



GROUPE D'ETUDES ET D'OBSERVATION
SUR LES DRAGAGES ET L'ENVIRONNEMENT

Communication document on the French context of environmental management of marine and estuarine dredging and sea disposal operations

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DRAFT VERSION

Introduction

The GEODE group (group for the study and the observation of dredging and the environment) is composed of representatives of France's major maritime ports, national and local transport, environment and health administrations, scientific experts on the subject of dredging and environment.

The French Ministry for Ecology, Sustainable Development and Energy has entrusted this group with the mission of studying the environmental impacts of dredging operations. The group's main missions are:

- Providing technical expertise in support of regulation evolution at an international and national level and in the field of dredging and sea disposal operations. This expertise primarily focuses on priority substances listed in the OSPAR convention, reflections on the hazard potential of dredged sediments and the diffusion of legal, regulatory and technical information to stakeholders.
- Providing technical expertise in support of France's official position on dredging operations in international organizations (OSPAR committee, European Union, etc.).
- Participating as French expert representatives in international scientific, technical or professional congresses in the field of dredging and environment.
- Monitoring of sediment quality in marine and estuarine ports along the French metropolitan coast and overseas departments, through the annual survey conducted by the CEREMA (French organization for studies and expertise on risks, environment, mobility and land settlement).
- Providing technological surveillance and expertise development on common interest subjects regarding dredging and the environment.

In the face of current technical practices and scientific knowledge gaps, a number of additional missions are entrusted to the GEODE group:

- Improving environmental monitoring of dredging and sea disposal operations, particularly in estuarine contexts. The group's main task is to support decision-making on monitoring strategies with regards to existing management practices for the conservation of natural habitats.
- Doing an inventory of dredging and disposal techniques and their compatibility with local and national environment conservation strategies.
- Defining a methodology for the assessment of environmental impacts of dredging and sea disposal operations;
- Providing scientific knowledge for better management of the sediment stocks of the main French estuaries.

In the framework of these missions, the GEODE group has produced several methodological guides for the benefit of contracting authorities of dredging and sea disposal operations, local administrations, engineering offices, professional and recreational sea users and non-governmental organizations.

The most recent of these guides are the following:

- Methodological guide for the assessment of impacts of dredging operations of navigation channels in estuarine Natura 2000 sites (GEODE, 2006).
- Methodological guide for the environmental monitoring of dredging and sea disposal operations in marine and estuarine contexts (GEODE, 2012).
- Methodological guide for the assessment of environmental impacts of dredging and sea disposal operations in marine and estuarine contexts (GEODE, 2014).
- Methodological guide for the assessment of health risks of dredging and sea disposal operations in marine and estuarine contexts (GEODE, 2014).

This document aims at providing insight into the French context of environmental management of dredging and sea disposal operations in marine and estuarine environments. It comprises of three parts:

- Part 1: France's regulatory context relative to environmental management of dredging and sea disposal operations;
- Part 2: Best practice guidelines for environmental management of dredging and sea disposal operations
- Part 3: Overview of two methodological guides

1. France's regulatory context relative to environmental management of dredging and sea disposal operations

1.1 International Conventions and European Regulations

Numerous international conventions provide a direct or indirect framework for dredging activities and management of dredged sediments. The conventions oblige signatory states to comply with certain provisions. Concrete application of these provisions generally translates to regulations at the European and national level.

These conventions are not specifically cited by the French regulation's Environmental Code Article 122-5-II-6 which defines the plans and programmes which must be considered in the environmental impact assessment and with which a dredging and sea disposal operation must comply. Nevertheless, all dredging operations taking place on French territory must comply with these texts that are supranational in scope.

1.1.1 International conventions

The MARPOL 73/78 Convention

The MARPOL Convention is a convention for the prevention of pollution from ships and for the protection of the marine environment against infringement of legislation on illegal waste (specified in the convention). It complements the United Nations Convention on the Law of the Sea (UNCLOS) in its field. The member states acting as flag State, port State or coastal State must, pursuant to Article 6, cooperate and implement the provisions of the convention for environmental monitoring and detection of infractions.

The London Protocol

The "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972", known as the 'London Convention', is among the first international conventions aimed at protecting the marine environment from human activities. In force since 1975, it aims to promote the effective control of all sources of marine pollution and encourages the Parties to pursue all possible measures to prevent marine pollution stemming from sea disposal of waste.

In 1996, the 'London Protocol' was adopted with a view to updating the Convention and ultimately replacing it. Under the Protocol, all sea disposal activities are prohibited, except in cases of waste that may be acceptable and appears on a list that comprises waste and other materials, including dredged materials.

1.1.2 Regional sea conventions

The OSPAR Convention

The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention) of 22 September 1992 is the current instrument directing international cooperation on the protection of the marine environment of the North-East Atlantic. It merged and updated the Oslo Convention of 1972 on waste dumping at sea and the 1974 Paris Convention on marine pollution from land-based sources.

Annex I on the prevention and elimination of pollution from land-based sources establishes a list of substances (PAHs, PCBs, etc.) but does not define their tolerance thresholds. Annex II on the prevention and elimination of pollution by dumping or incineration in the sea establishes, in Article 3, point 2, the list of categories of “wastes or other matter” that may be dumped and includes “dredged material” (point (a)). In applying the convention, particularly Annex I, the Contracting States may define their own thresholds, as France has done.

In 2009, OSPAR published guidelines for the management of dredged sediments, including a set of criteria for the selection of sea disposal sites¹.

OSPAR regularly issues revised best-practice guidelines for dredging and sea disposal operations.

The Barcelona Convention

The Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona Convention, 1976) requires its signatories to “individually or jointly take all necessary measures to protect and enhance the marine environment in the area of the Mediterranean Sea so as to contribute towards its sustainable development and to prevent, abate, combat and to the fullest possible extent eliminate pollution of the area”.

Four types of pollution require special attention on the part of the signatories: “pollution caused by dumping from ships and aircraft; pollution from ships; pollution resulting from exploration and exploitation of the continental shelf and the seabed and its subsoil; pollution from land-based sources”.

