OSPAR
COMMISSION

Towards the cessation target:

Emissions, discharges and losses of OSPAR chemicals identified for priority action

Hazardous Substances Series

2008

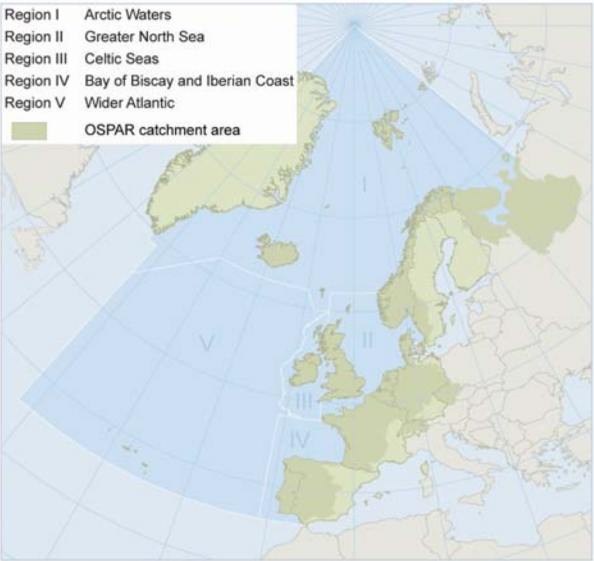
The Convention for the Protection of the Marine Environment of the North-East Atlantic (the "OSPAR Convention") was opened for signature at the Ministerial Meeting of the former Oslo and Paris Commissions in Paris on 22 September 1992. The Convention entered into force on 25 March 1998. It has been ratified 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.

Electronic navigator to complementary QSR assessments

This report is a major contribution to the overall assessment of the status and trend in marine chemical pollution and the Quality Status Report 2010. The 2005 assessments of waterborne and atmospheric inputs of nitrogen, which contributed to this report, have been updated in 2009.

- ↳ Status and trend in marine chemical pollution (publication 395/2009)
- ↳ Trends in atmospheric concentrations and deposition (publication 447/2009)
- ↳ Trends in waterborne inputs (publication 448/2009)



The OSPAR maritime area and its five Regions

ISBN 978-1-905859-93-1
Publication Number: 354/2008

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Executive summary

Releases of hazardous substances still continue

Releases of hazardous substances to the OSPAR maritime area have generally decreased as a result of measures adopted over the past 20 years. Nevertheless, releases continued in the assessment period 1998 – 2006 for most of the 26 chemicals identified by OSPAR for priority action. These are chemicals for which there was concern in the past that they could reach the marine environment. With current efforts, it is likely that the overall objective of the OSPAR Hazardous Substances Strategy to cease emissions, discharges and losses of OSPAR priority chemicals by 2020 will only be achieved for eight substances: the pesticides dicofol, endosulfan, HCH isomers including lindane, methoxychlor, pentachlorophenol and trifluralin; short chain chlorinated paraffins; and nonylphenol ethoxylates. For the other chemicals meriting priority action, further efforts are necessary to reach the cessation target. While sources within the OSPAR Convention area account for the main releases to the Greater North Sea (Region II), the Celtic Seas (Region III), and the Bay of Biscay and Iberian Coast (Region IV), the atmospheric transport of certain pollutants from sources in other parts of the world is relatively important especially for the Arctic Waters (Region I) and the Wider Atlantic (Region V).

A substantial regulatory framework is in place

Since 1998, new measures to regulate and control releases of OSPAR priority chemicals have been adopted and efforts to effectively implement existing measures have continued. This includes measures adopted by OSPAR and in the EU framework which target releases to air and water from large industries and control the marketing and use of substances in various products. The support of these regional efforts through global actions in other international forums is essential to reduce pollution in the North-East Atlantic, since OSPAR priority chemicals are produced and used in other parts of the world and can reach the OSPAR maritime area *e.g.* via transport by ocean and air currents, and via waste streams of imported products.

Some positive trends are observed, but no general trend statements are possible

Sufficient quantitative observation data for 1998 – 2006 to support overall conclusions on trends in emissions, discharges and losses are only available for cadmium, mercury, lead, PCBs, dioxins and PAHs. The available data suggest an overall downward trend of releases for the three heavy metals, PCBs and dioxins. In contrast to this overall trend, there is indication that air emissions of the heavy metals from some specific activities and countries have merely attained a constant level or even increased. For dioxins there is low confidence in the available data and the proposed trend. Despite overall reductions achieved, substantial releases of PAHs to air and water continue and there is indication of an increase in emissions to air from large industrial installations.

For all other substances, due to lack of data, no firm statements on trends in releases can be made. A prognosis can still be given for some of the substances based on expert judgement, drawing on qualitative information about the regulatory situation in the OSPAR Convention area, their production, use and import/export, and on their occurrence in the marine environment. Based on this, it is assumed that releases of the pesticides, organohalogens (PFOS, trichlorobenzenes, some of the brominated flame retardants, and SCCPs), nonylphenol ethoxylates and organotins have been decreasing and will continue to do so. In the absence of relevant information, no prognosis of the possible trends in releases of 6PPD, phthalates, tetrabromobisphenol-A, 2,4,6-tri-*tert*-butylphenol, octylphenol, clotrimazole, and musk xylene can be made.

More efforts are needed to reach the cessation target

While the regulatory body in place is expected to be effective in reducing emissions, discharges and losses for a number of substances, it does not address all relevant (diffuse) sources (mainly heavy metals, organohalogens and PAHs), not all measures aim at a ban of substances and the cessation of releases (*e.g.* application of BAT in large industries). Some measures have not yet been fully implemented, some measures have not taken effect yet as they have been adopted only recently, and for some substances marketing and use restrictions are still under development (*e.g.* organotins in consumer products, some phthalates and musk xylene).

The additional efforts needed to reach the cessation target include the full and effective implementation of existing measures, improved techniques to abate releases of heavy metals and unintended by-products of industrial processes (*e.g.* PAHs and dioxins), the support of EC measures to address remaining (diffuse) sources, and the promotion of global actions, for example, within the Stockholm POP Convention and the UN-ECE POP Protocol. The implementation of the obligations for the various OSPAR priority chemicals under the Water Framework Directive is essential in order to make progress towards the cessation target. There is also a need to fully implement the OSPAR monitoring strategies for priority chemicals through collecting and assessing the identified information in order to decide on the need for, and direction of, any further actions for those substances for which the knowledge basis was not sufficient for this assessment.

Are existing efforts likely to deliver the cessation target for OSPAR chemicals for priority action?
YES
Dicofol
Endosulfan
HCH isomers (lindane)
Methoxychlor
Nonylphenol-ethoxylates
Pentachlorophenol (PCP)
Short chained chlorinated paraffins
Trifluralin
?
2,4,6-*tri*-*tert*-butylphenol
4-(dimethylbutylamino) diphenylamine (6PPD)
Neodecanoic acid, ethenyl ester
NO
Brominated flame retardants
Cadmium
Clotrimazole
Lead and organic lead compounds
Mercury and organic mercury compounds
Musk xylene
Octylphenol
Organic tin compounds
PFOS
Phthalates: dibutylphthalate (DBP), diethylhexyl-phthalate (DEHP)
Polychlorinated biphenyls (PCBs)
Polychlorinated dibenzodioxins and dibenzofurans (PCDDs, PCDFs)
Polycyclic aromatic hydrocarbons (PAHs)
Tetrabromobisphenol-A (TBBP-A)
Trichlorobenzenes (TCB)

Récapitulatif

Persistance des rejets de substances dangereuses

Dans l'ensemble, les rejets de substances dangereuses dans la zone maritime OSPAR ont diminué à la suite des mesures adoptées au cours des vingt dernières années. Les rejets persistent encore durant la période d'évaluation 1998-2006 pour la plupart des vingt-six (groupes de) produits chimiques prioritaires déterminés par OSPAR, dans le passé, comme susceptibles de pénétrer le milieu marin. Il est probable, en tenant compte des efforts actuels, que l'objectif général de la Stratégie OSPAR substances dangereuses, à savoir de cesser les émissions, rejets et pertes des produits chimiques prioritaires OSPAR d'ici 2020 ne soit atteint que pour huit substances. Il s'agit des pesticides dicofol, endosulfane, isomères des HCH, notamment lindane, méthoxychlore, pentachlorophénol et trifluralin; des paraffines chlorées à chaîne courte et des *éthoxylates* de *nonylphénol*. Il est nécessaire de poursuivre les efforts pour les autres produits chimiques prioritaires afin de parvenir à l'objectif de cessation. Alors que les sources situées dans la zone de la Convention sont responsables des rejets principaux dans la mer du Nord au sens large (Région II), les mers celtiques (Région III), et le golfe de Gascogne et les côtes ibériques (Région IV), le transport atmosphérique de certains polluants à partir de sources situées dans d'autres parties du globe acquiert une certaine importance en particulier pour les eaux arctiques (Région I) et l'Atlantique au large (Région V).

Cadre réglementaire substantiel en place

Depuis 1998, on a adopté de nouvelles mesures dans le but de réglementer et de contrôler les rejets de produits chimiques prioritaires OSPAR et on a poursuivi les efforts pour mettre en oeuvre efficacement les mesures existantes. Il s'agit notamment des mesures adoptées par OSPAR et dans le cadre de l'UE visant les rejets dans l'air et dans l'eau provenant des grosses industries et la commercialisation et l'utilisation de substances dans divers produits. Il est essentiel de soutenir ces efforts régionaux en prenant des mesures globales dans d'autres forums internationaux pour réduire la pollution dans l'Atlantique du Nord-est étant donné que les produits chimiques prioritaires OSPAR sont produits et utilisés dans d'autres parties du monde et peuvent pénétrer la zone maritime OSPAR, par exemple en étant transportés par les courants océaniques et atmosphériques ainsi que par l'intermédiaire des flux de déchets de produits importés.

Quelques tendances positives relevées, mais pas de tendance générale possible

On dispose de données quantitatives suffisantes, pour la période de 1998 à 2006, à l'appui des conclusions générales sur les tendances des émissions, rejets et pertes uniquement pour le cadmium, le mercure, le plomb, les PCB, les dioxines et les HAP. Les données disponibles suggèrent une tendance générale à la baisse des rejets pour les trois métaux lourds, les PCB et les dioxines. Par contre, il semble que les émissions atmosphériques de métaux lourds provenant de quelques activités et pays spécifiques se soient maintenues ou aient même augmenté. Les données et les tendances proposées pour les dioxines n'inspirent que peu de confiance. En dépit des réductions générales obtenues, des rejets importants de HAP dans l'air et l'eau subsistent et il semble que les émissions dans l'air et dans l'eau, provenant de grosses installations industrielles, aient augmenté.

On ne peut émettre aucun jugement sur les tendances des rejets pour toutes les autres substances car les données ne sont pas suffisantes. On peut tout de même faire un pronostic pour certaines substances en se fondant sur les jugements d'expert qui s'inspirent des informations qualitatives sur la situation réglementaire dans la zone de la Convention OSPAR, leur production, utilisation et importation/exportation et leur présence dans le milieu marin. On peut donc présumer que les rejets de pesticides, organohalogènes (PFOS, trichlorobenzènes, certains retardateurs de flamme bromés et SCCP), éthoxylates de nonylphénol et étains organiques ont diminué et continueront à diminuer. En l'absence d'informations pertinentes, on ne peut faire aucun pronostic de tendances possibles dans les rejets de 6PPD, phthalates, tétrabromobisphénol A, 2,4,6-tri-*tert*-butylphénol, octylphénol, clotrimazole, et xylène musqué.

Efforts supplémentaires nécessaires pour parvenir à l'objectif de cessation

Alors que l'on s'attend à ce que l'organe réglementaire en place soit efficace pour réduire les émissions rejets et pertes d'un certain nombre de substances, il ne traite pas de toutes les sources (diffuses) pertinentes (métaux lourds, organohalogènes et HAP). Toutes les mesures n'ont pas pour objectif d'interdire des substances et de cesser les rejets (par exemple application de la BAT dans les grosses industries) certaines mesures n'ont pas encore été complètement mises en œuvre, certaines mesures n'ont pas encore eu d'effet car elles ont été récemment adoptées et les restrictions relatives à la commercialisation et à l'utilisation de certaines substances sont encore en cours de développement (par exemple les étains organiques dans les produits de consommation, certains phthalates, le xylène musqué).

Les efforts supplémentaires nécessaires pour parvenir à l'objectif de cessation consistent notamment à mettre en oeuvre complètement et efficacement des mesures existantes, à améliorer les techniques permettant d'atténuer les rejets de métaux lourds et de dérivés accidentels des processus industriels (par exemple les HAP et les dioxines), à soutenir les mesures de la CE portant sur les sources (diffuses) restantes et promouvoir des mesures globales, par exemple dans le cadre de la Convention de Stockholm sur les POP et le Protocole de l'UN-ECE sur les POP. Il est essentiel de mettre en œuvre les exigences de la Directive cadre sur l'eau relatives aux divers produits chimiques prioritaires OSPAR afin de progresser sérieusement dans le sens de l'objectif de cessation. Il est également nécessaire de mettre en œuvre intégralement les stratégies de surveillance OSPAR en recueillant et en évaluant des informations afin de décider s'il est nécessaire de prendre des mesures supplémentaires, et dans quel sens, au sujet des substances pour lesquelles on ne dispose pas assez de connaissances pour cette évaluation.

Les efforts actuels sont ils susceptibles de permettre d'atteindre l'objectif de cessation pour les (groupes de) produits chimiques prioritaires OSPAR?
OUI
Dicofol
Endosulfane
Isomères de HCH (lindane)
Méthoxychlore
Ethoxylates de nonylphénol-
Pentachlorophénol (PCP)
Paraffines chlorées à chaîne courte
Trifluralin
?
2,4,6-*tri*-*tert*-butylphénol
4-(diméthylbutylamino) diphénylamine (6PPD)
Acide néodecanoique, ester éthényl
NON
Retardateurs de flamme bromés
Cadmium
Clotrimazole
Plomb et ses composés organiques
Mercure et ses composés organiques
Xylène musqué
Octylphénol
Composés organiques de l'étain
PFOS
Phthalates: dibutylphthalate (DBP), diéthylhéxyl-phthalate (DEHP)
Biphényl polychlorés (PCB)
Dibenzodioxines et dibenzofuranes polychlorées (PCDD, PCDF)
Hydrocarbures aromatiques polycycliques (HAP)
Tetrabromobisphénol-A (TBBP-A)
Trichlorobenzènes (TCB)

1. Introduction

This report is a first assessment of emissions, discharges and losses of chemicals identified by OSPAR for priority action ("OSPAR priority chemicals"). The 2003 OSPAR Strategy for a Joint Assessment and Monitoring Programme (JAMP) requires regular assessments (every 5 years) of discharges, emissions and losses (OSPAR, 2003a). The purposes of this assessment are:

- to evaluate progress made for the individual OSPAR priority chemicals towards the cessation of their emissions, discharges and losses, as required by 2020 under the OSPAR Hazardous Substances Strategy (OSPAR, 2003b);
- to consider the effectiveness of measures taken to abate releases of OSPAR priority chemicals;
- to identify priorities for action.

This assessment will also contribute to an overall evaluation in 2009 of the quality status of the maritime area in relation to hazardous substances and form an important contribution to the Quality Status Report 2010. This assessment therefore pays particular attention to developments and trends since 1998, the closing date for information taken into account in the OSPAR Quality Status Report in 2000 (OSPAR, 2000). This means that the important reductions in emissions, discharges and losses achieved by Contracting Parties in the late 1980s and the 1990s are not reflected in this assessment.

