Effects due to chemical disturbance

All Contacting Parties only permit marine disposal of sediment within specific quality standards. The chemical impact of this sediment is therefore considered to be zero or acceptably low. In most studies, ecotoxicological tests showed that the sediments collected at dumpsites were not toxic to slightly toxic. Based on the literature review, it can be concluded that the disposal of dredged sediments, when sediments comply with the sediment quality criteria, causes no or minimal chemical disturbances (OSPAR, 2008a).

Trend assessment of total contaminant loads is not regarded as an appropriate means to evaluate the effectiveness of measures for the reduction of contaminant inputs from the disposal of dredged material at sea. This is because contaminant loads at any given location are influenced by several factors such as the amounts of dredged material, the origin of the material dumped and possible relocation of material from other areas. Furthermore, not all data are collected and reported to the same standard. Assessment of contaminant concentrations in dredged material from selected harbour areas has proven to be a more effective tool for this purpose, as demonstrated in the overall assessment from the mid-1980s to 2001 (OSPAR, 2003). For this assessment, the same approach has been adopted with information updated to 2007.

Data from Belgium, the United Kingdom, the Elbe Estuary and Rotterdam Harbour demonstrated that there was a rapid decline of Mercury (Hg) and Cadmium (Cd) concentrations with a reduction of approx 60 – 80% from 1986/1987 to 1991 (see Figure 4.8a – 4.8d). In addition, data from Belgium, the Netherlands, and the United Kingdom showed a steady decline in concentrations of Copper (Cu), Nickel (Ni), Lead (Pb) and Zinc (Zn) with a reduction of approx. 40 – 60% in the same period while concentrations of these trace metals in the Elbe Estuary showed only little or no decrease. A similar decrease of about 50% was reported for PCB and PAHs in Rotterdam Harbour. It is worth noting that the actual concentrations also vary markedly between different regions.

From 1991 to 2007 most contaminant concentrations did not decrease significantly, except PCB, PAH and TBT concentrations which, according to the most recent measurements, continue to fall. Nonetheless, trends suggest that most contaminants are closer to background levels than they were 10 – 15 years ago. Despite some uncertainty in the early data, TBT concentrations have decreased over the last decade. In addition, chromium (Cr) concentrations in dredged material from Belgium and Rotterdam Harbour decreased by about 50 – 60%. However, in Germany and the United Kingdom little or no decline could be observed over the same period, though a slight decrease is evident over the last five years.

Specific local trends can be summarised as follows:

- In the United Kingdom, Cd, Hg, Cr and Zn decreased very slightly from 1995 – 2007 and As and Pb concentrations increased slightly.
- Trace metal concentrations from the Netherlands over the period 1995 – 2007 do not show discernible trends, confirmed by the analysis of the contaminant concentrations from Rotterdam Harbour over this time period.
- In Belgium, trace metal concentrations decreased slightly over the period 1995 – 2006 except for As, Cr and Cu.
- Total trace metal concentrations from France increased slightly from 1995 – 2007 (as did the total quantity of dredged material).
- In Germany, total trace metal concentrations decreased slightly over the period 1995 – 2007.

In future, a further steady downward trend in some trace metals, PCB, PAHs and TBT inputs may be expected as a result of reduction measures such as better control on contaminant sources and on land-based disposal. However, few data are available for organic contaminants and TBT in dredged material, and no proper assessment can thus be carried out. The OSPAR Guidelines for the Management of Dredged Material (OSPAR 2009) do not require organic substances to be analysed in all circumstances, thus, complete data sets for these substances are lacking.

The reported trace metal data are considered to be sufficient for an assessment. However, it should be kept in mind that due to incomplete reporting and differences in the analytical approaches, there is significant uncertainty when comparing national total trace metal loads between Contracting Parties. Therefore, the overall total trace metal load for all Contracting Parties can only be regarded as an order of magnitude estimate of loads.