1.1.3 European regulations

Water Framework Directive

The Water Framework Directive 2000/60/EC of 23 October 2000 defines an objective of good chemical status, good ecological status, and non-deterioration of the quality of water bodies for 2015. The good status of water bodies is estimated based on ecological and chemical criteria.

The directive also emphasises a high level of protection of aquatic environments (groundwaters and territorial and marine waters) from priority chemical substances (33 substances listed in Annex X of the Directive). Directive 2013/39/EU of 24 August 2013 updates this list by adding 12 substances to the original list of 33 substances monitored and controlled by the European Union.

¹ OSPAR Commission. OSPAR Guidelines for the Management of Dredged Material. Reference number: 2009-4.

The Member States have until 14 September 2015 to transpose this directive into their national law.

It should be noted that in assessing the good chemical status of water, the substances in List I of the Directive 76/464/EEC not listed in the two directives mentioned above must also be considered.

**Waste
Framework
Directive**

The Waste Framework Directive 2008/98/EC of 19 November 2008 establishes a legal framework for waste treatment within the EU. It aims to protect the environment and human health by preventing harmful effects of waste production and management.

The "sediments relocated inside surface waters for the purpose of managing waters and waterways or of preventing floods or mitigating the effects of floods and droughts or land reclamation shall be excluded from the scope of this Directive if it is proved that the sediments are non-hazardous". By extension, hazardous sediments are considered to be waste under this directive.

**Marine
Strategy
Framework
Directive**

The Marine Strategy Framework Directive 2008/56/EC of 17 June 2008 sets the goal of achieving good environmental status in the marine environment by 2020 and improving the conservation status of marine biodiversity. The good environmental status is defined by 11 qualitative descriptors, several of which may be applied to the potential impacts of dredging operations, particularly descriptors 6-9 and 11:

- descriptor 6: "Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected",
- descriptor 7: "Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems",
- descriptor 8: "Concentrations of contaminants are at levels not giving rise to pollution effects",
- descriptor 9: "Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards", and
- descriptor 11: "Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment".

Sediment quality appears in the list of features (Annex III, Table 1 of the directive) and in the list of pressures and impacts (Annex III, Table 2 of the directive).

Therefore dredging activities are directly considered by the national declaration of this directive in France. This is done through monitoring and supervision actions specific to this activity and its impact on the environment.

1.2 French regulation and associated framework for dredging and sea disposal operations

1.2.1 Notification and authorization procedures

The French Environmental Code defines a list of projects (appendix to Article R.214-1) that are subject to specific notification or authorization procedures with regards to their possible impacts on water resources and aquatic environments. Given certain criteria, notification or request of authorization procedures must be made to local authorities for these projects. The procedures provide a framework to ensure that appropriate environmental management is enforced for these operations.

In this regulatory context, dredging and sea disposal operations form a category of projects that are specifically cited in this list of projects: *category 4.1.3.0 – “Dredging and / or related discharge in the marine environment”*.

As such, contracting authorities of these operations must notify or request authorization for their projects. The type of procedure (notification or request of authorization) is determined according to the following criteria.

■ The chemical composition of dredged sediments

Threshold values (N1 and N2) of mean concentration in sediments are defined by regulation for a series of contaminants. They constitute points of reference that simultaneously define the operation's administrative procedure (notification or request of authorization) and assess the possible effect that the projected operation may have on the environment. These levels therefore facilitate decision-making on whether disposal of dredged sediments should be made at sea or on land.

- Below level N1, the potential impact is in principle deemed neutral or negligible, as levels are 'normal' or comparable to environmental background noise.
- Between level N1 and level N2, an additional investigation may prove necessary, depending on the project and the extent by which level N1 has been exceeded.
- Above level N2, an additional investigation is generally necessary, as high levels point to a potential negative impact of the operation.

In matters of administrative procedures, if the N2 value is exceeded for one of the contaminants, the project is subject to the procedure of request of authorization. If the N2 value is not exceeded for any of the contaminants, the following criteria must be considered to define whether the project is subject to the procedures of notification or request of authorization.

Table 1. Threshold levels for trace elements (mg/kg; dry weight; analysis of a fraction < 2 mm)

Trace elements	Level N1	Level N2
Arsenic	25	50
Cadmium	1,2	2,4
Chrome	90	180
Copper	45	90
Mercury	0,4	0,8
Nickel	37	74
Lead	100	200
Zinc	276	552

Table 2. Threshold levels for TBT and PCB trace compounds (µg/kg of dry sediment analysed on a fraction < 2 mm)²

	Level N1	Level N2
Congeneric PCB 28	5	10
Congeneric PCB 52	5	10
Congeneric PCB 101	10	20
Congeneric PCB 118	10	20
Congeneric PCB 138	20	40
Congeneric PCB 153	20	40
Congeneric PCB 180	10	20
TBT	100	400

Table 3. Threshold levels of PAHs (µg/kg of dry sediment analysed on a fraction < 2 mm)²

PAH	Level 1	Level 2
Naphthalene	160	1 130
Acenaphthene	15	260
Acenaphthylene	40	340
Fluorene	20	280
Anthracene	85	590
Phenanthrene	240	870
Fluoranthene	600	2 850
Pyrene	500	1 500
Benzo(a)anthracene	260	930
Chrysene	380	1 590
Benzo(b)fluoranthene	400	900
Benzo(k)fluoranthene	200	400
Benzo(a)pyrene	430	1 015
Dibenzo(a,h)anthracene	60	160
Benzo(g,h,i)perylene	1 700	5 650
Indeno(1,2,3-cd)pyrene	1 700	5,650

It should be noted that these contaminants and their associated thresholds correspond to the current regulatory values at the time of the publication of this document. They are likely to be modified over time in relation to the evolution of scientific knowledge.

² Values in force at the time of publication

■ **The distance of the project to aquaculture farms**

A distance limit of 1 km is defined by regulation and determines, in combination with the other criteria, whether the project is subject to the procedures of notification or request of authorization.