The aim of the Hazardous Substances Strategy is to prevent pollution of the maritime area by continuously reducing discharges, emissions and losses of hazardous substances, with the ultimate aim of achieving concentrations in the marine environment near background values for naturally occurring substances and close to zero for man-made synthetic substances. The cessation target set by the Hazardous Substances Strategy for OSPAR priority chemicals is an important step towards this ultimate objective.

With the adoption of the Hazardous Substances Strategy in 1998, and its revision in 2003, the focus of OSPAR work has shifted from specific sectors and activities to substances. The commitments of the Hazardous Substances Strategy apply to "hazardous substances", which are defined for this purpose as substances which are either persistent, liable to bioaccumulate and toxic (PBT) or which, even if they do not meet all the PBT criteria, are considered by the OSPAR Commission to give rise to an equivalent level of concern, for example because of endocrine disruptive properties.

From a preliminary list of some 400 substances of possible concern for the marine environment, OSPAR has selected a number of chemicals requiring immediate action for inclusion in the List of Chemicals for Priority Action (OSPAR, 2004a). This was based on information on intrinsic properties (PBT) and occurrence in the environment, using a selection and prioritisation mechanism developed for this purpose (OSPAR, 2006a). Eight substances have subsequently been removed from the List of Chemicals for Priority Action because new information has shown that they were not PBT substances or of an equivalent level of concern to the marine environment. Work on substances of possible concern has continued since 1998. Based on new information on their properties, a number of substances have been deselected from the OSPAR List of Substances of Possible Concern (OSPAR, 2002). Recently, OSPAR has started a comprehensive screening of all substances of possible concern to identify those hazardous substances on which future OSPAR work should concentrate. These are substances that are of concern to the marine environment and to which therefore the commitments of the Hazardous Substances Strategy should apply, but which are not covered adequately by the EC framework or some other international forum. The screening process is expected to be completed in 2009.

This report focuses on the substances on Part A of the OSPAR List of Chemicals for Priority Action. These are the substances which give concern that they may reach the marine environment. Part B of the list includes those substances which are intermediates in closed systems, and Part C includes those substances for which there is no current production or use interest. The substances on Parts B and C have rankings in terms of persistency, liability to bioaccumulate and toxicity which are of equal concern as the other substances on the list. However, to the best of OSPAR's knowledge, on the basis of information from industry, OSPAR accepts that the substances on Part B of the list are produced and used exclusively as an intermediate in closed systems in the production of other substances, under conditions where the safeguards applied are sufficient to avoid reasonable concerns that discharges, emissions or losses of the substance could reach the marine environment. Likewise, for the substances on Part C of the list, to the best of OSPAR's knowledge and on the basis of information from industry, OSPAR accepts that there is no current production or use in the OSPAR Contracting Parties (OSPAR, 2004a).

Background Documents and monitoring strategies have been prepared for each of the substances or groups of substances on Part A of the List of Chemicals for Priority Action. The Background Documents identify sources of the substances and pathways by which they could reach the sea, give an overview of the inputs and concentrations in the environment, assess their associated risks to the marine environment, and propose actions that should be taken either under OSPAR or by other organisations.

The monitoring strategies set out for each of the substances the most appropriate means for measuring progress towards OSPAR's objectives. The Agreement on Monitoring Strategies summarises the data and information to be collected for all the substances to support assessments of changes in their emissions, discharges and losses and in their concentrations and effects in the marine environment (OSPAR, 2004b).

The following is an overview of the sources of information collected for the assessment (Section 2), a description of the main land-based and sea-based sources and an overview of the measures taken together with OSPAR and the EU to reduce inputs to the marine environment (Section 3). This is followed in Section 4 by summary assessments of progress towards the cessation target for each of the substances (or group of substances) on the OSPAR List of Chemicals for Priority Action. Conclusions and recommendations for further actions are presented in Section 5.

2. Collection of data and information

2.1 General

The monitoring strategies for the OSPAR priority chemicals of Part A of the List of Chemicals for Priority Action have been set up to provide an efficient means for collecting most appropriate data and information from relevant OSPAR and external sources to give an overall indication of progress on reductions in discharges, emissions and losses. In addition to the collection of monitoring data on actual releases from point and diffuse sources, this includes the use of indicator information for example on waterborne and atmospheric inputs of the substances; use, production, sales and import/export of OSPAR priority chemicals, especially where no monitoring of releases is undertaken; and on the implementation of OSPAR and European Community (EC) measures regulating the use and controlling releases to the environment. They also envisage one-off surveys or activities by OSPAR to close identified gaps in knowledge.

Not all data and information needed for this assessment have been delivered as envisaged by the monitoring strategies. This includes, for example, recent information on production, use and sales of substances, updates of some Background Documents with latest developments and data; one-off surveys and data on riverine and direct inputs under the Water Framework Directive. The latter has now been reported by European Union (EU) Member States, but at the time of the preparation of this report, the data were not available for inclusion in the assessment. For some substances, the data collection envisaged by their monitoring strategies were no longer relevant, for example for pesticides which are no longer in use.

On the implementation of relevant EC legislation regulating marketing and use of substances and controlling their releases to the environment, in many cases implementation reports are not available. The existence of such measures still provides a basis for expert judgement on the extent to which emissions and discharges are likely to have been reduced. Given the legal force of EC legislation within the EU and the European Economic Area (EEA)[1], and the judicial enforcement system in the EU and the EEA, there is confidence that the implementation of those measures is ensured. Information on national regulations in Switzerland has been collected to complement information on EU/EEA measures for the OSPAR Convention area.

Table 2.1 gives an overview of the data and information collected for each OSPAR priority chemical as the basis for this assessment. In addition, the assessment draws on information from the OSPAR Background Documents and any updates thereof. If no specific reference is made in this report, data and information are taken from the relevant Background Documents, a full list of which is given in Section 6 for reference.

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[1] All OSPAR Contracting Parties are EU Member States except: Iceland, Norway and Switzerland. Iceland and Norway are signatories of the Agreement on the European Economic Area by virtue of which most EC legislation concerning the internal market and relevant for this assessment also apply to those two countries.

Table 2.1 Overview of data collected for the assessment of emissions, discharges and losses of chemicals identified for priority action. The white cells show information to be collected for substances on Part A of the LCPA according to the Agreement on Monitoring Strategies (OSPAR, 2004b), + = collected, – = data not collected or collected but not suitable for use, nr = data collection not relevant any more. The data sources are described in Section 2.2.

Substance	**CAMP**	**RID**	**EPER**	**EMEP**	**Dumping**	**Production/ sales/ use**	**Import/ export**
Cadmium	+	+	+	+	+	–	
Lead and organic lead compounds	+	+	+	+	+	–	
Mercury and organic mercury compounds	+	+	+	+	+	–	
Organic tin compounds			+		+		
PFOS						–	–
Tetrabromobisphenol-A							
Trichlorobenzenes			+			–	
Brominated flame retardants							
Polychlorinated biphenyls (PCBs)		–		+			
Polychlorinated dibenzodioxins and dibenzofurans (PCDDs, PCDFs)			+	+			
Short chained chlorinated paraffins			+	+			
4-(dimethylbutylamino) diphenylamin (6PPD)						–	
Dicofol						–	–
Endosulfan						nr	nr
HCH isomers (lindane)	+	–		+			
Methoxychlor							
Pentachlorophenol (PCP)				+		–	–
Trifluralin						–	–
Clotrimazole						–	
2,4,6-tri-*tert*-butylphenol						–	–
Nonylphenol-ethoxylates							
Octylphenol							
Phthalates: dibutylphthalate (DBP), diethylhexyl-phthalate (DEHP)						+	–
Polycyclic aromatic hydrocarbons (PAHs)		–	+	+	+	–	
Musk xylene						+	–

2.2 Description of data sources

Below is a description of the sources of data and information collected for the substances on the List of Chemicals for Priority Action, as shown in Table 2.1.

2.2.1 CAMP

Since 1989, the OSPAR Comprehensive Atmospheric Monitoring Programme (CAMP) has collected annual data on concentrations of contaminants in precipitation and air from a network of 49 coastal stations in order to study their atmospheric inputs to the sea. Of the OSPAR priority chemicals, CAMP includes cadmium, mercury, lead and γ-HCH (lindane) as mandatory contaminants for measurement in precipitation and recommends monitoring of PAHs and certain PCBs on a voluntary basis.

The data are collected and published in annual CAMP data reports on the OSPAR website. OSPAR undertakes periodic assessments of the collected data to evaluate status and trends in atmospheric inputs to the sea. The results of the latest trend assessment of data from 1990 – 2000 (OSPAR, 2005a) were used in this assessment. A further assessment covering the period up to 2006 is scheduled for 2009.

The 2005 assessment observed that time series for mercury and lindane were patchy in spatial and temporal coverage. For lindane, concentrations were often below detection limits and time series of only two stations were suitable for assessment. Due to scarcity of data, PCBs and PAHs were not included in the 2005 assessment. Re-suspension of substances and meteorological variations are factors of uncertainty in estimating status and trends in atmospheric inputs.

Monitoring and assessment under CAMP is complemented through co-operation with the European Monitoring and Evaluation Programme (EMEP) on modelled atmospheric deposition of cadmium, mercury, lead, lindane and PCBs (CB-153) for 1990 – 2005 (OSPAR, 2008a). This covers all five OSPAR Regions and the sub-regions of the Greater North Sea. Against a 90% confidence interval of uncertainty variation over each of the OSPAR Regions, the uncertainty of the model results for each parameter and each Region range between 41% and 52% for the heavy metals, and 50% - 70% for PCB-153. Overall model results match reasonably well with the CAMP observation data. Trends in modelled deposition are derived in this report from simple comparison of input levels in 1998 and 2005. A more robust assessment using statistical trend analysis tools is being prepared as part of the CAMP data assessment scheduled for 2009.

2.2.2 RID

The Comprehensive Study on Riverine Inputs and Direct Discharges (RID) collects annual data on the waterborne inputs of selected substances to the marine environment. Riverine inputs are based on the loads crossing the freshwater limit into tidal waters. Direct discharges are discharges (for example, through pipelines) directly into the sea. The RID Study started in 1990 and includes cadmium, mercury, lead and γ-HCH (lindane) as mandatory contaminants; it recommends monitoring of PAHs and certain PCBs on a voluntary basis.

The data collected under the RID Study are published in annual RID data reports on the OSPAR website. OSPAR undertakes periodic assessments of RID data. The results of the latest published RID data assessment (OSPAR, 2005b), which looked at trends over time and space for data collected for the period 1990 – 2002, have been used in the present assessment. Data coverage for lindane and PCBs were too patchy for inclusion in the RID trend assessment. A further assessment by OSPAR of waterborne inputs for the period 1990 – 2006 is scheduled for 2009.

The 2005 RID assessment covers three of the five OSPAR regions: Region I (Arctic Waters), Region II (Greater North Sea), and Region III (Celtic Seas). Region IV (Bay of Biscay and the Iberian Coast) and Region V (Wider Atlantic) have been omitted because in Region IV few or no time series are currently available, and in Region V, no significant riverine or direct discharges exists.

2.2.3 EPER

In the assessment period, the Integrated Pollution Prevention and Control (IPPC) Directive (96/61/EC), recently codified in IPPC Directive (2008/1/EC), obliges EU and EEA Member States to report emissions of pollutants to air and water to the European Pollutant Emission Register (EPER) database every 3 years. The categories of industry facilities covered are listed in Annex I of the IPPC Directive (2008/1/EC). Facilities which need to report are those exceeding specified emission thresholds set at a level that aims to cover about 90% of the emissions from facilities covered by the IPPC Directive (2008/1/EC). EPER now holds data on emissions and discharges from approximately 12 000 facilities in the EU Member States and Norway. So far, emissions and discharges of the substances shown in Table 2.1 have been reported by EU Member States and Norway for 2001 and 2004. The next reporting will take place in 2009 for the year 2007.

OSPAR has collected data on direct and indirect discharges to water for 2001 and 2004 from all industries reporting on these substances in OSPAR countries. EPER data on air emissions have not been collected, since air emissions data are available from EMEP.

As the reporting process for EPER has only recently started up, there are still inconsistencies in reporting practices that need to be consolidated before national data become fully comparable. Interpretation of EPER data has proved difficult in this assessment due to the fluctuation of facilities which reported for 2001 and 2004. This does not allow a comparison of the magnitude of discharges in both years for the purpose of observing trends. Yet, EPER data provide indication that substances are still discharged and that the cessation target has not yet been met.

2.2.4 EMEP

Officially reported data on emissions to air have been collected from the online database (WebDab) of the European Monitoring and Evaluation Programme (EMEP), set up under the UN Economic Commission for Europe's (UN-ECE) Convention on Long-Range Transport of Air Pollution (LRTAP). OSPAR Contracting Parties, who are all parties to the LRTAP Convention, are asked under the Convention to report emission data for selected substances from large point sources. Reporting to EMEP is based on the UN-ECE LRTAP Guidelines for Estimating and Reporting Emissions Data (NFR, 2002) which includes a guide to the sector references used by EMEP and in this assessment. Emission data were collected for the substances as required by the monitoring strategies and in addition for SCCPs, lindane, PCP and PCBs.

Officially reported data may be inconsistent and/or incomplete. While for SCCPs, lindane and PCP data were patchy, data sets for all other investigated contaminants were available for most Contracting Parties and sectors for 1998 – 2005 except for Belgium (data since 2000) and Finland (data since 2001). While this has impact on the precise calculation of % reduction of emissions achieved for 1998 - 2005, the lack of emission data for those years and countries does not impair the overall picture and trend of observed emissions.

2.2.5 Reports on dumping of dredged material

Since 1998, OSPAR has annually collected information on the amount of dredged material disposed of at sea and its content of certain trace metals and organic contaminants. Due to a change of the reporting requirements from wet weight of dredged material to dry weight in 1995, only data for the period 1995 – 2005 have been examined. It is difficult to establish trends in contaminant loads of dredged material. This is mainly due to incomplete data sets and, to a smaller extent, due to a lack of comparability of data provided by different Contracting Parties.

In the latest assessment of data reported by Contracting Parties on dredged material for 2003 – 2005, trace metal data were considered to be sufficient for an assessment. However, due to incomplete reporting and to differences in the analytical approaches, comparison of national total trace metal loads between Contracting Parties might be associated with large uncertainty. Therefore, the overall total trace metal load can only give an indication of the order of magnitude of loads. For organic contaminants, including PAHs and TBT, no proper assessment could be carried out, as only little information on these contaminants is available from Contracting Parties (OSPAR, 2007a).

2.2.6 Information on production, use, sales, import and export

For substances where the main source is diffuse (such as pesticides or substances used in consumer products), an estimate of the quantities produced, sold and used in the OSPAR Regions, and imported to, or exported from, the European Union/European Economic Area has been sought from industry in order to provide an indication of changes in pressure. Some updated information has been submitted by industry or collected from publications of the relevant European industries' associations; to a limited extent relevant information in Background Documents has been updated. Since there is no central register where such information can be found, information is often incomplete.

2.2.7 Reports from specific industries

Since 1985, OSPAR has been collecting annual data on the emission of mercury from the chlor-alkali industry. Since 2003, this has been done via Euro Chlor, who represent 97% of the chlor-alkali producers in Europe. The reported annual data up to 2006 and the latest assessment of reported data (OSPAR, 2007b) were available for the present report. Due to changes in the reporting format over the years, there are some uncertainties associated with the time series.

Since 2004, OSPAR has undertaken repeated efforts under the lead of the Offshore Industry Committee to generate monitoring data with the aim of producing an overall picture of the inputs from offshore installations of cadmium, lead and mercury. So far, data of discharges of heavy metals in produced water from offshore oil and gas installations have not been of sufficient quality and comparability. The results of a further monitoring exercise will become available in 2009.

