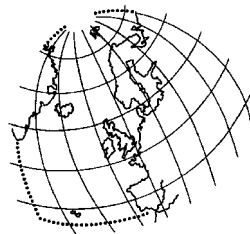


**Assessment of the
Reports on Dumping of Wastes at Sea
in 1997 and 1998**



**OSPAR Commission
2002**

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the “OSPAR Convention”) was opened for signature at the Ministerial Meeting of the former Oslo and Paris Commissions in Paris on 22 September 1992. The Convention entered into force on 25 March 1998. It has been ratified by Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, Netherlands, Norway, Portugal, Sweden, Switzerland and the United Kingdom and approved by the European Community and Spain.

La Convention pour la protection du milieu marin de l'Atlantique du Nord-Est, dite Convention OSPAR, a été ouverte à la signature à la réunion ministérielle des anciennes Commissions d'Oslo et de Paris, à Paris le 22 septembre 1992. La Convention est entrée en vigueur le 25 mars 1998. La Convention a été ratifiée par l'Allemagne, la Belgique, le Danemark, la Finlande, la France, l'Irlande, l'Islande, le Luxembourg, la Norvège, les Pays-Bas, le Portugal, le Royaume-Uni de Grande Bretagne et d'Irlande du Nord, la Suède et la Suisse et approuvée par la Communauté européenne et l'Espagne.

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INTRODUCTION

Assessments of the OSPAR Reports on Dumping of Wastes at Sea should aim at identifying issues of concern related to data and information reported by Contracting Parties. They also should examine whether requirements of the OSPAR Guidelines for the Management of Dredged Materials (OSPAR agreement reference number 1998-20) and of the reporting formats (OSPAR agreement reference number 1996-1) are fulfilled, and whether reporting requirements are appropriate. A further issue of the assessment consists in providing reliable data on contaminant inputs to the OSPAR maritime area. Furthermore, the assessment should examine, whether trends of the amounts of dredged material dumped and the associated contaminant loads can be established.

All Contracting Parties except Portugal provided data on dumping of wastes at sea for 1997, and for 1998, only information from Denmark and Portugal was outstanding. According to the latest data reported, dredged material dumped at sea by Denmark from 1995 until 1997 only amounted to about 1 % of the total quantity dumped by all Contracting Parties. As Portugal did not dispose of dredged material at sea in 1993 and 1994, it is assumed that also in 1997 and 1998 no appreciable amounts were dumped. Therefore the lack of the data mentioned above may not have much influence on the overall assessment.

However, data sets reported for 1997 and 1998 often were not complete and did not fulfil the reporting requirements. For example, reporting on organic contaminants was very incomplete. Furthermore, only a few Contracting Parties provided the additional information requested in the reporting format. When reviewing the reporting formats, it should be checked, which information is difficult to collect or to report and which information really is required for a proper assessment.

In order to assess the effectiveness of measures to reduce the quantities of dredged material as well as the associated contamination, it might be worth examining trends in the amounts dumped and contaminant inputs over a period of several years. As the reporting requirements changed from wet weight of dredged material to dry weight only in 1995, it will be difficult to examine trends in the amounts dumped including data before 1995. Trend evaluation should not be started before data of 1999 are available. It may also be difficult to establish trends in contaminant loads of dredged material, as data sets often are not complete. Currently, only a rough comparison can be carried out.

PERMITS

Table 1 of the Annual OSPAR Reports on Dumping of Wastes at Sea summarises the numbers of permits issued and the tonnes licensed for the different types of wastes dumped. As in previous years, most of the permits were issued for dredged material: about 90% of the permits and more than 99 % of the overall amount licensed for disposal at sea refer to dredged material. As sea disposal of sewage sludge ceased in 1998, the tonnes licensed by Ireland and the UK were as small as in 1996. Disposal of 450 t of inert material consisting of sand and gravel was permitted by Norway in 1998. In 1997 and 1998, a total of about 246 t and 702 t of fish waste were permitted for sea disposal by Norway and UK. Only Norway reported on a permit for other waste, i.e. 6000 t concrete waste in 1997. The number of vessels licensed for disposal was 16 in 1997 and 7 in 1998. The number of vessels dumped in 1995/1996 was similar, i.e. 5 in 1995 and 18 in 1996. All vessels were under 150 ft long and prior to dumping all chemicals and removable parts were removed.

As in previous years, a comparison of the permits and the amounts of dredged material licensed in 1997 and 1998 reflect the different licensing procedures of the Contracting Parties (Table I of this assessment). In Belgium and the Netherlands, for example, only 5 permits were issued for about 20 Mt and 11 Mt dredged material in 1997, whereas e.g. in Norway 48 permits and in the UK 149 permits were issued for the disposal of about 1,3 Mt and 29 Mt dredged material. In other Contracting Parties, a general permit (Iceland) or no permits are issued (Germany) or reported (Spain, Sweden).

Furthermore, Table I shows that the amounts of waste licensed for disposal often differs strongly from the amounts actually dumped. As permits often are issued for more than one year (e.g. in Belgium and the Netherlands they are issued every 2 years) or licensed amounts perhaps are not disposed of, an evaluation of this information is difficult. When reviewing the reporting format, changes should be considered with regard to permits for the disposal of dredged material and the amounts licensed.