■ **The volume of dredged sediments over 12 consecutive months**

Volume thresholds of dredged sediments are defined by regulation and determine, in combination with the other criteria, whether the project is subject to the procedures of notification or request of authorization. Threshold values vary according to the considered coastline: Mediterranean or Atlantic and English Channel.

The combination of criteria and implications in terms of regulatory procedures are summarized in the following table.

Table 1 : criteria for the analysis of dredging and sea disposal operations and implications in terms of regulatory procedures

1° The mean concentration in the dredged sediments is equal or superior to the N2 reference level for at least one of the contaminants		A	
2° The mean concentration in the dredged sediments is between the N2 and N1 reference levels for one of the contaminants	a) when the discharge is located on the Atlantic, the English Channel or the North sea coastline and at a distance superior to 1 km from aquaculture farms	I. the maximum <i>in situ</i> volume of dredged sediments during 12 consecutive months is superior to 50 000 m ³	A
		II. the maximum <i>in situ</i> volume of dredged sediments during 12 consecutive months is inferior to 50 000 m ³	N
	b) when the discharge is located on other coastlines and at a distance inferior to 1 km from aquaculture farms	I. the maximum <i>in situ</i> volume of dredged sediments during 12 consecutive months is superior to 5 000 m ³	A
		II. the maximum <i>in situ</i> volume of dredged sediments during 12 consecutive months is inferior to 5 000 m ³	N
3° The mean concentration in the dredged sediments is below the N1 reference levels for all of the contaminants	a) the <i>in situ</i> volume of dredged sediments during 12 consecutive months is superior to 500 000 m ³	A	
	b) the <i>in situ</i> volume of dredged sediments during 12 consecutive months is superior to 5 000 m ³ on the Atlantic, the English Channel or the North Sea coastline and to 500 m ³ on other coastlines or when discharge is located at a distance inferior to 1 km from aquaculture farms, but inferior to 500 000 m ³ .	N	

For the dredging and sea disposal projects that fall in the scope of notification or request for authorization, a number of specific procedures apply (evaluation of impacts on water quality and aquatic environments, project evaluation by local authorities, etc.), which in turn may trigger other types of procedures (environmental impact assessment, public consultation, etc.).

1.2.2 Environmental impact assessment

The criteria for launching an impact assessment, its content and its appraisal procedures are defined by articles R.122-1 and subsequent articles of the French Environmental Code. As for the notification or request of authorization procedures described above, a list of projects that are subject to the realization of an environmental impact assessment is defined by French regulation (appendix to article R122-4 of the French Environmental Code).

The environmental impact assessment is a tool that supports reflection on the project's compatibility with the preservation of the environment and that supports decision making in regard to three essential questions: should the project be done, should it not be done or should it be done differently? It therefore provides a framework for the improvement of a project's design as regards the mitigation of its effects on the environment.

Dredging and sea disposal operations form a category of projects for which an environmental impact assessment may be requested: *category 21 – "Extraction of minerals and sediments by marine dredging"*. In this category an environmental impact assessment is requested for dredging project that are subject to a procedure of request of authorization as mentioned in the previous section of this document.

It should be noted that dredging and sea disposal operations often form a part of broader maritime works, which include other operations that may figure on the regulatory list of project subject to the realization of an environmental impact assessment.

Directive 2011/92/EU was recently substantially amended by directive 2014/52/EU of 16 April 2014 on the assessment of the effects of certain public and private projects on the environment. This new directive is to be transposed into French law by 2017.

1.2.3 Other regulations and procedures

Other regulations may apply to dredging and sea disposal operations given the specific environmental sensitivity of a project's area of influence. Associated procedures provide specific framework for implementation of specific environmental management practices.

- Natura 2000: additional environmental baseline assessment, specific impact evaluation and mitigation measures,
- Preventive archeology: additional environmental baseline assessment and specific conservation measures if necessary,
- Protected species: additional environmental baseline assessment, specific impact evaluation and mitigation measures, and specific request of authorization for the destruction or displacement of concerned species.

Finally, article L. 123-2 of the French Environmental Code stipulates that public consultation must be carried out for any project for which an environmental impact assessment must be conducted (see above).

2. Best practice guidelines for environmental management of dredging and sea disposal operations

The GEODE group has produced a number of methodological guides aimed at supporting stakeholders in the establishment of best practice guidelines for the environmental management of dredging and sea disposal operations. If these guides each focus on a specific management aspect (impact assessment, health risks evaluation, impact monitoring), they however promote common general guidelines. The key principles of these common guidelines are presented hereafter.

2.1 Appropriation and customisation

The implementation of standard environmental management procedures is not consistent with the diversity of project characteristics that stakeholders may face for different dredging and sea disposal operations. For example, it is not relevant to carry out a similar monitoring program for a major dredging operation done in an estuary along the Atlantic coastline and for a small dredging operation occurring in a marina set on the Mediterranean coastline, as volumes, sediment contamination and environment sensitivity may differ greatly for these two operations.

The methodological guidelines provided in the GEODE guides provide tools and methods which stakeholders must apply to the specific contexts of their operations in order to define customized environmental management strategies.

2.2 Proportionality

Article R. 122-5 of the French Environmental Code introduces the principle of proportionality in the environmental impact assessment process: *“The content of the impact assessment is proportionate to the environmental sensitivity of the area likely to be affected by the project; to the extent and nature of the planned works, construction and development projects; and to their repercussions on the environment and human health”.*

Without calling into question the necessity of properly managing environmental aspects of dredging and sea disposal operations, the scientific, technical and financial limits that contracting authorities face in marine and estuarine environments must be considered. Several difficulties inherent to the uniqueness of these aquatic environments may limit the feasibility of environmental practices, regardless of regulatory obligations.

Indeed, marine and estuarine environments are dynamic environments made up of dynamic components. These open environments are further influenced by a set of human disturbances with overlapping and interacting effects. Our understanding of these biological and physicochemical processes has its limits, as does our capacity to assess certain specific interactions.

In this regard, operational means for the management of impacts on the environment are not always available.