2.2.8 One-off surveys and other additional activities

To complement the data collected from the above mentioned sources, a number of one-off surveys, one-off actions and additional voluntary activities were foreseen in the monitoring strategies. Only few relate to discharges, emissions and losses.

None of the anticipated surveys has been reported except the voluntary data collection on releases from non-IPPC sources. This involved the collection of data from Norway and the Netherlands of discharges to water in 2004 of cadmium, lead, mercury, and polycyclic aromatic hydrocarbons from land-based sources not covered by the IPPC Directive (2008/1/EC). The results have not been included in the assessment as they have not yet been fully assessed and some of the reported figures refer to releases to soil and may not reach surface water. The collected information suggests, however, that the contribution of the non-IPPC sources to discharges is relatively small. Based on observations from some Contracting Parties, a one-off survey on riverine inputs of tributyltin has not been given priority because concentrations found in rivers were below detection limits.

2.3 Data quality and completeness

Good time series for the assessment of trends in discharges, emissions and losses hardly exist on an OSPAR wide scale. Incompleteness in reporting and use of different methodologies make comparison between Contracting Parties impossible. For some Contracting Parties good time series exist, and these can also be taken as indicators of trends for other countries. Data from CAMP and EMEP together allow for assessment of trends in atmospheric inputs for the heavy metals and PCB. Similarly, as regards riverine inputs, trends can only be estimated for the heavy metals. Updated figures on production, sales and use are available only for some substances. The data presented in this report do not allow for the calculation of the overall % reduction of discharges, emissions and losses for the OSPAR maritime area and its five Regions, but they can be used to say something about trends.

3. Sources and measures

3.1 Sources

Only few substances on the OSPAR List of Chemicals for Priority Action are naturally occurring. Examples are the heavy metals cadmium, lead and mercury which are widely distributed in the earth's crust and geological formations, thus providing natural emission sources. The anthropogenic sources addressed in this assessment cover activities on land and, to a limited extent, at sea (shipping, dumping of dredged material or emissions and discharges from offshore oil and gas installations). Land-based activities are still the greatest contributor to emissions, discharges and losses of OSPAR priority chemicals.

Some of the major industrial centres in Contracting Parties bordering the North-East Atlantic are located along estuaries and close to the main coastal cities and ports. Since 1998, changes in market conditions, production methods and volumes, technological developments and environmental regulations have contributed to changes in some of the major industries and their related pressures on the marine environment. In the last ten years, Europe has seen, in general, a shift away from heavy industries towards knowledge- and service-based economic activities.

In 2005, manufacturing - which has been a focus of OSPAR regulatory activities in the past - was still the main activity of the 1.15 million enterprises in OSPAR Contracting Parties (Eurostat, 2008a). In 2005, the manufacturing industries in OSPAR Contracting Parties had a turnover of 4875.6 billion Euro and produced an added value at factor cost of 1265.8 billion Euro. They invested a total of 3184 million Euro in pollution abatement (64%) and clean technologies (36%); investments into the reduction of air emissions were twice as high as investments into reduction of the discharges to water (Eurostat, 2008a).

Figure 3.1 gives an indication of the relative importance of the manufacturing industries in the OSPAR Convention area. EU-wide production in the manufacturing industries grew on average by 26% between 1996 and 2006. Particular high growth rates were seen in the production of 'Electrical and optical equipment' (53%), 'Transport equipment' (50%) and 'Chemicals' (44%), while there was a drastic decrease for 'Leather' (-42%) and 'Textiles' (-32%) (Eurostat, 2008b).

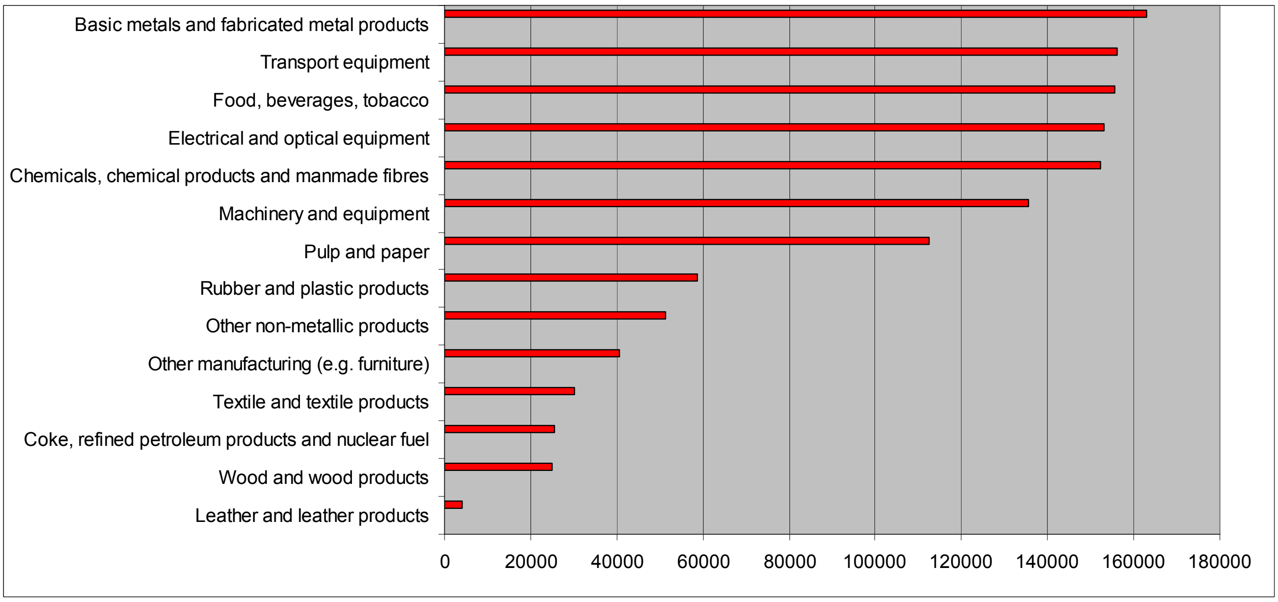

Figure 3.1 Relative importance of individual manufacturing industries in the OSPAR Convention area based on value added by factor cost in million Euros in 2005.

Examples of market and structural changes for relevant manufacturing industries in the last ten years include:

- the iron and steel industry: This is still an important economic sector for Europe with stable production at an average annual increase rate of 0.6% in the period 2000 – 2007 (IISI, 2008). While technological developments and abatement measures have drastically reduced the sector's contribution to releases of hazardous substances, there is first indication that the steep growth of steel production especially in Asia is adding to pressures from this sector on the North-East Atlantic through transboundary air transport of pollutants such as cadmium and mercury (OSPAR, 2008a);
- the pulp and paper industry: This saw an average 2.5% increase per annum of production output over the last ten years (CEPI, 2008). At the same time all bleached kraft and sulphite paper mills, which were an important contributor of discharges of chlorinated organic substances, have been closed in the OSPAR maritime area (OSPAR, 2005c);
- the textile sector: This saw a substantial reduction in production and cessation of activities, especially mass production, over the period 1995 – 2005 due to a combination of technological changes, evolution of the different production costs and the emergence of important international competitors (EC, 2007a).

In addition to industrial processes, diffuse sources for releases of OSPAR priority chemicals include the use of and waste associated with, products manufactured in the EU or imported from other parts of the world which contain such substances.

3.2 Measures

In putting in place measures to reduce discharges, emissions and losses, OSPAR is guided by the precautionary principle, the polluter pays principle, the principle of substitution of hazardous substances, avoidance of emissions, discharges and losses of new hazardous substances, scientific risk assessments, and the application of best available techniques and best environmental practice, including, where appropriate, clean technology.

OSPAR also takes into account measures and information which have already been agreed or are being negotiated by Contracting Parties in other forums, including the European Union, the Organisation for Economic Co-operation and Development (OECD), the United Nations Economic Commission for Europe (UN-ECE), the United Nations Environmental Programme (UNEP), the Arctic Council, the North Sea Conferences, and other regional seas and international river organisations.

In the assessment period, Contracting Parties continued to periodically report on their legal, regulatory and other efforts to implement OSPAR measures. The latest assessments of the implementation and effectiveness of the various measures in the OSPAR Convention area are published on the OSPAR website. These provide evidence that Contracting Parties have broadly implemented the requirements of OSPAR Decisions and Recommendations to reduce the emissions and discharges of hazardous substances in national rules and regulations. Information on the effectiveness of those measures is limited and it still remains to be seen if they are sufficient to reach the cessation target.

3.2.1 Point sources

Point source discharges and emissions are the most amenable to control. In the period 1980 – 1998, OSPAR adopted control and reduction measures promoting the application of best available techniques and associated emission and discharge limit values for the most important industries (Table 3.1). In the following period up to 2007, Contracting Parties reported full implementation of most OSPAR measures and the achievement of their objectives. One example of the pioneering role of OSPAR in targeting main industrial polluters is the chlor-alkali industry. In 1998 – 2006, the capacity of chlorine production based on mercury cells has been reduced by 37.8% for the entire OSPAR maritime area and by 17.2% for production sites draining into catchments of the OSPAR maritime area (OSPAR, 2008b). This was mostly achieved through the closure of facilities or change of production techniques. The phase-out of mercury cells in the chlor-alkali industry is envisaged by OSPAR by 2010 (Decision 90/3).

In the meantime, the European Community has adopted similar initiatives in regulating point sources and releases of hazardous substances to air and water. The 1996 Integrated Pollution Prevention and Control (IPPC) Directive has recently been codified (Directive 2008/1/EC). It pursues reductions of discharges to water and emissions to air from most industries covered by OSPAR measures through the use of Best Available Techniques (BAT) and emission/discharge limit values. To avoid duplication of work and to ensure a harmonized approach, OSPAR concentrated its efforts in the period 1998 – 2006 on reviewing BAT Reference documents (BREFs) developed under the IPPC Directive (2008/1/EC) to ensure that the concerns for the marine environment were taken into account and that they were appropriate to achieve the objectives under the Hazardous Substances Strategy (*cf*. Table 3.1). As a result OSPAR BAT measures have not been updated to latest technical standards and developments. At the same time, a few new measures were adopted where the issue concerned had not been addressed by other international forums at the time, for example the vinyl industry. The European Pollution Emission Register (Commission Decision 2000/479/EC) set up under the IPPC Directive and its successor, the European Pollution Release and Transfer Register (E-PRTR) which implements the inventory requirements of the UN-ECE POP Protocol at EC level (Regulation (EC) No. 166/2006), are important tools to monitor effectiveness of the measures taken to reduce emissions from main industries.

All OSPAR substances are addressed by the EU Water Framework Directive through the requirement to achieve ‘good chemical status’ in all fresh-water bodies and territorial marine waters (including coastal waters). The review of the status of priority substances under the Water Framework Directive has resulted in the proposed Water Framework Daughter Directive on environmental quality standards (COM(2006) 397 final) which is anticipated to be adopted and to enter into force in 2008/2009. In the proposed Daughter Directive, nine (groups of) OSPAR priority chemicals are assigned status as ‘priority hazardous substances’ (Table 3.2). For those substances, measures shall be taken under the Water Framework Directive aiming at the cessation or phasing-out of discharges, emissions and losses within 20 years after their adoption. Releases of seven other (groups of) OSPAR priority chemicals are subject to further substantial reduction under the Directive. Five OSPAR priority chemicals are listed for review for their future identification as priority substances or priority hazardous substances. It is expected that the full implementation of the Water Framework Directive and its Daughter Directive will provide an important additional instrument for addressing sources of pollution of transitional, coastal and territorial waters with chemicals.

The recently adopted Marine Strategy Framework Directive (2008/56/EC) requires EU Member States to take the necessary measures to achieve or maintain good environmental status in the marine environment by the year 2020 at the latest. This includes the development and implementation of strategies to prevent and reduce inputs in the marine environment, with a view to phasing out pollution, so as to ensure that there are no significant impacts on, or risks to, marine biodiversity, marine ecosystems, human health or legitimate uses of the sea. The Directive is also intended to contribute to the fulfilment of the obligations and commitments of the European Community and the Member States under several international agreements, including the OSPAR Convention.

3.2.2 Diffuse sources

Already in the 1980s and 1990s, OSPAR adopted a number of measures to control diffuse pollution sources and the use of certain priority chemicals in products (Table 3.2). An example of OSPAR’s pioneering role and synergies with other international organisations in banning the use of certain substances is Recommendation 87/1 on the phase-out of tributyltin (TBT) in paints for seagoing vessels and underwater structures, which has been implemented by most Contracting Parties. This was supported by recommendations in the 1990s by the International Maritime Organisation (IMO) to globally prohibit the application of organotin compounds, which act as biocides in antifouling systems on ships. This has culminated in the 2001 global Convention under the aegis of IMO on the Control of Harmful Antifouling Systems on Ships. The Convention entered into force on 17 September 2008. It envisaged a ban of TBT containing antifouling paints on all ships by 1 January 2008; this effective date has been suspended until the date of entry into force of the Convention. The ban was transposed into EC legislation in 2002 (Commission Directive 2002/62/EC).

In addition to the measures listed in Table 3.2, OSPAR also addressed specific activities and uses resulting in releases of hazardous substances, including chemicals other than those identified by OSPAR for priority action. Aquaculture is an example of an activity which makes use of a number of chemicals for different purposes - as antifoulant, veterinary medicines, and disinfectants. Losses of substances used in aquaculture end up directly in the coastal waters concerned. Recommendation 94/6 requires Contracting Parties to set up action programmes for the application of best environmental practices to avoid or reduce the use of hazardous substances in fish farming and their inputs to the sea either directly or via freshwater transport. Contracting Parties have broadly implemented the requirements set by OSPAR, most of which are today covered by use restrictions under EC legislation (including the Veterinary Medicines Directive (2001/82/EC) and the Biocides Directive (98/8/EC)). Other OSPAR measures address the use of pesticides and the application of best environmental practices and best available techniques in agriculture in order to reduce the use and releases of hazardous substances to the environment (Recommendations 94/7, 2000/1 and 2000/2). The phase-out of uses of cationic detergents in fabric softeners (Recommendation 93/4) is supported by EC marketing and use restrictions under Directive 76/769/EEC.

To ensure a consistent approach and avoid duplication of work, OSPAR concentrated efforts in the period 1998 – 2007 on collaborating with the European Community on promoting measures to restrict the use of certain substances in products and production processes (*e.g.* under the EC Marketing and Use Directive 79/769/EEC). A recent example of successful co-operation with the EU on restrictions of marketing and use of OSPAR priority chemicals are the limitations of contents of PFOS in a number of consumer products (Directive 2006/122/EC) with effect from summer 2008.

Important complementary EC legislation is in place on treatment of waste streams containing hazardous substances.

The REACH Regulation (EC) No. 1907/2006, dealing with the registration, evaluation, authorisation and restriction of chemical substances, is an important instrument in the European Community which will help improve the protection of the marine environment through a better and earlier identification of the intrinsic properties of chemical substances and the control of their uses.

3.2.3 Global actions

Even though uses and releases of many OSPAR priority chemicals are regulated in the OSPAR Convention area, these substances may still be in use and released in other parts of the world or imported to the OSPAR area as substances or in products.

