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GUIDELINES FOR THE DUMPING OF INERT UNCONTAMINATED GEOLOGICAL MATERIALS

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INTRODUCTION

These guidelines are intended to assist the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) in the implementation of the Protocol for the Prevention and Elimination of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft or Incineration at Sea (the Dumping Protocol), hereinafter referred to as "the Protocol", with regard to the dumping of inert, inorganic geological materials into the Mediterranean Sea (article 4.2 and 6.2)

The Protocol was adopted on 16 February 1976 by the Conference of Plenipotentiaries of the Coastal States of the Mediterranean Region for the Protection of the Mediterranean Sea. The Protocol was amended and signed by 16 Contracting Parties on 10 June 1995.

These guidelines are intended for use by national authorities in evaluating applications for the dumping of inert, inorganic geological materials so as to prevent pollution in the Mediterranean Sea in a manner consistent with the provisions of the 1972 London Convention (Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter, 1972) and/or the 1996 Protocol thereto.

It is, however, implicitly recognized that the general considerations and detailed procedures described in these guidelines are not applicable in their entirety to all national or local situations.

PART A

Definitions

For the purposes of these guidelines:

1. Inert, inorganic geological materials (called materials) the chemical constituant of which are unlikely to be released into marine environment

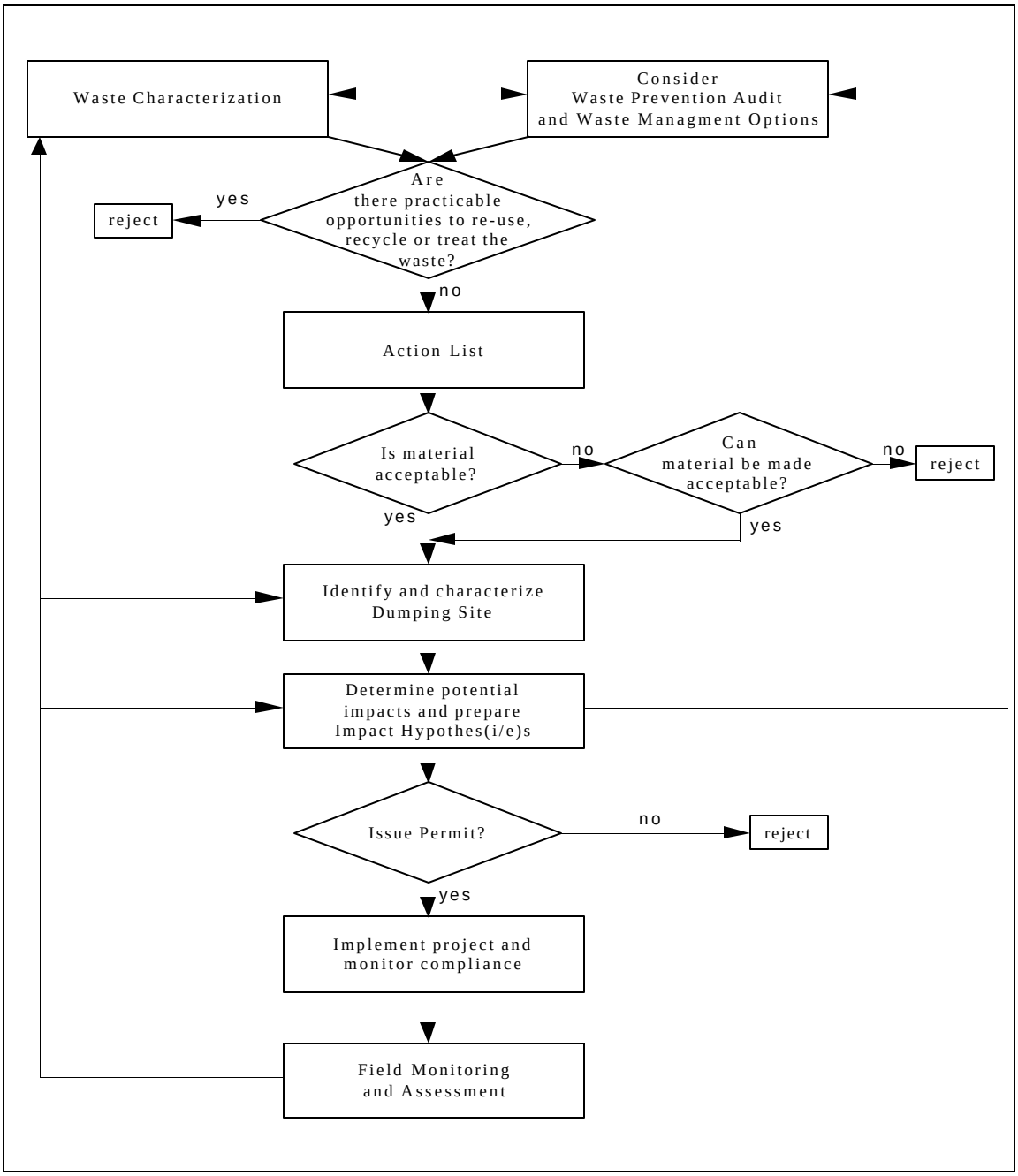
2. MAP means Mediterranean Action Plan

Scope

The schematic shown in Figure 1 provides a clear indication of the stages in the application of the Guidelines where important decisions should be made and is not designed as a conventional "decision tree". In general, national authorities should use the schematic in an iterative manner ensuring that all steps receive consideration before a decision is made to issue a permit. The guidelines contain the following elements:

1. Waste Characterization Part B (Chemical, Physical and Biological Properties);
2. Waste Prevention Audit and Waste Management Options Part B
3. Action List Part B
4. Identify and Characterize Dump-site Part B (Dump-site Selection);
5. Determine Potential Impacts and Prepare Impact Hypothesis(es) Part B (Assessment of Potential Effects);
6. Issue Permit Part B (Permit and Permit Conditions);
7. Implement Project and Monitor Compliance Part C (Monitoring); and
8. Field Monitoring and Assessment Part C (Monitoring).

Figure 1



The Guidelines begin with a summary of the provisions of the Dumping Protocol, which relate to the control of all disposal operations at sea. This is followed by Part B which deal with the assessment of the characteristics and composition of materials to be disposed at sea, including, dump site selection, the potential impacts of disposal at sea guidance on the conditions under which permits may be issued for the disposal at sea of inert, inorganic geological materials and monitoring programme Part C