In this context, the principle of proportionality is applied accordingly to environmental management of dredging and sea disposal operations.

2.3 Progressivity

The consistency and relevance of environmental management practices of dredging and sea disposal operations must constantly be assessed with regards to available feedback of past operations and evolution of scientific knowledge on the matter.

For example, a monitoring program must be able to evolve accordingly to monitoring results. Part of a program may need to be enforced or on the contrary suppressed if monitoring results show that the initial monitoring strategy has failed to produce consistent results.

As another example, an environmental impact assessment does not, from its preliminary steps, call for analysing all data to the smallest detail. The precision of the analysis must be defined in accordance to a prioritisation of the environmental issues of the project. This progressive approach makes it possible to select the components of the environment that may require an in-depth baseline condition study and the ones that require the application of specific mitigation measures.

The French methodological frameworks for the definition and implementation of best environmental practices of dredging and sea disposal operations therefore promote doing so according to a progressive, on-going and iterative process.

3. Overview of two methodological guides

3.1 Guide for the environmental impact assessment of dredging and sea disposal operations

3.1.1 Guide content

This guide comprises six sections and two technical annexes:

- **Section 1: principles, processes and conduct of an environmental impact assessment**

This section contains information on what an EIA is and what its objectives are, the key principles that must be considered for its realization including regulation, the stakeholders directly or indirectly implicated in its conduct and their organization.

- **Section 2: regulatory analysis of the operation**

This section guides the reader through the process of identifying what environmental regulations and procedures may apply to a given project. This section also presents how EIAs interact with other types of evaluation and authorization procedures and provides details on the content of the different dossiers that have to be produced.

- **Section 3: preliminary impact study and preparation of the environmental impact assessment**

The preliminary impact study is a tool for specifying the content of the environmental impact assessment, and for identifying the type of detailed data that could be necessary during the assessment process (in-situ habitat identification, flow and dispersion modeling, etc.). This section provides guidelines for the realization of this preliminary impact study, for the definition of the study's investigation area, and for the pre-identification of the project's major environmental issues. This section also provides examples of specific in-situ expertise that may be needed as part of the baseline environmental assessment and the time-scale to be considered for their realization. This section finally provides guidelines on how to write technical specifications of EIA tenders.

- **Section 4: environmental impact assessment**

This section defines the content of each of the EIA's sub-sections and includes methods on the realisation of specific parts of the EIA.

- **Section 5: non-technical summary of the EIA**

The non-technical summary of the EIA is a key document in the public consultation process. As it constitutes the main document through which communication is made on the project and its effects on the environment, it must be simple, clear and instructive. The quality of this document defines the quality of public participation in the authorization process of the project. This section provides methods and guidelines for the production of appropriate non-technical summaries.

■ Section 6: examination procedures

Finally, Section 6 describes the procedures for appraisal of the authorisation application dossier under the French Water Act, including the impact assessment for a dredging and sea disposal operation.

■ Technical appendix 1: regulations

This appendix supplements the guide by clarifying certain specific regulatory matters such as:

- The contents of the impact assessment and the regulatory dossiers with which it is likely to be associated.
- The sediment contamination reference values N1 and N2 to be considered for assessing the regulatory procedure to be applied to the operation: simple notification of local authorities or request for authorisation.
- The concepts of sediment hazardousness and toxicity associated to the type of disposal and the conceptual differences to be considered depending on whether disposal is made at sea or on land.
- The regulatory foundations related to the concept of impact compensation in French law.
- The international conventions and European regulations with which the dredging and sea disposal operations performed in France must comply.

■ Technical appendix 2: effects of dredging and sea disposal operations on the environment

This appendix is a bibliographic review of existing scientific knowledge on the effects of dredging and sea disposal operations on the environment.

3.1.2 Focus on governance of EIAs of dredging and sea disposal operations in the French context

3.1.2.1 Stakeholders

The contracting authority

The contracting authority is the natural or legal person that initiates a project or applies for authorisation to implement it. In French dredging and sea disposal operations, contracting authorities can be the following:

- Public or semi-public entity:
 - The port authorities of the Grands Ports Maritimes,
 - Territorial authorities in charge of port facilities: general councils, chambers of commerce, etc.,
 - Local authorities in charge of development projects located in their territory or requiring waterway dredging/maintenance operations: municipalities, communities of municipalities, syndicates, etc., and
 - The Ministry of Defence for military port infrastructure.
- Private entities: these include private operators of estuarine or maritime infrastructure potentially requiring dredging to carry out

development projects or waterway maintenance (e.g. wind operators in the process of setting up offshore wind farms, facilities classified for environmental protection [ICPEs], etc.).

The contracting authority is responsible for both the performance of the impact assessment and its content.

It bears all related costs (field investigations, analyses and surveys, and drafting, reproduction and circulation of the impact assessment).

Engineering offices and consultants

These organisations bring together experts in environmental assessment skilled in analysing the impacts of dredging and sea disposal on marine and estuarine aquatic environments. They have special expertise in the fauna and flora of these environments, as well as competences that allow them to assess the key physical processes of these operations: sediment disturbance, oceanographic influences, hydrology, marine uses, constraints related to the development of maritime works, etc.

The French state administrations

The French State administrations are involved in assessing the impact assessment's content and suitability and in appraising the various regulatory dossiers related to the operation. The appraisal is ensured by the prefect and its technical departments, including water police departments.

↻ Departments responsible for the water police: appraisal of dossiers pertaining to water legislation and guidance on applicable procedures

Departments responsible for the water police appraise, monitor and review notification and request of authorisation dossiers pertaining to water legislation. These State representatives can be contacted for support on regulatory aspects, and for the validation of the regulatory procedures applicable to the project.

In France, the water police departments responsible for appraising maritime and estuarine dossiers most often form part of the French Departmental Directorate of Territories and the Sea (DDTM). In certain regions, they may be part of the French Regional Division of the Environment, Development Works and Housing (DREAL).