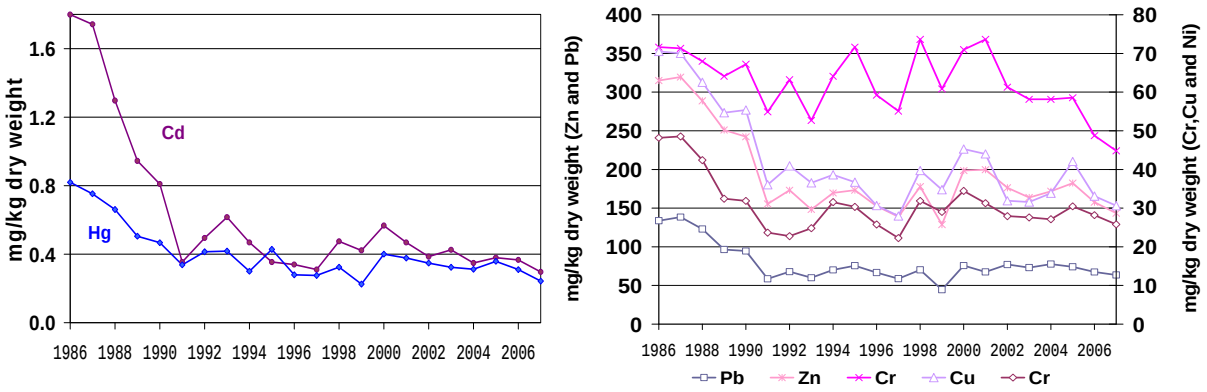

Figure 4.8a: *Trends in trace metal concentrations in dredged material disposed of at sea in the United Kingdom (average concentrations in sediment fraction < 2mm)*
Source: Cefas Regulatory Assessments Team

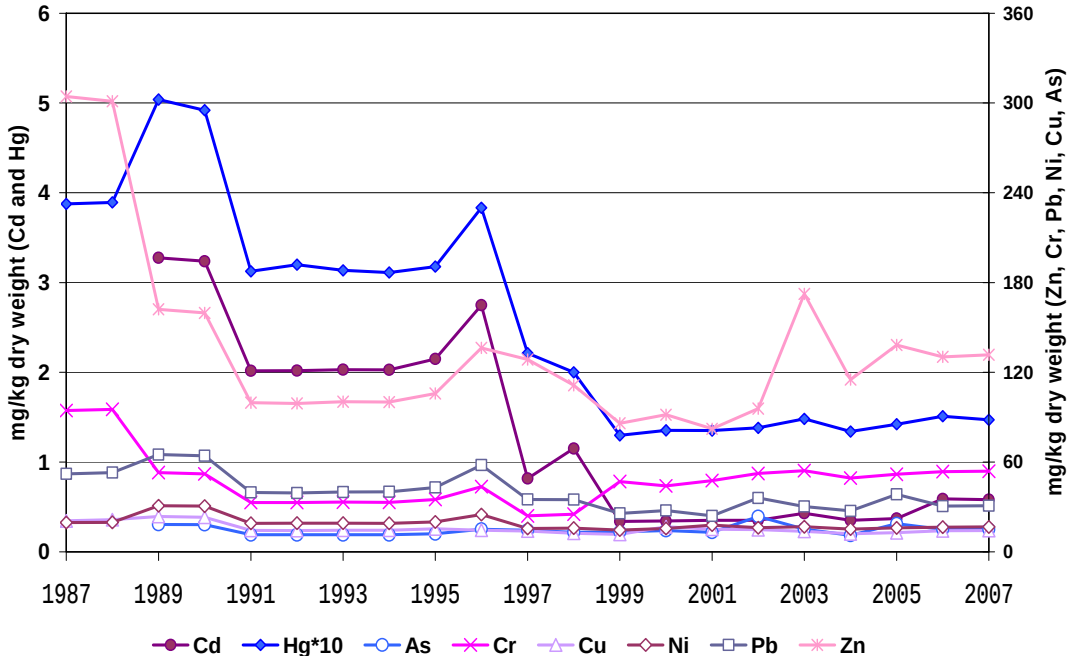

Figure 4.8b: *Trends in trace metal concentrations in dredged material disposed of at sea in Belgium (average concentrations in sediment fraction < 2 mm)*
Source: Annual OSPAR Reports on Dumping of Wastes at Sea