PART B

1. ASSESSMENT AND MANAGEMENT OF DUMPING OPERATIONS AT SEA

1.1 REQUIREMENTS OF THE DUMPING PROTOCOL

In accordance with Article 4.1 of the Protocol, the dumping of inert, inorganic geological materials is prohibited.

Nevertheless, under the terms of Article 4.2(d) of the Protocol, an exception may be made to this principle for the dumping of inert, inorganic geological materials, which may be authorized under certain conditions (the removal to the maximum extent of material capable of creating floating debris or otherwise contributing to pollution of the marine environment).

Under the terms of Article 5, the dumping of wastes or other matter listed in Article 4.2 requires a prior special permit from the competent national authorities.

Furthermore, in accordance with Article 6.1 of the Protocol, the permit referred to in Article 5 shall be issued only after careful consideration of the factors set forth in the Annex to the Protocol and taking into consideration article 20 of the offshore protocol.

Article 6.2 provides that 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.

Article 7 of the Protocol states that incineration at sea is prohibited.

1.2 WASTE PREVENTION AUDIT

The initial stages in assessing alternatives to dumping should, as appropriate, include an evaluation of:

1. types, amounts and relative hazards of wastes generated. In case the material is inert, the relative hazards are confined to physical impacts;

2. details of the production process and the sources of wastes within that process; and

3. feasibility of the following waste reduction/prevention techniques:

    1. clean production technologies;
    2. process modification;
    3. input substitution; and
    4. on-site, closed-loop recycling.

In general terms, if the required audit reveals that opportunities exist for waste prevention at source, an applicant is expected to formulate and implement a waste prevention strategy in collaboration with relevant local and national agencies which includes specific waste reduction targets and provision for further waste prevention audits to ensure that these targets are being met. Permit issuance or renewal decisions shall assure compliance with any resulting waste reduction and prevention requirements.

For this category of material the most pertinent issue will be waste minimization.

1.3 CONSIDERATION OF WASTE MANAGEMENT OPTIONS

Applications to dump wastes or other matter shall demonstrate that appropriate consideration has been given to the following hierarchy of waste management options, which implies an order of increasing environmental impact:

1. re-use, such as refilling of mines;
2. recycling such as road construction and building materials; and
3. disposal on land, and into water.

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.

