

A2 INTERNATIONAL CONVENTIONS

At the heart of the London and OSPAR Conventions, and many other conventions as well, are two basic principles (the precise wording varies and is here abbreviated):

- a) The precautionary principle, by which preventative measures are to be taken when there are reasonable grounds for concern that substances or energy introduced into the marine environment may bring about hazard, harm, damage or interference, even when there is no conclusive evidence of a causal relationship between inputs and the effects.
- b) The polluter pays principle, by which the costs of pollution prevention, control and reduction measures are to be borne by the polluter.

A result of the first principle has been the development of the "reverse list" where by only substances which have been proven NOT to cause harm are permitted to be disposed at sea. The phrase "reasonable grounds for concern" allows some flexibility.

In 1993 the London (Dumping) Convention was renamed the Convention on the Preservation of Marine Pollution by Dumping of Wastes and Other Matter (London Convention 1972), hereafter LC72. There are currently 81 Parties to the Convention (i.e. nation states that have signed, ratified, and otherwise acceded to it). The 1996 Protocol is a separate agreement that modernised and updated LC72 following a detailed review that began in 1993. The 1996 Protocol will eventually replace the LC72 and so far, 28 states have acceded to the 1996 Protocol. States can be a Party to either the LC72, or the 1996 Protocol, or both.

A list of the signatories to the LC72 and the 1996 Protocol is given in Appendix 1.

The Oslo and Paris Conventions have been merged into the OSPAR Convention. This covers the northeast Atlantic and North Sea and is open to countries which border these sea areas or which have rivers passing through that discharge into them (e.g. Switzerland and Luxembourg). CEDA has observer status both at the London Convention and OSPARCON and has contributed significantly to drawing up the Dredged Material Assessment Framework (DMAF). Each signatory country is obliged to put in place legislation and infrastructure to implement the LC72 and 1996 Protocol.

The London Convention 1972 (LC72) and 1996 Protocol

LC72 has 10 articles that address the obligations of the contracting parties to ensure that the properties of the material to be disposed of at sea are in accordance with the convention requirements, that the parties encourage co-operation amongst themselves and seek the formation of regional agreements, and that measures are taken to punish any conduct in contravention of the Convention. Other articles are concerned mainly with the details of procedures for setting up and operating the Convention.

In 1993, Parties started a detailed review of the LC72, leading to the adoption of a number of crucial amendments prohibiting the dumping of all radioactive wastes or

other radioactive matter and industrial wastes, as well as the prohibition of incineration at sea of industrial wastes and sewage sludge. The review was completed in 1996 with the adoption of the 1996 Protocol to the LC72. This Protocol required ratification by 26 countries, 15 of who must be Contracting Parties to the original 1972 treaty. Mexico was the 26th country to ratify the 1996 Protocol and the Protocol entered into force on 24th March 2006.

The 1996 Protocol reflects a more modern and comprehensive agreement on protecting the marine environment from Placement activities than the original LC72 and reflects the broader aims to protect the environment in general. It embodies a more precautionary approach to dumping at sea. The Articles of the 1996 Protocol are summarised below.

LC72 permits Placement of wastes to sea, with the exception of those materials on a banned or "black list". The 1996 Protocol is more restrictive and, in essence, prohibits dumping, except for those materials on a "reverse list" in Annex 1 which defines categories of wastes that may be considered for dumping, which includes dredged material. Annex 2 of the Protocol provides the framework to be used in any such consideration. Formally titled the "Assessment of Wastes or other Matter that may be considered for Dumping", it is generally referred to as the Waste Assessment Framework (WAF). Annexes 1 and 2 of the 1996 Protocol can be found in Appendix 2.

The Waste Assessment Framework applies to all substances considered for sea Placement and is available to guide national authorities in evaluating applications for dumping of wastes in a manner consistent with the provisions of the LC72 or the 1996 Protocol. Waste-specific guidance documents have been prepared to assist Parties to assess several classes of material. For dredged material the application of the LC72 and 1996 Protocol is covered by special guidelines entitled the "Dredged Material Assessment Framework" (DMAF).

The 1996 Protocol begins by setting the basis and objectives (here abbreviated and paraphrased):

The contracting parties:

- Stressing the need to protect the marine environment and to promote the sustainable use and conservation of marine resources,
- Noting in this regard the achievements within the framework of the LC72 and especially the evolution towards approaches based on precaution and prevention,
- Noting further the contribution in this regard by complementary regional and national instruments,
- Reaffirming the value of a global approach to these matters and the importance of continuing co-operation and collaboration between Contracting Parties,
- Recognising that it may be desirable to adopt, on a national or regional level, more stringent measures with respect to prevention and elimination of pollution of the marine environment from dumping at sea than are provided for in international conventions or other types of agreements with a global scope,
- Taking into account relevant international agreements and actions,
- Recognising also the interests and capacities of developing States and in particular small island developing States, and

- Being convinced that further international action to prevent, reduce and where practicable eliminate pollution of the sea caused by dumping can and must be taken without delay to protect and preserve the marine environment and to manage human activities in such a manner that the marine ecosystem will continue to sustain the legitimate uses of the sea and will continue to meet the needs of present and future generations.

Have agreed as follows:

Article 1: Definitions

Sets out definitions, including dumping.

Article 2: Objectives

Contracting Parties shall individually and collectively protect and preserve the marine environment from all sources of pollution and take effective measures, according to their scientific, technical and economic capabilities, to prevent, reduce and where practicable eliminate pollution caused by dumping or incineration at sea of wastes or other matter. Where appropriate, they shall harmonize their policies in this regard.

Article 3: General obligations

1. In implementing this Protocol, Contracting Parties shall apply a precautionary approach to environmental protection from dumping of wastes or other matter whereby appropriate preventative measures are taken when there is reason to believe that wastes or other matter introduced into the marine environment are likely to cause harm even when there is no conclusive evidence to prove a causal relation between inputs and their effects.
2. Taking into account the approach that the polluter should, in principle, bear the cost of pollution, each Contracting Party shall endeavour to promote practices whereby those it has authorized to engage in dumping or incineration at sea bear the cost of meeting the pollution prevention and control requirements for the authorized activities, having due regard to the public interest.
3. In implementing the provisions of this Protocol, Contracting Parties shall act so as not to transfer, directly or indirectly, damage or likelihood of damage from one part of the environment to another or transform one type of pollution into another.
4. No provision of this Protocol shall be interpreted as preventing Contracting Parties from taking, individually or jointly, more stringent measures in accordance with international law with respect to the prevention, reduction and where practicable elimination of pollution.

