

INTERNATIONAL MARITIME ORGANIZATION



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SPECIFIC GUIDELINES FOR ASSESSMENT OF *DREDGED MATERIAL*

1 INTRODUCTION

1.1 Dredging is essential to maintain navigation in ports, harbours, marinas and inland waterways; for the development of port facilities; for flood mitigation; and for removal of sediments from structures, basins and water intakes. Much of the material removed during these necessary activities may require disposal at sea. The greater proportion of the total amount of material dredged worldwide 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 considering disposal or use of these sediments.

1.2 Environmental impacts may result from both dredging activities and the disposal of dredged material. These specific Guidelines, however, deal only with aspects under the purview of the London Convention 1972 and the 1996 Protocol, that is, the disposal of dredged material.

Evaluation of need for dredging and disposal

1.3 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, etc., are maintained at their designed dimensions; and
- .3 *Clean up dredging* - deliberate removal of contaminated material for human health and environmental protection purposes.

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.

1.4 The Guidelines for the Assessment of Wastes or Other Matter that May be Considered for Dumping¹, referred to in short as the “Generic Guidelines”, as well as the Specific Guidelines for Assessment of Dredged Material addressed in this document are intended for use by national authorities responsible for regulating dumping of wastes and embody a mechanism to guide national authorities in evaluating applications for dumping of wastes in a manner consistent with the provisions of the London Convention 1972 or the 1996 Protocol thereto. Annex 2 to the 1996 Protocol places emphasis on progressively reducing the need to use the sea for dumping of wastes. Furthermore, it recognizes that avoidance of pollution demands rigorous controls on the emission and dispersion of contaminating substances and the use of scientifically based procedures for selecting appropriate options for waste disposal. When applying these Guidelines uncertainties in relation to assessments of impacts on the marine environment will need to be considered and a precautionary approach applied in addressing these uncertainties. They should be applied with a view that acceptance of dumping under certain circumstances does not remove the obligation to make further attempts to reduce the necessity for dumping.

1.5 The 1996 Protocol to the London Convention 1972 follows an approach under which dumping of wastes or other matter is prohibited except for those materials specifically enumerated in Annex I, and in the context of that Protocol, these Guidelines would apply to the materials listed in that Annex. The London Convention 1972 prohibits the dumping of certain wastes or other matter specified therein and in the context of that Convention these Guidelines meet the requirements of its Annexes for wastes not prohibited for dumping at sea. When applying these Guidelines under the London Convention 1972, they should not be viewed as a tool for the reconsideration of dumping of wastes or other matter in contravention of Annex I to the London Convention 1972.