Generally, DREALs are responsible for regional coordination of water police and are the preferred gateway for identifying the most appropriate interlocutor. Interdepartmental Water Task Forces (MISEs) bring together all French State departments and public departmental establishments directly involved in water affairs (Departmental Directorates for Territories [DDTs], DREALs, water agencies, the French National Agency for Water and Aquatic Environments [ONEMA], etc.). They constitute another means of identifying the competent authorities for the regulatory analysis of the project.

➤ **The environmental authority: opinion on the environmental impact assessment**

The environmental authority issues its opinion on the impact assessment performed by the applicant. This authority is designated in accordance with Article R. 122-6 of the French Environmental Code.

For dredging and sea disposal operations, three possibilities may be considered:

- The project is performed under the contracting authority of a French public establishment or department: the environmental authority is the environmental authority (AE) of the **General Council for the Environment and Sustainable Development (CGEDD)**.

This is the case of, for example, the Grands Ports Maritimes.

- The project is authorised by decree or by a minister (other than the one responsible for the environment) or by an independent administrative or public authority: the environmental authority is the minister responsible for the environment. An opinion is then prepared by the **French General Commission for Sustainable Development (CGDD)**.

This is the case of, for example, the ports managed by the French Ministry of Defence.

- The project is not led by the French State or any of its public establishments, and the authorisation decision is made by the departmental prefect or the maritime prefect: the environmental authority is the **regional prefect**. An opinion is issued following examination of the dossier by the environmental department of the relevant DREAL.

This is the case of, for example, the ports managed by a territorial authority (municipality, group of municipalities, département or region).

Furthermore, the minister responsible for the environment (French General Commission for Sustainable Development) can decide, on his or her own initiative or at the proposal of any natural or legal person, to seize any impact assessment that falls under the jurisdiction of the regional prefect in order to formulate the opinion of the environmental authority relating to this assessment.

In a process of preliminary guidance, the environmental authority may be consulted before the impact assessment is performed and asked to issue an opinion on the degree of precision of the information to be supplied in the impact assessment, pursuant to Article L. 122-1-2.

Local stakeholders

The conduct of a dredging and sea disposal operation, whether or not it forms part of a larger development operation, affects local stakeholders in the territory owing to the environmental and socio-economic impacts it produces. A number of examples are listed below.

- **Maritime and estuarine economic stakeholders**, such as:
 - Professional fishermen;
 - Marine farmers;
 - Various stakeholders in commercial navigation (port managers, carriers, etc.);
 - Operators of maritime leisure and tourism activities (diving, yachting, etc.);
 - Holders of specific easements (army, network operators, etc.);
 - Aggregate extractors;
 - Offshore energy companies;
- **Environmental institutions and managers:**
 - Authorities;
 - The Grands Ports Maritimes;
 - Managers of protected marine areas;
 - Etc.
- **Civil stakeholders** making use of areas in or close to the working site; and
- **Non-governmental organisations** involved in environmental protection.

3.1.2.2 Existing forms of governance

Modes of governance must be suited to the specific territorial and operational contexts of these operations, depending on:

- the nature of the project: occasional or sporadic dredging and sea disposal in small volumes, regular dredging and sea disposal of substantial volumes over sizeable areas, contaminated or non-contaminated sediments, etc. and
- the environmental sensitivity of the sites affected by the operations.

The primary objective is to favour the establishment of an effective and responsive governing body that is capable of providing support during the design of the operation and the impact assessment based on the specific environmental issues at hand.

Feedback shows that governing bodies should at least involve water police departments asked to appraise the notification and authorisation procedures (Box 1), monitoring committees established in response to the scope of the issues (Box 2) and all local stakeholders, mobilised at the departmental level (Box 3).

Example no. 1: Simplified governance involving the contracting authority and the water police departments.

In small-scale dredging operations characteristic of small to medium-sized ports, the simplest and most widespread form of governance is bipartite and involves the contracting authority and the water police departments that appraise the authorisation or notification application dossier.

Regular exchanges between the applicant and the water police department are necessary during the preparation of the impact assessment and prior to administrative appraisal of the dossier. These exchanges enable the validation of assessment methodologies (for example, the sampling plan used to characterise the sediments' physico-chemical quality) and of the environmental monitoring programme.

In cases of more regular or more sizeable operations, forms of governance that bring together more stakeholders may be established. In any case, consulting stakeholders and users, even informally, is recommended.

Example no. 2: governance involving the creation of a specific monitoring committee and the information of commissions for works supervision

In certain contexts, monitoring committees may be created to ensure that the environmental monitoring is correctly performed and that the mitigation measures are appropriately carried out by the contracting authority. An information commission is kept informed of the monitoring results and takes part in all the local information and communication actions that it deems useful.

Example no. 3: Departmental dredging schemes

At present, two départements in France (Finistère and Morbihan) have adopted dredging management schemes to pool efforts to organise the activity of all the ports in their territories. These schemes exemplify two similar modes of governance in a context encompassing various forms of works at ports of various sizes and which involve various contracting authorities. These dredging schemes aim to:

- establish both a common working method and a shared departmental vision on dredging operations and the management of dredged materials.
- enable better sharing of knowledge on dredging operations, their regulation and their impacts, during the dredging phase itself and during the phase of land treatment or sea disposal of dredged materials.
- help assess and consider the cumulative effects of multiple dredging and sea disposal operations on a larger scale.

3.1.2.3 Fostering of a participatory process

The environmental impact assessment must form part of a participatory process. By engaging very early on in dialogue with all affected stakeholders (elected representatives of authorities, French State departments, representatives from various sea professions and trades, associations, and the public), the contracting authority is able to inform them about the objectives of the operation and demonstrate its capacity to take their concerns and proposals into account.

A participatory process is defined as the participation of civil society in establishing an operation. There are multiple advantages to participation by the public:

- Bringing major environmental challenges to light,
- Sharing and discussing information with the public,
- Participating in preparing alternative solutions,
- Anticipating current and future conflicts, and
- Giving rise to a shared vision of the project.

Consultation is thus a key step for creating a common vision among the different stakeholders at the local level.