Some of the substances can be transported by air or ocean currents to the OSPAR maritime area. Air transport of persistent organic pollutants (POPs), for example, is dependent on temperature. They evaporate in warm climates and are transported by wind towards the cooler poles where they enter the marine environment as a result of condensation. Global actions are therefore considered or taken for the most harmful substances under the Stockholm Convention on Persistent Organic Pollutants within the UNEP framework (the “Stockholm POP Convention”) and, at pan-European level, the UN-ECE Convention on Long-Range Transboundary Air Pollution (the “UN-ECE POP Protocol”). Those actions set up a strict regime for an initial list of substances including: the prohibition or restriction of production and use; restrictions on import/export of intentionally produced POPs (Stockholm POP Convention); requirements for safe handling of stockpiles (Stockholm POP Convention); provisions on environmentally sound disposal of wastes containing POPs and provisions on the reduction of emissions of unintentionally produced POPs (*e.g.* dioxins and furans). These global and pan-European actions are important measures to support progress towards the objectives of the OSPAR Hazardous Substances Strategy. Both instruments have been implemented at European Community level (Regulation (EC) No. 850/2004).

The Rotterdam Convention on the Prior Informed Consent (PIC) procedure for certain hazardous chemicals and pesticides in international trade supports information exchange and decision-making on imports of pesticides and industrial chemicals that have been banned or severely restricted for health or environmental reasons by parties to that Convention. There are currently 39 chemicals on the PIC list, including OSPAR priority chemicals: mercury compounds, HCH isomers including lindane, PCP and PCBs. OSPAR Contracting Parties are signatories of the Convention which has also been implemented at European Community level (Regulation (EC) No. 304/2003).

Table 3.1 OSPAR measures on point sources and their coverage by the IPPC Directive.
Note: R = PARCOM or OSPAR Recommendation, D = PARCOM or OSPAR Decision

Industrial sectors		OSPAR measures				IPPC BREF (year of adoption)
		Measure	**BAT/BEP**	**Limit values for emissions and discharges**	**Targeted substances**	
Iron and steel industry (primary and secondary)		R92/2 R93/1	X	X	Phenol, PAHs, nitrogen	2001 and 2005
		R92/3	X	X	Hydrocarbons, cadmium, chromium, nickel, zinc, nitrogen dioxides	
		R91/3	X		Cadmium, mercury, chlorinated oils, other chlorinated compounds, dioxin	
		R90/1	X		Metals, PAHs, nitrogen oxides	
		R91/2	X		Metals, PAHs, sulphur dioxides, nitrogen oxides, fluorides	
Non-ferrous metal industry (primary and secondary)		D96/1			Phase-out of the use of hexachloroethane	2001 and 2005
		R2002/1		X	PAHs	
		R98/2		X	Fluoride, PAHs	
		R92/1	X	X	PAHs, fluorides	
		R94/1	X		PAHs, fluorides, fluorocarbon gases, sulphur dioxides	
		R96/1	X		Fluorides, sulphur dioxides	
		R98/1	X		Cadmium, lead, mercury	
Surface treatment of metals		R92/4	X	X	Chromium, copper, lead, nickel, silver, tin, zinc, unbound cyanide, volatile organic halogens	2006
Chlor-alkali industry		D80/2, D81/1, D81/2, D90/3 R85/1		X	Mercury	2001
		D82/1	X		Mercury	
Textile industry		R97/1		reference values	Antimony, arsenic, cadmium, chromium, cobalt, copper, lead, nickel, tin, zinc, organohalogen substances (*e.g.* PCBs, chlorine), organochlorine pesticides, organophosphorous pesticides	2003
		R94/5	X			
Pharmaceutical industry		R92/5	X		Heavy metals, halogenated and aromatic hydrocarbons, nutrients	
Organic chemical industry		R94/4	X		Hydrocarbons, PAHs, organoholagens, heavy metals	2003 and 2006
Large combustion plants		R97/2	X		Heavy metals, PAHs and other POPs	2006
Pulp and paper industry		D96/2			Phase-out of the use of molecular chlorine in bleaching. Target substances: dioxins	2001 (under review)
		D92/1		X	Chlorinated organic substances	
		D95/2		X	Nitrogen oxides, sulphur dioxides	
		D95/3		X	Nitrogen oxides, gaseous sulphur, organic sulphuric compounds (methyl-mercaptan, di-methyl-sulphide, di-methyl-disulphide)	
		R94/2 R94/3	X		Nitrogen oxides, sulphur dioxides, organic substances	
Vinyl chloride monomer (VCM) industry	VCM, 1,2-dichloroethane	D98/4 R96/2	X	X	Vinyl chloride monomer, 1,2-dichloroethane, polychlorinated dibenzo-p-dioxins and dibenzofurans, hydrogen chloride, chlorinated hydrocarbon, copper, organohalogen substances	2007
	Suspension PVC	D98/5 R96/3	X	X	Vinyl chloride monomer, organohalogen substances	
	Emulsion PVC	R2000/3 R99/1	X	X	Vinyl chloride monomer, organohalogen substances	
Refineries		R83/1 R89/5	X		Hydrocarbons	2003

Table 3.2 OSPAR measures on diffuse sources and international activities to cut emissions and discharges of OSPAR priority chemicals

*Note: D = PARCOM or OSPAR Decision, R = PARCOM or OSPAR Recommendation, A = limit values for emissions to air; W = limits for discharges to water, PS = Water Framework Directive Priority Substance, PHS = Water Framework Directive Priority Hazardous Substance (status as at COM(2006) 397); X = EC restriction applies, or substance is covered by the UN-ECE POP Protocol and the UNEP Stockholm POPs Convention; – EC restriction does not apply, or substance is not covered by the UN-ECE POP Protocol and the UNEP Stockholm POPs Convention; * = under consideration for inclusion in UNEP Stockholm POPs Convention*

Substance (Section A of the OSPAR List of Chemicals for Priority Action)		OSPAR measures				EC restrictions			EC WFD	International actions on POPs	
		Measure	Uses	BAT/BEP	Restrictions	Marketing and use	Biocide	Pesticide		UN-ECE	Stock-holm
Metals and organometallic compounds	Cadmium	D85/2	Various sources		A/W	X	–	–	PHS	–	–
		D90/2	Batteries	X	X						
	Lead and organic lead compounds	–	–	–	–	X	–	–	PS	–	–
	Mercury and organic mercury compounds	R89/3	Discharges from various sources	X	Use of alternatives	X	–	–	PHS	–	–
		R93/2	Discharges from dentistry	X	–						
		R2003/4	Dispersal from crematoria	X	–						
		R81/1	Thermometers, batteries, dental filters	X	–						
		D90/2	Batteries	X	X						
	Organic tin compounds	R87/1	Antifouling paints for use on sea-going vessels and underwater structures	–	X	X	X	–	PHS (TBTs)	–	–
		R88/1	Docking activities (sand-blasting *etc*)	X	–						
Organic ester	Neodecanoic acid, ethenyl ester	–	–	–	–	X	–	–	–	–	–
Organohalogens	PFOS	–	–	–	–	X	–	–	–[1]	*	*
	Tetrabromobisphenol-A	–	–	–	–	–	–	–	–	–	–
	Trichlorobenzenes	–	–	–	–	X	–	–	PS	–	–
	Brominated flame retardants	–	–	–	–	X	–	–	PBDEs: PHS other: PS	OBDE* PBDE* HBB*	OBDE* PBDE* HBB*
	Polychlorinated biphenyls (PCBs)	D92/3	Any use	–	Phase-out	X	–	–	–[1]	X	X
	Polychlorinated dibenzodioxins and dibenzofurans (PCDDs, PCDFs)	–	–	–	–	X	–	–	–[1]	X	X
	Short chained chlorinated paraffins	D95/1	Plasticiser in paints, coatings and sealants, use in metal work fluids and as flame retardants in rubber, plastics and textiles	–	Phase-out	X	–	–	PHS	*	*
Organic Nitrogen comp.	4-(dimethylbutylamino) diphenylamin (6PPD)	–	–	–	–	–	–	–	–	–	–
Pesticides/ biocides/ organohalogen	Dicofol	–	–	–	–	–	X	X	–[1]	–	–
	Endosulfan	–	–	–	–	–	X	X	PHS	–	–
	HCH isomers	–	–	–	–	X	lindane	lindane	PHS	X	*
	Methoxychlor	–	–	–	–	–	–	–	–	–	–
	Pentachlorophenol (PCP)	–	–	–	–	X	–	–	PS	–	–
	Trifluralin	–	–	–	–	–	X	–	PS	–	–
Pharma-ceuticals	Clotrimazole	–	–	–	–	–	–	–	–	–	–
Phenols	2,4,6-tri-*tert*-butylphenol	–	–	–	–	–	–	–	–	–	–
	Nonylphenol-ethoxylates	R92/8	Cleaning agents		Phase-out	X	–	X	NPs: PHS	–	–
	Octylphenol	–	–	–	–	X	–	X	PS	–	–
Phtha-late esters	Phthalates: dibutylphthalate (DBP), diethylhexyl-phthalate (DEHP)	–	–	–	–	X	–	–	DEHP: PS	–	–
Polycyclic aromatic compound	Polycyclic aromatic hydrocarbons (PAHs)	R96/4	One-component coal tar coating systems for inland ships	–	Phase-out	X	–	–	PHS	X	–
Syn-thetic musk	Musk xylene	–	–	–	–	X	–	–	–	–	–

[1] Added to the list of substances subject to review for possible identification as priority substances or priority hazardous substances (Annex III) of the draft directive on environmental quality standards in the field of water policy, which was agreed in the European Parliament's second reading (17 June 2008) in the Co-decision Procedure of the European Parliament and Council.

4. Assessment of trends in emissions, discharges and losses

In the following sections, an assessment of available information on each of the OSPAR priority chemicals is undertaken with a view to judging progress made towards the target of the OSPAR Hazardous Substances Strategy on cessation of emissions, discharges and losses.

4.1 Metals and organometals

The three heavy metals cadmium, lead and mercury and the metal tin are naturally occurring elements in the environment. Their hazardous properties depend on the chemical form the element occurs in. Both mercury and tin are much more toxic as organic compounds. The metals were added to the OSPAR List of Chemicals for Priority Action in 1998.

Releases to the environment of heavy metals are targeted by a number of OSPAR and EC measures. Actions taken by OSPAR include a suite of Recommendations and Decisions describing best available techniques and emission/discharge limit values for relevant industries. Actions targeting emissions, discharges and losses of heavy metals in general include best available techniques in the primary production of non-ferrous metals (Recommendation 98/1), the secondary metallurgic industries, for example the surface treatment of metals (Recommendation 92/1), the textile industry (Recommendations 94/5 and 97/1), the pharmaceutical industry (Recommendation 92/5), the organic chemical industry (Recommendation 94/4), and large combustion plants (Recommendation 97/2). The uptake of lead and other trace components in marine organisms from barite and other weight materials used for offshore drilling is subject to monitoring by the OSPAR Offshore Industry Committee.

These measures are reflected in a similar approach and coverage of industrial sectors by the IPPC Directive (2008/1/EC). A suite of EC legislation on waste streams also target the release of heavy metals to the environment (for example landfill – Directive 1999/31/EC; incineration – Directive 2000/76/EC). Restrictions on the use of cadmium, lead and mercury in vehicles and vehicle components applies under the End-of-life Vehicle Directive (2000/53/EC) and a ban applies to their use in new electronic and electrical equipment (Directive 2002/95/EC). Lead is a priority substance, and the other two heavy metals and the organic tin compound tributyltin (TBT) are priority hazardous substances under the Water Framework Directive.

Estimates of loads of cadmium, mercury and lead discharges within produced water from offshore industries and their relative contribution to other input sources is still under investigation in OSPAR. It is expected that their contribution to total releases of heavy metals may be relatively small.

The three heavy metals and TBT are also of concern in relation to the dumping of sediments dredged for navigational purposes, especially from harbours, which may contain high levels of those substances. Dumping may only have net effects of increasing the load of those substances to the sea as long as sediments in harbours, rivers and estuaries keep receiving fresh loads of these substances from land-based sources or, in the case of TBT, from ships' hulls. Where dredged material dumped at sea is transported back into waterways and harbours by the currents, the dredging/dumping operations triggered by such returns in general do not result in net input loads of the relevant substances. However, the relocation of such sediments may cause a remobilisation of such substances to the water column where they are more available for up-take in the food chain. In the period 2002 – 2005, a decrease in the load of trace metals and TBT has been observed for total dredged material loads, although quantities of dredged material disposed of increased in that period (OSPAR, 2007a). This has been attributed to improved management of dumping of dredged material based on OSPAR Guidelines (OSPAR, 2004c).

4.1.1 Cadmium

Cadmium is naturally occurring in the marine environment in form of salts. The effect of cadmium on the marine environment depends on the nature of these salts in combination with other elements such as oxygen, chlorine or sulphur. The zinc-cadmium ratio is very important as the toxicity and accumulation of cadmium increases significantly due to zinc deficiency. Cadmium is liable to bioaccumulate in marine organisms.

Uses, production and sources

In 2004, cadmium was used worldwide in the production of batteries, in intermediates and catalysts for electroplating, in pigment in paint, in stabilizer for plastic, in photographical processes and in dyes (Figure 4.1). More than 80% of the global production of cadmium in 1998 was derived from mining, smelting and refining of zinc. The rest was recovered in secondary processes whilst recycling cadmium from products.

In 2004, primary production of cadmium in Europe was 1998 tonnes, 12% of worldwide production (16 649 tonnes). In 1997 – 2004, world primary production of cadmium decreased from its highest peak in 1997 which roughly corresponds to the peak in worldwide nickel-cadmium battery production. Reductions have mainly occurred in Europe where many of the zinc/cadmium producers shut down their cadmium refineries and now dispose of the cadmium-containing material from their zinc smelting process as hazardous waste (ICdA, 2005).

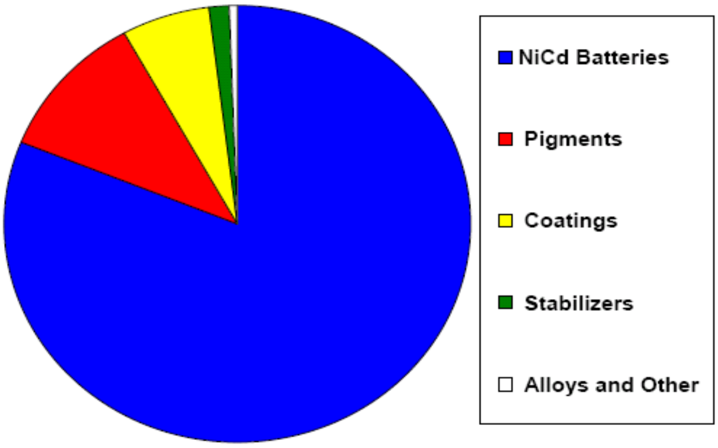

Figure 4.1 Estimated worldwide consumption patterns for cadmium in 2004. Source: ICdA, 2005

Important sources of cadmium releases are the primary iron and steel industry, the non-ferrous industry, and the combustion of fuel in power plants. In addition road transport, commercial, domestic and industrial combustion processes, waste treatment and disposal, and other minor sources, such as extraction of fossils, solvent use, or the use of fertiliser in agriculture, contribute to cadmium releases.

Measures

In addition to the above mentioned OSPAR and EC measures which generally address pollution from hazardous substances, including heavy metals, specific actions taken by OSPAR towards the cessation of cadmium emissions, discharges and losses include the substitution of cadmium in batteries. This is supported by marketing and use restrictions adopted in the EC framework restricting the contents and use of cadmium in batteries (Directives 91/157/EEC and 2006/66/EC) and for a number of other uses and applications including: fertilizers (Directive 76/116/EEC), ceramics (Directive 84/500/EEC), sewage sludge (Directive 86/278/EEC), colouring, stabiliser and metal plating (Directive 91/338/EEC), toys (Directive 88/338/EEC) and packaging and packaging waste (Directive 94/62/EC).