SPECIFIC REPORTING ON DUMPING PERMITS

In 1997 and 1998, only Norway specifically reported on permits for dumping dredged material, vessels and concrete. In 1997, Norway issued 9 permits for dredged material with contaminant concentrations exceeding level 2 of 300 µg/kg for PCB in order to maintain navigation and safety.

However, it should be kept in mind, that not all Contracting Parties report on or issue permits. Specific reporting may also be incomplete, since not all Contracting Parties have established national action levels yet.

With regard to the environmental risk, future reporting formats should include specific reporting with a view to obtain an overview on the actual dumped amounts of heavily contaminated dredged material exceeding action level 2. As mentioned above, the amounts of dredged material licensed for disposal often do not reflect the amounts actually dumped in the respective year.

AMOUNTS OF DREDGED MATERIAL DUMPED

As disposal of dredged material may have physical impacts on the marine environment, total amounts of material disposed of are included in the assessment (Tables II and III). As in 1995/1996, also in 1997 and 1998, more than 90 % of the dredged material reported to OSPAR were dumped by only 5 Contracting Parties (Belgium, France, Germany, The Netherlands, UK).

As the amounts of material to be dredged are strongly influenced by natural conditions as well as the dumping strategy, trends in the amounts dumped may be difficult to observe. No significant changes in the overall amounts of 1995, 1996, 1997 and 1998 can be observed. As reporting of the amounts dumped changed from wet to dry weight in 1995, a time trend for a sufficient time period cannot be established yet. However, national totals show some variations. In Sweden, for example, the amount of material dumped decreased significantly from 1995/1996 to 1996/1998 by a factor 4 - 8. It has to be pointed out, that quantities of dredged material for France might be overestimated for the years 1995/1996. Due to a lack of reported data, 1994 data were used as an indication for the amounts disposed of. The quantities disposed of in 1997 and 1998 by France only amounted to about 70 % of those dumped in 1994.

In addition, a separate evaluation of the amounts dredged in harbours on the one hand and in estuaries/sea channels on the other hand is carried out (cf. Tables IV and V). Contracting Parties often indicated more than one type of area dredged per dumping operation, but usually the reports did not include information on the percentages of dredged material associated with the respective types. When both, harbours and estuaries/sea channels, are indicated as origin of the dredged material without the respective percentages, usually 50 % were attributed to harbours and 50% to estuaries/sea channels. As the percentages only can be estimated roughly, the amounts assigned to harbours and to estuaries/sea channels have large uncertainties. The estimated amounts of dredged material for both categories are included in Tables IV and V.

Whereas the total amount of dredged material from estuaries/sea channels is quite constant since 1995, data indicate a slight decrease of dredged material originating from harbours in 1998 compared to 1995 – 1997 (Table VI). As in 1995/1996, the quantities of dredged material from estuaries or sea exceeded those from harbours significantly in 1997 and 1998. However, compared to earlier years, the relative amount of dredged material from estuaries/sea channels increased. For a proper trend assessment, it should be checked, whether

the increased percentage is due to a different procedure for assigning the material to sub-categories or whether it is due to an actual increase of dredging activities in estuaries/ sea channels.

Although the total quantities of dredgings from estuaries/sea channels exceeded those of harbours, the distribution is quite different for Contracting Parties. The bulk of dredged material in Belgium, Germany and to a minor extent in France originates from estuaries and sea channels, whereas Iceland, The Netherlands and Norway only reported dredgings from harbours. For most other Contracting Parties, larger amounts of material were attributed to harbours than to estuaries/sea channels. In 1997/1998, for most Contracting Parties the ratios of dredged material from harbours to that of estuaries/sea channels were similar as in 1995/1996. However, in the UK this ratio decreased significantly from about 6 in 1995/1996 to 1,2 in 1997. This may be due to the influence of large capital dredging projects in particular years.

So far, the assessment does not distinguish between capital and maintenance dredging. For most Contracting Parties, the bulk of dredged material originates from maintenance dredging. In 1997, appreciable amounts of material from capital dredging, i.e. more than 10 %, were reported only by Belgium, Iceland, Ireland and the UK, and in 1998 by Iceland, Spain and the UK. In Iceland, all the material came from capital dredging. For Spain and the UK, the proportion of capital dredging is difficult to estimate, as often both, capital and maintenance dredging is indicated without giving the ratio of the respective amounts.

As already observed in 1995 and 1996, the number of dumping sites compared to the amounts dumped differs strongly for the Contracting Parties (cf. Table I). Similarly as in 1997, Belgium, France, Germany and the Netherlands used 12, 32, 22 and 8 dumping sites for about 29 Mt, 19 Mt, 24 Mt and 10 Mt of dredged material, whereas the ratio of the amount of dredged material to the number of dumping sites was much smaller in other Contracting Parties. Norway and the UK e.g., disposed of about 1,3 Mt and 22,5 Mt dredged material at 13 and 103 dumping sites, respectively. This indicates that some of the dumping sites receive much higher amounts of dredged material than others. It should be considered to evaluate impacts on the seabed depending on the disposal of different amounts of dredged material per dumping site, if possible. This information might be available from reports on monitoring dumping sites.

