective when interpreting the data. Such size fraction information might be useful in tracing the regional dispersal of metals associated with specific grain-size fractions, when the provenance of the material remains the same. However, sample fractionation is a tedious procedure that introduces considerable risk of contamination and potential losses of contaminants due to leaching. The applicability of this approach is thus limited.

## 4. Normalization Procedures

### 4.1 Granulometric normalization

Since contaminants tend to concentrate in the fine fraction of sediments, correlations between total concentrations of contaminants and the weight percent of the fine fraction, determined separately on a sub-sample of the sediment by sieving or gravity settling, constitute a simple but powerful method of normalization. Linear relationships between the concentration and the weight percentage of the fine fraction are often found and it is then possible to extrapolate the relationships to 100% of the fraction studied, or to characterize the size dependence by the slope of the regression line.

### 4.2 Geochemical normalization

Granulometric normalization alone is inadequate to explain all the natural trace variability in the sediments. In order to interpret better the compositional variability of sediments, it is also necessary to attempt to distinguish the sedimentary components with which the contaminants are associated throughout the grain-size spectrum. Since effective separation and analysis of individual components of sediments is extremely difficult, such associations must rest on indirect evidence of these relationships.

Since contaminants are mainly associated with the clay minerals, iron and manganese oxi-hydroxides and organic matter abundant in the fine fraction of the sediments, more information

can be obtained by measuring the concentrations of elements representative of these components in the samples.

An inert element such as aluminium, a major constituent of clay minerals, may be selected as an indicator of that fraction. Normalized concentrations of trace elements with respect to aluminium are commonly used to characterize various sedimentary particulate materials (see below). It may be considered as a conservative major element, that is not affected significantly by, for instance, early diagenetic processes and strong redox effects observed in sediments.

In the case of sediments derived from the glacial erosion of igneous rocks, it has been found that contaminant/Al ratios are not suitable for normalizing for granular variability (Loring, 1988). Lithium, however, appears to be an ideal element to normalize for the grain size effect in this case and has the additional advantage of being equally applicable to non-glacial sediments.

In addition to the clay minerals, Mn and Fe compounds are often present in the fine fraction, where they exhibit adsorption properties strongly favouring the incorporation of various contaminants. Mn and Fe are easily analyzed by flame atomic absorption spectrometry and their measurement may provide insight into the behaviour of contaminants.

Organic matter also plays an important role as scavenger of contaminants and controls, to a major degree, the redox characteristics of the sedimentary environment.

Finally, the carbonate content of sediments is easy to determine and provides additional information on the origin and the geochemical characteristics of the sediments. Carbonates usually contain insignificant amounts of trace metals and act mainly as a diluent. Under certain circumstances, however, carbonates can fix contaminants such as cadmium and copper. A summary of the normalization factors is given in Table 2.

### 4.3 Interpretation of the data

The simplest approach in the geochemical normalization of substances in sediments is to express the ratio of the concentration of a given substance to that of the normalizing factor.

Normalization of the concentration of trace elements with respect to aluminium (or scandium) has been used widely and reference values on a global scale have been established for trace elements in various compartments: crustal rocks, soils, atmospheric particles, river-borne material, marine clays and marine suspended matter (cf., e.g., Martin and Whitfield, 1983; Buat-Menard and Chesselet, 1979).

This normalization also allows the definition of an enrichment factor for a given element with respect to a given compartment. The most commonly used reference level of composition is the mean global normalized abundance of the element in crustal rock (Clarke value). The enrichment factor EF is given by:

$$EF_{crust} = (X/Al)_{sed} / (X/Al)_{crust}$$

where X/Al refers to the ratio of the concentration of element X to that of Al in the given compartment.

However, estimates of the degree of contamination and time trends of contamination at each sampling location can be improved upon by making a comparison with metal levels in sediments equivalent in origin and texture.

These values can be compared to the normalized values obtained for the sediments of a given area. Large departures from these mean values indicate either contamination of the sediment or local mineralization anomalies.