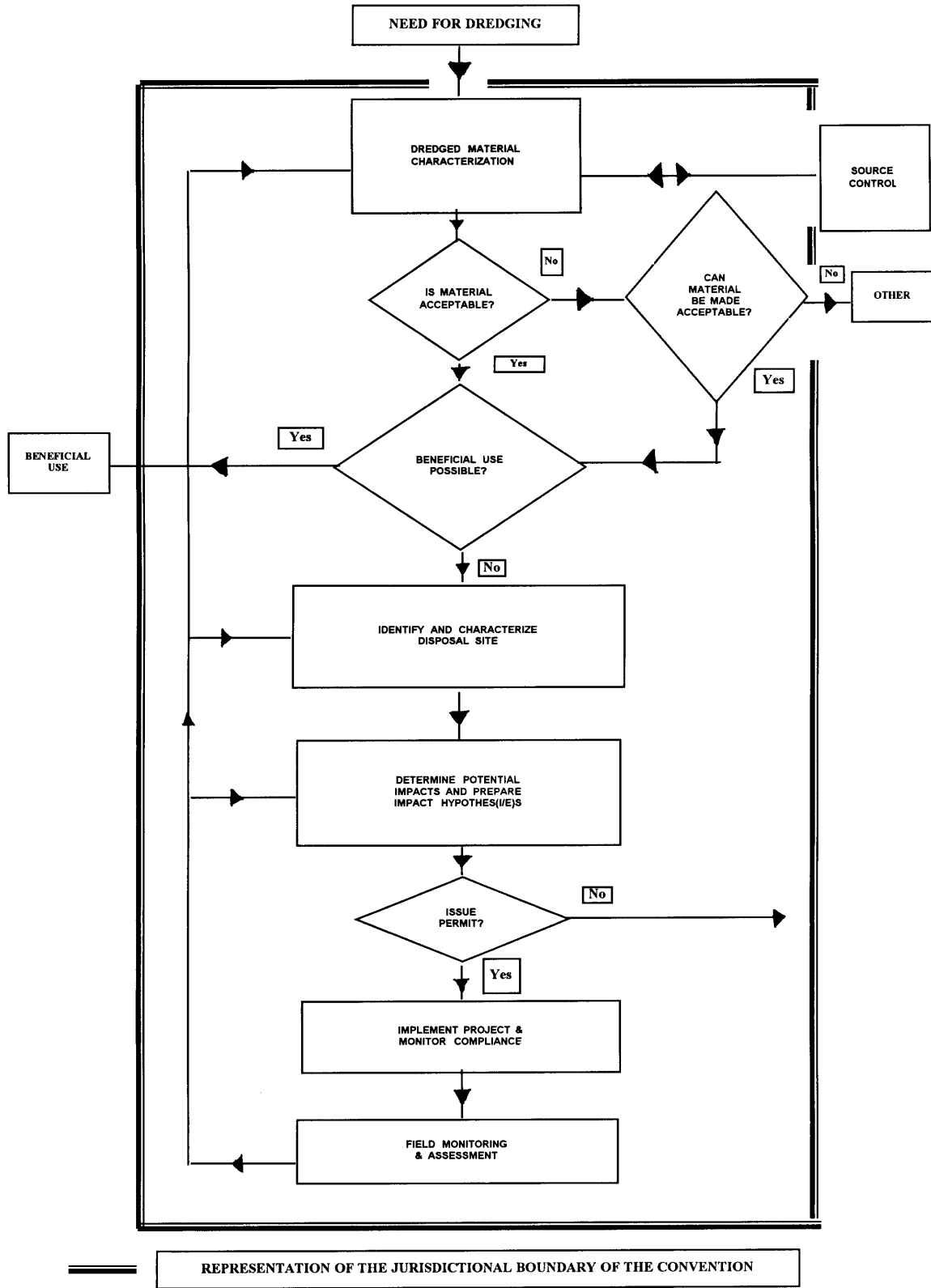
1.6 The schematic shown in Figure 1 provides a clear indication of the stages in the application of this guidance where important decisions should be made. In general, national authorities should use this schematic in an iterative manner ensuring that all steps receive consideration before a decision is made to issue a permit. Figure 1 illustrates the relationship between the operational components of Annex 2 of the 1996 Protocol and contains the following elements:

- .1 Dredged Material Characterization (Chapter 4);
- .2 Waste Prevention Audit and Evaluation of Disposal Options (Chapters 2 and 3);
- .3 Is Material Acceptable (Chapter 5) (Action List);
- .4 Identify and Characterize Dump-site (Chapter 6) (Dump-site Selection);
- .5 Determine Potential Impacts and Prepare Impact Hypothesis(es) (Chapter 7) (Assessment of Potential Effects);
- .6 Issue Permit (Chapter 9) (Permit and Permit Conditions);
- .7 Implement Project and Monitor Compliance (Chapter 8) (Monitoring); and
- .8 Field Monitoring and Assessment (Chapter 8) (Monitoring).

¹ The Nineteenth Consultative Meeting of Contracting Parties to the London Convention 1972 adopted these Guidelines in 1997.