1.4 ASSESSMENT OF THE CHARACTERISTICS AND COMPOSITION OF MATERIALS TO BE DISPOSED AT SEA

1.4.1

The character and form of the material and the basis on which it is characterized as materials in the marine environment should be assessed. From this specification, it should be demonstrated that the chemical nature of the materials (including uptake of any elements or substances from the material by biota) is such that the only effects will be due to its physical properties. Thus, the assessment of the environmental impacts will be based solely upon a set of physical, chemical and biological assessment together with the origin mineralogy and the total amount and physical nature of the materials.

1.4.2 Physical assessment

The physical assessment consists of the characterization of the physical characteristics of the materials namely: size characteristics in relation to the physical characteristics of the marine sediments and materials in the dumping area.

It must first be established whether or not the subject area is dispersive or depositional in nature. A dispersive site, generally one in a high-energy hydrodynamic environment is unlikely to contain fine-grained sediments. A depositional site, which generally reflects a low energy hydrodynamic environment, is likely to contain fine-grained sediments. In each case, the indigenous biological assemblages will reflect the structure and texture of the sediment and associated hydrodynamic conditions. There are also locations that change from depositional to dispersive as a result of hydrodynamic variability.

1.4.3 Chemical assessment

a. Background metals

Chemical investigations can be used to determine if a particular material contains elevated levels of contaminants relative to natural or ambient conditions. The abundance of these constituents and any differences from natural conditions in the sediment where the materials will be dumped can be evaluated using the element:normalizer ratios of the materials and sediments. The literature shows that elemental Aluminium (Al) could be the most relevant normalizer to be considered.

This concept can be expressed in the following form:

If

$$EF = \frac{(M/N)\ obs}{?\ \ (M/N)nat} < 2$$

Where:

EF is the metal enrichment factor for the sediment,
(M/N) Obs is the metal:normalizer (Al) ratio observed for the materials, and
(M/N) Nat is the sediment metal:normalizer (Al) ratio.

Given the natural variability of metals in sediments and the materials, an enrichment factor of less than 2 would reflect insignificant contamination. If sediment data are available from uncontaminated areas, the same approach can be taken by substituting the metal:normalizer ratios for such materials as the denominator of the above equation. Estimates of sediment ambient contaminant levels are often an essential prerequisite to detecting and quantifying recent contamination from local sources.

b. Background and baseline organic constituents

The presence of organic compounds at trace levels can be addressed in a somewhat similar manner. Both natural and artificial organic compounds might be present in materials as a result activities such as forest fires, mineral weathering, agriculture, soil erosion, fossil fuel combustion, mining and smelting, etc. Background levels created in this way are beyond national control as they are the legacy of natural processes and previous anthropogenic activities.

Clearly, there will be cases and areas in which the levels of organic compounds will be further augmented by nearby anthropogenic activities and these increases may be of concern. Consequently, a method is needed for defining baseline levels that largely represent natural conditions or a legacy of previous human activities and are therefore beyond local control.

The method for approaching the definition of baseline levels of organic compounds in the materials is based on an examination of the contents of the sediments in the dumping site of a specific organic material. This method is being used to define baseline and more likely to reflect the level of baseline contamination, they do pose some analytical difficulties because of their normally low organic carbon content. These analytical difficulties can be overcome by the use of increased sample sizes to ensure the analysis of a larger quantity of organic matter.

The procedure consists of obtaining a few representative samples of the sediments in which a range of commonly-occurring synthetic organic compounds and total organic carbon are determined. The selection of the specific synthetic compounds should be made primarily on the basis of local and regional sources of such organic compounds. Ideally, it should include some petroleum hydrocarbons, some polycyclic aromatic hydrocarbons (PAHs) and a number of synthetic compounds or congeners of compound groups such as polychlorobiphenyls (PCBs). The baseline would then be represented by the relationship between each of the selected organic compounds and total organic carbon.

A comparison of the ratios of organic compounds to total organic carbon in the materials to be dumped and reference sediments then provides a basis for assessing the degree of local

contamination of the materials. If the ratios are similar, say within a factor of 2, the subject materials would be of little concern in terms of damage or risks resulting from the organic chemicals present.

1.4.4 Biological assessment

Regulatory authorities must determine the limits of acceptable biological responses to chemical contamination. This will vary according to the location and spatial scale of contamination, and on local management objectives and socio-economic judgments. If the objective is to avoid alterations to biochemical processes in individual organisms, less contamination can be accepted than in the case of an objective that aims to sustain populations of commercial species. Once the range of acceptable response is determined, there are suites of field and laboratory tests that can be incorporated into biological assessments.