TOTAL CONTAMINANT LOADS

In 1997 and 1998, most Contracting Parties reported on trace metal concentrations, however, often there was a lack on information for a number of dumping sites. Norway and Sweden submitted only few data, and in 1998, Denmark did not report at all. Iceland exempted all dredged material from analyses in both years. For most dumping sites without data for contaminant loads, there was no information whether the dredged material was exempted from analyses according to the OSPAR Dredged Material Guidelines or whether data required were not reported. This information would support data assessment, as contaminant loads of material exempted from analyses are negligible in contrast to contaminant loads of material that might be contaminated to varying degrees.

Nevertheless, trace metal data are considered to be sufficient for an assessment. For organic contaminants, no proper assessment can be carried out, as both, in 1997 and 1998, only little information is available. Contracting Parties often only reported on few organic contaminants and/or on selected dumping sites. As the Dredged Material Guidelines which introduced the requirement of analyses of organic contaminants, came into force only in June 1998, a more complete reporting on these compounds should be expected from 1999 onwards.

National total contaminant loads associated with dredged material are summarised in Tables II and III. Loads which could not be estimated reliably due to a lack of data are identified with brackets and italic letters.

National trace metal loads often show considerable variations between 1997 and 1998 e.g.:

- For a few trace metals, loads reported by Belgium in 1997 seem to be up to a factor 2 higher than those in 1998, however, it should be taken in account that in 1998, no data for internal dumping sites have been submitted. When excluding these data, loads in 1997 are only up to a factor 1,5 higher than in 1998.
- In Germany, trace metal loads were more than a factor 2 higher in 1998 compared to 1997 and previous years. This increase may be (partly) due to disposal of large amounts of dredged material from Elbe harbours at Cuxhaven in 1998.
- Trace metal loads reported for Ireland and Spain in 1997 are a factor of 2 or higher than in 1998. Correspondingly, the quantity of material disposed of is a factor of 5 (Ireland) and 3 (Spain) higher in 1997 compared to 1998.
- In the Netherlands, the national totals for trace metals in 1997 were almost a factor 2 higher than in 1998, and also higher than in 1996. This difference is probably caused by dumping 9,7 Mt dredged material from the Rotterdam harbour in 1997 compared to 5,2 Mt in 1998 or 2 Mt in 1996.
- Trace metal loads reported by France are similar for both years. However, in 1994, loads for As, Cr, Cu, and Pb were by about a factor 2, and for Ni even by a factor 3,5 lower than in 1997/1998 although the quantity of material dumped was by about 45 % higher. The increase of the loads for the above mentioned trace metals seems to be partially due to the disposal of dredged material from the harbour of Nantes and the Gironde estuary.

In 1998, however, the total loads of trace metals summed for all Contracting Parties seem to be consistently smaller than in 1997. The relative decrease of the load varies from ca. 10 for Ni to ca. 25 % for Hg, and the total quantity of dredged material decreased by ca. 11 %. Partially, the decrease of trace metal loads may be due to the reduction of the total quantities of dredged material, however uncertainties might be larger than the observed decrease.

A comparison of the sums of the national total loads from 1995 to 1998 shows some variability. This is true for the total loads, and for specific total loads, i.e. total loads per e.g. 1 million tonnes, too (Fig. 1a and 1b). The extreme high Hg load reported by Denmark for 1995 was not considered in Fig. 1, as an error in data transfer is assumed. Data for Cd and Ni indicate a slight decrease for data reported in 1997 and 1998 compared to data from 1995/1996. However, data are not considered to be sufficient for deriving a trend, especially having in mind that contaminant loads reported often were incomplete and associated with large uncertainties. Furthermore, data for France in 1995/1996 were assumed to equal those in 1994. The use of these data might bias the comparison of contaminant loads slightly.

As total contaminant loads may be influenced strongly by varying amounts of dredged material from areas with a different degree of contamination, trends probably can be established only, if long time series are available. In addition, trends in total contaminant loads of dredged material are not regarded as appropriate means to assess the effectiveness of measures for the reduction of contaminant inputs, as these loads include "pseudo-loads" from varying amounts of dredged material relocated within estuaries/sea channels. Furthermore, a reduction of loads may be detected more reliably, if the natural component of the loads is taken into account.

Due to a lack of data, the high TBT loads observed in 1995 and 1996, could not be verified. The Netherlands, which reported in 1995 a high TBT load of 577 kg that was mainly due to dredged material from Rotterdam harbour, submitted 1997/1998 data on TBT that were only in the range of 20 kg. However, no TBT loads for Rotterdam were included in 1997/1998. Generally TBT-data may not be reliable due to frequent difficulties in analytical methods, and therefore data from different laboratories might not be comparable.

