

## Polycyclic hydrocarbons

The large group of polycyclic aromatic hydrocarbons (PAHs) are natural components of coal and oil. PAHs are primarily formed as by-products of incomplete combustion of carbon-containing fuels (wood, coal, diesel, fat, tobacco or incense), including forest fires and volcanoes. As a result they are one of the most widespread organic pollutants and can be used as markers for combustion processes in a region. Different types of combustion yield different distributions of PAHs in both relative amounts of individual PAHs and in which isomers are produced. Some PAHs occur in crude oil arising from chemical conversion of natural molecules. PAHs have few intended uses. These are mainly as intermediates or in final products. For example, naphthalene serves as a chemical intermediate in the production of insecticides, stabilisers, pharmaceuticals, cosmetic additives, and PAHs are contained in the plastic or rubber handles of tools and in tar widely used in the past in asphalt works, floorings and floor coatings.

### ***What is the problem?***

PAHs are toxic, persistent and bioaccumulate, especially in invertebrates. Some PAH compounds are carcinogenic. PAHs are released to the environment from a variety of diffuse sources. The dominant diffuse sources are wood preservatives (e.g. creosote), incomplete combustion of fossil fuel and biomass in fixed installations (particularly in small or older installations, including domestic stoves) and road traffic, and industrial processes, especially the primary aluminium industry. Other sources include dredged materials, discharges from offshore installations, shipping and oil spills. The main pathways to the sea are through long-range atmospheric transport or waterborne inputs. Long-range air transport of PAHs from other parts of the world may contribute to atmospheric inputs to the OSPAR maritime area. Given expected growth of industrial activities for example in Asia, the relative share of long-range PAH air transport to atmospheric inputs in the OSPAR area is likely to increase in future.

### ***What has been done?***

Specific OSPAR measures targeting emissions, discharges and losses of PAHs have focussed on the main industrial PAH sources including aluminium plants, the iron and steel industry, and refineries. OSPAR has also recommended the phase-out of the use of one-component coating systems on inland ships containing considerable quantities of PAHs. Less specific OSPAR measures on Best Available Techniques for large combustion plants and the organic chemical industry have also addressed PAH emissions. Both the UNECE POP Protocol to the Convention on Long-Range Transboundary Air Pollution and the UNEP Stockholm POP Convention addressing mobile sources of PAHs have been implemented through EU legislation. Other measures in the EU framework address PAHs in tyres, use of creosote treated timber in a number of products and content of PAHs in diesel fuels. It is expected that new and stricter emission limits for cars and trucks in the EU will reduce PAH emissions from this diffuse source. The full and effective implementation of the requirements of the Water Framework Directive for PAHs will also support further reduction in releases. As complementary approach standards have been developed for residual solid fuel burning appliances.