Article 4: Dumping of wastes or other matter

1. Contracting Parties shall prohibit the dumping of any wastes or other matter with the exception of those listed in Annex 1.

2. The dumping of wastes or other matter listed in Annex 1 shall require a permit. Contracting Parties shall adopt administrative or legislative measures to ensure that issuance of permits and permit conditions comply with provisions of Annex 2. Particular attention shall be paid to opportunities to avoid dumping in favour of environmentally preferable alternatives.
3. This paragraph says that anything else, not listed in Annex 1, can be prohibited by a Contracting Party if it so wishes.

Article 5: Incineration at sea

Deals with the prohibition of incineration at sea.

Article 6: Export of wastes or other material

States that Contracting Parties shall not allow the export of wastes or other matters to other countries for dumping or incineration at sea.

Article 7: Internal waters

1. Notwithstanding any other provision of this Protocol, this Protocol shall relate to internal waters only to the extent provided for in paragraphs 2 and 3.
2. Each Contracting Party shall at its discretion either apply the provisions of this Protocol or adopt other effective permitting and regulatory measures to control the deliberate Placement of wastes or other matter in marine internal waters where such Placement would be "dumping" or "incineration at sea" within the meaning of article 1, if conducted at sea.
3. Each Contracting Party should provide the Organization with information on legislation and institutional mechanisms regarding implementation, compliance and enforcement in marine internal waters. Contracting Parties should also use their best efforts to provide, on a voluntary basis, summary reports on the type and nature of the materials dumped in marine internal waters.

Article 8: Exceptions

Deals with "force majeure". This means that if there is a threat to human life or other overriding considerations the provisions of Articles 4.1 and 5 will not apply.

Dredged Material Assessment Framework

The Protocol is supported by generic WAF Guidelines for implementation of Annex 2 and by guidelines for each of the specific categories of wastes that may be considered for dumping. For dredged material the specific guideline is entitled "Dredged Material Assessment Framework" (DMAF). This is aimed at decision makers in the field of management of dredged material and sets out the basic practical, though not necessarily detailed, considerations required for determining the conditions under which dredged material might (or might not) be deposited at sea. Under

DMAF Placement of material for which contamination is not a concern will still be subject to an audit, such that sea Placement will be permitted subject to consideration of beneficial use options and assessment of Placement site impacts. A summary of the DMAF is given in Appendix 3.

Compliance with LC72 and the 1996 Protocol

The secretariat receives reports from Contracting Parties notifying annually the permits issued in the previous year, or reports stating that no permits have been issued in that year, the so-called "nil reports". While there has been an improvement in the number of Contracting Parties reporting since the first publication of this guide in 1996, many do not submit reports or contact the secretariat. Countries are encouraged to respond routinely as decisions are only based on the evidence of the compilers.

The OSPARCON

The revision of the Oslo and Paris Conventions was completed in 1992 and the new version is called the OSPAR Convention. Both the Oslo and Paris Conventions covered the sea areas of the northeast Atlantic and the North Sea. The two original conventions were:

Oslo: Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft, 1972; and

Paris: Convention for the Prevention of Marine Pollution from Land-based Sources, 1974.

The new convention has five annexes:

1. The prevention and elimination of pollution from land-based sources.
2. The prevention and elimination of pollution by dumping or incineration.
3. The prevention and elimination of pollution from offshore sources.
4. The assessment of the quality of the marine environment.
5. The protection and conservation of the ecosystems and biological diversity of the maritime area.

The Placement at sea Annex II is set out in the form of a reverse list of materials that may be disposed of at sea, with dredged material at the top of the list (Article 3, paragraph 2 (a)).

Dredged material guidelines

As with the LC72, there are dredged material ties. In 1989 the Oslo Commission decided to review the 1986 guidelines. France organised a seminar in Nantes in November 1989 on the environmental aspects of dredging and examined ways of

reducing the impact. A number of management tools were identified for incorporation in the revised dredged material guidelines.

These revised OSPAR Guidelines for the management of dredged material (Ref: 1998-20) deal with the assessment and management of dredged material Placement and provide guidance on the design and conduct of monitoring marine and estuary Placement sites. The assessment should contain a concise "impact hypothesis" which will also form the basis of subsequent monitoring.

The main constituents of the OSPARCON revised guidelines are:

- Conditions under which permits for Placement of dredged material may be issued.
- Assessment of the characteristics and composition of dredged material.
- Guidelines on dredged material sampling and analysis.
- Characteristics of Placement site and method of Placement.
- General considerations and conditions.
- Placement management techniques.

In addition, the Oslo and Paris Conventions for the Prevention of Marine Pollution Working Group on Sea-Based Activities (SEBA) 1995 requested contracting parties to submit details of their sediment quality criteria and how they are applied, in order to allow the preparation of an overview for SEBA 1996. The dredged material activities of SEBA are now undertaken by the Working Group on the Environmental Impacts of Human Activities (EIHA). A draft report on Contracting Parties sediment quality criteria was submitted to EIHA 2003 and subsequently published (Overview of Contracting Parties' National Action Levels for Dredged Material, Biodiversity Series, OSPAR Commission 2004, available at www.ospar.org). The criteria provided by contracted parties are reported for individual countries where available. Where these criteria are preliminary they appear under future trends.

OSPAR is undertaking a thematic assessment of human activities in the marine environment (the Joint Assessment Monitoring Programme – JAMP), which includes dredging and Placement, to produce a Quality Status Report by 2010.

Similarities and differences between OSPARCON and LC72

As the original version of the OSCON guidelines was drawn up in parallel with the LC guidelines they are very similar in both structure and content. An important difference between them is that OSPAR offers more flexibility in the case where concentrations of contaminants exceed "trace" levels. If it can be shown that marine Placement is the "option of least detriment" it may be permitted, whereas under the EC guidelines such material would be prohibited. Another difference is that oil and its products, listed in Annex I of the EC, are not included.