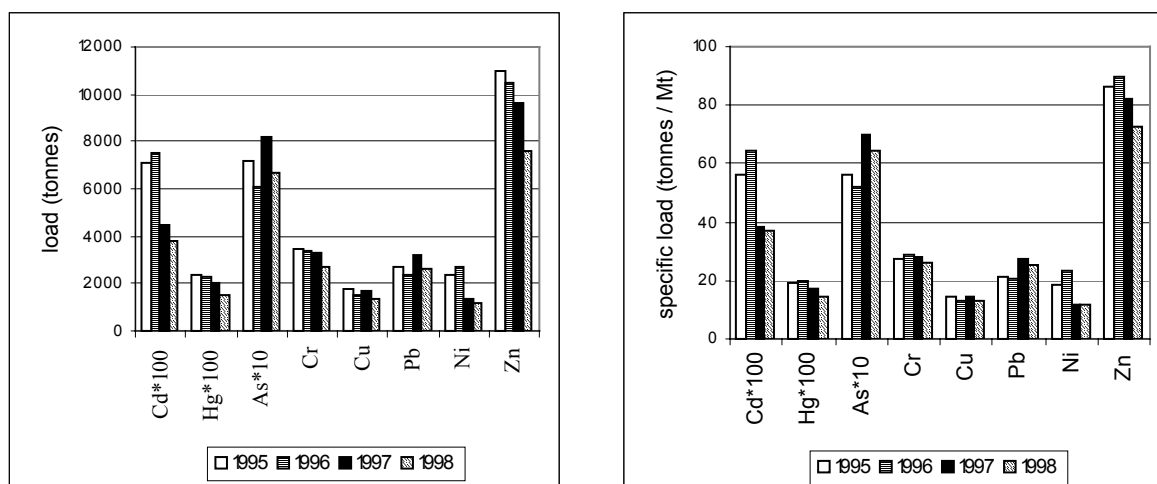


Fig. 1a and 1b: Total loads and Specific loads of trace metals for total quantities of dredged material in 1995 to 1998

In order to have one y-axis for all trace metals, loads of Cd and Hg were multiplied by a factor of 100, and the As load was multiplied by a factor of ten for presentation in Fig. 1.

ENVIRONMENTALLY RELEVANT CONTAMINANT LOADS

When summing up total loads, the contaminant input to the OSPAR maritime area by dredged material is overestimated (e.g. Oslo and Paris Commissions, 1997: Dumping at Sea in 1994; SEBA 99/11/8). Therefore, in addition to total loads, the current reporting formats require information on environmentally relevant loads. However, by now these loads are only reported by the Netherlands. The procedure for estimating environmentally relevant loads takes into account natural background concentrations (cf. SACSA 20/2/3-E).

Environmentally relevant loads as derived by the Netherlands, may be harmful to the ecosystem and thus may be of environmental relevance. However, even these anthropogenic loads do not necessarily constitute a new input of contaminants to the OSPAR maritime area, especially in case they are predominantly relocated repeatedly in estuaries/sea channels. Therefore, efforts are being made to develop a procedure for estimating the actual contaminant input that is added to the OSPAR maritime area by dredged material. However, there is still no agreed procedure. It should be considered whether an actual contaminant input could replace the environmentally relevant loads which are required in the current reporting formats.

In order to get a rough estimate of the actual contaminant input, loads are estimated separately for two categories of dredged material (Tables IV a,b and V a,b; cf. Chapter "Amounts of dredged material") according to the approach used for the assessment of the 1995 and 1996 data. It is assumed that dredging activities in estuaries, sea areas and navigation channels mainly relocate the sediments whereas particularly harbour dredgings may constitute new contaminant inputs. Therefore, separate evaluation of the two categories should allow to estimate the order of magnitude of "pseudo loads" that do not add contaminants to the OSPAR maritime area and of loads that may represent an input. This first approach does not take into account natural background concentrations, yet. It must, however, be emphasised that this approach to the estimation of actual contaminant inputs is very complex to implement and associated with large uncertainties. For example some industrialised estuaries may need to be considered in the same category as harbour dredgings as they may contribute to new contaminant inputs.

Tables IV and V give the contaminant loads separately for harbours (Tables IV a, V a) and for estuaries and sea channels (Tables IV b and V b).

In 1997 and 1998, the mean percentage of trace metal loads in dredged material from harbours amounts to about 55 % and 50 % of the reported total trace metal loads. The percentage was very similar for all trace metals and both years. Thus, the maximum actual input is assumed to amount to about 50 % of the total trace metal loads. In 1995/1996, the percentage load from harbours was 5 to 10 % higher and it differed significantly for different trace metals (ca. 40 – 80 %). However, as data submitted often were incomplete, no further conclusions can be drawn.

Fig. 2a and b present trace metal loads and specific loads (tonnes of a trace metal / million tonnes of dredged material) from harbour dredgings reported for 1995 – 1998. In order to minimise uncertainties in estimating specific loads which are due to a lack of information on contamination for a number of dumping sites, only data sets for harbour dredgings sets accompanied by trace metal loads were considered for evaluation. As a consequence, only data for Belgium, Denmark, Germany, Ireland, the Netherlands, Spain and the UK were included in the comparison. As for the assessment of total loads, the extremely high Hg load reported by Denmark in 1995 was excluded. Contaminant loads from harbour dredgings summed for all Contracting Parties show a similar variability as the total loads. In 1998, trace metal loads from harbour dredgings are by about 20 – 30 % smaller compared to 1997. However, taking into account the amounts disposed of in both years, data are quite similar. Furthermore, compared to data from 1995/1996, the reported absolute as well as specific loads of Cd, Ni and Zn are smaller in 1997/1998. However, as already pointed out for the assessment of total trace metal loads, further data are required for a proper trend examination.