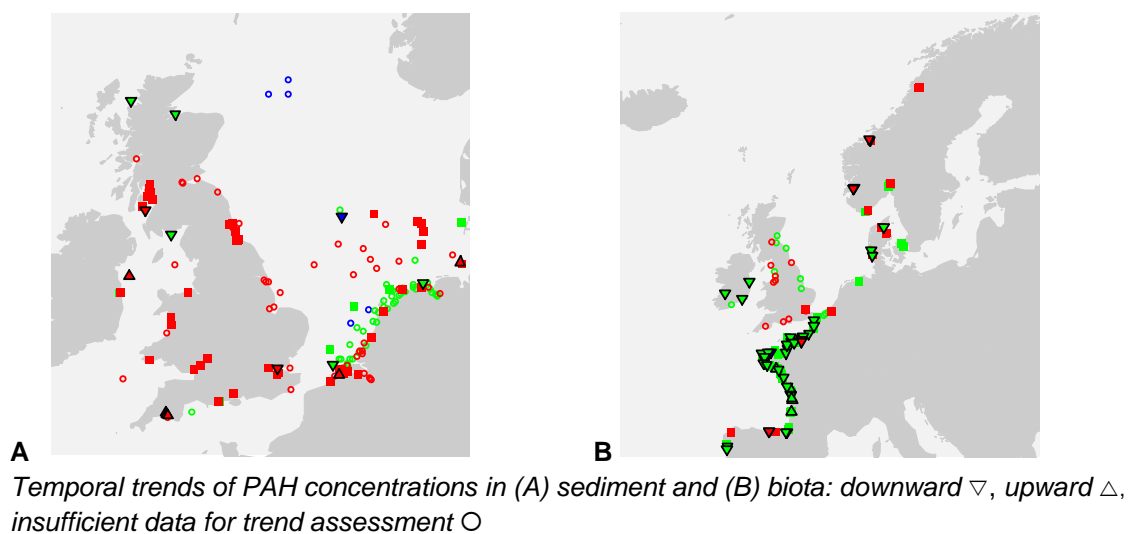
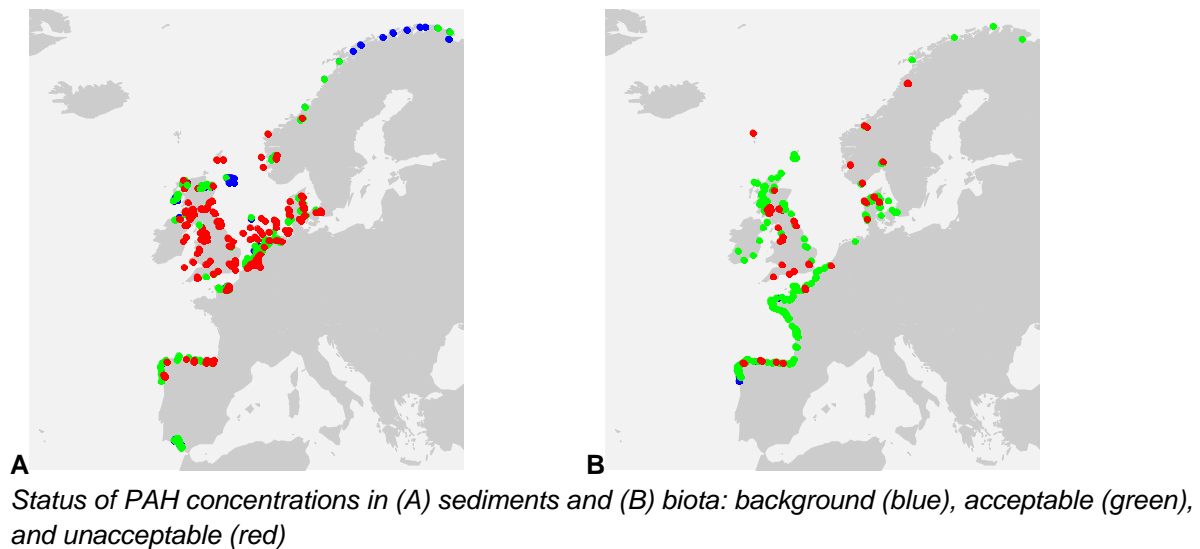
### ***Did it work?***

Point sources have been regulated, but total elimination of PAH releases is impossible. There are still substantial releases of PAHs to air and water. Data on discharges, emissions and losses of PAH are of poor quality for various reasons and it is not possible to give an overall trend in releases. For some sources e.g. in the aluminium production, reductions have been achieved due to technical improvements, but there is indication that in some sectors and for some Contracting Parties emissions to air might even be increasing. Additional efforts are needed to address emissions to air, in particular from combustion processes, but it will not be possible to eliminate all emissions. With increasing emissions outside the Convention area, the contribution of atmospheric deposition to inputs of PAHs to the OSPAR maritime area is likely to increase and it is therefore doubtful that the cessation of releases can be achieved. Atmospheric deposition of PAHs from combustion processes is an important pathway to the North-East Atlantic. Data reported to EPER indicate that discharges from heavily regulated point sources continue, but do not allow conclusions on trend. Data on riverine inputs of PAHs are scarce although this is an important pathway. PAHs are also discharged by the

offshore oil and gas industry with produced water. From data reported to OSPAR no reduction in these discharges is evident.

**How does this affect the quality status?**

OSPAR environmental monitoring has concentrated on a set of 6 PAH compounds (benz[a]anthracene; benzo[ghi]perylene; benzo[a]pyrene; fluoranthene; pyrene; phenanthrene). In the maps below the assessment results for the target group have been aggregated to simplify their presentation. Overall there is a dominance of downward trends in PAH concentrations in coastal shellfish (mussels) between 1998 and 2007. In contrast, there are relatively fewer temporal trends in sediment concentrations, suggesting that concentrations in sediments respond less rapidly to changes in inputs to the sea than concentrations in biota. This is reflected in widespread concentrations of PAHs in sediments at levels which give rise to risk of pollution effects. The implied decrease in exposure of marine life to PAHs is supported by decreases in some observations of EROD activity in fish (dab) liver in the Greater North Sea and the Celtic Seas. However, the failure to achieve background concentrations of PAHs in mussels is evidence of continuing widespread contamination, possibly mediated through atmospheric transport. The scattered occurrence of concentrations which give rise to risk of pollution effects are often in harbours, estuaries and close to industrial installations.



Electronic navigator to OSPAR publication sources (publication number):

- Status and trend of marine chemical pollution (395/2009)
- Towards the cessation target (354/2008)
- Trends and concentrations in marine sediments and biota (390/2009)
- Background Documents for PAHs (137/2001) (as updated)