Many ecotoxicological methods are described in the scientific literature that may be used for determining if an observed impact on benthic organisms is due to chemical contamination. These range from acute and chronic toxicity tests, including sublethal effects measurements performed in the field or in the laboratory, to biochemical assays at a subcellular level (e.g. biochemical biomarkers). Together, these techniques provide a variety of end-points and exposure pathways at different levels of biological organization. The extrapolation of the results to higher levels of biological organization (e.g. population, community) remains very difficult. Simple biological effects tools are being developed (e.g. lysosomal neutral red assay, cardiac monitoring in crustaceans, cholinesterase inhibition assays, etc.) that offer the potential of detecting contaminant gradients and impaired organismal health. These are valuable for environmental assessment. There are standard protocols for some biomarkers and inter-laboratory ring tests for enhancing biomarker utility.

More ecologically relevant studies involve measurements of population variables and analysis of communities.

The selection of an appropriate suite of biological test methods depends on the particular questions being addressed by managers, the level of contamination at the site and the degree to which the available methods have been standardized and validated.

Until recently, efforts to determine the toxicity of contaminants in the materials have focused on measurements of acute toxicity.

Biomarkers may be used to provide early warning of subtle effects at low and sustained levels of contamination and may also provide insight into the nature of the contaminants present.

1.5 ACTION LIST

The Action List provides a screening mechanism for determining whether a material is considered acceptable for dumping. The initial screening should be judged by considering answers to the following questions:

- What are the particle size characteristics of the materials;
- What are the current uses and management objectives of the dumping site;
- Are there any contaminants in the materials;
- Is contaminants levels are above the natural (EF<2);
- Is there a basis for concern about risks to human health related to contaminants in seafood;
- Is the benthic assemblages allowing for the effects of any physical perturbation.

1.6 SELECTION OF THE DUMPING SITE

Matters relating to the criteria for the selection of the dumping site are addressed in greater detail in studies prepared by GESAMP.

Assessment of the disposal site

The criteria for selecting a new site for dumping operations should be determined so as to minimise interference with the environment and with other current and potential users of the sea. Basic information on the site under consideration should include the coordinates (latitude and longitude) of the disposal site, as well as its location with regard to:

- the nearest coastline;
- recreational areas;
- sport and commercial fishing areas;
- are as of natural beauty or significant cultural or historical importance;
- shipping lanes;
- military exclusion zones;
- engineering uses of the seabed (e.g. potential or ongoing seabed mining, undersea cables, desalination or energy conversion sites).

Consideration also has to be given to the size and capacity of the dumping site for future use as a dumping ground for other inert, inorganic geological materials in the area. In such cases, the following aspects should be taken into consideration:

- the dumping site should be large enough to contain the bulk of the anticipated waste material within the site limits or within a predicted impact area after dumping;
- the capacity of the dumping site should be sufficient to accommodate the anticipated volumes of solid and/or liquid waste to be diluted to near background levels before or upon reaching the boundaries of the site;
- the size and capacity of the dumping site should be sufficiently large to contain the anticipated volumes of waste for a pre-determined period of time; and
- the dumping site should be sufficiently large to allow the necessary monitoring to be carried out without undue expenditure of time and money.

The presence of other dumping sites in the vicinity of a proposed new site has to be taken also into account, since they could affect decisions relating to the amounts and types of wastes to be dumped at the site and the frequency of dumping operations. This condition also applies for existing dumping sites under consideration for new disposal operations.

Finally, site selection criteria should include the physical, sedimentological and biological characteristics of the seabed and surrounding area in which the site is to be located, details of which are given below:

Physical considerations

Particular atte ntion should be paid to constituents of the waste which float on the surface or which, in reaction with seawater, may produce floating substances and which, because they are confined to a two-dimensional rather than a three-dimensional medium, may disperse very slowly. The possibility of the reaccumulation of such substances as a result of the presence of surface convergences, which may interfere with amenities, as well as fisheries and shipping, has to be investigated. In general, the most important physical factors influencing the transport and mixing of waste consist of:

- *the oceanic flow environment*: several types of motion contribute significantly to turbulence and shear levels, resulting in the mixing of waste; these include surface waves, tidal and inertial oscillations, wind driven surface currents and the internal circulation of the ocean;
- *turbulent diffusion*: this process influences the spreading of waste through turbulent eddies;
- *shear induced diffusion*: this process results in the advection of waste due to variations in velocities with depth; and
- *vertical mixing*: this waste mixing process is caused by the intermittent hydrodynamic instability of water.