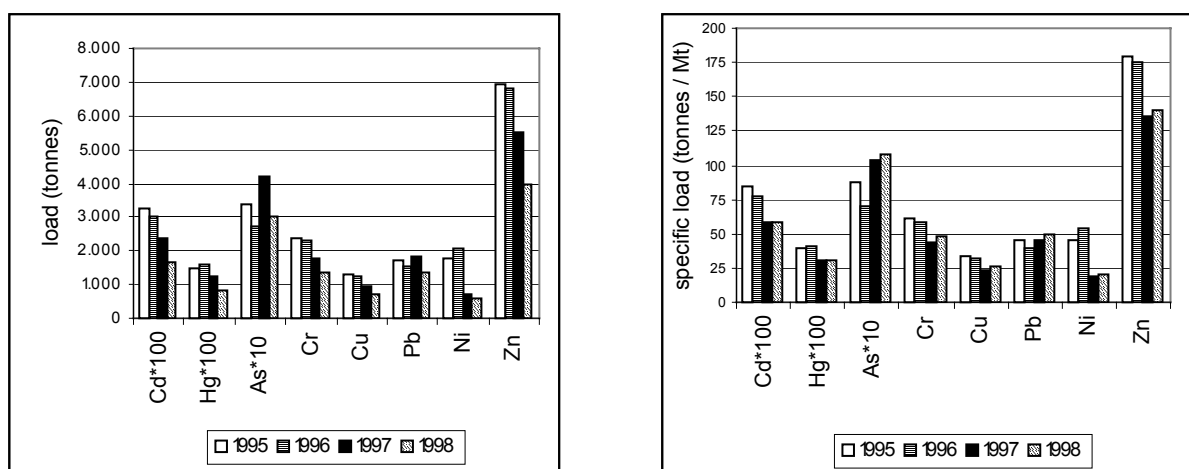


Fig. 2a and 2b: Trace metal loads and Specific loads of trace metals from harbour dredgings in 1995 to 1998

In order to have one y-axis for all trace metals, loads of Cd and Hg were multiplied by a factor of 100, and the As load was multiplied by a factor of ten for presentation in Fig. 2.

It should be considered that even total loads from harbours probably will overestimate the actual contaminant input, as part of this load is due to the long existing contamination of the respective water body and has been taken into account when estimating contaminant loads in earlier years and/or by other input paths. Furthermore, the sediments contain trace metals within their mineral matrix. As mentioned above, the Netherlands take into account these background concentrations, when estimating environmentally relevant loads. These environmentally relevant loads estimated by the Netherlands only amount to about 20 – 50 % of the total loads for Cd, Hg, As, Pb and Zn, and to about 0 % - 10 % for Cr, Cu and Ni. These results indicate that actual trace metal inputs from harbours may be considerably overestimated, if background concentrations are not taken into account. For oil, the environmentally relevant load is by about 50 %, and

for PAHs by about 20 % smaller than the total loads reported. For organochlorine and organotin compounds, the natural background concentrations are assumed to be zero, and as an approach the total load from harbours should be regarded as input to the maritime area.

ADDITIONAL INFORMATION

Only few Contracting Parties gave additional information. Toxicity of dredged e.g., seems not to be investigated by Contracting Parties yet. The Netherlands indicated that a new assessment system including biological tests is developed and their implementation as quality criteria in a permit is intended. However, respective quality criteria are not incorporated into national legislation but are foreseen for the year 2002.

There is a particular lack on information on methods of determination. In the dumping reports 1997 and 1998, only Spain and the UK submitted information on analytical methods. In addition, information of the Netherlands on analytical methods and detection limits were received together with the comments on the first draft of this assessment. France submitted quite comprehensive information on the calculation of the dry weight of dredged material. Based on the information provided in the dumping reports and the additional information, it was impossible to evaluate the comparability and quality of data. However, for quality assurance purposes such a huge amount of information had to be examined by the expert assessment panel that an evaluation could not be carried out in the frame of SEABED Therefore, it is recommended that Contracting Parties ensure for themselves the quality of data provided for the Dumping Reports.

When reviewing the reporting format, it should be considered whether it shall include the requirement for information on analytical methods. However, it should be kept in mind that an evaluation of data is probably biased more due to incomplete reporting than due to analytical uncertainties.

MAPS

The design of maps presented in the reports differs widely for Contracting Parties. It would be an advantage to have the same or a similar presentation for all Contracting Parties, e.g. based on a GIS. When reviewing the reporting format, the usefulness of the maps should also be considered, and if deemed useful, improvements should be considered.