Other conventions and regional agreements

A number of other international conventions and regional treaties have been set up with the general aim of protecting the marine environment. These will also affect dredged material Placement at sea practices for signatory countries. Such agreements are given in Appendix 4.

A3 ASIA

A3.1 HONG KONG

Hong Kong classifies sediments based on their contaminant levels with reference to the Chemical Exceedance Levels (CEL) shown below.

Sediment quality criteria for the classification of sediment in Hong Kong

Contaminants	Lower Chemical Exceedance Level (LCEL)	Upper Chemical Exceedance Level (UCEL)
Metals (mg/kg dry wt.)		
Cadmium (Cd)	1.5	4
Chromium (Cr)	80	160
Copper (Cu)	65	110
Mercury (Hg)	0.5	1
Nickel (Ni)*	40	40
Lead (Pb)	75	110
Silver (Ag)	1	2
Zinc (Zn)	200	270
Metalloid (mg/kg dry wt.)		
Arsenic (As)	12	42
Organic-PAHs (µg/kg dry wt.)		
Low Molecular Weight PAHs	550	3160
High Molecular Weight PAHs	1700	9600
Organic-non-PAHs (µg/kg dry wt.)		
Total PCBs	23	180
Organometallics (µg TBT/L in Interstitial water)		
Tributyltin*	0.15	0.15

*The contaminant level is considered to have exceeded the UCEL if it is greater than the value shown.

The sediment is classified into 3 categories based on its contaminant levels:

Category L: Sediment with all contaminant levels not exceeding the Lower Chemical Exceedance Level (LCEL).

Category M: Sediment with any one or more contaminant levels exceeding the Lower Chemical Exceedance Level (LCEL) and none exceeding the Upper Chemical Exceedance Level (UCEL).

Category H: Sediment with any one or more contaminant levels exceeding the Upper Chemical Exceedance Level (UCEL).

A3.2 THE REPUBLIC OF KOREA

Action list for the dredged material disposal at sea in the Republic of Korea

Parameter	1st level (Upper Level) mg/kg dry weight	2nd Level (Lower Level) mg/kg dry weight
Chromium and its compounds	370	80
Zinc and its compounds	410	200
Copper and its compounds	270	65
Cadmium and its compounds	10	2.5
Mercury and its compounds	1.2	0.3
Arsenic and its compounds	70	20
Lead and its compounds	220	50
Nickel and its compounds	52	35
Total Polychlorinated Biphenyls	0.180	0.023
Total Polyaromatic Hydrocarbons	45	4

Notes:

1. Total polychlorinated biphenyls is the sum of contents of PCB-28, PCB-52, PCB-101, PCB-138, PCB-153 and PCB-180 congeners in a sample.
2. Total polyaromatic hydrocarbons is the sum of contents of naphthalene, phenanthrene, anthracene, benzo(a)pyrene, fluoranthene, benzo(a)anthracene, benzo(b)fluoranthene in a sample.

A4 EUROPE

A4.1 EUROPEAN LEGISLATION

EC Legislation

Several Western European countries have developed their own Placement policies or guidelines, but certain EC Directives govern the Placement and/or use of dredged material in EC countries under the definition of "waste". This chapter briefly reviews both the EC Directives and the individual countries' policies.

Classification of dredged material in the EC region

Several EU Member States have defined or proposed sediment quality levels that trigger various levels of action. While definitions vary they may be generalised as:

Class 1 – Below Action Level 1: sea Placement permitted

Class 2 – Between Action Levels 1 and 2: sea Placement permitted with restrictions (e.g. monitoring)

Class 3 – Higher than Action Level 2: sea Placement permitted only under very specific conditions.

One beneficial use option is the spreading of material on agricultural land. An EC guideline concerning the use of "wastes", predominantly sewage sludge but including dredged material, in agriculture (86/278/EEC) is binding for all EC members.

The EC itself has no specific limits for contaminant levels in dredged material but a summary of various countries' Action Levels for heavy metals is given in Table E1. The last row gives the standards for placement of sludge on agricultural land.

Limit values for heavy metals (mg/kg dry matter)
(Le Quiliec *et al.*, 2004)

	Cd	Hg	As	Cr	Cu	Ni	Pb	Zn
Netherlands								
L1	0.8	0.3	29.0	100	36	35	85	140
L2	2.0	0.5	55.0	380	36	35	530	480
L3	7.5	1.6	55.0	380	90	45	530	720
L4	12.0	10.0	55.0	380	190	200	530	720
Germany								
N1	0.5	0.5	10	90	40	40	50	150
N2	5.0	5.0	40	150	150	150	150	500
N3	10.0	10.0	70	250	250	250	250	1000
N4	25.0	25.0	100	500	500	500	500	2000
Portugal								
L1	1.0	0.5	20	50	35	30	50	100
L2	3.0	1.5	50	100	150	75	150	600
L3	5.0	3.0	100	400	300	125	500	1500
L4	10.0	10.0	500	1000	500	250	1000	5000
Italy								
A	1.0	0.5	15	20	40	45	45	200
B	5.0	2.0	25	100	50	50	100	400
C	20.0	10.0	50	500	400	150	500	3000
Belgium								
Reference	2.5	0.3	20	60	20	70	70	160
Limit	7.0	1.5	100	220	100	280	350	500
France								
N1	1.2	0.4	2.5	90	45	37	100	276
N2	2.4	0.8	5.0	180	90	74	200	552
ES/Barcelona								
N1	1.0	0.6	80	200	100	100	120	500
N2	5.0	3.0	200	1000	400	400	600	3000
EEC Sludges	20-40	16-25	-	-	1000-1750	300-400	750-1200	2500-4000

Marine Strategy

This is in the process of development. The EC Thematic Strategy on the Protection and Conservation of the Marine Environment aims to achieve good environmental status of the EU's marine waters by 2021 and to protect the resource base upon which marine-related economic and social activities depend. This Marine Strategy will constitute the environmental pillar of the future maritime policy that the EC is working on, designed to achieve the full economic potential of oceans and seas in harmony with the marine environment. The Marine Strategies will contain a detailed assessment of the state of the environment, a definition of "good environmental status"

at regional level and the establishment of clear environmental targets and monitoring programmes. The Marine Strategy is consistent with the Water Framework Directive (2000/60/EC) which requires the achievement of good ecological status by 2015 and the first review of the river basin management plans by 2021. The strategy is at the discussion stage so the consequences for dredging and Placement activities are still uncertain but may have implications for how the Dredged Material Assessment Framework (DMAF) is applied.