Analyses of these physical phenomena may be required to predict the behaviour of waste once it has been disposed at sea.

Consideration also needs to be given to the potential of material left on the seabed to snag fishing gear, taking into account its location, condition and the existence of any fishery exclusion zones.

Sediment stability is an important factor which needs to be taken into account in any assessment of materials disposal sites. Mass submarine movements can involve enormous volumes of sediment. These occur in the form of slumps, slides, debris flows and turbidity currents, which are activated by a number of factors, including tectonic events, sediment overloading, erosion and changes in sediment compaction.

Biological considerations

An evaluation of the biological sensitivity of potential dumping areas needs to be made, either through a study of existing data or, if necessary, by means of new surveys. The main considerations are summarised below:

- *fishing grounds and aquaculture sites*: dumping in active fishing areas can affect the living resources, interfere with fishing vessels and may damage or foul fishing gear;
- *breeding and nursery grounds*: certain grounds, although not in use for fishing, may be important for fish stocks through their role as spawning, nursery or feeding areas;
- *migration routes*: migrating species use their acute senses of detection to find their native region or to move from one area to another; dumped materials may disrupt the physiological detection processes used by the fish, resulting in migrating species becoming confused as to their migration routes;
- *areas of high productivity or other special interest*: some areas may be judged to require particular attention because of unusually high biological productivity; the dumping of toxic substances in such areas could reduce production, while the addition of wastes containing nutrients, whether organic or inorganic, may augment primary production and result in eutrophication.

Depending on the characteristics of waste materials, certain general precautions should be observed in planning disposal operations. If the waste contains toxic materials, the dilution achieved during disposal and the subsequent mixing with seawater will determine whether the concentrations are likely to damage the marine biota.

1.7. EVALUATION OF THE POTENTIAL IMPACTS OF THE DISPOSAL AT SEA OF INERT, INORGANIC GEOLOGICAL MATERIALS

Any adverse environmental impacts of the disposal at sea inert, inorganic geological materials should be minimised through the implementation of the pollution prevention plan and best environmental practices. Such adverse effects should in any case be limited to the following:

- deep sea dump sites;
- the coastal and estuarine area of the Mediterranean Sea;
- recycling facilities; and,
- waste disposal facilities and sites.

Significant physical impacts at the disposal site of inert, inorganic geological materials disposed of at sea may include:

- physical and chemical perturbation of seabed inert, inorganic geological materials;
- physical and chemical perturbation of the water column;
- short and long-term effects on pelagic and benthic invertebrates;
- short and long-term effects on fish and fisheries; and
- short and long-term effects on users of the sea.

With a view to assessing the likely magnitude of impacts from dumping activities, background data should be obtained on:

- the dispersal and dilution of chemicals offshore;
- the potential bioaccumulation or biomagnification of metals in marine organisms;
- the effects of contaminants in the sea;
- the effects of naturally occurring radioactive materials in the sea compared with their disposal on land;
- the potential movement of debris in the sea.

When assessing the impact of disposal operations, it may be necessary to compare the physical and, where appropriate, the chemical or biological quality of the affected area with reference to sites located away from the disposal site. Experience of the selection of reference sites for biological and physical monitoring can be acquired from monitoring programmes carried out in the vicinity of dumping site . Such areas can be identified during the early stages of impact assessment.

To avoid excessive use of and impacts on the seabed, the number of dumping sites should be limited in so far as possible. To the maximum extent possible, each site should be used without interfering with navigation.

Interference with the migration or spawning of fish or crustaceans, or with seasonal fishery activities, may be avoided by the imposition of timing restrictions on disposal operations.

Contaminant mobility

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

1. type of matrix;
2. form of contaminant;
3. physical state of the system, e.g., temperature, water flow, suspended matter; and

4. biological activities, e.g. bioturbation.

1.8 ASSESSMENT OF POTENTIAL EFFECTS-IMPACT HYPOTHESIS

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.

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.

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.

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.

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. The only effects requiring detailed consideration in this context are physical impacts on biota.

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.

Emphasis should be placed on biological effects and habitat modification as well as physical and chemical change. The following factors should be addressed:

1. physical changes and physical effects on biota; and
2. effects on sediment transport.

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 or planned.

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.

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

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.