When other variables (Fe, Mn, organic matter and carbonates) are used to characterize the sediment, regression analysis of the contaminant concentrations with these parameters often yields useful information on the source of contamination and on the mineralogical phase associated with the contaminant.

A linear relationship between the concentration of trace constituents and that of the normalization factor has often been observed (Windom et al., 1989). In this case and if the natural geochemical population of a given element in relation to the normalizing factor can be defined, samples with anomalous normalized concentrations are easily detected and may indicate anthropogenic inputs.

According to this method, the slope of the linear regression equation can be used to distinguish the degree of contamination of the sediments in a given area. This method can also be used to show the change of contaminant load in an area if the method is used on samples taken over intervals of some years (Cato, 1986).

A multi-element/component study in which the major and trace metals, along with grain size and organic carbon contents, have been measured allows the interrelationships between the variables to be established in the form of a correlation matrix. From such a matrix, the most significant ratio between trace metal and relevant parameter(s) can be determined and used for identification of metal carriers, normalization and detection of anomalous trace metal values. Factor analyses can sort all the variables into groups (factors) that are associations of highly correlated variables, so that specific and/or non-specific textural, mineralogical, and chemical factors controlling the trace metal variability may be inferred from the data set.

Natural background levels can also be evaluated on a local scale by examining the vertical distribution of the components of interest in the sedimentary column. This approach requires, however, that several favourable conditions are met: steady composition of the natural uncontaminated sediments; knowledge of the physical and biological mixing processes within the sediments; absence of diagenetic processes affecting the vertical distribution of the component of interest. In such cases, grain-size and geochemical normalization permits compensation for the local and temporal variability of the sedimentation processes.

## 5. Conclusions

The use of the granulometric measurements and of component/reference element ratios are useful approaches towards complete normalization of granular and mineralogical variations, and identification of anomalous concentrations of contaminants in sediments. Their use requires that a large amount of good analytical data be collected and specific geochemical conditions be met before all the natural variability is accounted for, and the anomalous contaminant levels can be detected. Anomalous metal levels, however, may not always be attributed to contamination, but rather could easily be a reflection of differences in sediment provenance.

Geochemical studies that involve the determination of the major and trace metals, organic contaminants, grain size parameters, organic matter, carbonate, and mineralogical composition in the sediments are more suitable for determining the factors that control the contaminant distribution than the measurement of absolute concentrations in specific size fractions or the use of potential contaminant/reference metal ratios alone. They are thus more suitable for distinguishing between uncontaminated and contaminated sediments. This is because such studies can identify the factors that control the variability of the concentration of contaminants in the sediments.

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**Table 1:** **A typical approach for determinations of physical and chemical parameters in marine sediments**

