



# Trends in Concentrations of Polybrominated Diphenyl Ethers (PBDEs) in Sediment

MSFD Descriptor: 8 - Concentration of contaminants

MSFD Criteria: 8.1 - Concentration of contaminants



**Key Message** Concentrations of polybrominated diphenyl ethers (PBDEs) detected in sediment in the areas assessed either show no statistically significant change (Northern North Sea) or are declining (Irish Sea). The lack of assessment criteria means the environmental significance of the concentrations cannot be assessed

## Background

Polybrominated diphenyl ethers (PBDEs) are a group of congeners, mainly used as flame retardants in a variety of materials including plastics, textiles, electronic products, building materials, furnishings and vehicles (Figure 1).

PBDEs may enter the environment through emissions from manufacturing processes, evaporation from products that contain PBDEs, recycling wastes and leachate from waste disposal sites. They are widespread and have been detected in air, sediments, surface waters, fish and other marine animals.

PBDEs are toxic, they take a long time to degrade and have the potential to accumulate in fish or shellfish (taken in either directly from the surrounding water or indirectly via food). As a result, some PBDEs were banned or restricted within the European Union starting in 2004. Production of some groups of PBDEs was banned in 2009 by 180 countries that are signatories to the Stockholm Convention.

The spatial distribution of PBDEs in marine sediments is variable. PBDEs do not dissolve in water and bind strongly to soil or sediment. As a result PBDEs in sediment are not very mobile.

The OSPAR Hazardous Substances Strategy has the ultimate aim of achieving concentrations in the marine environment close to zero for man-made synthetic substances, and PBDEs are included in the group of brominated flame retardants on the OSPAR List of Chemicals for Priority Action. The status of PBDE concentrations in sediment is calculated but not assessed because there are no OSPAR assessment values developed with which to assess status.

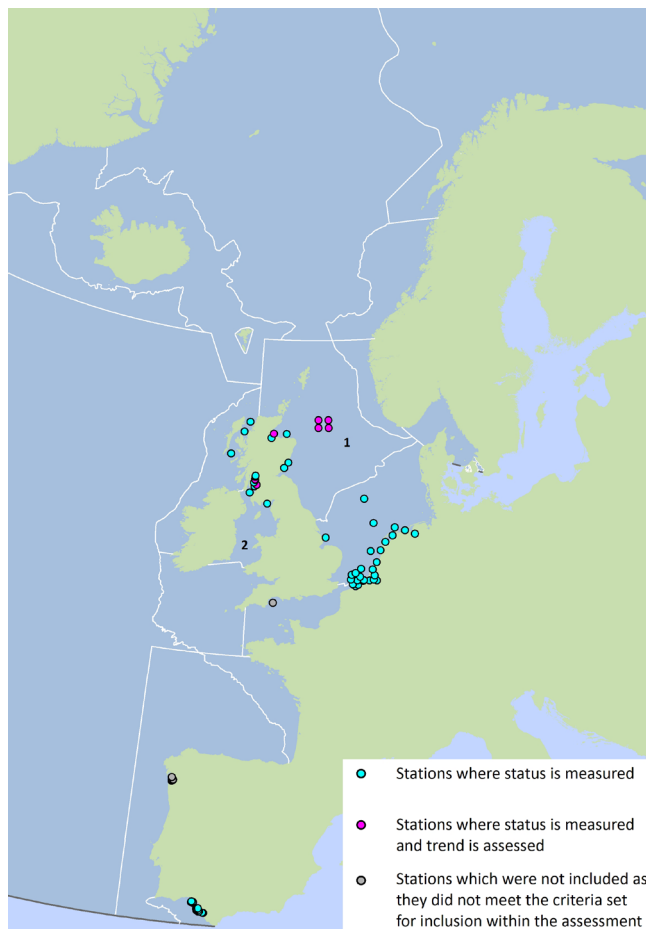


Figure 2: Monitoring sites used to assess PBDE concentrations in sediment by OSPAR. The assessment area (white lines) is determined by hydrogeographic principles and expert knowledge, not OSPAR internal boundaries.