EU Environmental Liability Directive

This was adopted in March 2004 and is due to enter into force shortly. The aim is to hold operators whose activities have caused environmental damage financially liable for the necessary remedial actions and as such enforces the "polluter pays" principle.

Dredging and Placement are not specifically listed in the "occupational activities", however, the Directive applies to *all* significant damage to protected species and habitats if the operator is at fault. Given the proportion of maintenance dredging that takes place in the vicinity of designated sites and the difficulty of what constitutes "significant" impact, this could be a matter of real concern (Brooke, 2005).

A4.2 BELGIUM

Sediment quality criteria for Belgium, on metals and organics in dredged material

Parameter	Action level 1 (target value) (ppm d.m.)	Action level 2 (limit value) (ppm d.m.)
Hg	0.3	1.5
Cd	2.5	7
Pb	70	350
Zn	160	500
Ni	70	280
As	20	100
Cr	60	220
Cu	20	100
TBT	3	7
Mineral oil	14 mg/g _{oc}	36 mg/g _{oc}
PAKs	70 µg/g _{oc}	180 µg/g _{oc}
PCBs	2 µg/g _{oc}	2 µg/g _{oc}

A4.3 FINLAND

The action levels for dredged material in Finland were adopted by the Ministry of the Environment on 19 May 2004. These values are still, however, guidance values and not binding norms within a few years time. The aim is to be able to give binding norms within a few years time. All measured contaminant contents are normalised to a "standard soil" – composition (10% organic material and 25% clay). The values in the table on page 315 refer to the normalised values.

Contaminant	Action level 1 (ppm d.w.)	Action level 2 (ppm d.w.)
Hg	0.1	1
Cd	0.5	2.5
Cr	65	270
Cu	50	90
Pb	40	200
Ni	45	60
Zn	170	500
As	15	60
PaHs		
naphthalene	0.01	0.1
anthracene	0.01	0.1
phenanthrene	0.05	0.5
fluoranthene	0.3	3
benzo(a)anthracene	0.03	0.4
chrysene	1.1	11
benzo(k)fluoranthene	0.2	2
benzo(a)pyrene	0.3	3
benzo(ghi)perylene	0.8	8
indeno(123-cd)pyrene	0.6	6
mineral oil	500	1500
DDT+DDE+DDD	0.01	0.03
	ppb d.w.	ppb d.w.
PCB (IUPAC-numbers)		
28	1	30
52	1	30
101	4	30
118	4	30
138	4	30
153	4	30
180	4	30
tributyltin (TBT)	3	200
	ng WHO-TEQ/kg	ng WHO-TEQ/kg
dioxins and furans (PCDD and PCDF)	20	500

A4.4 FRANCE

If analysis shows that concentrations are less than action level 1, a general permit is given without specific study.

If analysis shows that concentrations exceed action level 2, dumping at sea may be prohibited, especially when this dumping does not constitute the least detrimental solution for the environment (particularly with respect to other solutions, *in situ* or on land). These values do not consider the toxic character and the bioavailability of each element.

If analysis shows that concentrations are situated between action level 1 and action level 2, a more comprehensive study might be necessary. The content of these studies will be established on a case-by-case basis taking account of the local circumstances and the sensitivity of the environment.

The action levels are as shown in the following table.

Substance	Action level 1 (ppm d.w.)	Action level 2 (ppm d.w.)	Substance	Action level 1 (ppm d.w.)	Action level 2 (ppm d.w.)
Metals			PCB		
Hg	0.4	0.8	CB 28	0.025	0.05
Cd	1.2	2.4	52	0.025	0.05
As	25	50	101	0.050	0.05
Pb	100	200	118	0.025	0.10
Cr	90	180	180	0.025	0.05
Cu	45	90	138	0.05	0.10
Zn	276	552	153	0.05	0.10
Ni	37	74	Total PCBs	0.5	1.0

A4.5 GERMANY

Sediment quality criteria for the German Federal Waters and Navigation Administration on trace metals and organic contaminants in dredged material (sediment fraction <20 µm)

		Action level 1	Action level 2
Arsenic	ppm	30	150
Cadmium	ppm	2.5	12.5
Chromium	ppm	150	750
Copper	ppm	40	200
Mercury	ppm	1	5
Nickel	ppm	50	250
Lead	ppm	100	500
Zinc	ppm	350	1750
PCB28	ppb	2	6
PCB52	ppb	1	3
PCB101	ppb	2	6
PCB118	ppb	3	10
PCB138	ppb	4	12
PCB153	ppb	5	15
PCB180	ppb	2	6
Sum of 7 PCBs	ppb	20	60
α-Hexachlorocyclohexane	ppb	0.4	1
γ-Hexachlorocyclohexane	ppb	0.2	0.6
Hexachlorobenzene	ppb	2	6
Pentachlorobenzene	ppb	1	3
p,p'-DDT	ppb	1	3
p,p'-DDE	ppb	1	3
p,p'-DDD	ppb	3	10
PAH ¹ (Sum of 6 PAHs)	ppm	1	3
Hydrocarbons	ppm	300	1000

¹ Total of six PAH compounds: fluoranthene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(ghi)perylene, indeno(1,2,3-cd)pyrene

Action levels for the German Federal Waters and Navigation Administration on tributyltin (TBT) in dredged material

Action Level 1	Action Level 2	Unit	Valid from
20	600	µg TBT/kg total sediment	2001
20	300	µg TBT/kg total sediment	2005
20	60	µg TBT/kg total sediment	2010

A4.6 IRELAND

Guidelines for the assessment of dredged material for Placement in Irish waters have been published (Cronin *et al.*, 2006).