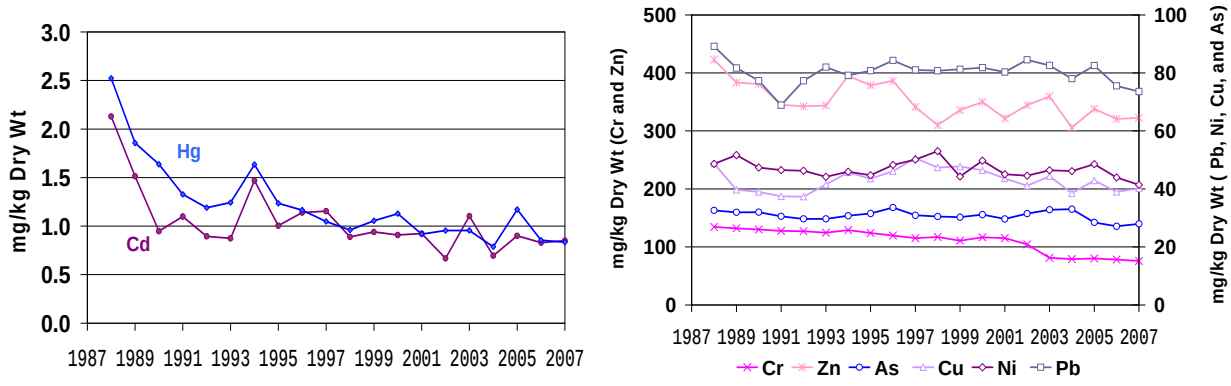

Figure 4.8c: *Trends in trace metal concentrations in dredged material from Elbe Convention area disposed of at sea in Germany (average concentrations in sediment fraction < 20 µm)*
Source: Bundesanstalt für Gewässerkunde (Federal Institute of Hydrology), unpublished.