Emissions to air and atmospheric deposition

The total air emissions reported by OSPAR Contracting Parties under their commitments under the Convention on Long-Range Transboundary Transport of Pollutants to EMEP amounted to 44.9 tonnes in 2005. The main driver behind overall reductions since 1998 seems to be a steep decrease in French emissions in 2002, the reasons for which still need to be established. Without France, the total reduction achieved in the Convention area between 2001 and 2005 would be around 10% with no clear trends for some of the Contracting Parties.

Emissions have been significantly reduced from the main emission sectors (Figure 4.2) combustion and industrial processes by a quarter each in 1998 – 2005 while no clear trend could be observed for commercial, residential and other stationary combustion. Among manufacturing industries, reductions were most significant for the non-ferrous metal industries, still the main contributing manufacturing industry, and the chemicals sector where emissions have more than halved. Yet, an increase of more than 20% emissions was observed for the pulp and paper sector, as well as for the smaller sources such as road, rail and air transport. The most pronounced reduction in the order of some 70%

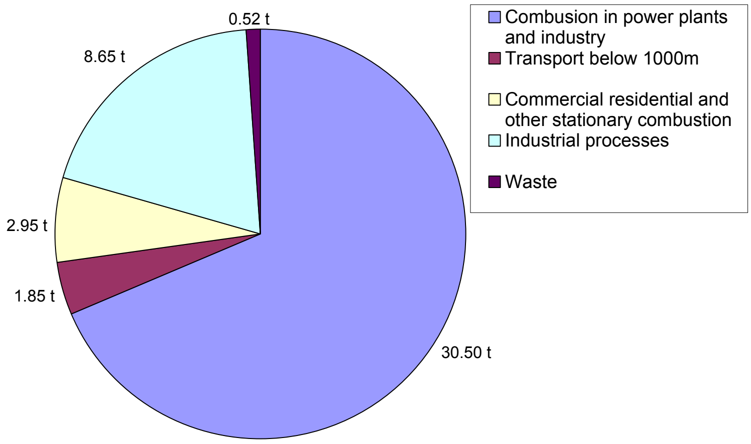

Figure 4.2 Relative contribution of main sectors to cadmium emissions in 2005. Source: EMEP Webdab

was achieved for the waste sector, though a relatively small contributor to overall emissions.

Emissions from combustion in power plants and in industry and industrial processes are the main contributors to total atmospheric deposition of cadmium ranging from 69% in Region II to 91% in Region IV (OSPAR, 2008a). EMEP model results estimate the net anthropogenic input load of cadmium to the OSPAR maritime area in 2005 to amount to 54 tonnes compared to a total deposition (including re-suspension) of 115.4 tonnes. This is a decrease of 8.9% in 1998 – 2005. The decrease varies for the OSPAR Regions from 2.5 times (Region IV) to 1.5 times (Region V). The contribution of the OSPAR Contracting Parties to net depositions of cadmium to Region II in 2005 is 72%; 20% are attributable to Poland. Decreasing trends in atmospheric deposition of cadmium were also observed for some stations of the OSPAR Comprehensive Atmospheric Monitoring Programme, especially in the Greater North Sea.

Discharges, losses and waterborne inputs

The total (direct and indirect) discharges to water reported by OSPAR Contracting Parties to EPER under their commitments under the IPPC Directive in 2001 and 2004 are 8.9 tonnes and 3.7 tonnes respectively. The discharges reported relate mainly to the pulp and paper industry, basic inorganic chemicals and fertilisers industry and hazardous waste installations. While uncertainties in the exact discharge figures for 2001 and 2004 exist due to inconsistencies in reporting and do not allow conclusions on trends, the discharge data still give an indication that discharges from heavily regulated point sources continue.

Total direct and riverine inputs of cadmium to the OSPAR maritime area have substantially decreased in the period 1990 – 2002 (OSPAR, 2005b). Statistically significant downward trends in total cadmium inputs were observed for the Arctic Waters (89%), the Greater North Sea (49%) and the Celtic Seas (68%). For the Greater North Sea and the Celtic Seas, direct discharges of cadmium were in general the smaller and progressively diminishing component of overall inputs. The inputs from riverine inputs and direct discharges of cadmium to the North Sea main body is estimated to be roughly of the same magnitude as its atmospheric deposition (OSPAR, 2005b).

A first estimate of quantities of cadmium lost per year by leaching from anodes of sea ships to the Greater North Sea indicate that this is a minor source compared to land-based sources. It may contribute approximately 1 – 2% to the total cadmium entering the Greater North Sea. The estimates of annual losses for the period 1997 – 2002 ranged from 0.8 to 0.9 tonne. Yet, there are a number of uncertainties linked to the estimate and this can only provide a rough indication of the magnitude of losses of cadmium from ships.

Conclusions

DIFFUSE SOURCES GAIN RELATIVE SIGNIFICANCE

The main industrial sources for cadmium releases to the environment have been regulated. Combustion remains the main source of concern for cadmium emissions to air. With point sources being well controlled, the relative importance of diffuse sources has increased. Main uses in products, for example in batteries, have been restricted. Nevertheless, considerable other uses remain.

RELEASES TO THE ENVIRONMENT HAVE DECREASED BUT AIR EMISSIONS ARE STILL OF CONCERN

Releases of cadmium to air and water still continue. While overall the trends point down, there is indication that emissions to air in some sectors are going up and the picture is not coherent.

NO CLEAR TREND TOWARDS CESSATION TARGET

Some substantial reductions have been achieved in the period 1998 – 2005. Yet, overall there is currently no clear move towards the cessation target. Further efforts are needed to make progress in reducing emissions, discharges and losses of cadmium through improving abatement technology, for example in combustion processes, further investigating remaining uses in products not yet regulated, and effectively implementing the obligations of the Water Framework Directive for cadmium.

4.1.2 Lead and organic lead compounds

Lead is persistent and non-degradable and is an acute toxic compound for mammals and aquatic organisms. It can cause blood-related diseases, damage to the immune defence system and is suspected to have carcinogenic properties. It is also toxic to reproductive processes. Lead occurs in a number of compounds and in various chemical groups. Dissolved lead is considered the most hazardous form.

Uses, production and sources

Lead is one of the most widely used non-ferrous metals and is a vital material in everyday life. Lead is used in a large number of applications as metallic lead in batteries and accumulators, lead shots, boat keels, building materials but also in products such as paint, leaded petrol, glass, electronic and electrical equipment, plastic, and ceramic products. The main consumption of lead worldwide has been for lead-acid batteries for vehicles, emergency systems and industrial batteries (Figure 4.3).

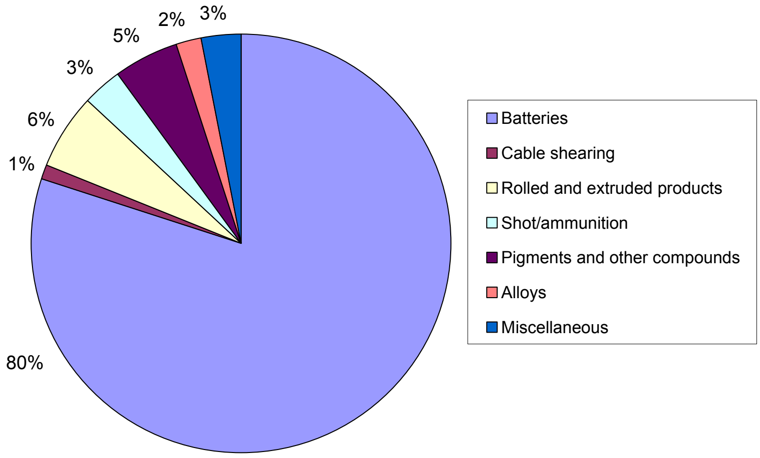

Figure 4.3 End uses of lead in the last five years worldwide. Source: ILZSG, 2008

Lead production worldwide saw an increase by 14.5% from 2003 to 2006 with highest increase rates in Asia. Lead production in Europe has steadily been rising in the period 1998 – 2006 in response to increasing consumption. Consumption figures for Europe suggest a small average increase per annum (2.4%) since 2003. In 2006, production in Europe reached 1 662 000 tonnes (up 4.6% since 2003). By 2006, 50% of the total lead production in Europe was from recycling. (ILZSG, 2008)

Important sources of lead emissions and discharges are primary production processes such as ferrous and non-ferrous metal production, mining, glass production and recycling processes, ceramics production, offshore industry, and waste incineration and disposal. As many primary pollutant sources are regulated, the need to assess secondary sources increases. In this context contaminated sediments and hazardous waste sites on the coast are especially important as long-term sources.

Measures

In addition to OSPAR and EC measures targeting heavy metals in general, OSPAR has promoted specific actions on lead releases in other forums, especially in the EU, including for example the substitution of lead in paints (as colouring pigments, anti-corrosive and siccatives), in PVC products and in a number of products and articles (lead shot used in hunting and clay pigeon shooting, fishing sinkers, curtain hems and roofing material). So far, the use of two lead compounds in paint is prohibited under Directive 76/769/EEC (Directive 89/677/EEC). A voluntary risk assessment for restricting the uses of lead in ammunition and fishing sinkers is still under development in the EU. The use of lead in batteries and accumulators is restricted under Directives 91/157/EEC and 2006/66/EC.

Other specific measures in the EU framework targeting emissions, discharges and losses of lead to the environment include limit values for lead in ambient air of 0.5 µg/m^3 (Directive 99/30/EC), prohibition of marketing of leaded petrol (Directive 98/70/EC) and waste legislation on batteries and accumulators (Directive 2006/66/EC). To prevent leaching of lead to soil, groundwater and runoff water, its allowable contents in sewage sludge used in agriculture on land are also restricted (Directive 86/278/EEC).

Emissions to air and atmospheric deposition

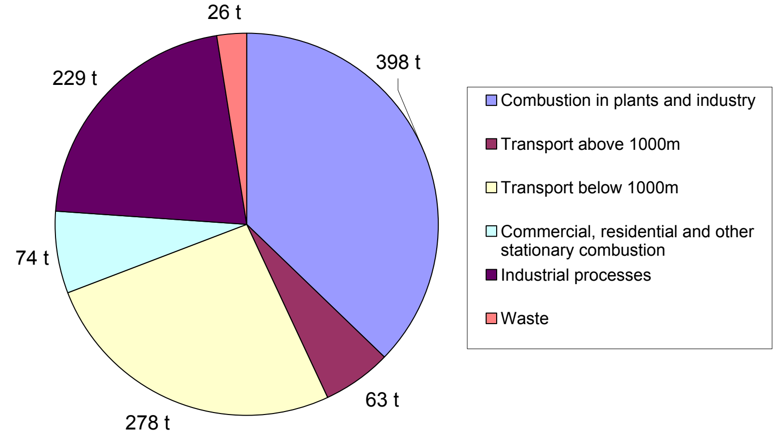

Figure 4.4 Relative contribution of main sources of lead emissions to air in 2005. Source: EMEP Webdab. Note: 'Transport below 1000m' is dominated by emissions from road transport but also includes emissions from civil aviation, railways, national navigation, and other mobile sources.

The total air emissions reported by OSPAR Contracting Parties under their commitments under the Convention on Long-Range Transboundary Transport of Pollutants to EMEP amounted to 1076 tonnes in 2005. The figures held by EMEP suggest that about half of the emissions are accounted for by both Spain (mainly from combustion and industrial processes) and Portugal (mainly from road transport and aviation). Since 1998, total emissions decreased by more than two thirds. The most significant reduction (more than 90%) was achieved in emissions from road transport, reflecting the phase-out of leaded petrol in the OSPAR Convention area. While in 1998 the transport sector (below 1000m) contributed two thirds to the total lead emissions in the Convention area, it still accounted for one fourth of the total emissions in 2005 and was the second largest emission source after combustion in power plants and industry and before industrial processes (Figure 4.4).

In the same period, emissions from air transport (above 1000m) increased by one third. Reductions in emissions from main sources in 2001 – 2005 were less pronounced for industrial processes (15%) and combustion in power plants and industry (18%) but reached 31% for commercial, residential and other stationary combustion. The picture for the individual manufacturing industries is inconsistent. In 2001 – 2005 overall emissions from the non-ferrous metal manufacture halved but the trend was less clear for iron and steel (down 6%); yet emissions remained stable or even increased for some Contracting Parties. With the emission reductions achieved for the two largest single manufacture emission sources, emissions from 'other manufacturing industries' (including furnaces and the manufacture of glass, ceramics, tiles *etc.*) as a group have become the biggest manufacture emission source with no clear trend in emissions in 1998 – 2005.

Emissions from combustion in power plants and in industry and industrial process are the main contributors to total atmospheric deposition of lead to the OSPAR maritime area in 2005 with highest contributions to input loads in Region V (Wider Atlantic) (66.4 tonnes) and Region II (Greater North Sea) (64.0 tonnes) (OSPAR, 2008a). Transport is the second largest emission source contributing to lead depositions. EMEP model results estimate the net anthropogenic input load to the OSPAR maritime area in 2005 to amount to 1981 tonnes (compared to total deposition including re-suspension of 4435 tonnes) with highest deposition in Region V (Wider Atlantic) (730 tonnes) and Region II (Greater North Sea) (570 tonnes). This is an overall decrease of lead deposition of 18.3% in 1998 – 2005 with varied downward trends in each of the OSPAR Regions ranging from 14 – 15% in Regions I, II and V to 25% and 32% in Regions III and IV, respectively. The total contribution of all OSPAR Contracting Parties to total depositions of lead to Region II from anthropogenic sources in 2005 is around 82%. Decreasing trends in atmospheric deposition of lead were also observed for some CAMP stations especially in the Greater North Sea.

Discharges, losses and waterborne inputs

The total discharges of lead reported by Contracting Parties to EPER under their commitments under the IPPC Directive in 2001 and 2004 are 93.6 and 82.2 tonnes, respectively. The reported discharges relate mainly to the metal industry, the pulp and paper industry, the basic organic chemicals industry and basic inorganic chemicals or fertilisers. While uncertainties in the exact discharge figures exist due to inconsistencies in reporting and do not allow conclusions on trends, the discharge data still give an indication that discharges from these heavily regulated point sources still continue.

In the period 1990 – 2002, total inputs of lead through rivers and direct discharges decreased by 87%. In the same period a decrease of inputs were observed for the Greater North Sea (33%). Direct discharges were the smaller and progressively diminishing component of overall inputs (OSPAR, 2005b). The total direct and riverine inputs of lead to the North Sea main body is estimated to be roughly of the same magnitude as atmospheric inputs of lead (OSPAR, 2005a).

Conclusions

SOME IMPORTANT SOURCES STILL REMAIN UNREGULATED

The main industrial sources for lead releases to the environment have been regulated. Combustion and industrial processes remain the main sources for lead emissions to air. The use of leaded petrol has been banned for automobiles but its use still continues for some small aircraft. Some of the diffuse sources of lead from products are regulated through use restrictions in EU legislation. However major use areas, such as lead-acid batteries, ammunition and fishing equipment, are still not regulated by most Contracting Parties.

OVERALL RELEASES TO THE ENVIRONMENT HAVE DECREASED BUT ACTIVITY AND COUNTRY SPECIFIC UPWARD TRENDS ARE OF CONCERN

There are still releases of lead to air and water. Overall trends are mainly pointing down. For some sources, emissions and discharges are mainly related to total activities within a sector and not to the implementation of BAT or emission limit values and show activity-dependent trends. Emissions for some specific activities and countries do not follow the general downward trend but have stagnated or even increased over the last years.

NO CLEAR TREND TOWARDS CESSATION TARGET

Substantial reductions have been achieved in the period 1998 – 2005. Yet, overall there is currently no clear move towards the cessation target.

Further progress in reduction is more difficult to achieve and is slowing down. More effort is needed to support further reductions in releases through improved technology, for example in combustion processes.