Figure 1

DREDGED MATERIAL ASSESSMENT FRAMEWORK



1.7 These Guidelines, which were adopted in 2000 by the Twenty-second Consultative Meeting, are specific to dredged material. They are based on the generic Guidelines of 1997 and replace the “Dredged Material Assessment Framework” adopted in 1995 by the Eighteenth Consultative Meeting (resolution LC.52 (18)), which, in turn, replaced the “Guidelines for the Application of the Annexes to the Disposal of Dredged Material”, adopted in 1986 by the Tenth Consultative Meeting (resolution LDC.23 (10)). Adherence to the following represents neither a more restrictive nor a less restrictive regime than that of the generic Guidelines of 1997.

2 WASTE PREVENTION AUDIT

2.1 For dredged material, the goal of waste management should be to identify and control the sources of contamination. Contaminant source evaluation and control should be carried out as follows:

- .1 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;
- .2 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 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.

3 EVALUATION OF DISPOSAL OPTIONS

3.1 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

3.2 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 4 of these Guidelines 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 *Agriculture 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

3.3 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.

3.4 Treatment, such as separation of contaminated fractions, can make the material suitable for a beneficial use and should be considered before opting for sea disposal. Disposal management techniques include placement on or burial in the sea floor followed by clean sediment capping, utilization of geo-chemical 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.

3.5 A permit to dump wastes or other matter shall be refused if the permitting authority determines that appropriate opportunities exist to re-use, recycle or treat the waste without undue risks to human health or the environment or disproportionate costs. The practical availability of other means of disposal should be considered in the light of a comparative risk assessment involving both dumping and the alternatives.

4 DREDGED MATERIAL CHARACTERIZATION²

Physical characterization

4.1 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.

² A good perspective for managing sediments is contained in the GIPME Report entitled: "Guidance on Assessment of Sediment Quality". This report describes various approaches to assessing anthropogenic impacts on marine sediments and associated risks to marine life and human health. It is concluded that numerical sediment quality criteria are unsuitable for widespread application because chemical measurements alone cannot reliably predict sediment toxicity. The report does not provide a rigid framework for assessment of sediment quality but does identify empirical procedures that can be used to distinguish among natural sedimentary conditions, anthropogenically disturbed (e.g., contaminated) sediments and sediment conditions causing adverse effects (i.e., pollution). This report can be obtained from IMO free of charge.

The basic physical characteristics required are the amount of material, particle size distribution and specific gravity of solids.

Exemptions from detailed characterization

4.2 Dredged material may be exempted from the full characterization requested in paragraphs 4.3 to 4.9 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

4.3 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.

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

- .1 major geo-chemical 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.

4.5 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.

4.6 Further information may also be useful in interpreting the results of chemical testing, such as grain size distribution, total organic carbon (TOC), and other normalizing constituents.

Biological characterization

4.7 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.

4.8 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.

4.9 Biological tests should incorporate species that are considered appropriately sensitive and representative and exposures should be to representative materials so as to determine the potential for:

- .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

at and in the vicinity of the disposal site.

4.10 If dredged material is so poorly characterized that proper assessment cannot be made of its potential impacts on human health and the environment, it shall not be dumped.

5 ACTION LIST

5.1 The Action List provides a screening mechanism for determining whether a material is considered acceptable for dumping. It constitutes a crucial part of Annex 2 to the 1996 Protocol and the Scientific Group will continuously review all aspects of it to assist Contracting Parties with its application. It may also be used in meeting the requirements of Annexes I and II to the London Convention 1972.

5.2 Each Contracting Party shall develop a national Action List to provide a mechanism for screening candidate wastes and their constituents on the basis of their potential effects on human health and the marine environment. In selecting substances for consideration in an Action List, priority shall be given to toxic, persistent and bio-accumulative substances from anthropogenic sources (e.g., cadmium, mercury, organohalogens, petroleum hydrocarbons and, whenever relevant, arsenic, lead, copper, zinc, beryllium, chromium, nickel and vanadium, organosilicon compounds, cyanides, fluorides and pesticides or their by-products other than organohalogens). An Action List can also be used as a trigger mechanism for further waste prevention considerations.

5.3 For an individual waste category, it may be possible to define national action levels on the basis of concentration limits, biological responses, environmental quality standards, flux considerations or other reference values.