Each dredging and sea disposal operation is part of a broader territorial framework involving multiple sea users and managers whose interests are often complementary, but sometimes conflicting.

This section proposes a methodological framework for fostering a participatory process, bearing in mind that the number-one issue at hand is selecting a mode of governance suited to the project's territorial and operational context.

Key steps in consultation during the preparation of the impact assessment

Key step no. 1

Qualification and prioritisation of environmental issues

Step 1	Objectives
The contracting authority describes: <ul style="list-style-type: none"> • its port development policy and the “dredging” strategy that derives from it, • the available technical options (potential dredging techniques and destination of materials, especially sea disposal sites and/or means of land management), and • the log of dredging and sea disposal operations already performed. 	<ul style="list-style-type: none"> • Become familiar with the stakeholders' objectives, • Spark exchanges on potential technical options (storage of dredging materials on land vs sea disposal of materials; reuse and repurposing), and • Identify the sections of the maritime area where effects cannot be prevented (“zero disposal”) and where they can be prevented (potential sea disposal sites).



Key step no. 2 if sea disposal remains an option

Selection of a sea disposal site and establishment of a shared approach to assessing effects

Step 2	Objectives
<p>The contracting authority presents:</p> <ul style="list-style-type: none"> • Preliminary assessments (diagnosis of the marine environment and its uses) and the environmental constraints that derive from it; • Projected dredging and sea disposal techniques and potential sea disposal sites; • Technical, environmental and economic comparative indicators; • Results of a multi-criteria comparison of the different disposal sites; and • The approach to assessing the projected effects. 	<ul style="list-style-type: none"> • Seek a consensus on one or several potential techniques and a sea disposal site (new comparisons may be made at the request of the governing body in cases of deadlock or to validate one solution versus another). It should be noted that the techniques used to carry out the works have not always been defined at this stage; indeed, decisions regarding technique(s) are often made after the tendering phase. Thus, the advantages and disadvantages of all potential techniques should be presented at this stage. This process could moreover support an initial comparison of alternatives and serve as a technical guide to the operation. • Align stakeholder observations with the “best environmental practices” to be implemented, after site acceptance, in order to conclude to a shared assessment process for the next phase, which consists in the environmental impact assessment of the project



Key step no. 3 Assessment of the effects of dredging and sea disposal operations

Step 3	Objectives
<p>In the impact assessment, the contracting authority describes:</p> <ul style="list-style-type: none"> • the effects of dredging and sea disposal on the environment and other socio-economic activities, as well as their cumulative effects with other projects; • how it intends to reduce or prevent negative effects of its operations at source and apply “good environmental practices”, and even how it intends to compensate for the significant effects that cannot be prevented nor reduced; and • how it plans to assess the operation’s effects <i>a posteriori</i>. 	<ul style="list-style-type: none"> • Inform on the results of the impact assessment; • Demonstrate the efficacy of measures taken at source to prevent damaging effects; and • Involve the governing body in preparing and implementing an environmental monitoring programme.



Key step no. 4. Monitoring of environmental effects

Step 4	Objectives
<p>The contracting authority:</p> <ul style="list-style-type: none"> • defines the content of the environmental monitoring program in the impact assessment dossier (nature of the parameters to be followed, sampling strategy and analytical methods); • organises operational implementation; • analyses monitoring results to determine trends in environmental evolution, specify the state of knowledge, highlight potential gaps and propose adapted evolutions to the monitoring program; • submits monitoring results to the governing body; and • presents an assessment of consultation showing how the dredging operation has been optimised with respect to environmental concerns and how local stakeholders' suggestions and recommendations have been considered. 	<ul style="list-style-type: none"> • Prepare in conjunction with the governing body the specifications of the monitoring programme (objectives, means and methods; expected results); • Provide information on operational steps of monitoring; • Understand the results obtained and the real effects of the dredging operation; and • Make monitoring transferable to and reproducible in other dredging operations in other contexts.

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3.2 Guide for the environmental monitoring of dredging and sea disposal operations

3.2.1 Guide content

This guide comprises five sections and four technical appendixes:

- **Section 1: technical, regulatory and environmental context of dredging and sea disposal operations**

This section contains information on how dredging and sea disposal operations are carried out (types of machines, types of materials, range of volumes, etc.), the regulations associated to these operations and a summary of the main environmental effects to be considered for these projects.

- **Section 2: fundamental principles of environmental monitoring**

Environmental monitoring is an analytical and scientific process that measures the environmental impacts of an operation and assesses the efficiency of the mitigation measures that were put into place to eliminate, reduce or compensate these impacts. It is an ongoing or periodic examination of a project, part of a project or set of projects and of specific components of the environment. This section defines the objectives of environmental monitoring applied to dredging and sea disposal operations, and provides guidelines for the determination of a project's monitoring program and organization.

- **Section 3: governance**

This section provides guidelines for the implementation of efficient forms of governance of monitoring programs and information of stakeholders on the results of monitoring survey and their interpretation. The general guidelines are common to those exposed in the previous section of this document for environmental impact assessments.

- **Section 4: monitoring protocols**

This section provides methods for implementing monitoring surveys for each component of the environment that could theoretically be impacted by a dredging and sea disposal operation: It also provides a reflection on the relevance of monitoring these components in view of available scientific knowledge and available monitoring techniques.

- **Section 5: case studies and application of methods and tools provided in the guide and its appendixes**

This section describes the application of the methods and tools provided in the guide to three fictional case studies. The case studies were defined so as to represent different forms of project conditions likely to be found along French coastlines. They vary from one another in terms of dredged material volume, contamination levels of dredged sediments and environmental sensitivity of project areas.

■ **Technical appendix 1: regulations**

This appendix supplements the guide by clarifying certain specific regulatory matters in relation to monitoring.

■ **Technical appendix 2: effects of dredging and sea disposal operations on the environment**

This appendix is a bibliographic review of existing scientific knowledge on the effects of dredging and sea disposal operations on the environment.