Where the impact-hypothesis indicates any transboundary impacts, a consultation procedure should be initiated in accordance with paragraph 2.5

2. REQUIREMENTS FOR THE AUTHORIZATION OF THE DUMPING AT SEA OF INERT, INORGANIC GEOLOGICAL MATERIALS

The Protocol establishes the permitting requirements for the sea disposal operations of a *single* inert, inorganic geological materials dumping activity.

2.1 REQUIREMENTS FOR A PERMIT APPLICATION

Any application for a permit has to contain data and information specifying:

- the types, amounts and sources of the materials to be dumped;
- the location of the dumping site(s);
- History of previous dumping operations and/or past activities with negative environmental impacts;
- the method of dumping; and
- the proposed monitoring and reporting arrangements.

2.2 CRITERIA FOR THE EVALUATION OF A PERMIT APPLICATION

Article 6.1 of the Protocol states that a permit shall be issued only after careful consideration of the factors set forth in the Annexes to the Protocol, guidelines and procedures adopted by the Contracting Parties.

Before considering the dumping of the materials at sea, every effort should be made to determine the practical availability of alternative land-based methods of treatment, disposal or elimination.

In special cases where it is decided to dump the materials at sea, this should be regarded as an exception. The practical availability of other means of disposal should be considered in the light of a comparative assessment of:

- their characteristics: chemical, biological and physical (chapter .1.4)

- their potential impact on the environment, including:
  - their effects on marine habitats and communities, and other legitimate uses of the sea;
  - the effect of their on-shore re-use, recycling, or disposal, including potential impacts on land, surface and groundwater and air pollution; and
  - the impact of the use of the necessary energy and materials (including an overall assessment of the use of energy and materials and the savings achieved through re-use, recycling or disposal options), including transportation and the resultant environmental impact.

- their potential impact on human health, including:
  - the identification of routes of exposure and the analysis of potential impacts on sea and land re-use, as well as of recycling and disposal options, including the potential secondary impacts of energy use; and
  - the quantification and evaluation of the safety risks associated with onshore re-use, recycling and disposal, compared with disposal at sea.

- their technical and practical feasibility, including:
  - the identification of the practical limitations of disposal alternatives, taking into account the characteristics of the inert, inorganic geological materials and oceanographic considerations.

- economic considerations, including:
  - an analysis of the full cost of inert, inorganic geological materials re-use, recycling or disposal alternatives, including their secondary impacts; and
  - a review of costs in relation to benefits in such areas as resource conservation and the economic benefits of steel recycling.

Where the comparative assessment reveals that adequate information is not available to determine the likely effects of the proposed disposal option, including the potential long-term harmful consequences, then this option should not be considered further. In addition, where analysis of the comparative assessment shows that the dumping option is less preferable than a land alternative, a permit should not be issued for the dumping.

Each assessment should conclude with a statement in support of a decision to either issue or refuse a permit for dumping.

Opportunities should be provided for public review and participation in the permit evaluation process.

2.3 CONDITIONS FOR ISSUING A PERMIT

A decision to issue a permit should be based on the elements provided by a pre-disposal site survey. If the characterisation of these conditions is insufficient for the formulation of an *impact hypothesis*, additional information will be required before any final decision is made with regard to issuing a permit.

A decision to issue a permit should only be made where all the impact assessments are complete, taking into account the defined criteria, and where the monitoring requirements have been determined. The conditions set out in the permit should be such as to ensure, in so far as practicable, that environmental disturbance and detriment are minimised, and that benefits are maximised.

In the event that the determined criteria cannot be met, a Contracting Party should not issue a permit unless a detailed assessment shows that disposal at sea is nonetheless the least detrimental option. Where such a conclusion is reached and a permit is issued, the Contracting Party should take all practical steps to mitigate the impact of the disposal operation on the marine environment.

Regulators should strive at all times to enforce procedures which ensure that environmental changes are as far below the limits of allowable environmental change as practicable, taking into account technological capacities and economic, social and political considerations.

The authority responsible for issuing the permit should take into consideration relevant research findings when specifying permit requirements.

2.4 SUPPLEMENTAL CONDITIONS FOR ISSUING A PERMIT FOR AN EXISTING DUMPING SITE

The issuing of a permit for inert, inorganic geological materials disposal at a site where past dumping activities were carried out should be based on a comprehensive review of results and objectives of existing monitoring programmes. The review process provides an important feedback and informed decision-making regarding the impacts of further disposal activities, and whether a permit may be issued for further dumping operations on site. Furthermore, such a review will indicate whether the field-monitoring programme needs to be continued, revised or terminated.