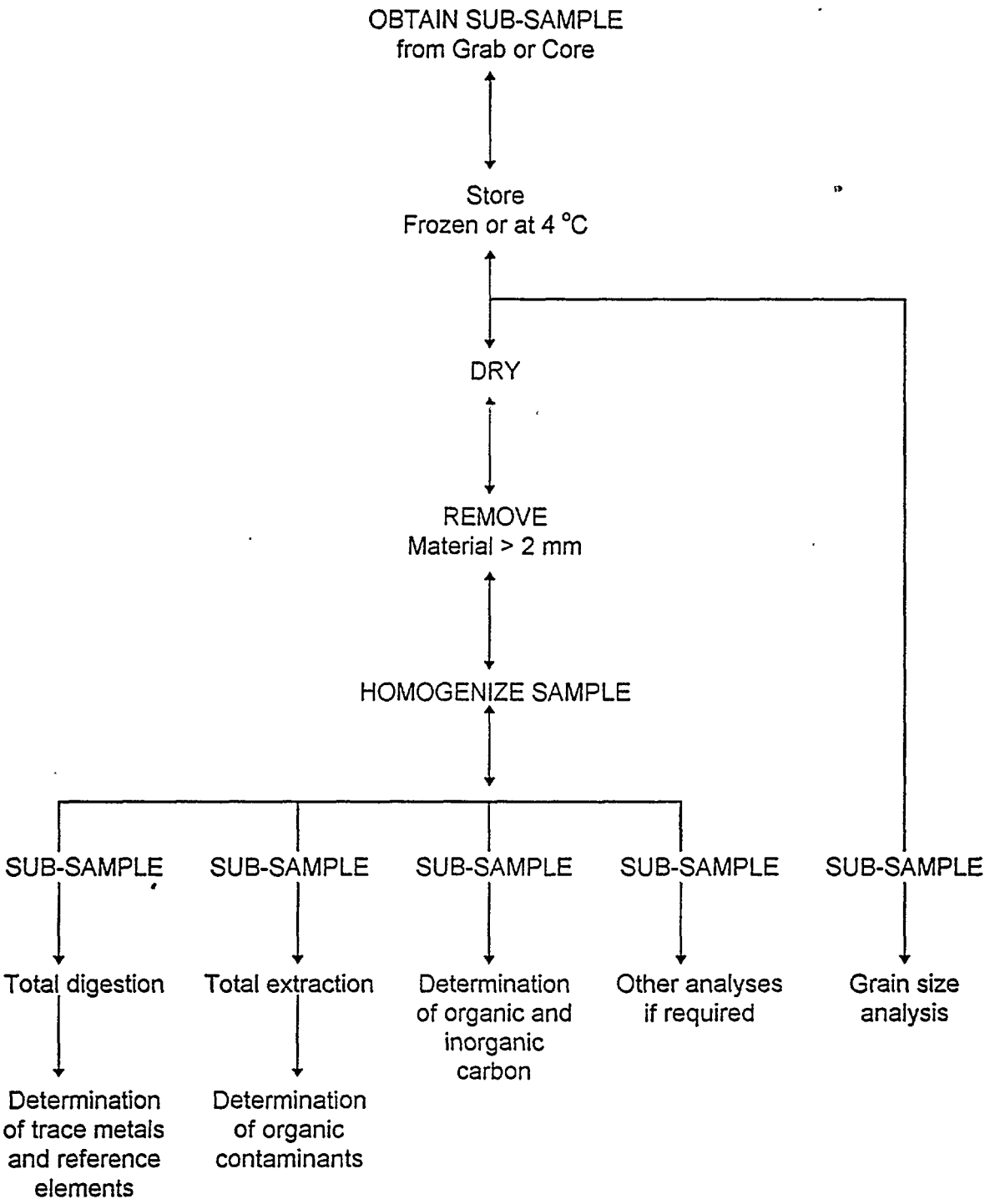

**Table 2: Summary of normalization factors**

| NORMALIZATION FACTOR | SIZE ($\mu$m) | INDICATOR | ROLE |
|---|---|---|---|
| Textural | | | Determines physical sorting and depositional pattern of metals |
| Sand | 2000 - 63 | Coarse-grained metal-poor minerals/compounds | Usually diluent of trace metal concentrations |
| Mud | < 63 | Silt and clay size metal-bearing minerals/compounds | Usually overall concentrator of trace metals |
| Clay | < 2 | Metal-rich clay minerals | Usually fine-grained accumulator of trace metals |
| Chemical | | | |
| Si | | Amount and distribution of metal-poor quartz | Coarse-grained diluter of contaminants |
| Al | | Al silicates, but used to account for granular variations of metal-rich fine silt and clay size Al-silicates | Chemical tracer of Al-silicates, particularly the clay minerals |
| Li, Sc | | Structurally combined in clay minerals and micas | Tracer of clay minerals, particularly in sediments containing Al-silicates in all size fractions |
| Organic carbon | | Fine-grained organic matter | Tracer of organic contaminants. Sometimes accumulator of trace metals like Hg and Cd |
| Fe, Mn | | Metal-rich silt and clay size Fe-bearing clay minerals, Fe-rich heavy minerals and hydrous Fe and Mn oxides | Chemical tracer for Fe-rich clay fraction. High absorption capacity of organic and inorganic contaminants |
| Carbonates | | Biogenic marine sediments | Diluter of contaminants. Sometimes accumulate trace metals like Cd and Cu |