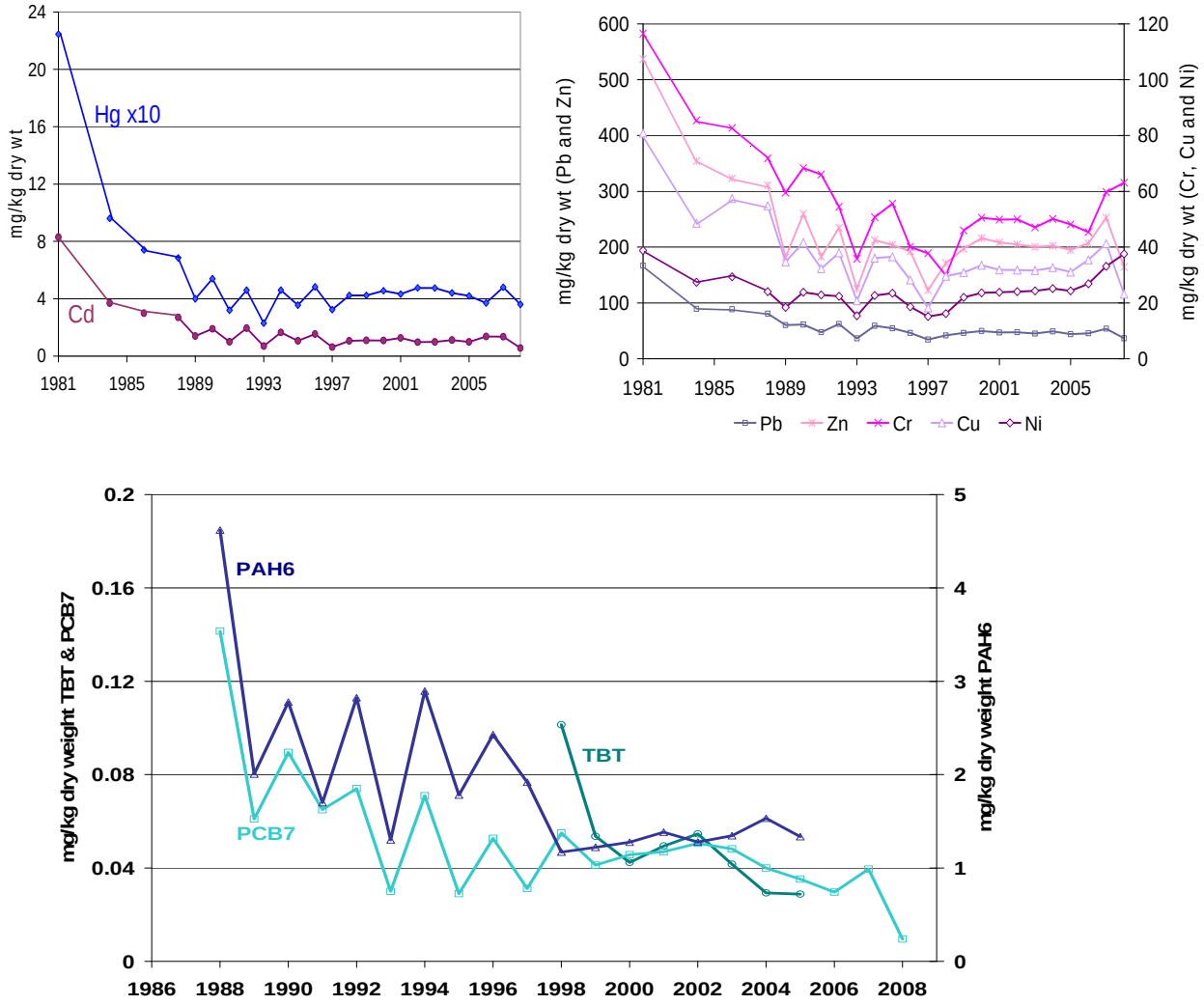

Figure 4.8d: *Trace metal, PCB, PAH and TBT concentrations in dredged material disposed of in Rotterdam Harbour (average concentrations in sediment fraction < 2mm)*
Source: Annual OSPAR Reports on Dumping of Wastes at Sea

The total trace metal concentrations from 1995 to 2007 are highly variable (Figure 4.9a and Figure 4.9b). In general, trace metal loads increased slightly from 1995-2002 and have subsequently decreased from 2002 – 2005, despite quantities of dredged material being higher in 2003 – 2005. The exception is Cd increased sharply in 2003. This is caused by the high Cd load at one particular deposit site in Belgium in 2003. The high Cu and Zn loads in 2002 are caused by increased loads from France and Portugal.

Harbour dredging follow the same pattern. The proportion of metals contributed by harbour dredging has decreased from about 60% to about 40% of the reported total trace metal loads from 1995-2007. The mean percentage of Cr, Cu, Ni, Pb and Zn loads in dredged material from harbours decreased from 70% in the mid-1990s to about 40 – 50% of the reported total trace metal loads in 2007.