Table I: Overview on the number of permits. Dumping sites and amounts of dredged material licensed (in tonnes dry weight) and dumped in 1997 and 1998

	1997				1998			
	Number of permits	Number of Dumping Sites	Amounts licensed	Amounts dumped	number of permits	Number of Dumping Sites	amounts licensed	Amounts dumped
Belgium	5	15	19 820 000	33 159 019	-	12	-	29 905 661
Denmark	NI	30	NI	1 239 758	NI	NI	NI	NI
France	29	29	19 177 201	19 177 201	32	31	19 802 522	19 802 522
Germany	-	22	-	20 006 000	-	22	-	24 098 000
Iceland	G.P.	9	164 456	164 456	G.P.	8	160 430	160 430
Ireland	12	10	499 680	628 340	12	4	681 302	132 175
The Netherlands	5	8	11 240 626	14 740 689	5	8	11 252 000 ¹	10 339 328
Norway	48	13	1 292 600	1 314 164	51	14	684 318	684 318
Portugal	NI	NI	NI	NI	NI	NI	NI	NI
Spain	-	9	-	3 817 821	-	8	-	1 169 959
Sweden	-	16	-	424 964	9	9	-	447 622
UK	149	103	28 818 721	22 683 822	139	122	45 419 813	17 358 911

¹ tonnes dry weight converted from the volume reported with the factor derived from 1997 data
NI: not indicated

Table II: Summary of Amounts of Wastes Dumped at Sea in 1997

Waste Material/ Country	total quantity (in metric tonnes) dry weight	in tonnes										in kilograms					
		Cd	Hg	As	Cr	Cu	Pb	Ni	Zn	Oil	Total PAH	Total CB	HCB	γ- HCH	Diel- drin	DDT	TBT
Dredged Material																	
Belgium	33 159 019	14,0	3,6	326	644	367	609	288	2307	<i>n.r.</i>	<i>n.r.</i>	134	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
Denmark	1 239 758	(0,16)	(0,04)	(0,93)	(7,1)	(7,3)	(6,2)	(1,3)	(25)	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
France	19 177 201	(9,9)	(2,5)	(165)	(692)	(277)	(493)	(252)	(1520)	(656)	(0,38)	(267)	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
Germany *	20 006 000	0,50	0,16	22	64	29	87	33	166	<i>n.r.</i>	<i>n.r.</i>	(0,05)	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
Iceland	164 456	<i>exempted from analyses</i>										<i>exempted from analyses</i>					
Ireland	628 340	0,53	0,06	5,0	17,3	16,8	21,9	11,5	61,7	289	<i>n.r.</i>	10,7	0,21	0,24	0,30	1,3	28,0
The Netherlands	14 740 689	8,6	4,7	218	535	286	501	220	1.772	1.122	15,8	236	20,0	19,0	23,0	2,0	17,0
Norway	1 312 964	(0,005)	(0,002)	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	(0,29)	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	(0,01)	(1,8)	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
Spain	3 817 821	4,1	2,8	35,6	133	81,3	139	70,0	660	<i>n.r.</i>	1,7	82	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
Sweden	424 964	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
UK	22 683 822	7,0	6,3	50	1238	629	1321	500	3137	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
Total=	117 355 034	44,8	20,1	822	3330	1692	3178	1375	9648	(2067)	(17,9)	(729)	(20,2)	(19,2)	(23,3)	(3,3)	(45)
Other Waste																	
Norway																	
Sewage Sludge																	
Ireland	22 912	0,02	0,02	0,11	0,63	3,9	4,0	0,6	10,3	410	<i>n.r.</i>	2,1	0,30	0,30	0,30	0,89	<i>n.r.</i>
UK	258 307	0,70	0,51	0,05	57	121	76	12,5	270	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
total=	281 219	0,72	0,53	0,16	58	125	80	13,1	280	(410)	<i>n.r.</i>	(2,1)	(0,3)	(0,3)	(0,3)	(0,89)	<i>n.r.</i>
Fish Waste																	
Ireland	420																
UK	41																
total=	441																
Vessels/Aircraft																	
Norway **	16																