■ **Technical appendix 3: evaluation of project conditions**

This appendix provides methods for the analysis and description of project characteristics likely to affect the extent of project impacts on the environment: project site description methods and necessary *in situ* investigations, dredged materials description methods, specific hydrodynamic conditions that must be considered for the evaluation of environment sensitivity.

■ **Technical appendix 4: monitoring protocols**

This appendix provides monitoring protocols for the main environmental compartments likely to be impacted by dredging and sea disposal operations. Each protocol includes a description of the parameters to be measured and the associated acquisition methods (sampling strategy, sampling tools, frequency, etc.). The protocols provided in this appendix are based on the most relevant practices available and include application recommendations specific to the context of dredging and sea disposal operations.

3.2.2 Focus on the methodological framework of environmental monitoring of dredging and sea disposal operations

The methodological framework proposed in this guide for implementing appropriate monitoring programs of dredging and sea disposal operations follows six fundamental steps.

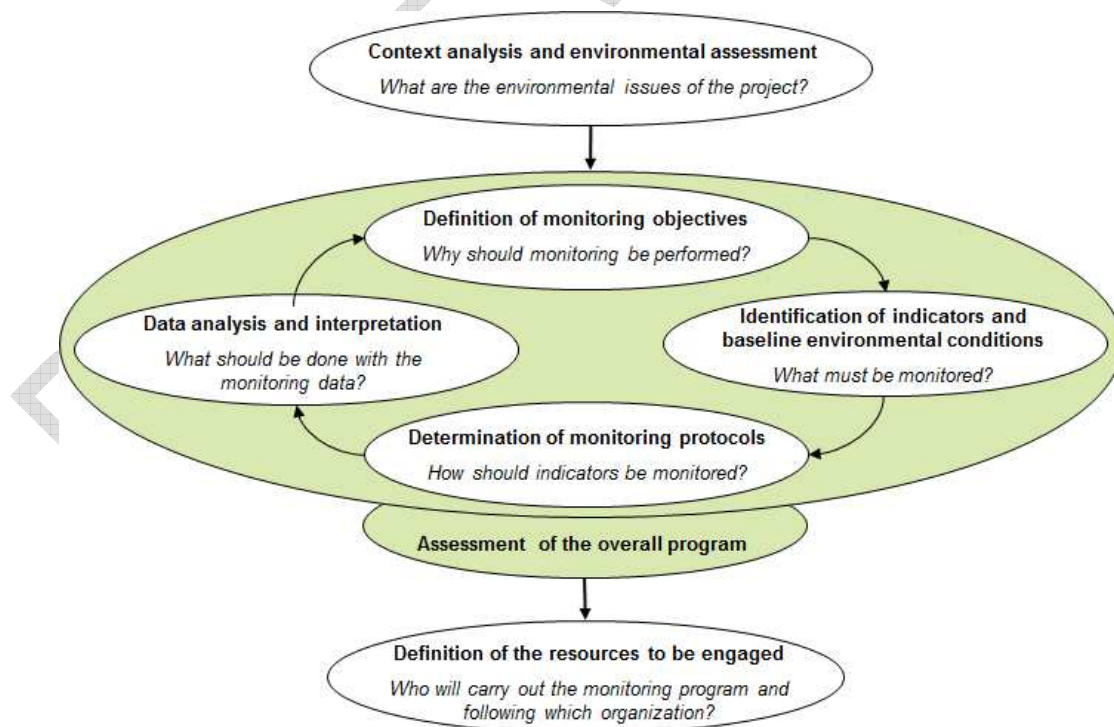


Figure 1: Methodological steps for designing a monitoring programme

3.2.2.1 Step no. 1: Context analysis and environmental assessment

This first step involves analysing the technical context of the operation while considering the environmental characteristics of the areas that are likely to be impacted. The aim is to prepare a clear description of cause-effect relationships between the project and the environment. The environmental impact assessment is a suitable tool for this first phase of analysis.

The term 'environment' is used in a broad sense here and generally comprises six dimensions:

- **Ecology:** preserving the biodiversity and sustainability of ecosystems;
- **Pollution:** minimising effluent discharges to the environment;
- **Natural resources:** ensuring sustainable use of natural resources (water, energy, space, air, fish and shellfish resources, etc.);
- **Health and safety:** minimising and preventing health risks;
- **Living environment:** improving the daily living environment and reducing nuisances; and
- **Heritage:** conserving remarkable elements of heritage and passing them on to future generations.

3.2.2.2 Step no. 2: Determination of monitoring objectives

The determination of monitoring objectives is done by answering the question: **why should environmental monitoring be performed on a given component of the environment?**

In this step, monitoring objectives are determined based on the results of the aforementioned environmental assessment stage. Control and monitoring needs are determined for each of the most significant impacts that the project is likely to have on the environment.

As the figure in the previous page illustrates, the determination of monitoring objectives is an iterative process. Therefore, the control and monitoring needs that emerge from the environmental impact assessment must systematically be subjected to the questions that structure the subsequent methodological steps:

- What types of data are needed for each potential monitoring activity?
- How often must this data be collected, and over what length of time?
- Is sufficient scientific knowledge and technical expertise available, to perform the projected monitoring surveys and correctly interpret their results?

3.2.2.3 Step no. 3: Determination of indicators and baseline situation

The determination of monitoring indicators and associated baseline situations values are done by answering the question: **what must be monitored?**

An indicator may be defined as "a variable intended to assess the value of and measure changes in an environmental process. Many indicators may be determined for each component of the environment on which dredging and sea disposal operations are likely to have impacts and for which monitoring may be carried out. Nevertheless, not all indicators may be measured, and not all indicators may correctly reflect changes due to the project given natural variability, availability of reference values, etc.. Therefore, the selection of appropriate indicators is a key step during the definition of any monitoring programme.

The guide provides methods for the description and classification of indicators as well as for the analysis of their relevance in the context of dredging and sea disposal operations.

The difference between quantitative and qualitative indicators is explained for example as these notions influence monitoring strategy and the extent of the interpretations that can be made in matters of description of impacts of the project on the environment. For example, the determination of the species richness of the benthos at a sea disposal site must be supported by the assessment of species quality relative to the baseline situation of the pre-existing marine habitat. An inventory of many species does not necessarily reflect a good environmental quality or a return to a state of equilibrium if the communities are dominated by opportunistic species during the recolonisation stage.