Provisional Irish action levels in mg kg⁻¹dry wt

Chemical	Category 1	Category 2	Category 3
As	<10	10–80	>80
Cd	<1	1–3	>3
Cr	<100	100–300	>300
Cu	<50	50–200	>200
Hg	<0.3	0.3–5.0	>5
Ni	<50	50–200	>200
Pb	<50	50–400	>400
Zn	<400	400–700	>700
PCB (7)	<0.01	0.01–0.1	>0.1
TBT	<0.1	0.1–0.5	>0.5
Total PCB	<0.1	0.1–1.0	>1.0

A4.7 THE NETHERLANDS

The Dutch classification system for dredged material has recently been revised:

- *Target value*: Indicates the level below which risks to the environment are considered to be negligible, at the present state of knowledge.
- *Limit value*: Concentration at which the water sediment is considered as relatively clean. The limit value is the objective for the year 2000.
- *Reference value*: Is a reference level indicating whether dredged sediment is still fit for discharge in surface water, under certain conditions, or should be treated otherwise. It indicates the maximum allowable level above which the risks for the environment are unacceptable.
- *Intervention value*: An indicative value, indicating that remediation may be urgent, owing to increased risks to public health and the environment.
- *Signal value*: Only for heavy metals. Concentration level of heavy metals above which the need for cleaning up should be investigated.

Constants in the correction of measured levels for heavy metals and arsenic based on the local sediment composition (derived from reference value)

Metal	A	b	c
Zn	50	3	1.5
Cu	15	0.5	0.6
Cr	50	2	0
Pb	50	1	1
Cd	0.4	0.0007	0.021
Ni	10	1	0
Hg	0.2	0.0034	0.0017
As	15	0.4	0.4

The water sediment standards now existing have been based upon information which estimates the effects on the aquatic ecosystem. In addition, the water sediment composition influences the standards. For the availability of heavy metals and arsenic, clay fraction (lute, particle size $< 2 \mu\text{m}$) and the quantity of organic material are of particular importance. For the availability of organic compounds, the organic substance level is a determining factor. The standards are set for sediment containing 25% of lute and 10% of organic substance. Conversion towards the standard sediment composition is done in conformity to the method followed by the WOB (Water Sediments Study Group), which is also applied to calculate the reference values for soil quality.

Classification of water sediment:

Class 0 is below target value and can be spread over the land without restrictions.

Class 1 exceeds the target value, but is below the limit value and is allowed to be disposed unless the soil quality is not significantly impaired.

Class 2 does not meet the limit value, but is below the reference value, and can be spread in surface water or on land, under certain conditions.

Class 3 does not meet the reference value, but remains below the intervention value, and should be stored under controlled conditions, specific requirements can be set, depending on the storage location.

Class 4 does not meet the intervention value, and should be contained in isolation in deep pits or on land, in order to minimise the influence on the surroundings.

Target and other values

Parameter	Unit	Target value	Limit value	Reference value	Intervention value	Signal value
Arsenic	Mg/kg ds	29	55	55	55	150
Cadmium	Mg/kg ds	0.8	2	7.5	12	30
Chromium	Mg/kg ds	100	380	380	380	1000
Copper	Mg/kg ds	35	35	90	190	400
Mercury	Mg/kg ds	0.3	0.5	1.6	10	15
Lead	Mg/kg ds	85	530	530	530	1000
Nickel	Mg/kg ds	35	35	45	210	200
Zinc	Mg/kg ds	140	480	720	720	2500
PAH Total 10 PAK*	Mg/kg ds	1	1	10	40	--
PCB-28	µg/kg ds	1	4	30	--	--
PCB-52	µg/kg ds	1	4	30	--	--
PCB-101	µg/kg ds	4	4	30	--	--
PCB-118	µg/kg ds	4	4	30	--	--
PCB-138	µg/kg ds	4	4	30	--	--
PCB-153	µg/kg ds	4	4	30	--	--
PCB-180	µg/kg ds	4	4	30	--	--
Total 6 PCB	µg/kg ds	20/0	--	--	--	--
Total 7 PCB	µg/kg ds	--	--	200	1000	--
Chlordane	µg/kg ds	10	20	--	--	--
α-HCH	µg/kg ds	2.5	--	20	--	--
β-HCH	µg/kg ds	1	--	20	--	--
γ-HCH (lindane)	µg/kg ds	0.05	1	20	--	--
HCH-compounds	µg/kg ds	--	--	--	2000	--
Heptachlor	µg/kg ds	2.5	--	--	--	--
Heptachlorepoxyde	µg/kg ds	2.5	--	--	--	--
Heptachlor + epoxide	µg/kg ds	--	20	20	--	--
Aldrin	µg/kg ds	2.5	--	--	--	--
Dieldrin	µg/kg ds	0.5	20	--	--	--
Total aldrin & dieldrin	µg/kg ds	--	40	40	--	--
Endrin	µg/kg ds	1	40	40	--	--
Drins	µg/kg ds	--	--	--	4000	--
DDT (incl. DDD & DDE)	µg/kg ds	2.5	10	20	4000	--
α-endosulfan	µg/kg ds	2.5	--	--	--	--
α-endosulfan +	µg/kg ds	--	10	20	--	--
Sulphate	µg/kg ds	2.5	--	100	--	--
Hexachlorobutadiene						
Total pesticides	µg/kg ds					
Pentachlorobenzene	µg/kg ds	2.5	300	300	--	--
Hexachlorobenzene	µg/kg ds	2.5	4	20	--	--
Pentachlorophenol	µg/kg ds	2	20	5000	5000	--
Mineral oil	Mg/kg ds	50	100	3000	5000	--
EOX	Mg/kg ds	--	0	7	--	--

Napthalene, benzo(a)anthracene, benzo(ghi)perylene, benzo(a)pyrene, phenanthrene, ideno(123-ad)pyrene, anthracene, benzo(k)fluoranthene, chrythene, fluoranthene

Dredged material standards for the Netherlands

ppm d.w.	Action level 1 ¹	Action level 2 ²
As	29	29
Cd	0.8	4
Cr	100	120
Cu	36	60
Hg	0.3	1.2
Pb	85	110
Ni	35	45
Zn	140	365
Mineral oil (C10-40)	50	1250
Sum 10 PAHs ³		8
Sum 7 PCBs ⁴		0.1
Alpha-HCH	0.003	-
Beta-HCH	0.009	-
Gamma-HCH (lindane)	0.00005	0.02
Sum HCHs	0.01	-
Heptachlor	0.007	-
Heptachlorepoide	0.0000002	0.02
Aldrin	0.00006	0.03
Dieldrin	0.0005	0.03
Endrin	0.00004	0.03
Sum Aldrin + Dieldrin - Endrin	0.005	-
DDT	0.00009	-
DDD	0.00002	-
DDE	0.00001	-
Sum DDT + DDD + DDE	0.01	0.02
Hexachlorobenzene	0.00005	0.02
TBT	0.000007	0.24 (100 µg Sn/kg dw)
Sum organic compounds	0.001	

Notes:

1. General environmental quality objective (water system)
2. Numerical values for the content test distribution into salt waters (2001)
3. Naphthalene, phenanthrene, anthracene, fluoranthrene, chrysene, benzo(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene, indenopyrene, benzo(ghi)perylene
4. PCBs 28, 52, 101, 118, 138, 153 and 180

A4.8 NORWAY

The Norwegian sediment criteria for Classification of Environmental Quality and Degree of Pollution (CEQDP) in fjords and coastal waters represent the basis for managing dredging and dredged material.