## Results

Polybrominated diphenyl ether (PBDE) concentrations are measured in sediment samples taken annually (or every few years) from monitoring sites in the Greater North Sea, Celtic Seas, and Bay of Biscay and Iberian Coast. The locations of the PBDE monitoring sites are shown in Figure 2.



Figure 1: Polybrominated diphenyl ethers (PBDEs) are a group of compounds mainly used as flame retardants in a variety of materials, including electronic products (upper) and vehicles (lower)

## Results cont...

The number of time series used in each area assessed is very limited. Some of the PBDE in sediment data for the Greater North Sea, Celtic Seas, and Bay of Biscay and Iberian Coast could not be taken into account, either because some time series include data below concentration levels that can be accurately measured or because time series are too short for analysis. Furthermore, an OSPAR sub-region was only assessed if at least three monitoring sites had enough years of data and a representative geographic spread across a sub-region. It is expected that more monitoring sites can be included for future assessments.

Temporal trends in mean PBDE concentrations were assessed in two OSPAR sub-regions where there were at least five years of data (**Figure 3**). Mean PBDE concentrations in sediment show no statistically significant change in the Northern North Sea and decreasing in the Irish Sea.

The mean concentrations of PBDE in sediment were analysed for five sub-regions; Northern North Sea, Southern North Sea, Irish Sea, Irish and Scottish West Coasts and the Gulf of Cadiz. Concentrations in sediment are low ( $<1 \mu\text{g/kg}$  dry weight) and often below detection levels. The Gulf of Cadiz has the lowest concentrations of PBDE in any assessed area ( $<0.01 \mu\text{g/kg}$  dry weight), while the Irish Sea and Southern North Sea have the highest.

There is high confidence in the assessment and sampling methodology and high confidence in the data used.

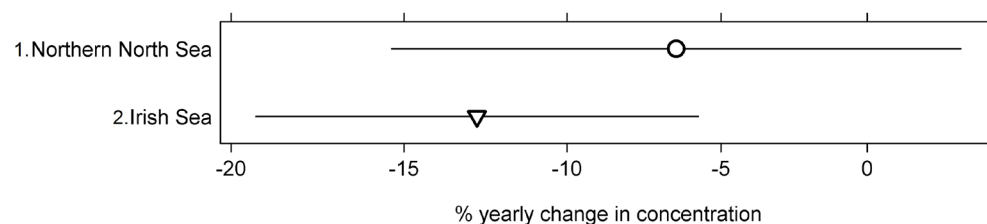


Figure 3: Percentage annual change in overall PBDE concentrations in each OSPAR sub-region. No statistically significant ( $p < 0.05$ ) change in mean concentration (circle), mean concentration is significantly decreasing (downward triangle). 95% confidence limits (lines)

## Conclusion

Polybrominated diphenyl ether (PBDE) concentrations in sediment are measured at very few monitoring sites in the Greater North Sea, Celtic Seas, and Bay of Biscay and Iberian Coast. As there are no assessment criteria available for PBDEs in sediment, it is not possible to assess the environmental significance of the concentrations observed.

There were enough years of data from some of the monitoring sites in the Northern North Sea and Irish Sea to carry out temporal trend analyses. PBDE concentrations are declining in Irish Sea and show no statistically significant change in the Northern North Sea.

The majority of measured concentrations of PBDE in sediment are low and often below detection levels. The Gulf of Cadiz has the lowest concentrations of PBDE in any assessed area, while the Greater North Sea has the highest.

## Knowledge Gaps

There are few monitoring sites for the assessment temporal trends in polybrominated diphenyl ether (PBDE) concentrations in sediment in the OSPAR sub-regions which means the assessment cannot be considered representative for the OSPAR Maritime Area as a whole. Cooperation between OSPAR and the Arctic Monitoring and Assessment Programme (AMAP) will improve access to data for Arctic Waters.

Background Assessment Concentrations (BACs) and Environmental Assessment Criteria (EACs) need to be developed for PBDE concentrations in sediment in order to be able to assess the environmental significance of the concentrations observed.

This document was published as part of OSPAR's Intermediate Assessment 2017. The full assessment can be found at [www.ospar.org/assessments](http://www.ospar.org/assessments)