5.4 An Action List shall specify an upper level and may also specify a lower level. The upper level should be set so as to avoid acute or chronic effects on human health or on sensitive marine organisms representative of the marine ecosystem. Application of an Action List will result in three possible categories of waste:

- .1 wastes which contain specified substances, or which cause biological responses, *exceeding* the relevant upper level shall not be dumped, unless made acceptable for dumping through the use of management techniques or processes.

Management options, for dredged material that would not meet the requirements of the Convention, are given in paragraphs 3.3 and 3.4 above;

- .2 wastes which contain specified substances, or which cause biological responses, *below* the relevant lower levels should be considered to be of little environmental concern in relation to dumping; and
- .3 wastes, which contain specified substances, or which cause biological responses, *below* the upper level but *above* the lower level require more detailed assessment before their suitability for dumping can be determined.

6 DUMP-SITE SELECTION

Site selection considerations

6.1 Proper selection of a dump-site at sea for the reception of waste is of paramount importance.

6.2 Information required to select a dump-site shall include:

- .1 physical, chemical and biological characteristics of the water-column and the seabed;
- .2 location of amenities, values and other uses of the sea in the area under consideration;
- .3 assessment of the constituent fluxes associated with dumping in relation to existing fluxes of substances in the marine environment; and
- .4 economic and operational feasibility.

6.3 Guidance for procedures to be followed in dump-site selection can be found in a report of the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP Reports and Studies No. 16 - Scientific Criteria for the Selection of Waste Disposal Sites at Sea). Prior to selecting a dump-site, it is essential that data be available on the oceanographic characteristics of the general area in which the site is to be located. This information can be obtained from the literature but fieldwork should be undertaken to fill the gaps. Required information includes:

- .1 the nature of the seabed, including its topography, geo-chemical and geological characteristics, its biological composition and activity, and prior dumping activities affecting the area;
- .2 the physical nature of the water column, including temperature, depth, possible existence of a thermocline/pycnocline and how it varies in depth with season and weather conditions, tidal period and orientation of the tidal ellipse, mean direction and velocity of the surface and bottom drifts, velocities of storm-wave induced bottom currents, general wind and wave characteristics, and the average number of storm days per year, suspended matter; and
- .3 the chemical and biological nature of the water column, including pH, salinity, dissolved oxygen at surface and bottom, chemical and biochemical oxygen demand, nutrients and their various forms and primary productivity.

6.4 Some of the important amenities, biological features and uses of the sea to be considered in determining the specific location of the dump-site are:

- .1 the shoreline and bathing beaches;
- .2 areas of beauty or significant cultural or historical importance;
- .3 areas of special scientific or biological importance, such as sanctuaries;
- .4 fishing areas;
- .5 spawning, nursery and recruitment areas;
- .6 migration routes;
- .7 seasonal and critical habitats;
- .8 shipping lanes;
- .9 military exclusion zones; and
- .10 engineering uses of the seafloor, including mining, undersea cables, desalination or energy conversion sites.

Size of the dump-site

6.5 Size of the dump-site is an important consideration for the following reasons:

- .1 it should be large enough, unless it is an approved dispersion site, to have the bulk of the material remain either within the site limits or within a predicted area of impact after dumping;
- .2 it should be large enough to accommodate anticipated volumes of solid waste and/or liquid wastes to be diluted to near background levels before or upon reaching site boundaries;
- .3 it should be large enough in relation to anticipated volumes for dumping so that it would serve its function for many years; and
- .4 it should not be so large that monitoring would require undue expenditure of time and money.

Site capacity

6.6 In order to assess the capacity of a site, especially for solid wastes, the following should be taken into consideration:

- .1 the anticipated loading rates per day, week, month or year;
- .2 whether or not it is a dispersive site; and
- .3 the allowable reduction in water depth over the site because of mounding of material.

Evaluation of potential impacts

6.7 An important consideration in determining the suitability of a waste for dumping at a specific site is the degree to which this results in increased exposures of organisms to substances that may cause adverse effects.