Germany * including 460.000 t from the Netherlands
Norway ** number of vessels

Table III: Summary of Amounts of Wastes Dumped at Sea in 1998

Countries	total quantity (in metric tonnes) dry weight	in tonnes										in kilograms					
		Cd	Hg	As	Cr	Cu	Pb	Ni	Zn	Oil	Total PAH	Total CB	HCB	γ-HCH	Diel-drin	DDT	TBT
Dredged Material																	
Belgium	29 905 661	(13,1)	(2,3)	(148)	(287)	(140)	(397)	(180)	(1267)	n.r.	n.r.	(88)	n.r.	n.r.	n.r.	n.r.	n.r.
Denmark	not reported	not reported										not reported					
France	19 802 522	8,1	2,2	181	643	221	543	257	1494	(572)	(2,8)	(488)	n.r.	n.r.	n.r.	n.r.	n.r.
Germany	24 098 000	(1,7)	(1,4)	(54,0)	(244)	(82,5)	(153)	(85,4)	(505)	(3,6)	(0,09)	(0,62)	(0,05)	(0,02)	(0,09)	(0,55)	(3,2)
Iceland	160 430	exempted from analyses										exempted from analyses					
Ireland	132 175	0,11	0,04	1,6	7,0	5,7	9,5	4,5	31,4	n.r.	n.r.	2,0	n.r.	n.r.	n.r.	10,1	n.r.
The Netherlands	10 339 328	4,8	2,3	96,7	241	143	271	107	887	809	7,4	174	19,0	13,0	14,0	10,0	20,0
Norway	684 318	not reported										not reported					
Spain	1 169 959	1,7	1,0	15,1	39,9	38,5	67,7	19,5	323	n.r.	1,0	27,1	n.r.	n.r.	n.r.	n.r.	n.r.
Sweden	447 622	(0,50)	(0,16)	n.r.	n.r.	(0,08)	n.r.	n.r.	n.r.	n.r.	n.r.	not reported					
UK	17 358 911	8,2	5,6	171	1278	689	1218	553	3084	n.r.	n.r.	not reported					
Total=	0	38,2	14,9	667	2739	1321	2659	1207	7593	(1385)	(11,3)	(780)	(19,1)	(13,0)	(14,1)	(17,6)	(23,2)
Inert Materials																	
Norway	450																
Sewage Sludge																	
Ireland	15 539	0,02	0,02	n.r.	0,81	4,12	4,04	0,84	11,1	n.r.	n.r.	not reported					
UK	193 304	0,47	0,37	0,37	35,4	79,4	48,6	12,0	172	n.r.	n.r.	not reported					
	208 843	0,49	0,39	0,37	36,2	83,5	52,6	12,8	183								
Fish Waste																	
Norway	290																
UK	114																
	404																
Vessels/Aircraft																	
Norway **	7																

Germany * including 555.000 t from the Netherlands

Norway ** number of vessels

Table IV a: Amounts of Dredged Material and Associated Contaminants Dumped in 1997 from Harbours

Countries	total quantity (in metric tonnes) dry weight	in tonnes										in kilograms					
		Cd	Hg	As	Cr	Cu	Pb	Ni	Zn	Oil	Total PAH	Total CB	HCB	γ-HCH	Diel-drin	DDT	TBT
Belgium	3 945 897	3,6	0,9	65,5	128	72,6	183	68,9	656	<i>n.r.</i>	<i>n.r.</i>	61	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
Denmark	613 639	0,09	0,04	0,89	7,0	7,2	6,1	1,2	24,3	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
France	4 965 951	3,6	1,5	49,6	230	103	183	65,8	609	(431)	(0,38)	(267)	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
Germany *	1 116 500	0,50	0,16	21,6	63,1	28,4	86,3	32,0	164	<i>n.r.</i>	<i>n.r.</i>	(0,05)	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
Iceland	164 456	<i>exempted from analyses</i>										<i>exempted from analyses</i>					
Ireland	450 640	0,41	0,03	3,6	13,1	12,6	15,4	8,1	41,3	139	<i>n.r.</i>	6,3	0,18	0,20	0,20	0,95	20,3
The Netherlands	14 740 689	8,6	4,7	218	535	286	501	220	1772	1122	15,8	236	20,0	19,0	23,0	2,0	17,0
Norway	1 314 164	(0,005)	(0,002)	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	(0,29)	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	(0,01)	(1,8)	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
Spain	3 514 155	2,7	1,6	28,5	122	68,1	113	65,0	513	<i>n.r.</i>	1,0	57,6	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
Sweden	376 975	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
UK	12 095 999	4,0	3,7	33,0	677	356	727	279	1730	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
Total=	43 299 065	23,5	12,7	421	1774	934	1815	740	5510	(1691)	(17,3)	(630)	(20,2)	(19,2)	(23,2)	(2,95)	(37,3)

Germany * including 460.000 t from the Netherlands

Table IV b: Amounts of Dredged Material and Associated Contaminants Dumped in 1997 from Estuaries and Sea Channels

Countries	total quantity (in metric tonnes) dry weight	in tonnes										in kilograms					
		Cd	Hg	As	Cr	Cu	Pb	Ni	Zn	Oil	Total PAH	Total CB	HCB	γ-HCH	Diel-drin	DDT	TBT
Belgium	29 213 122	10,4	2,6	260	516	294	426	219	1651	<i>n.r.</i>	<i>n.r.</i>	72,5	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
Denmark	626 119	(0,07)	(0,001)	(0,04)	(0,14)	(0,12)	(0,13)	(0,09)	(0,63)	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
France	14 211 250	(6,29)	(1,06)	(115)	(462)	(173)	(310)	(187)	(910)	(226)	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
Germany	18 889 500	(0,007)	<i>n.d.</i>	(0,32)	(0,83)	(0,26)	(0,70)	(0,49)	(2,4)	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
Iceland		<i>not applicable</i>										<i>not applicable</i>					
Ireland	177 700	0,12	0,03	1,3	4,2	4,2	6,5	3,5	20,5	150	<i>n.r.</i>	4,4	0,03	0,04	0,10	0,35	7,7
The Netherlands		<i>not applicable</i>										<i>not applicable</i>					
Norway		<i>not applicable</i>										<i>not applicable</i>					
Spain	303 666	1,5	1,1	7,1	11,6	13,2	26,5	5,0	147	<i>n.r.</i>	0,65	24,1	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
Sweden	47 989	<i>not reported</i>										<i>not reported</i>					
UK	10 587 823	3,0	2,6	16,9	561	273	594	220	1407	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>	<i>n.r.</i>
Total=	74 057 169	21,3	7,4	401	1556	758	1363	635	4138	(376)	(0,6)	(101)	(0,03)	(0,04)	(0,10)	(0,35)	(7,7)