Some further restriction on the use of lead containing products are being implemented in the EU, but still lead containing products are expected to be on the market up to the target date. Uses in products not yet regulated need to be further investigated to inform the need and scope for further action. The effective implementation of the obligations under the Water Framework Directive for lead is important to help the progress towards the cessation target.

4.1.3 Mercury and organic mercury compounds

Mercury has a high toxicity to both man and biota and, as an elementary substance, is persistent and non-degradable. Metallic mercury can be oxidized to mercury ions which have a high affinity to sediments and are easily transformed in the environment into mercuric ions. Many mercuric salts are very soluble in water. Mercury can also be transformed by biochemical and biological reactions into more toxic organic compounds (*e.g.* methyl mercury). In the environment, mercury mainly occurs as elemental mercury and as inorganic mercury compounds (chlorides, hydroxides, oxides and sulphides).

Use, production and sources

Mercury is used in a number of products including dental amalgam, batteries, industrial and control instruments, laboratory and medical instrument and lighting appliances (Figure 4.5).

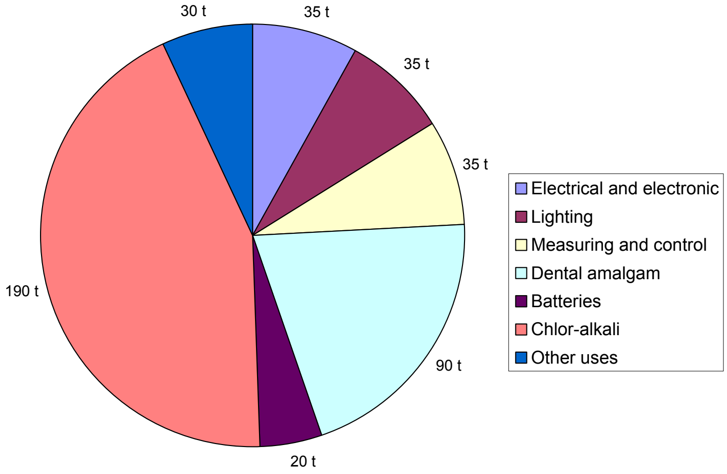

Figure 4.5 Mercury consumption in tonnes in EU in 2005. Source: Maxons, 2006

Mercury production (mining and processing of primary mercury ores) stopped in the EU in 2003 and is not expected to restart (Maxons, 2006). Mercury is also a by-product from mining and other metallurgic activities involving the extraction and processing of raw and recycled mineral material including iron and steel and non-ferrous metals, especially zinc. In the chlor-alkali industry, 31 mercury cell plants with a capacity of 4273 tonnes (a decrease of 37.8% since 1998), were still operating in 2006 OSPAR wide (OSPAR, 2008b). 74% of the capacity is with 23 plants in the drainage area of the OSPAR maritime area; the reduction of their production in 1998 – 2006 was less pronounced with a decrease of 17.2%. With the progressive phasing-out of mercury in the chlor-alkali industry, dental amalgam will become the major remaining use of mercury in the EU. Some Contracting Parties consider dental amalgam a significant source of mercury releases to the environment.

Measures

In addition to the general OSPAR and EC measures targeting heavy metals, a suite of Decisions apply under the Hazardous Substances Strategy which control mercury emissions and discharges from the chlor-alkali industry, including Decision 90/3 on the complete phase-out of mercury cell plants by 2010. Other specific actions taken by OSPAR address a variety of important sources for mercury including recommendations of best available techniques and environmental practice to reduce emissions, discharges and losses of mercury from dentistry (Recommendation 93/2), thermometers, batteries and dental filters (Recommendation 81/1), crematoria (Recommendation 2003/4) and other diffuse sources (Recommendation 89/3).

OSPAR has promoted actions in other international forums, especially the EU. This includes, for example, a call for actions to prevent pollution from the disposal of large amounts of pure and waste mercury arising from the closure or conversion of mercury cell chlor-alkali plants under Decision 90/3, and for control measures on the use and marketing of mercury in various products. These issues have been addressed in the EU Mercury Strategy (COM(2005) 20 final) recommending (investigation into) legislative actions to control those diffuse sources, except crematoria. The recent opinion of the Scientific Committee on Health and Environmental Risks on mercury in dental amalgam will inform further discussions in the EC on the need for additional regulatory measures (EC, 2008a). Other measures in the EU framework include under Directive 76/769/EEC the prohibition of the use of mercury-based biocides for boats, cages *etc*. in fish farms, preservation of wood and textiles and treatment of industrial wastes, and the use of plant protection products containing certain active substances including mercury oxide, mercurous chloride, other inorganic mercury compounds, alkyl mercury, and alkoxylalkyl and aryl mercury compounds. Directive 2007/51/EC restricts the marketing of certain measuring devices containing mercury. Other measures restrict the use of mercury in batteries (Directive 2006/66/EC), toys (Directive 88/338/EEC) and ceramics (Directive 84/500/EEC), and contents of mercury in packaging and packaging waste (Directive 94/62/EC). Mercury compounds used as pesticides are subject to the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, implemented in the EU by Regulation (EC) No. 304/2003, which also bans export of cosmetic soaps containing mercury and requires export notification of mercury compounds for all other uses. The European Commission has also proposed a Regulation banning the export of metallic mercury from the EU and requiring its safe storage (COM(2006) 636 final).

Emissions to air and atmospheric deposition

The total air emissions reported by OSPAR Contracting Parties under their commitments under the Convention on Long-Range Transboundary Transport of Pollutants to EMEP amounted to 43 tonnes in 2005. This is an overall reduction of less than 20% since 1998. This is mainly attributable to significant reductions achieved by France (45%) and the United Kingdom (30%). Yet, this trend is not reflected in all Contracting Parties and in all sectors and activities (Figure 4.6). Emissions remained fairly stable in a number of countries, including for example Spain, the largest contributor to total emissions (27%) in the OSPAR Convention area in 2005. The overall reductions of 16% achieved for combustion in 2001 – 2005 are mainly attributable to reductions in France and the United Kingdom, whereas emission levels remained stable in most other Contracting Parties. Total emissions from industrial processes, including manufacturing industries, remained fairly stable (down 6% in 2001 – 2005) with no clear trends for some activities and Contracting Parties. There is even an increase of overall emissions from the metal production sector since 2001 by 13% to 4.33 tonnes in 2005, with the most pronounced increase (23%) in Spain as the main contributor to emissions from this sector. The most consistent development

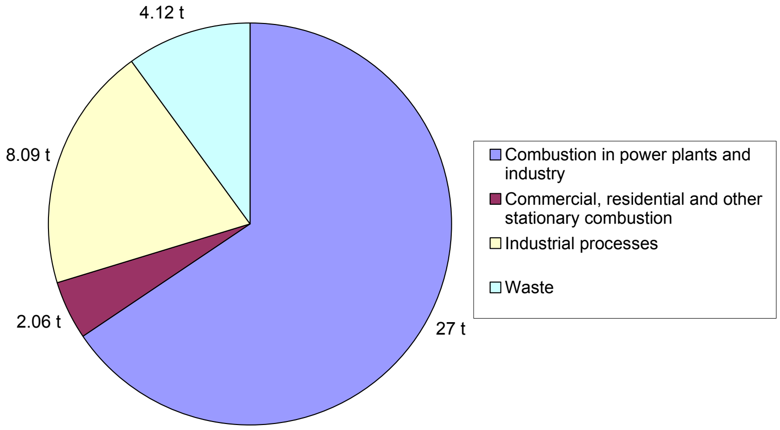

Figure 4.6 Relative contribution of main sectors to mercury emissions in 2005 in tonnes. Source: EMEP Webdab

across OSPAR and explicit reduction (47%) of mercury emissions since 1998 was achieved in the chlor-alkali industry, reaching 3.9 tonnes in 2005.

Emissions from combustion in power plants and in industry and industrial processes are the main contributors to total atmospheric deposition of mercury ranging from 71% in Region III (Celtic Seas) to 84% in Region IV (Bay of Biscay and Iberian Coast) (OSPAR, 2008a). Emissions from the waste sector are the second largest contributor to mercury deposition. While model calculations of net anthropogenic inputs contain significant uncertainties (estimated at 39.6 tonnes in 2005), EMEP model results estimate a total deposition of mercury to the OSPAR maritime area, including re-suspension, of 95.4 tonnes in 2005. For total inputs, this is a decrease of 7% from 1998 to 2005 ranging from 2% in Region I and 7% in Region V to 13% - 14% in Regions II, III and IV. The low reduction rates have been explained with the large contribution of global sources and increasing importance of re-suspension from land. Recent estimates suggest that despite significant emission reduction in Europe and North America, the global mercury emissions did not significantly change over the last 15 years due to emissions growth in other parts of the world (*e.g.* Asia). In 2005, Contracting Parties contributed 90% to the total anthropogenic depositions of mercury in Region II (Greater North Sea). Reductions in emissions have not been found to be fully reflected in concentrations in precipitation for stations under the OSPAR Comprehensive Atmospheric Monitoring Programme and a statistically significant downward trend could only be confirmed for 1990 – 2002 for one station (Sweden); the reason for this is probably of methodological nature (use of detection limits) (OSPAR, 2005a).

Discharges, losses and waterborne inputs

The total discharges of mercury reported by Contracting Parties to EPER under their commitments under the IPPC Directive in 2001 and 2004 are 1.41 and 1.36 tonnes. The reported discharges relate mainly to the sectors basic inorganic chemicals and fertilisers, basic organic chemicals, metal industry, pulp and paper, hazardous waste, mineral oil and gas refineries and textile industry. While uncertainties in the exact discharge figures for 2001 and 2004 exist due to inconsistencies in reporting and do not allow conclusions on trends, the discharge data still give an indication that discharges from heavily regulated point sources continue.

Trends in direct and riverine inputs of mercury differ considerably between OSPAR Regions and within each of the Regions in 1990 – 2002 (OSPAR, 2005b). Direct discharges of mercury in Arctic waters went down by 91%. For riverine inputs of mercury in Region I, inputs in 2002 were lower than in 1990 but calculations show an upward trend, although not statistically significant. The total level of mercury inputs is still well under 0.5 tonne a year. In the same period, total inputs of mercury went down by 73% in the Greater North Sea (Region II). The discharges were the smaller and progressively diminishing component of overall waterborne inputs. Major reductions in mercury direct discharges were also observed for the Celtic Seas (86%). Data were however not sufficient to allow conclusions on changes in either riverine or total waterborne mercury inputs in Region III.

Losses of mercury through product, waste water and air from chlor-alkali installations with waste water discharges in the drainage of the OSPAR maritime area have halved in the period 1998 – 2006 and reached 4192 kg in 2006 (OSPAR, 2008b). Losses from installations range between 0.165 g per tonne production capacity from one plant in Sweden to 1.957 g per tonne production capacity from one plant in the United Kingdom.

A recent study of the European Environmental Bureau estimates that the EU discharges 109 tonnes of mercury per year from dental practices and that mercury in the teeth of deceased persons contribute 14 tonnes mercury per year to the EU waste stream (EEB, 2007). The study suggests that 46 tonnes of the total 123 tonnes per year may be removed from circulation, leaving 77 tonnes that are likely to end up in various environmental media: 30 tonnes in soil, 23 tonnes in the atmosphere, 14 tonnes in surface water and 10 tonnes in ground water.

The total dispersal reported by six Contracting Parties in the context of implementation of Recommendation 2003/4 in 2005 indicate nearly 450 kg per year from crematoria fitted with mercury removal techniques and 700 kg of mercury per year from crematoria not applying such techniques. A very rough and provisional estimate would be that crematoria contribute with around 1 tonne of mercury per year to releases of mercury to the environment (OSPAR, 2006b).

Conclusions

MEASURES ON DIFFUSE SOURCES HAVE NOT YET SHOWN EFFECT

Control systems and best available techniques are in place for all main sources. There is however a focus on industrial sources and opportunity to improve regulatory activity. Most diffuse sources are addressed by the EC mercury strategy but the strategy has not yet resulted in a ban of dental amalgam.

RELEASES TO THE ENVIRONMENT HAVE DECREASED BUT WITH NO CONSISTENT TREND

Releases of mercury to the environment continue from all main point and diffuse sources. While overall the trends point down, for many Contracting Parties, sectors and activities, emission levels to air from large point sources stagnated or, in some cases, even increased in 1998 – 2005. This is reflected in limited reduction rates in atmospheric inputs to the OSPAR Regions; which is also partly due to the contribution of global emission sources.

FURTHER EFFORT IS NEEDED TO MOVE TOWARDS THE CESSATION TARGET

Reductions in mercury releases have reached a plateau and further progress is more difficult to achieve and is slowing down.

It is expected that the cessation target will be largely achieved for major point sources but further work is needed to foster this trend, for example, through improvement of technology to support further reductions of releases (*e.g.* combustion).

Under EC marketing and use restrictions, mercury containing products will phase out in coming years thus reducing pressures from diffuse sources (especially waste streams). Yet, there is opportunity to investigate the need for further initiatives on diffuse sources under the EC mercury strategy. Special attention is warranted to investigate into the ban of dental amalgam, waste water treatment and storm water overflow to inform the need for further actions towards the cessation target for mercury.

The effective implementation of the obligations of the Water Framework Directive for mercury is important to facilitate the progress towards the cessation target for mercury.

4.1.4 Organic tin compounds

Organic tin compounds known to be environmental pollutants comprise mono-, di-, tri-, and tetrabutyl and triphenyl tin compounds. Tributyl tin (TBT) compounds are considered the most hazardous of all organic tin compounds, causing shell malformations of oysters, imposex in marine snails, reduced resistance to infections *e.g.* in flounders, and effects on the human immune system.

Uses, sales and sources

One important use of TBT has been as antifoulant on underwater structures and ships. This and the use of TBT and triphenyl tin (TPT) as biocide (*e.g.* fish cages, wood treatment and preservation, *etc*.) are currently being phased out in Europe. Locally, shipping docks not properly managing their discharges and run-off may, for some years, continue to be a source of TBT and dibutyl tin (DBT) contamination. Contaminated sediments will remain a source of those compounds, especially in the context of dumping at sea of dredged harbour sediments.

The remaining commercial uses of organic tin compounds include uses as stabilisers in PVC, catalysts in chemical reactions and glass coatings; the use as pesticide has ceased to a large extent in OSPAR Contracting Parties. Industrial sources include the ferrous metal industry, pulp and paper industry and surface treatment of metals.

Organic tin compounds are high production volume (HPV) chemicals under the OECD HPV Chemicals Programme. It is estimated that the four major commercial applications (PVC stabilizers, catalysts, agrochemicals, and glass coatings) accounted for approximately 21 000 tonnes of tin consumption in Europe in 2007 (Table 4.1). The substances are mainly used as stabilisers and catalysts as di-substituted organotins, in particular dibutyltin and dioctyltin (RPA, 2007). It is expected that the use of organic tin compounds as stabiliser in plastics will grow worldwide about 4% annually (Batt, 2006).

Table 4.1 Uses of organic tin compounds and quantities sold in the EU in 2002 and 2007 (tonnes per year). Source: RPA, 2007

Applications	Quantity (t/Yr) 2002	Quantity (t/Yr) 2007
PVC stabilizers	15 000	>16 000
Catalysts	1300 to 1650	~2000
- Plasticisers	150 – 350[1]	
- Silicones	50 – 100	
- Electrodeposition coatings	700 – 800	950
- Polyurethanes	400	750
Other uses		
- Glass coating	760 to 800	Same
- Biocide in antifouling paints	1250	Phased out globally
- Synthesis	< 150	~500
- Biocide (other)[2]	< 100	Reduced
- Pesticide	100	Unknown
- Intermediate in synthesis (tetra-substituted)[3]	N/A	Unknown
All uses	**Approx. 19 000**	**Approx. 21 000**

[1] Derived by subtracting sub-totals for silicones, EDC and polyurethanes from total for 'catalysts'.