Dredged material standards for Norway

Parameter	Category 1 good/fair (class I & II)	Category 2 poor/bad (class III & IV)	Category 3 very bad (class V)
Metals (ppm dry weight)			
Arsenic	<20-80	80-1000	>1000
Lead	<30-120	120-1500	>1500
Fluoride	<800-3000	3000-20000	>20000
Cadmium	<0.25-1	1-10	>10
Copper	<35-150	150-1500	>1500
Mercury	<0.15-0.6	0.6-5	>5
Chromium	<70-300	300-5000	>5000
Nickel	<30-130	130-1500	>1500
Zinc	<150-700	700-10000	>10000
Silver	<0.3-1.3	1.3-10	>10
Organic component (ppb dry weight)			
Sum PAH (EPA 16)	<300-2000	2000-20000	>20000
Benzo(a)pyrene	<10-50	50-500	>500
Sum PCB	<5-25	25-300	>300
Hexachlorobenzene	<0.5-2.5	2.5-50	>50
EPOCI ¹	<100-500	500-15000	>15000
2, 3, 7, 8-TCDD eqv. ²	<0.03-0.12	0.12-1.5	>1.5

Notes:

1. Extractable persistent organic chloride. 2 Total toxicity potential for polychlorinated dibenzofurans/dioxins, given as equivalents of the most toxic of these components (2, 3, 7, 8-tetrachlorodibenzo-p-dioxin)

A4.9 PORTUGAL

Dredged material classification for Portugal

Substance	Class 1	Class 2	Class 3	Class 4	Class 5
As	<20	50	100	500	>500
Cd	<1	3	5	10	>10
Cr	<50	100	400	1000	>1000
Cu	<35	150	300	500	>500
Hg	<0.5	1.5	3	10	>10
Pb	<50	150	500	1000	>1000
Ni	<30	75	125	250	>250
Zn	<100	600	1500	5000	>5000
PCB sum	<5	25	100	300	>300
PAH sum	<300	2000	6000	20000	>20000
HCB	<0.5	2.5	10	50	>50
Description	Clean	Vestiges of contamination	Slightly contaminated	Contaminated	Very contaminated
Fate	Aquatic environment and beaches	Aquatic environment	Aquatic environment with monitoring	Landfill with special monitoring	Landfill (residues have special treatment)

Notes:

1. Concentrations are upper bounds for each class. 2. Concentrations of metals are in mg/kg dry solids (ppm)
3. Concentrations of organics are in micrograms/kg dry solids (ppb)

A4.10 SPAIN

Sediment quality criteria applicable to Spanish harbours

ppm d.w.	Action level 1	Action level 2
Hg	0.6	3
Cd	1	5
Pb	120	600
Cu	100	400
Zn	500	3000
Cr	200	1000
As	80	200
Ni	100	400
Sum 7 PCBs	0.03	0.1

A4.11 SWEDEN

In Sweden, action levels are based on the following background concentrations. Information is not provided on the possible link between these concentrations and action levels:

Substance	Background value (ppm dry weight)
As	10
Pb	10
Fe	40000
Cd	0,3
Co	15
Cu	20
Cr	20
Hg	0,1
Ni	15
Sn	1
V	20
Zn	125

A4.12 THE UNITED KINGDOM

Most dredged material in the UK is placed at sea and is governed by Part II of the Food and Environment Protection Act 1985 (FEPA).

Sediment quality criteria for the UK on metals and organics in dredged material

Contaminant	Existing Action Level 1 mg · kg ⁻¹ (ppm)	Existing Action Level 2 mg · kg ⁻¹ (ppm)	Suggested Revised Action Level 1 mg · kg ⁻¹ (ppm) dry weight	Suggested Revised Action Level 2 mg · kg ⁻¹ (ppm) dry weight
Arsenic (As)	20	50–100	20	70
Cadmium (Cd)	0.4	2	0.4	4
Chromium (Cr)	40	400	50	370
Copper (Cu)	40	400	30	300
Mercury (Hg)	0.3	3	0.25	1.5
Nickel (Ni)	20	200	30	150
Lead (Pb)	50	500	50	400
Zinc (Zn)	130	800	130	600
Tributyltin (TBT, DBT, MBT)	0.1	1	0.1	0.5
Polychlorinated Biphenyls (PCBs)	0.02	0.2	0.02	0.18
Polyaromatic Hydrocarbons (PAHs)				
Acenaphthene			0.1	
Acenaphthylene			0.1	
Anthracene			0.1	
Fluorene			0.1	
Naphthalene			0.1	
Phenanthrene			0.1	
Benzo[a]anthracene			0.1	
Benzo[a]fluoranthene			0.1	
Benzo[k]fluoranthene			0.1	
Benzo[g]perylene			0.1	
Benzo[a]pyrene			0.1	
Benzo[g,h,i]perylene			0.1	
Dibenzo[a,h]anthracene			0.01	
Chrysene			0.1	
Fluoranthene			0.1	
Pyrene			0.1	
Indeno[1,2,3cd]pyrene			0.1	
Total hydrocarbons	100		100	
Booster Biocide and Brominated Flame Retardants ¹	–	–	–	–

¹ Provisional Action Levels for these compounds are subject to further investigation

A5 MIDDLE EASTERN LEGISLATION

A5.1 QATAR

The following information has been obtained from The Environmental Guidelines and Environmental Protection Criteria for Ras Laffan Industrial City. They may be periodically updated, as new regulations, permits or standards are issued by an appropriate regulatory authority such as the Supreme Council for the Environment & Natural Reserves (SCENR).