Table V a: Amounts of Dredged Material and Associated Contaminants Dumped in 1998 from Harbours

Countries	total quantity (in metric tonnes) dry weight	in tonnes										in kilograms					
		Cd	Hg	As	Cr	Cu	Pb	Ni	Zn	Oil	Total PAH	Total CB	HCB	γ-HCH	Diel-drin	DDT	TBT
Belgium	2 174 780	2,1	0,52	35,8	71,8	40,6	102	38,2	360	n.r.	n.r.	33,0	n.r.	n.r.	n.r.	n.r.	n.r.
Denmark	not reported	not reported										not reported					
France	4 115 985	2,47	0,97	42,1	211	78,3	168	61,6	456,5	(412)	(2,8)	(458)	n.r.	n.r.	n.r.	n.r.	n.r.
Germany *	1 857 500	1,1	0,74	33,7	142	47,8	94,4	53,3	302	(3,6)	(0,09)	(0,62)	(0,05)	(0,02)	(0,09)	(0,55)	(2,3)
Iceland	160 430	exempted from analyses										exempted from analyses					
Ireland	79 622	0,09	0,02	1,2	4,8	4,0	7,3	3,1	24,0	n.r.	n.r.	1,7	n.r.	n.r.	n.r.	7,1	n.r.
The Netherlands	10 339 328	4,8	2,3	96,7	241	143	271	107	887	809	7,4	174	19,0	13,0	14,0	10,0	20,0
Norway	684 318	not reported										not reported					
Spain	650 224	1,3	0,54	7,9	22	26	49	11,2	245	n.r.	0,8	24,1	n.r.	n.r.	n.r.	n.r.	n.r.
Sweden	446 907	(0,50)	(0,16)	n.r.	n.r.	(0,08)	n.r.	n.r.	n.r.	n.r.	n.r.	not reported					
UK	9 892 653	4,7	3,5	86,9	688	398	693	305	1706	n.r.	n.r.	not reported					
Total=	30 401 747	17,0	8,7	304	1381	738	1385	580	3980	(1225)	(11,1)	(691)	(19,1)	(13,0)	(14,1)	(17,6)	(22,3)

Germany * including 555.000 t from the Netherlands

Table V b: Amounts of Dredged Material and Associated Contaminants Dumped in 1998 from Estuaries and Sea Channels

Countries	total quantity (in metric tonnes) dry weight	in tonnes										in kilograms					
		Cd	Hg	As	Cr	Cu	Pb	Ni	Zn	Oil	Total PAH	Total CB	HCB	γ-HCH	Diel-drin	DDT	TBT
Belgium	27 730 881	(11,0)	(1,8)	(113)	(215)	(100)	(295)	(142)	(907)	n.r.	n.r.	(55,0)	n.r.	n.r.	n.r.	n.r.	n.r.
Denmark	not reported	not reported										not reported					
France	15 686 537	5,7	1,2	138	432	143	375	196	1038	(160)	n.r.	(30,5)	n.r.	n.r.	n.r.	n.r.	n.r.
Germany	22 240 500	(0,66)	(0,66)	(20,1)	(102)	(34,7)	(58,8)	(32,2)	(203)	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	(0,94)
Iceland		not applicable										not applicable					
Ireland	52 554	0,02	0,01	0,5	2,2	1,7	2,2	1,4	7,4	n.r.	n.r.	0,36	n.r.	n.r.	n.r.	3,0	n.r.
The Netherlands		not applicable										not applicable					
Norway		not applicable										not applicable					
Spain	519 734	0,43	0,42	7,2	17,8	12,4	18,5	8,3	78,0	n.r.	0,22	3,3	n.r.	n.r.	n.r.	n.r.	n.r.
Sweden	715	not reported										not reported					
UK	7 466 257	3,6	2,1	84,0	590	292	525	248	1379	n.r.	n.r.	not reported					
Total=	73 697 178	21,4	6,2	363	1358	583	1274	627	3612	(160)	(0,22)	(89,2)				(3,0)	(0,94)

n.r.: not reported

Table VI: Relative quantities of dredged material from different areas disposed of at sea since 1987

origin of dredged material	total dredged material (Mt dry weight)	harbour dredgings		estuaries/sea channel dredgings	
		(Mt dry weight)	(%)	(Mt dry weight)	(%)
1998	104	30	29	74	71
1997	117	43	37	74	63
1996	117	47	40	70	60
1995	127	49	39	78	61
1994	(1)	(1)	52	(1)	48
1993			42		58
1992			40		60
1991			46		54
1990			52		48
1989			47		51
1988			64		36
1987			44		56

(1): reported as wet weight