Moreover the choice of appropriate assessment indicators draws on solid scientific knowledge and on feedback from previous monitoring. However, general recommendations may be made to serve as guidance towards selecting the most suitable indicators. The guide defines criteria that indicators must meet in order to be relevant in the context of any monitoring program (suitability, precision, sensitivity, reliability, comparability, specificity, selectivity, significance, interpretability, etc).

Finally, the guide stresses the importance of the following notions: standards, benchmarks and baseline situations.

A standard may be defined as the reference value of an indicator needed to make an objective comparison and quality assessment that extends beyond the context in which measurements are made. These are often used in the context of dredging and sea disposal operations. For example, regulatory quality standards such as health standards for shellfish consumption constitute national reference values against which monitoring results from shellfish farming areas may be compared. The indicator 'product quality' is thus judged independently of local context.

A baseline situation is a situation of the environment at a certain time and in a certain place. It may be used as a reference point to determine certain trends. Comparison of a monitoring situation against a baseline situation makes it possible to assess the project's effects and/or impacts within the limits of representativeness of the reference point (natural variability, other human influences, margin of error related to characterisation technique, etc.). For example, the organisation and quality of benthic communities are assessed according to the specific characteristics of a given environment. Changes in benthic communities at a dredging site are monitored by comparing monitoring data against a baseline situation of the communities that specifically describes the dredging site prior to works.

Moreover, in order to assess whether a trend is due to the influence of the operations or an environmental fluctuation unrelated to the project's influence, it is necessary to determine a reference baseline situation that may be monitored over time and that is not influenced by the project's operations. For example, monitoring of water turbidity at a sea disposal site must be associated to monitoring of water turbidity outside of the sea disposal operations' area of influence in order to judge the proportion of variation in turbidity that may be attributed to sea disposal and not to natural fluctuations in turbidity.

It must finally be noted that the consistency of a comparative analysis requires a precise description of natural environmental fluctuations in order to produce a representative baseline situation. For example: monitoring species over a representative length of time in their biological cycle, monitoring of water turbidity over a period of one year in order to incorporate seasonal fluctuations associated with meteorological conditions and human activities.

3.2.2.4 Step no. 4: Determination of monitoring methods

This step is carried out by answering the question: **how should the selected indicators be monitored?**

The main objective of this step is to determine the strategies for collecting information. In other words, it is the phase during which the monitoring protocols are defined.

3.2.2.5 Step no. 5: Data analysis and interpretation

This last step answers the question: **What should be done with the monitoring data?** It involves analysing the data collected in monitoring campaigns, drawing associated conclusions, incorporating these results and feedback into the overall monitoring process (iterative improvement) and, finally, reporting the conclusions to the different stakeholders concerned by the project.

The above-mentioned data sheets provide methods for analysing the data and interpreting the results. Indeed, this step raises some major questions that must be considered when designing the monitoring program (step 2) and selecting the indicators (step 3):

- What is the precision of the collected data, and can suitable conclusions be drawn in view of the margins of error?
- On which scale of impact may conclusions be drawn: that of the cell, individual, stock or population for example?
- In view of environmental fluctuations and other occasional pressures, what proportion of the change in the indicator's value is due to the project?
- Does current scientific knowledge allow conclusions to be drawn regarding the impact of the project (relative or real impact)?

Data analysis should therefore be based on strong knowledge of physical and biological environmental processes and cause-effect relationships between the various components of the environment.

Data analysis should also allow conclusions to be drawn regarding the monitoring system's efficiency. It may validate or invalidate the sampling strategy and protocols proposed in the original program. The choice of indicators falls within an interactive and integrative process, and feedback must be incorporated to improve protocols and the quality and suitability of the collected data.

Feedback must also be incorporated to improve dredging and sea disposal practices themselves.

3.2.2.6 Step no. 6: Assessment of the overall system

The overall monitoring strategy must follow a logical progression to optimise efficacy and costs. Once monitoring opportunities have been identified and objectives have been firmly established, the suitability of the overall system and any steps that may be taken to prioritise, harmonise, integrate and synergise the selected monitoring criteria should be examined.

- **Prioritisation:** are there priority monitoring actions with respect to temporal and spatial phasing of the overall monitoring program?
- **Harmonisation:** should criteria and indicators be harmonised with monitoring going on elsewhere (e.g. monitoring of water bodies) or with previous monitoring activities to enhance the value of the results?

- **Integration:** is the monitoring incorporated into or streamlined with ongoing monitoring, and what are the operational and methodological implications?

Many coastline monitoring networks provide information on the quality of the marine environment. If the location of these networks' sampling sites and the time scale of the monitoring surveys correspond to project monitoring needs, data provided from these networks may be used to monitor the project's impact on the corresponding component of the environment. Adding one or several points to the monitoring network's system may prove necessary (addition of a baseline point, creation of a new sampling station, etc.), the rest of the network providing reference data to which monitoring results may be compared.

- **Synergies:** which synergies may be generated among the various projected monitoring activities (marine interventions and phasing of operations)?

3.2.2.7 Step no. 7: Determination of necessary resources

The objective of this step is to answer the three following questions: **How can the fulfilment of the monitoring specifications be ensured? How can the quality of the protocols and analyses implemented be verified? How can the traceability of the results and their reporting be ensured?**

This step aims to determine the human and financial means for executing the projected monitoring program. The quality of the results obtained during monitoring surveys largely depends on this last step. Once the monitoring objectives, indicators and protocols have been validated by the decision-making bodies, the contracting authority or applicant must ensure that:

- The protocols are managed by consulting agencies specialised in monitoring in order to ensure the quality of the results (quality assurance plan) and
- The parties engaged in activity at the site (project manager and companies responsible for dredging) respond optimally during the operational phases by adapting to unforeseen circumstances, reporting monitoring indications in real time, adapting works according to monitoring results, etc.

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