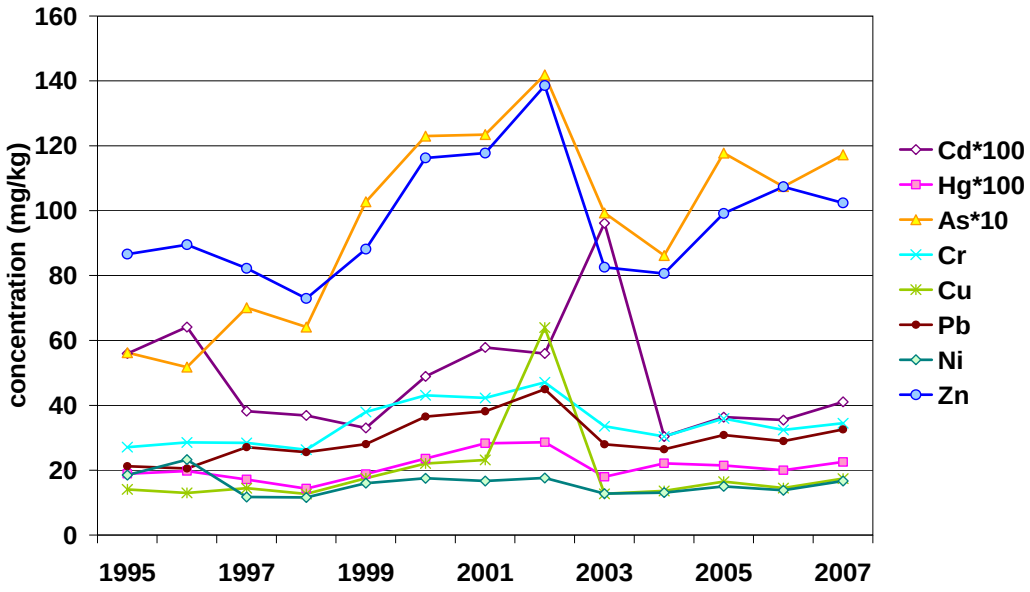

Figure 4.9a: *Calculated total trace metal concentrations within the OSPAR area 1995-2007*
Source: Annual OSPAR Reports on Dumping of Wastes at Sea

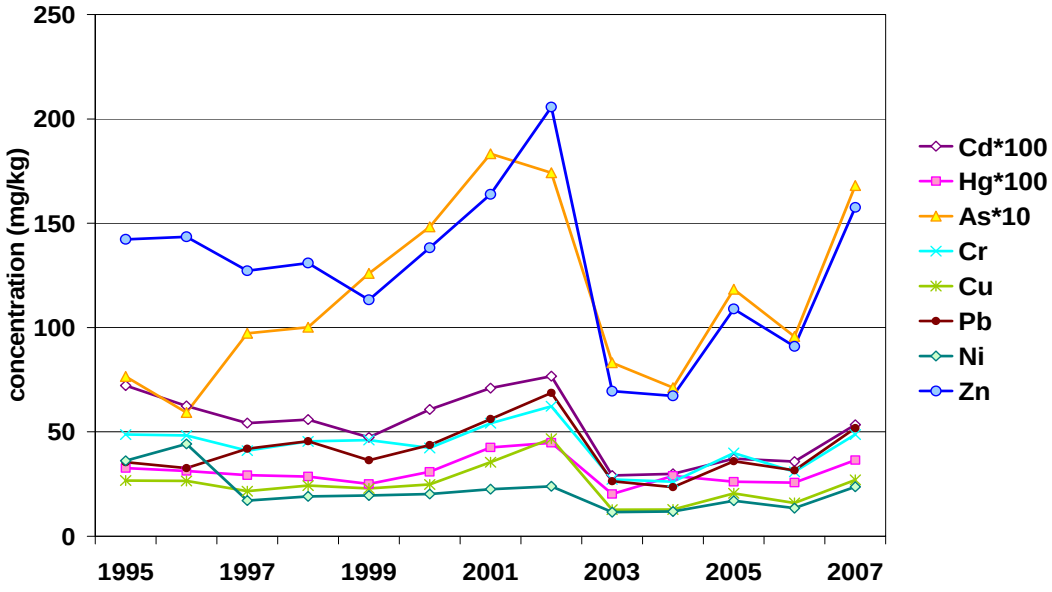

Figure 4.9b: *Calculated trace metal concentrations in harbour dredging in the OSPAR area, 1995-2007*
Source: Annual OSPAR Reports on Dumping of Wastes at Sea

The total contaminant loads reported to OSPAR are considered to be much higher than the actual inputs to the OSPAR maritime area. This is because reported loads also include elements in mineral matrices as well as pre-exiting material redistributed through re-dredging and other activities. At present there is no way to distinguish the proportion that represents new inputs from the marine disposal of dredged material from the relocation within the system.

The trace metal concentrations as shown in Figure 4.9a and 4.9b are calculated by dividing the total loads of contaminants by the total amounts of dredged material. However, some countries only reported the total amount of dredged material and not the contaminant load, leading to some over-estimation of concentrations.

➥*Go to full QSR assessment report on the environmental impact of dumping of wastes at sea (publication number 433/2009)*