[2] Use of tributyltin compounds for these applications is now prohibited within the EU as they have not been notified under the Biocides Directive (1998/8/EC).

[3] The European Tin Stabilisers Association has advised that the total quantity of tri-substituted tins for use as an intermediate in 2004 was substantially higher than the estimate for 2002. Although not clarified, this could perhaps be because the quantities present in the tetra-substituted tins had been excluded.

Measures

OSPAR measures focused on controlling uses and losses of organic tin compounds as antifoulant in paints. Recommendation 87/1 urges Contracting Parties to put in place a ban on the retail sale or use of organotin paints for pleasure boats and fish net cages, restrictions on the use of organotin compounds in antifouling paints for the use on sea-going vessels and for underwater structures, and the adoption of quality standards for organotin compounds in coastal and marine waters. In 2005, Contracting Parties reported a (gradual) decrease of sales of TBT-containing paints in general until 2003 when an EU ban of organotin compounds on ships entered into force (OSPAR, 2006c).

Recommendation 88/1 complements Recommendation 87/1 by committing Contracting Parties to developing procedures and technology aiming at a reduction of the amount of organotin losses to the aquatic environment due to of docking activities (sand-blasting *etc*.) while further actions concerning the use of TBT paints on sea-going vessels were under development in the International Maritime Organisation (IMO). Most Contracting Parties reported in 2005 that due to the ban of TBT in paint they expect emissions of TBT from sand-blasting to cease in the near future. Figures on emissions/discharges of organotin compounds by shipyards in the Netherlands for 2000 – 2003 indicate that discharges were still ongoing, probably due to the presence of organotin-based antifouling on sea-going vessels (OSPAR, 2006c).

The OSPAR measures have been supported by the International Convention on the Control of Harmful Antifouling Systems on Ships, adopted by the IMO in 2001 (AFS Convention) which entered into force on 17 September 2008. The implementing Regulation (EC) No. 782/2003 prohibits, as from 1 July 2003, the use of organotin compounds which act as biocides in antifouling systems on ships in the EU and, as from 1 January 2008, on any ship entering EU waters. Other EC legislation includes the prohibition to place on the market organostannic compounds for use in treatment of industrial water and for use as biocides and antifoulants in free association paint and on all craft used in marine, coastal, estuarine and inland waterways and lakes, on cages, floats, nets or other equipment used for fish or shellfish farming, and on submerged structures (Directive 76/769/EEC as amended by Directive 2002/63/EC). Recommendation 94/6 on aquaculture practices seeks to prevent that substitution of TBT in products used in aquaculture leads to pollution by other harmful substances, in particular copper and organic biocides.

Marketing and use restrictions are currently being investigated in the EC in other uses of organotin compounds (RPA, 2007). This includes for example consideration of restrictions on all uses of di-substituted organotins and (partial) restrictions on certain major uses of dibutyltin and dioctyltin, such as the use as stabiliser in consumer PVC products.

Emissions, discharges and losses

The main pathway of organotins to the marine environment, besides re-location and re-suspension through dumping of dredged sediments, are discharges to water and riverine inputs.

A rough estimate of total TBT discharges and losses to water in 1995, based on different estimates and measurements reported by Contracting Parties participating in the North Sea Conferences, was around 70 tonnes a year. This figure is likely to reflect the use of TBT as antifoulant which was at the time still common practice outside the OSPAR Contracting Parties. For the period 2000 – 2003 the Netherlands reported estimated national discharges from docking activities of 1.5 tonne per year.

Total organotin discharges reported by Germany, Portugal, Spain and the United Kingdom to EPER in 2001 and 2004 indicate discharges of organic tin compounds of 1.6 and 3.4 tonnes, respectively. The reported discharges relate mainly to the metal industry, the basic organic chemicals industry and the pulp and paper industry. While uncertainties in the exact discharge figures exist for 2001 and 2004 due to inconsistencies in reporting and do not allow conclusions on trends, the data still give an indication that discharges from heavily regulated point sources continue. This is supplemented by estimates of organotin discharges and losses to water in the Netherlands from all sources other than maritime shipping and ship docks which amounted to less than 6% of the total loads of organotin to water (inland and sea) in 2005. The estimated magnitude of the loads in the Netherlands not originating from maritime shipping was about 500 kg per year.

Only limited information is available on the loads of organotin compounds reaching the sea from land-based sources via rivers. Measurements in the Netherlands and Norway showed that concentrations of organic tin compounds in rivers are mostly below detection limits (1 ng/l).

Conclusions

USE IN PRODUCTS GAINS RELATIVE SIGNIFICANCE

The ban of the use of TBT as antifoulant and biocide in the EU and the restrictions of the use of TBT in paints on ships worldwide through the IMO AFS Convention have sufficiently regulated the most pertinent sources of marine pollution with organic tin compounds. Abatement and control measures are also in place for the main industrial sources for organic tin compounds to the environment. Restrictions on the main remaining uses of di-substituted organotins in consumer products are still under consideration in the EC. The contribution of those uses to total releases of organic tin compounds to water (inland and sea) are estimated to be fairly small but the potential impact of waste streams need continued attention. It is as yet not expected that those remaining diffuse releases may reach levels of pollution and concern comparable to that of TBT pollution.

RELEASES TO THE ENVIRONMENT STILL CONTINUE

Releases of TBT and other organic tin compounds to water still continue. In the absence of sufficient data, quantification of releases is difficult and no statements on trends can be made. Yet, it is expected that the ban of uses of TBT as antifoulant and biocide in the EU and on ships worldwide has resulted in reductions of releases. It is expected that locally, ship docks removing ship coatings containing TBT still continue to be a source of TBT pollution. Redistribution and re-suspension of TBT and DBT through dumping of contaminated sediments, especially from harbours, add to the pollution in other areas and availability of those substances to living organisms in the marine environment. Releases of organic tin compounds from industrial processes and products also continue.

FURTHER EFFORT IS NEEDED TO MOVE TOWARDS THE CESSATION TARGET

With the ban of TBT as antifoulant and biocide in place, there is movement towards the cessation target. Whether the target will be achieved, cannot as yet be confirmed. Past uses of TBT as antifoulant left a long-lasting legacy in the form of contaminated sediments. The planned further cessation of uses of tri-substituted organotins in the EC would help the cessation target, but uses outside the OSPAR Convention area may remain a relevant source. The effective implementation of the IMO AFS Convention and of the obligations of the Water Framework Directive for TBT is necessary for moving towards the cessation target for TBT. The OSPAR Ecological Quality Objective for TBT-related imposex of gastropods will provide one of the means to monitor progress.

Based on the EU risk assessment on organotins in consumer products, measures should be adopted to support the cessation target. Restrictions will not immediately stop releases as organotin containing products are expected to be on the market for some more time and releases from products may continue for many more years due to their long lifetime. Current considerations of restrictions of the use of di-substituted organotins in the EU do not imply a full phase-out. However, the loads of (di-substituted) organotins entering the sea due to the current uses are much smaller than the TBT loads which caused the environmental harm drawing attention to the organotins.

4.2 Organohalogens

4.2.1 PFOS

Perfluorooctane sulphonate (PFOS) is a group of organic substances which contain the particular perfluorooctance sulphonyl arrangement of atoms. PFOS and PFOS-related substances (substances that can degrade to PFOS in the environment) are members of the large family of perfluoroalkyl sulphonate substances (PFAS). The majority of PFOS-related substances are polymers of high molecular weight, in which PFOS is only a fraction of the polymer and final product.

PFOS is considered to be very persistent, bioaccumulative and secondary toxic through the food chain and therefore to be a PBT substance according to the criteria of the EC Technical Guidance Document on risk assessment. It also has potential for long-range transport. Several PFOS related substances have been selected for inclusion on the OSPAR List of Substances of Possible Concern. PFOS was added to the OSPAR List of Chemicals for Priority Action in 2003.

Uses, production and sources

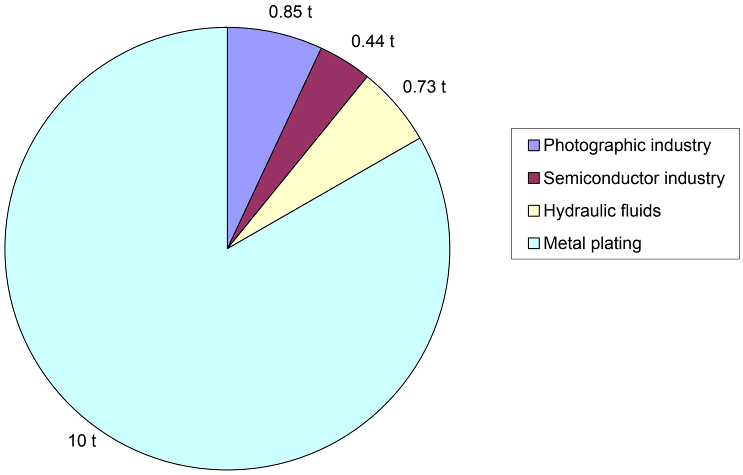

Figure 4.7 Estimated demand of PFOS in the EU. Source: EC, 2004

Perfluorinated substances with long carbon chains, including PFOS, are both lipid-repellent and water-repellent. Therefore, the PFOS-related substances are used as surface-active agents in different applications, such as providing water and oil resistance. Historic uses in Europe were mainly in fire fighting foams, textiles-, leather- and carpet-protection, paper and packaging, coatings, industrial and household cleaning products and as pesticides. It is unclear whether these uses of PFOS-related substances still occur in some parts of the world. In 2004, the main remaining uses in the EU were fire fighting foam stock, photographic industry, photolithography, semiconductor industry, hydraulic fluids for aviation and metal plating. Confirmed estimates, based mainly on information for the years 2002 and 2003, suggest a demand of PFOS for remaining uses to amount up to 12 tonnes with quantities used in metal plating ranging between 8.6 and 10 tonnes (Figure 4.7); the fire fighting foams held in stock in the EU have been estimated to amount to 122 tonnes (EC, 2004; OECD, 2005). Due to limited information, estimates of quantities used and produced in the OSPAR Convention area in 2005 or more recent years are not available (OECD, 2006).

The main producer worldwide (3M) announced in 2000 a voluntary phase-out of the manufacture of PFOS and PFOS-related substances. By the end of 2001, about 90% of 3M's production of these substances had stopped, and at the beginning of 2003, production ceased completely. This phase-out of PFOS production has led to a reduction in the use of PFOS-related substances. This is due not only to the limited availability of these substances (3M had at the time the greatest production capacity of PFOS-related substances in the world), but also to action within the relevant industry sectors to decrease companies' dependence on those substances. While for the year 2003, the OECD survey of uses and production of PFOS and related substances concluded that PFOS was still manufactured in Germany (20 – 60 tonnes) (OECD, 2005), the latest survey of 2006 (based on information for 2004 and 2005) provided no information on this.

Measures

OSPAR has not adopted specific measures on the reduction of emissions, discharges and losses of PFOS to the marine environment but promoted actions in the EU. The recently adopted restrictions on the marketing and use of PFOS (Directive 2006/122/EC) covers PFOS acid, its salts and PFOS derivatives, including PFOS polymers, and restricts their contents in a number of consumer products, with effect from summer 2008. This concerns the placing on the market and use of these compounds as a substance, a constituent of preparations or semi-finished products and articles. Derogations apply for certain uses in photolithography processes, in photographic coatings, in metal plating and hydraulic fluids for aviation. In addition, stocks of PFOS-based fire fighting foams that have been placed on the market before 27 December 2006 can be used until 27 June 2011. PFOS is listed in the proposed Water Framework Daughter Directive for review for possible identification as priority substances or priority hazardous substances.

In 2007, Norway banned the use of PFOS in fire fighting foams, as impregnating agent and in textiles. This covers almost all uses of PFOS in Norway.

In 2005, Sweden proposed PFOS for inclusion in the UNEP Stockholm POP Convention. The Risk Profile and the Risk Management Evaluation concluded that the most adequate control measures under that Convention would be elimination or restriction but that PFOS may be listed with specified acceptable purposes or specific exemption to allow for production and certain critical uses of PFOS and PFOS-related substances as intermediate (UNEP, 2007). The Conference of the Parties to the Convention is expected to conclude on the proposal in May 2009.

PFOS is also undergoing risk management evaluation under the UN-ECE Convention on Long-Range Transboundary Air Pollution with a view to its inclusion in the POP Protocol.

Emissions, discharges and losses

Waterborne and atmospheric inputs of PFOS to the OSPAR maritime area are not monitored under OSPAR monitoring programmes but PFOS has recently been included in the Co-ordinated Environmental Monitoring Programme. The PERFORCE project under the EC Research Framework Programme 2004 − 2006 investigated exposure of perfluorinated organic compounds in the European environment. The results showed that PFOS-related compounds are ubiquitously present in the environment. Effluents from sewage treatment plants were an important source. The substances were also detected in rivers, including the Rhine and the Elbe. Annual loads to the environment from rivers were estimated to amount to 2 − 20 tonnes depending on the substance (de Voogt *et al.*, 2006).

Conclusions

THE MAIN SOURCES OF THE SUBSTANCE HAVE BEEN REGULATED

OSPAR action triggered the adoption by the EC of restrictions on the use of PFOS in most products. The main sources of PFOS releases to the environment have been regulated in the OSPAR Convention area. Regulation of production and use on a global scale is expected to be taken under the Stockholm POP Convention.

RELEASES TO THE ENVIRONMENT IS EXPECTED TO DECREASE

The actions taken by OSPAR and the measures adopted by EU and EEA Member States and possibly worldwide are expected to reduce releases to the environment. There is not sufficient information available to assess trends in discharges, emissions and losses. Whether there are still releases can be answered through monitoring of PFOS in sediments and biota, and by continuing to collect information on production and uses, as suggested in the monitoring strategy for PFOS.

NO CLEAR TREND TOWARDS CESSATION TARGET

There will still be releases in 2010 mainly from waste streams. There will be an interim period before the substances vanish following the implementation of measures. It is expected that over the next 10 years the cessation target will be largely met. Progress should be checked by assessing the concentrations of the substance found in the marine environment through the OSPAR Co-ordinated Environmental Monitoring Programme.

4.2.2 Tetrabromobisphenol-A

Tetrabromobisphenol-A (TBBP-A) is a brominated organic compound mainly used as flame retardant (*cf.* also Section 4.2.4). TBBP-A is a derivative of bisphenol A and is synthesized from this substance in combination with various solvents such as halocarbon, hydrobromic acid, aqueous alkyl monoethers, acetic acid or methanol. Most commercial TBBP-A products are low in purity; they are a mixture of products which are brominated to varying extents. TBBP-A was included on the OSPAR List of Chemicals for Priority Action 2000. It meets the OSPAR criteria for persistency and toxicity but its liability to bioaccumulate is below the threshold set by OSPAR. It meets the P criterion of the EU Technical Guidance Document. TBBP-A might degrade in marine sediments to bisphenol A, which is an endocrine disruptor. There are indications of possible risks to the marine environment from some applications of TBBP-A (EC, 2008b).

Use, production, and consumption

TBBP-A is used as both a reactive flame retardant (where it is chemically bonded into the polymeric material), and additive flame retardant in plastics. The main uses as a reactive flame retardant are in epoxy and polycarbonate resins. The main uses as an additive flame retardant are in acrylonitrile-butadiene-styrene (ABS) resins and phenolic resins. In addition, TBBP-A is used as an intermediate in the production of other reactive and additive flame retardants.