2.5 CONSULTATION PROCEDURE

1. A relevant Contracting Party which is considering whether to issue a permit under paragraph 1.1 of Part B of this Guidelines shall start this consultation procedure at least 32 weeks before any planned date of a decision on that question by sending to MAP a notification containing:

   a. an assessment prepared in accordance with Part B to this Guidelines, including the summary in accordance with Part B of these guidelines;
   b. an explanation why the relevant Contracting Party considers that the requirements of Part B of these Guidelines may be satisfied;
   c. any further information necessary to enable other Contracting Parties to consider the impacts and practical availability of options for re-use, recycling and disposal.

2. MAP shall immediately send copies of the notification to all Contracting Parties.

3. If a Contracting Party wishes to object to, or comment on, the issue of the permit, it shall inform the Contracting Party which is considering the issue of the permit not later than the end of 16 weeks from the date on which the MAP circulated the notification to the Contracting Parties, and shall send a copy of the objection or comment to the MAP. Any objection shall explain why the Contracting Party which is objecting considers that the case put forward fails to satisfy the requirements of Part B of these Guidelines. That explanation shall be supported by scientific and technical arguments. MAP shall circulate any objection or comment to the other Contracting Parties.

4. Contracting Parties shall seek to resolve by mutual consultations any objections made under the previous paragraph. As soon as possible after such consultations, and in any event not later than the end of 22 weeks from the date on which the MAP circulated the notification to the Contracting Parties, the Contracting Party proposing

to issue the permit shall inform the MAP of the outcome of the consultations. The MAP shall forward the information immediately to all other Contracting Parties.

5. If such consultations do not resolve the objection, the Contracting Party which objected may, with the support of at least two other Contracting Parties, request the MAP to arrange a special consultative meeting to discuss the objections raised. Such a request shall be made not later than the end of 24 weeks from the date on which the MAP circulated the notification to the Contracting Parties.

6. MAP shall arrange for such a special consultative meeting to be held within 6 weeks of the request for it, unless the Contracting Party considering the issue of a permit agrees to an extension. The meeting shall be open to all Contracting Parties, the operator of the installation in question and all observers to MAP. The meeting shall focus on the information provided in accordance with Part A of these Guidelines. The chairman of the meeting shall be MAP Coordinator or a person appointed by MAP Coordinator. Any question about the arrangements for the meeting shall be resolved by the chairman of the meeting.

7. The chairman of the meeting shall prepare a report of the views expressed at the meeting and any conclusions reached. That report shall be sent to all Contracting Parties within two weeks of the meeting.

8. The competent authority of the relevant Contracting Party may take a decision to issue a permit at any time after:

   a. the end of 16 weeks from the date of dispatch of the copies under sub paragraph 2 of the consultation procedure, if there are no objections at the end of that period;
   b. the end of 22 weeks from the date of dispatch of the copies under sub paragraph 2 of the consultation procedure, if any objections have been settled by mutual consultation;
   c. the end of 24 weeks from the date of dispatch of the copies under sub paragraph 2 of the consultation procedure, if there is no request for a special consultative meeting;
   d. receiving the report of the special consultative meeting from the chairman of that meeting.

9. Before making a decision with regard to any permit under Part A of these Guidelines, the competent authority of the relevant Contracting Party shall consider both the views and any conclusions recorded in the report of the special consultative meeting, and any views expressed by Contracting Parties in the course of this procedure.

10. Copies of all the documents which are to be sent to all Contracting Parties in accordance with this procedure shall also be sent to thoseobservers who have made a standing request for this to the MAP/MEDPOL.

PART C

MONITORING OPERATIONS FOR THE DISPOSAL AT SEA OF INERT, INORGANIC GEOLOGICAL MATERIALS

1. DEFINITION

For the purposes of assessing and regulating the environmental impacts of disposal operations, monitoring is defined as the repeated measurement of an effect, whether direct or indirect, on the marine environment and/or of interferences with other legitimate uses of the sea.

2. OBJECTIVES

In order to carry out the monitoring programme in a resource-effective manner, it is essential for the objectives of the programme to be clearly defined. The monitoring observations required at a disposal site tend to fall into two basic categories:

- predisposal investigations designed to assist in the selection of the site or to confirm that the selected site is suitable; and
- post-disposal studies intended to verify that:
  - the permit conditions have been met; this process is referred to as *compliance monitoring*; and,
  - the assumptions made during the permit issuing and site selection processes were valid and adequate to prevent adverse environmental effects as a consequence of disposal; this process is referred to as field *monitoring*, with the results of such reviews providing the basis for modifying the criteria for issuing a new permit for future dumping operations at existing and proposed disposal sites.