6.8 The extent of adverse effects of a substance is a function of the exposures of organisms (including humans). Exposure, in turn, is a function, *inter alia*, of input flux and the physical, chemical and biological processes that control the transport, behaviour, fate and distribution of a substance.

6.9 The presence of natural substances and the ubiquitous occurrence of contaminants mean that there will always be some pre-existing exposures of organisms to all substances contained in any waste that might be dumped. Concerns about exposures to hazardous substances thus relate to additional exposures as a consequence of dumping. This, in turn, can be translated back to the relative magnitude of the input fluxes of substances from dumping compared with existing input fluxes from other sources.

6.10 Accordingly, due consideration needs to be given to the relative magnitude of the substance fluxes associated with dumping in the local and regional area surrounding the dump-site. In cases where it is predicted that dumping will substantially augment existing fluxes associated with natural processes, dumping at the site under consideration should be deemed inadvisable.

6.11 In the case of synthetic substances, the relationship between fluxes associated with dumping and pre-existing fluxes in the vicinity of the site may not provide a suitable basis for decisions.

6.12 Temporal characteristics should be considered to identify potentially critical times of the year (e.g., for marine life) when dumping should not take place. This consideration leaves periods when it is expected that dumping operations will have less impact than at other times. If these restrictions become too burdensome and costly, there should be some opportunity for compromise in which priorities may have to be established concerning species to be left wholly undisturbed. Examples of such biological considerations are:

- .1 periods when marine organisms are migrating from one part of the ecosystem to another (e.g., from an estuary to open sea or vice versa) and growing and breeding periods;
- .2 periods when marine organisms are hibernating on or are buried in the sediments; and
- .3 periods when particularly sensitive and possibly endangered species are exposed.

Contaminant mobility

6.13 Contaminant mobility is dependent upon several factors, among which are:

- .1 type of matrix;
- .2 form of contaminant;
- .3 contaminant partitioning;
- .4 physical state of the system, e.g., temperature, water flow, suspended matter;
- .5 physico-chemical state of the system;
- .6 length of diffusion and advection pathways; and
- .7 biological activities e.g., bioturbation.

7 ASSESSMENT OF POTENTIAL EFFECTS

7.1 Assessment of potential effects should lead to a concise statement of the expected consequences of the sea or land disposal options, i.e., the "Impact Hypothesis". It provides a basis for deciding whether to approve or reject the proposed disposal option and for defining environmental monitoring requirements. As far as possible, waste management options causing dispersion and dilution of contaminants in the environment should be avoided and preference given to techniques that prevent the input of the contaminants to the environment.

7.2 The assessment for dumping should integrate information on waste characteristics, conditions at the proposed dump-site(s), fluxes and proposed disposal techniques and specify 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.

7.3 The assessment should be as comprehensive as possible. The primary potential impacts should be identified during the dump-site selection process. These are considered to pose the most serious threats to 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 primary concerns in this regard.

7.4 In constructing an impact hypothesis, particular attention should be given to, but not limited to, potential impacts on amenities (e.g., presence of floatables), sensitive areas (e.g., spawning, nursery or feeding areas), habitat (e.g., biological, chemical and physical modification), migratory patterns and marketability of resources. Consideration should also be given to potential impacts on other uses of the sea including: fishing, navigation, engineering uses, areas of special concern and value, and traditional uses of the sea.

7.5 Even the least complex and most innocuous wastes may have a variety of physical, chemical and biological effects. Impact hypotheses cannot attempt to reflect them all. It must be recognized that even the most comprehensive impact hypotheses may not address all possible scenarios such as unanticipated impacts. It is therefore imperative that the monitoring programme be linked directly to the hypotheses and serve as a feedback mechanism to verify the predictions and review the adequacy of management measures applied to the dumping operation and at the dump-site. It is important to identify the sources and consequences of uncertainty.