Maximum concentration of contaminants for toxicity characteristic

Contaminant	Regulatory level mg/l	Contaminant	Regulatory level mg/l
Arsenic	5.0	Hexachlorobenzene	0.13
Barium	100.0	Hexachlorobutadiene	0.5
Benzene	0.5	Hexachloroethane	3.0
Cadmium	1.0	Lead	5.0
Carbon tetrachloride	0.5	Lindane	0.4
Chlordane	0.03	Mercury	0.2
Chlorobenzene	100.0	Methoxychlor	10.0
Chloroform	6.0	Methyl ethyl ketone	200.0
Chromium	5.0	Nitrobenzene	2.0
o-Cresol	200.0	Pentachlorophenol	100.0
m-Cresol	200.0	Pyridine	5.0
p-Cresol	200.0	Selenium	1.0
Cresol	200.0	Silver	5.0
Dichlorobenzene	7.5	Tetrachloroethylene	0.7
Dichloroethane	0.5	Toxaphene	0.5
Dichloroethylene	0.7	Trichloroethylene	0.5
Dinitrotoluene	0.13	Trichlorophenol	400.0
Endrin	0.02	Silvex	1.0
Heptachlor (and its epoxide)	0.008	Vinyl chloride	0.2

A6 NORTH AMERICA

A6.1 CANADA

Dredged material that exceeds the Lowest Effect Level for organic compounds and mercury is not suitable for open water and will go to land. For material with metals other than mercury exceeding the Lowest Effect Level, open water Placement may be applied under certain conditions. The quality of the material and the bed sediments at the Placement site are compared and matched (see table on page 325).

Provincial sediment quality guidelines for metals and nutrients

Substance	No effect level Below this level material is suitable for open water disposal	Lowest effect level Below this level material is suitable to use as clean fill	Severe effect level* Below this level material may be placed in a landfill or CDF. Above it, material is subject to hazardous waste disposal
Arsenic	--	6	33
Cadmium	--	0.6	10
Chromium	--	26	110
Copper	--	16	110
Iron	--	2	4
Lead	--	31	250
Manganese	--	460	1100
Mercury	--	0.2	2
Nickel	--	16	75
Zinc	--	120	820
TOC	--	1	10
TKN	--	550	4800
TP	--	600	2000
Aldrin	--	.002	8
BHC	--	.003	12
Chlordane	.0002	.007	6
DDT total	--	.007	12
Dieldrin	.0006	.002	91
Endrin	.0005	.003	130
HCB	.01	.02	25
Heptachlor	.0003	--	--
Hepoxide	--	.005	5
Mirex	--	.007	130
PCB (total)	.01	.07	530
Acenaphthene	--	--	--
Anthracene	--	.220	370
Benzo[a]anthracene	--	.32	1480
Benzo[b]fluorine	--	--	--
Benzo[k]fluoranthene	--	.24	1440
Benzo[a]pyrene	--	.37	2
Benzo[g,h,i]perylene	--	.17	320
Chrysene	--	.34	460
Dibenzol[a,h]anthracene	--	.06	130
Fluoranthene	--	.75	1020
Fluorene	--	.19	160
Naphthalene	--	--	--
Phenanthrene	--	.56	950
Pyrene	--	.49	850
PAH (total of 16)	--	4	10000

Notes:

Values are in mg/kg (ppm) dry weight unless otherwise specified

* The units of this column are mg/kg of organic carbon and require conversion based on the TOC value of the substance in question.

TOC Total Organic Carbon

TKN Total Kjeldahl Nitrogen

TP Total Phosphorus

-- Insufficient data

A7 REFERENCES

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Le Quillec, R. and Pittavino, A. (2004). "Strategie en matiere de dragage maritime". *PIANC Bulletin 115*, January.

OSPAR (2004). Overview of Contracting Parties' National Action Levels for Dredged Material. OSPAR Commission.

Appendix 1. Signatories to the London Convention and 1996 Protocol

Contracting parties to the Convention on the prevention of marine pollution by dumping of wastes and other matter, 1972 (London Convention 1972) (As at 10 September 2007)

Country	Date of ratification, accession or succession	Date of entry into force or effective date
Afghanistan	2 April 1975	30 August 1975
Antigua and Barbuda	6 January 1989	5 February 1989
Argentina	11 September 1979	11 October 1979
Australia	21 August 1985	20 September 1985
Azerbaijan	1 July 1997	31 July 1997
Barbados	4 May 1994	3 June 1994
Belarus	29 January 1976	28 February 1976
Belgium	12 June 1985	12 July 1985
Bolivia	10 June 1999	10 July 1999
Brazil	26 July 1982	25 August 1982
Canada	13 November 1975	14 December 1975
Cape Verde	26 May 1977	25 June 1977
Chile	4 August 1977	3 September 1977
China ¹	14 November 1985	14 December 1985
Costa Rica	16 June 1986	16 July 1986
Côte d'Ivoire	9 October 1987	8 November 1987
Croatia	8 October 1991	8 October 1991
Cuba	1 December 1975	1 January 1976
Cyprus	7 June 1990	7 July 1990
Democratic Rep. of the Congo	16 September 1975	16 October 1975
Denmark ²	23 October 1974	30 August 1975
Dominican Republic	7 December 1973	30 August 1975
Egypt	30 June 1992	30 July 1992
Equatorial Guinea	21 January 2004	20 February 2004
Finland	3 May 1979	2 June 1979
France	3 February 1977	5 March 1977
Gabon	5 February 1982	7 March 1982
Germany	8 November 1977	8 December 1977
Greece	10 August 1981	9 September 1981
Guatemala	14 July 1975	30 August 1975
Haiti	28 August 1975	27 September 1975
Honduras	2 May 1980	1 June 1980
Hungary	5 February 1976	6 March 1976
Iceland	24 May 1973	30 August 1975
Iran (Islamic Republic of)	13 January 1997	12 February 1997

(Continued)