The ultimate purpose of monitoring is to assess the effects of the disposal activity on the biotic and abiotic environment.

3. QUALITY CONTROL

Quality control is defined as the operational techniques and activities that are used to fulfill requirements relating to quality. These include monitoring criteria and standards, sampling methods, sample locations and frequency, and reporting procedures.

Before any monitoring programme is developed and implemented, the following quality control issues have to be addressed:

- What testable hypotheses can be derived from the impact hypothesis?
- What exactly should be measured?
- What is the purpose of monitoring a particular variable or physical, chemical or biological effect?
- In what compartment and at which locations can measurements be made most effectively?
- For how long should the measurements be carried out to meet the defined aim?
- With what frequency should measurements be carried out?
- What should be the temporal and spatial scale of the measurements made to test the impact hypothesis?

- How should the data from the monitoring programme be managed and interpreted?

Monitoring observations are typically concerned with the physical, chemical and biological characteristics of the dumping site.

- Physical observations consist of hydrological surveys of water mass properties, such as temperature, salinity and density, over the entire water column and extending horizontally over the entire region likely to be affected by the waste.

- Chemical observations conducted in and around the disposal site need to be related to the type of waste involved. Generally, where it is not possible to remove all potentially contaminating material before disposal (e.g. in emergencies), and where chemical effects may therefore be expected, proper analyses need to be carried out of the surface microlayer of sea inert, inorganic geological materials, which constitute an extremely active biological zone in which a wide range of chemicals, such as heavy metals and oil soluble substances, tend to accumulate. Chemical observations also need to be conducted on sea inert, inorganic geological materials where substances, although not present in the waste in major quantities or concentrations may, because of their persistent nature, accumulate either on the seabed or in benthic communities in the vicinity of the disposal site.

- The frequency of biological observations should reflect the scale of the disposal operation and the degree of risk to potential resources. Where physical effects on the seabed are expected, it may be necessary to conduct an assessment of the phytoplankton and zooplankton biomass and productivity prior to disposal to establish a general picture of the area. Observations of the plankton immediately following disposal can help to determine whether acute effects are occurring. Monitoring of the benthic and epibenthic flora and fauna is likely to be more informative because they tend to be subjected not only to the influence of the overlying water column and any changes that occur in it, but also to changes in the inert, inorganic geological materials resulting from the solids present in the waste.

Post-disposal monitoring should be designed to determine:

- whether the impact zone differs from the zone predicted; and
- whether the extent of changes outside the impact zone differs from those predicted.

The former can be ascertained by designing a sequence of measurements in space and time with a view to ensuring that the projected spatial scale of change is not exceeded. The latter can be shown through measurements which provide information on the extent of the change occurring outside the impact zone as a result of the dumping operation. These measurements are often based on a null hypothesis, i.e. that no significant change can be detected.

The spatial extent of sampling depends on the size of the area designated for disposal. However, it must be recognised that long-term variations arise as a result of purely natural causes and that it may be difficult to distinguish them from changes which are induced artificially, particularly in relation to populations of organisms.

Where it is considered that effects are likely to be largely physical, monitoring may be based on remote methods (e.g. acoustic measurements, side-scan sonar). It must be recognised,

however, that certain ground measurements will always remain necessary for the interpretation of the remote sensing images.

Concise reports on monitoring activities should be prepared and made available to relevant stakeholders and other interested parties. Reports should detail the measurements made, the results obtained and the manner in which these data relate to the monitoring objectives and confirm the impact hypothesis. The frequency of reporting will depend on the scale of the dumping operation, the intensity of monitoring and the results obtained.

4 QUALITY ASSURANCE

Quality assurance may be defined as all planned and systematic activities implemented to provide adequate confirmation that monitoring activities are fulfilling requirements related to quality.

The results of monitoring activities should be reviewed at regular intervals in relation to their objectives in order to provide a basis for:

- modifying or terminating the field monitoring programme;
- amending or revoking the dumping permit;
- redefining or closing the dumping site; and
- modifying the basis for assessing dumping permits in the Mediterranean Sea.

The results of any reviews of monitoring activities should be communicated to all Contracting Parties involved in such activities.

The licensing authority is encouraged to take relevant research findings into consideration with a view to the modification of monitoring programmes.