7.6 The expected consequences of dumping should be described in terms of affected habitats, processes, species, communities and uses. The precise nature of the predicted effect (e.g., change, response, or interference) should be described. The effect should be quantified in sufficient detail so that there would be no doubt as to the variables to be measured during field monitoring. In the latter context, it would be essential to determine "where" and "when" the impacts can be expected.

7.7 Emphasis should be placed on biological effects and habitat modification as well as physical and chemical change. However, if the potential effect is due to substances, the following factors should be addressed:

- .1 estimates of statistically significant increases of the substance in seawater, sediments, or biota in relation to existing conditions and associated effects; and

- .2 estimate of the contribution made by the substance to local and regional fluxes and the degree to which existing fluxes pose threats or adverse effects on the marine environment or human health.

7.8 In the case of repeated or multiple dumping operations, impact hypotheses should take into account the cumulative effects of such operations. It will also be important to consider the possible interactions with other waste dumping practices in the area, both existing and planned.

7.9 An analysis of each disposal option should be considered in light of a comparative assessment of the following concerns: human health risks, environmental costs, hazards (including accidents), economics and exclusion of future uses. If this assessment reveals that adequate information is not available to determine the likely effects of the proposed disposal option, including potential long-term harmful consequences, then this option should not be considered further. In addition, if the interpretation of the comparative assessment shows the dumping option to be less preferable, a permit for dumping should not be given.

7.10 Each assessment should conclude with a statement supporting a decision to issue or refuse a permit for dumping.

7.11 Where monitoring is required, the effects and parameters described in the hypotheses should help to guide field and analytical work so that relevant information can be obtained in the most efficient and cost-effective manner.

8 MONITORING

8.1 Monitoring is used to verify that permit conditions are met - compliance monitoring - and that the assumptions made during the permit review and site selection process were correct and sufficient to protect the environment and human health - field monitoring. It is essential that such monitoring programmes have clearly defined objectives.

8.2 The Impact Hypothesis forms the basis for defining field monitoring. The measurement programme should be designed to ascertain that changes in the receiving environment are within those predicted. 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?

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

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 whether the zone of impact and the extent of change outside the zone of impact differ from those predicted. The former can be answered by designing a sequence of measurements in space and time that ensures that the projected spatial scale of change is not exceeded. The latter can be answered by the acquisition of measurements that provide information on the extent of change that occurs outside the zone of impact as a result of the dumping operation. Frequently, these measurements will be based on a null hypothesis - that no significant change can be detected.

8.6 The results of monitoring (or other related research) should be reviewed at regular intervals in relation to the objectives and can provide a basis to:

- .1 modify or terminate the field-monitoring programme;
- .2 modify or revoke the permit;
- .3 redefine or close the dump-site; and
- .4 modify the basis on which applications to dump wastes are assessed.

9 PERMIT AND PERMIT CONDITIONS

9.1 A decision to issue a permit should only be made if all impact evaluations are completed and the monitoring requirements are determined. The provisions of the permit shall ensure, as far as practicable, that environmental disturbance and detriment are minimized and the benefits maximized. Any permit issued shall contain data and information specifying:

- .1 the types, amounts and sources of materials to be dumped;
- .2 the location of the dump-site(s);
- .3 the method of dumping; and
- .4 monitoring and reporting requirements.

9.2 If dumping is the selected option, then a permit authorizing dumping must be issued in advance. It is recommended that opportunities be provided for public review and participation in the permitting process. In granting a permit, the hypothesized impact occurring within the boundaries of the dump-site, such as alterations to the physical, chemical and biological compartments of the local environment is accepted by the permitting authority.

9.3 Regulators should strive at all times to enforce procedures that will result in environmental changes as far below the limits of allowable environmental change as practicable, taking into account technological capabilities as well as economic, social and political concerns.

9.4 Permits should be reviewed at regular intervals, taking into account the results of monitoring and the objectives of monitoring programmes. Review of monitoring results will indicate whether field programmes need to be continued, revised or terminated, and will contribute to informed decisions regarding the continuance, modification or revocation of permits. This provides an important feedback mechanism for the protection of human health and the marine environment.