Country	Date of ratification, accession or succession	Date of entry into force or effective date
Ireland	17 February 1982	19 March 1982
Italy	30 April 1984	30 May 1984
Jamaica	22 March 1991	21 April 1991
Japan	15 October 1980	14 November 1980
Jordan	11 November 1974	30 August 1975
Kenya	7 January 1976	6 February 1976
Kiribati	12 May 1982	11 June 1982
Libyan Arab Jamahiriya	22 November 1976	22 December 1976
Luxembourg	21 February 1991	23 March 1991
Malta	28 December 1989	27 January 1990
Mexico	7 April 1975	30 August 1975
Monaco	16 May 1977	15 June 1977
Montenegro	—	3 June 2006
Morocco	18 February 1977	20 March 1977
Nauru	26 July 1982	25 August 1982
Netherlands ³	2 December 1977	2 January 1978
New Zealand	30 April 1975	30 August 1975
Nigeria	19 March 1976	18 April 1976
Norway	4 April 1974	30 August 1975
Oman	13 March 1984	12 April 1984
Pakistan	9 March 1995	8 April 1995
Panama	31 July 1975	30 August 1975
Papua New Guinea	10 March 1980	9 April 1980
Peru	7 May 2003	6 June 2003
Philippines	10 August 1973	30 August 1975
Poland	23 January 1979	22 February 1979
Portugal	14 April 1978	14 May 1978
Republic of Korea	21 December 1993	20 January 1994
Russian Federation ⁴	30 December 1975	29 January 1976
Saint Lucia	23 August 1985	22 September 1985
Saint Vincent & the Grenadines	24 October 2001	23 November 2001
Serbia ⁵	—	3 June 2006
Seychelles	29 October 1984	28 November 1984
Slovenia	25 June 1991	25 June 1991
Solomon Islands	6 March 1984	5 April 1984
South Africa	7 August 1978	6 September 1978
Spain	31 July 1974	30 August 1975
Suriname	21 October 1980	20 November 1980
Sweden	21 February 1974	30 August 1975
Switzerland	31 July 1979	30 August 1979
Tonga	8 November 1995	9 December 1995
Tunisia	13 April 1976	13 May 1976
Ukraine	5 February 1976	6 March 1976
United Arab Emirates	9 August 1974	30 August 1975
United Kingdom ⁶	17 November 1975	17 December 1975

(Continued)

Country	Date of ratification, accession or succession	Date of entry into force or effective date
United States	29 April 1974	30 August 1975
Vanuatu	22 September 1992	22 October 1992

¹ By notification dated 12 June 1997 from the People's Republic of China, the Convention and its 1978, 1980 and 1989 amendments will apply to the Hong Kong Special Administrative Region with effect from 1 July 1997.

² Ratification by Denmark was declared to be effective in respect of the Faroe Islands as from 15 November 1976.

³ Ratification by the Netherlands was declared to be effective in respect of the Netherlands Antilles and, with effect from 1 January 1986, in respect of Aruba.

⁴ As from 26 December 1991, the membership of the former USSR in the Convention has been continued by the Russian Federation.

⁵ With effect from 3 June 2006, when the National Assembly of Montenegro adopted a declaration of independence, the State Union of Serbia and Montenegro was dissolved. In conformity with Article 60 of the Constitutional Charter of Serbia and Montenegro, the Republic of Serbia is continuing the membership of the State Union of Serbia and Montenegro in IMO and is henceforth known as the "Republic of Serbia", with "Serbia" being used as the short form of the name.

The Republic of Montenegro was admitted as a Member of the United Nations on 28 June 2006, and the Government has since expressed an interest in becoming a Member of IMO. To date, no further information to that effect has been received. Clarification has been sought from Montenegro as to its status vis-à-vis the treaties deposited with the Organization.

⁶ The United Kingdom declared ratification to be effective also in respect of:

Effective Date	
Bailiwick of Guernsey)
Isle of Man)
Belize*)
Bermuda)
British Indian Ocean Territory)
British Virgin Islands)
Cayman Islands)
Falkland Islands and Dependencies**)
Gilbert Islands***)
Hong Kong****) 17 November 1975
Montserrat)
Pitcairn)
Henderson)
Ducie and Oeno Islands)
Saint Helena and Dependencies)
Seychelles*****)
Solomon Islands*****)
Turks and Caicos Islands)
Tuvalu*****)
United Kingdom Sovereign Base Areas of Akrotiri and Dhekelia in the Island of Cyprus)
Bailiwick of Jersey) 4 April 1976

* Has since become the independent State of Belize

** A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas)

*** Has since become the independent State of Kiribati and a Contracting State to the Convention

**** Has since become (1 July 1997) a Special Administrative Region of the People's Republic of China

***** Has since become the independent State of Seychelles and a Contracting State to the Convention

***** Has since become the independent State of Solomon Islands and a Contracting State to the Convention

***** Has since become the independent State of Tuvalu

1996 Protocol to the London Convention 1972 list of contracting States (as at 5)

	Date of signature or deposit of instrument
Angola (accession)	4 October 2001
Australia (ratification) ¹	4 December 2000
Barbados (accession) ¹	24 July 2006
Belgium (ratification) ¹	13 February 2006
Bulgaria (accession)	25 January 2006
Canada (accession) ¹	15 May 2000
China (ratification) ¹	29 September 2006
Denmark (signature) ^{1, 2}	17 April 1997
Egypt (accession) ¹	26 May 2004
France (accession) ¹	7 February 2004
Georgia (accession)	18 April 2000
Germany (ratification) ¹	16 October 1998
Iceland (ratification) ¹	21 May 2003
Ireland (accession) ¹	26 April 2001
Italy (accession) ¹	13 October 2006
Luxembourg (accession) ¹	21 November 2005
Mexico (accession) ¹	22 February 2006
New Zealand (ratification) ^{1, 2}	30 July 2001
Norway (ratification) ^{1, 2}	16 December 1999
Saudi Arabia (accession)	2 February 2006
Slovenia (accession) ¹	3 March 2006
South Africa (accession) ¹	23 December 1998
Spain (ratification) ¹	24 March 1999
St Kitts and Nevis (accession)	7 October 2004
Suriname (accession) ¹	11 February 2007
Sweden (ratification) ^{1, 2}	16 October 2000
Switzerland (ratification) ¹	8 September 2000
Tonga (accession) ¹	18 October 2003
Trinidad and Tobago (accession)	6 March 2000
United Kingdom (ratification) ^{1, 2}	15 December 1998
Vanuatu (accession) ¹	18 February 1999

¹ Contracting Party to the London Convention 1972² With a declaration or reservation