TBBP-A is the brominated flame retardant with highest volumes in use today (see Figure 4.8 below). TBBP-A can be imported into a country as substance or in finished or partially finished products. Examples of TBBP-A containing products include plastic compounds, printed circuit boards and finished electronic equipment. These imports may be an important source of TBBP-A in the EU.

TBBP-A is produced in the USA, Israel and Japan, and imported into the EU (Table 4.2). The total EU usage of TBBP-A was around 13 800 tonnes per year in the late 1990s, but more recent figures show a sustained decline in use in the EU. This is attributed to a general move in the production of products such as printed circuit boards from the EU to other parts of the world. For 2003, consumption of TBBP-A was around 6500 – 7500 tonnes. A similar EU consumption of around 6200 tonnes is apparent for 2004 (EC, 2008b).

Table 4.2 EU imports of tetrabromobisphenol-A. Source: EC, 2008b

Route of importation into the EU	Amount in late 1990s (tonnes per year)	Amount in 2003/2004/2005 (tonnes per year
Tetrabromobisphenol-A imported as the substance	13 800	6 500
Tetrabromobisphenol-A imported as partly finished products (*e.g.* masterbatch, epoxy resins)	6 000	6 000
Tetrabromobisphenol-A imported in finished products and components	20 200	27 500
Total	40 000	40 000

TBBP-A is considered as an alternative additive flame retardant to octabromodiphenyl ether in ABS. It is therefore possible that the amount of TBBP-A used in this application in particular could increase in the future.

Measures

No specific OSPAR or EU measures have been agreed for TBBP-A. The Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC) however requires Member States to set up separate waste collection schemes and to ensure the proper treatment, recovery and disposal of those wastes. This will encourage the producers' responsibility to separate plastic containing brominated flame retardants from collected WEEE.

The EU risk assessment for the marine environment indicates a potential risk to water and sediment from compounding sites where TBBP-A is used as an additive flame retardant. Consequently, the EU risk reduction strategy recommends the IPPC Directive as the most appropriate measure to manage that risk. The report also indicates that the inclusion of TBBP-A in the Water Framework Directive would be a disproportionate measure (EC, 2008c).

As TBBP-A is produced in volumes greater than 1000 tonnes, it is considered as a high volume substance under REACH and will be one of the first substances to go through REACH registration (by December 2010).

Emissions, discharges and losses

Releases to the environment can occur both to the atmosphere (as vapour and as dust) and waste water. Sources of releases include production sites for flame retardants, polycarbonate resins, and polymers. In addition, emissions to the environment could also occur from finished articles (*e.g.* plastic components) during their use and at disposal.

There are no data available on loads of TBBP-A entering the OSPAR maritime area and on atmospheric inputs. Considering its low vapour pressure and tendency to adsorb to soils and sediments it can be expected that atmospheric concentrations will be extremely low. The available information on the long-range atmospheric transport of this substance indicates that the substance has a low, but not zero, potential to be transported over long distances via the atmosphere.

Reports from several OSPAR countries from 2001 and 2002 show that TBBP-A has been detected in estuarine sediments, as well as in freshwater, freshwater sediments and waste water effluents.

Conclusions

The consumption data indicate that the use of tetrabromobisphenol-A in Europe is declining, but there are no plans to phase out its use. There is not sufficient information on consumption or releases of TBBP-A to assess trends in pressures and to give a prognosis of whether the OSPAR cessation target will be met.

4.2.3 Trichlorobenzenes

Trichlorobenzenes (TCBs) are aromatic compounds formed by the addition of 3 atoms of chlorine to the benzene ring and comprising any of 3 isomers: 1,2,3-TCB, 1,2,4-TCB and 1,3,5-TCB. TCBs are not readily biodegradable and very toxic to aquatic organisms, and may cause long term adverse effects in the aquatic environment. The bioaccumulation potential is very high. Some reports have also shown that TCBs have reproductive and endocrine disrupting effects. There is indication that TCBs are volatile and evaporate from the water to the air or are bound to suspended particles in the water body and end up in the sediment, especially close to industrial sites. TCBs were included on the OSPAR List of Chemicals for Priority Action in 2000.

Uses, production and sources

Today, commercial TCB consists predominantly of 1,2,4-TCB (99.8%) while in the past TCB was produced as a mixture of all three isomers (mainly 1,2,4 and 1,2,3 isomers). 1,2,4-TCB is mainly used as intermediate for the production of herbicides, pigments and dyes (80%). The EC risk assessment suggests remaining uses as dielectric fluid additive at a level of around 5000 tonnes in the EU; this is based on a rough worst-case estimate approximately 10 years ago (EC, 2003a). This use has probably now ended. Both 1,2,3-TCB and 1,2,4-TCB are used as process solvents, such as dye carriers, and heat transfer media. Use of 1,3,5-TCB is not marketed commercially and is used only in small amounts as intermediate. The tonnage use of 1,2,3 and 1,3,5 isomers appear to be very limited. For 2005, Finland reported import of 35 kg of 1,2,4-TCB for laboratory uses.

There is only one remaining plant producing TCB in Europe (Euro Chlor, 2008). The plant is located in Germany. The TCB produced here is used as an intermediate in the production of herbicides: 2000 tonnes 1,2,4-TCB are exported to the USA, and 400 tonnes of 1,2,3-TCB are used per year in Germany. The German producer is no longer selling TCB for dispersive uses such as in the metal industry (still referred to by EPER in 2001) or uses as dye. TCB may however be imported to the OSPAR Convention area. No information has been collected on such imports.

TCB can be released to the environment from production, uses, waste streams and through other sources such as combustion of plastics and degradation of higher chlorinated benzenes. The main sources of releases to the environment in Europe seem to be production and intermediate uses in manufacture processes (>90% of releases). Other sources include releases of TCBs as side product of the production of hexachlorbenzol (HCB) and the (now ceased production of) lindane and hexachlorcyclohexan isomers (wood preservatives), and releases from contaminated sites and waste sites. In comparison to these releases, combustion processes or certain paper producing industries are less important sources.

Measures

OSPAR has not adopted specific measures targeting releases of trichlorobenzenes, but promoted activities in the EC on risk reduction from TCB releases. The use of TCBs as intermediates in chemical synthesis, process solvent in closed chemical applications for chlorination reactions, and in the manufacture of 1,3,5 trinitrobenzene and 2,4,6 triaminobenzene has recently been restricted in the EU (Directive 2005/59/EC). TCBs are also covered by the IPPC Directive (Directive 2008/1/EC) and EC waste legislation (including landfill, incineration of waste, and hazardous waste legislation). TCB is a priority substance under the Water Framework Directive (Directive 2000/60/EC).

Emissions, discharges and losses

Main discharges of TCBs are from industries using TCBs as intermediate (>90%). Releases from production of TCB alone are estimated at 30 kg per year (Euro Chlor, 2008). A 1997 survey of 78 European sites producing or using chlorinated substances, carried out by Euro Chlor, indicates discharges of TCBs of 0.552 t/Yr to water and of 0.351 t/Yr for emissions to air. In 2001 and 2004, no data on discharges to water were reported to EPER. In 2007, France reported to OSPAR one plant releasing 20 kg TCBs per year to the North Sea.

No data on emissions to air from point sources are available in the EMEP database. Releases of TCBs from point sources to air have been reported by Contracting Parties to EPER under their commitments under the IPPC Directive. In 2001, nearly all of the reported 37.1 tonnes of TCB emitted to air were from one facility in the metal industry in France; two facilities in Germany reported 30 and 40 kg emissions. In 2004, three facilities relating to the manufacture of basic organic chemicals (Belgium, France and Germany) and one facility relating to the surface treatment of metal (Spain) reported a total of 0.19 tonne of TCB emitted to air. These figures suggest a reduction of emissions to air since 1997.

Conclusions

SOME SOURCES ARE REGULATED

Some main uses as intermediate and main point sources for releases of TCB are regulated. Open uses and some diffuse sources, especially losses of TCB from products and uses, have not been regulated. To inform any regulatory needs, more information is needed on the actual releases to the environment from those sources.

RELEASES CONTINUE BUT INFORMATION ON DISCHARGES AND EMISSIONS IS NOT SUFFICIENT

For the period 1985 – 1999 there is clear indication of reduction in TCB releases. Since 1998, information and data on releases are fairly limited and do not allow any trend statement. Yet, the available information seems to indicate that emissions to air have gone down since 1998 but that releases still continue. There are hardly any data available on discharges of TCB to water.

NO CLEAR TREND TOWARDS CESSATION TARGET

The available data and information do not allow a conclusion on whether the cessation target will be reached for TCB. With recent use restrictions, there is however an indication that a downward trend in releases may be expected. The effective implementation of the obligations of the Water Framework Directive for TCB is important to support moving towards the cessation target for TCB.

4.2.4 Brominated flame retardants

Brominated flame retardants (BFR) are a diverse group of bromine containing chemicals used to retard the combustibility of commercial goods. There are five main classes of BFR: brominated bisphenols, diphenyl ethers, cyclododecanes, phenols and phthalic acid derivatives. Some of the polybrominated diphenyl ethers (PBDEs) are toxic, especially those with smaller molecules. Pentabromodiphenyl ether (PentaDBE) may disrupt the oestrogenic system. Polybrominated biphenyls (PBB) have similar effects to polychlorinated biphenyls (PCBs) (see Section 4.2.5) and may also produce hypothyroidism. Hexabromocyclododecane (HBCD) is toxic to aquatic organisms and degrades slowly. Some of these chemicals are liable to bioaccumulate. Brominated flame retardants were given priority in the 1992 OSPAR Action Plan and were included in the OSPAR List of Chemicals for Priority Action in 1998.

Uses, production and sources

BFR are widely used in consumer products including computers, electronics and electrical equipment, televisions, textiles, foam furniture, insulating foams, and other building materials. In 2000, electronics and electrical equipment (56%) and building/construction (31%) were the main areas of BFR consumption.

Of the 75 commercially recognised BFR, the following constitute the overwhelming majority of BFR used: tetrabromobisphenol-A (TBBP-A) (see Section 4.2.2), hexabromocyclododecane (HBCD) (mainly used in polystyrene), and decabromodiphenyl ether (DecaBDE) (mainly used in plastics, textile such as upholstery fabric, and synthetic carpets). In 2001, total consumption of BFR in Europe amounted to 29 460 tonnes, 28% of which were accounted for by PBDEs, including octabromodiphenyl ether (OctaBDE) and pentabromodiphenyl ether (PentaBDE) which, in the meantime, have been phased out and banned (Figure 4.8).

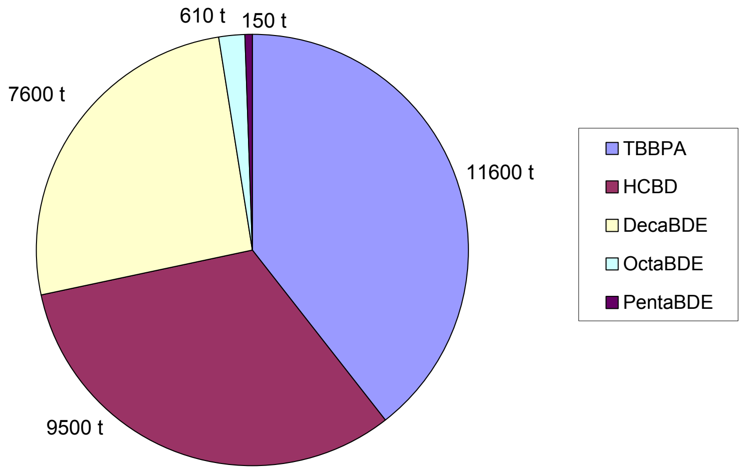

Figure 4.8 Consumption volume of the five major BFR in Europe in 2001 in tonnes. Source: Birnbaum and Staskal, 2004 (based on BSEF data)

In 2000, more than 200 000 tonnes of BFR were produced by three companies worldwide (Birnbaum and Staskal, 2004). This included production sites in the OSPAR Convention area with main manufacturers in France, the Netherlands and the United Kingdom. Some of those sites have closed down since then. It has been expected that world consumption and production of BFR may have seen a steady annual increase since 1998 due to growing demands, especially in Asia. More recent data on volumes of uses, production and import/export of BFR are not readily available and no further efforts have been undertaken to collect them from industry.

Main sources of BFR are products and associated waste streams and treatment (*e.g.* incineration, waste dumps, dismantling and recycling activities) but also production and manufacture processes. The importance of incineration routes to atmospheric emissions and to long-range transport has been highlighted recently (Law *et al*., 2006). HBCD for example can be released during production of several other chlorinated chemicals, including vinyl chloride, from the manufacture of plastics or as motor vehicle emissions. The production of plastic and the manufacture of textile are point sources for DecaBDE releases.

Measures

There are no specific OSPAR measures targeting releases of brominated flame retardants. OSPAR has promoted activities in the EC on use restrictions for PBDEs, risk-reduction strategies for OctaBDE, DecaBDE and HBCD, and waste legislation.

OctaBDE and PentaBDE have been banned in the EU in 2004 (Directive 76/769/EEC). Use of PBB and PBDEs in electrical and electronic appliances has been prohibited with effect from 1 July 2006 (Directive 2002/95/EC). DecaBDE was exempted from the prohibition by Commission Decision 2005/717/EC which has recently been annulled by the European Court of Justice for procedural reasons and has brought the exemption to an end by 30 June 2008[2]. The continued discussion on further actions in the EU relating to a ban or restriction of DecaBDE for other uses, especially in the textile sector, will be informed by the recent review of the risk assessment for DecaBDE (EC, 2007e). A number of restrictions of uses of HBCD are currently under consideration in the EU.

The EC risk reduction strategy for DecaBDE resulted in encouragement of product stewardships and the establishment of the Voluntary Emissions Control Action Programme (VECAP) by the BFR industry, organised through the European Brominated Flame Retardant Industry Panel (EBFRIP). The purpose is to manage, monitor and minimise industrial emissions of BFR into the environment through partnership with the supply chain including small and medium-sized enterprises. 99% of the textile EBFRIP supplied companies using DecaBDE and 87% of EBFRIP supplied HBCD textile users have committed to VECAP. In 2004, the United Kingdom was chosen as pilot country to run VECAP on DecaBDE; the third annual mass balance reported by the United Kingdom textiles sector estimates a 97% reduction of overall releases to water; in the first 12 months a reduction of DecaBDE discharges by 75% was reported by that industry (VECAP, 2007).

Among EC waste legislation, the Waste Electrical and Electronic Equipment Directive (2002/96/EC) supports the reduction of emissions, discharges and losses from end-of-life waste containing BFR.

BFR have been listed as priority substances, PBDEs as priority hazardous substances under the Water Framework Directive (Directive 2000/60/EC). HCBD has been nominated as candidate substance for authorisation under the REACH Regulation (EC) No. 1907/2006. OctaBDE and PentaBDE are currently being considered for inclusion in the UNEP Stockholm POP Convention and the UN-ECE POP Protocol. Under the latter, the inclusion of HBB, already listed under the Stockholm POP Convention, is also proposed.

Emissions, discharges and losses

There is only very limited national quantitative information available on the levels of emissions, discharges and losses of PBDEs and HBCD from point sources; no data are available on releases from products. Law *et al.* (2006) provide an overview of observed levels and trends of BFR in the marine environment in Europe which provide an indication of BFR releases.

Information from industry suggests that significant reductions have been achieved and are achievable in future through best practices and application of best available techniques from point sources. VECAP indicates current losses of DecaBDE of 150 g per barrel for the United Kingdom textile companies and releases of less than 0.4 g per tonne of total HBCD from a production plant in the Netherlands.

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[2] Judgement of 1 April 2008 on joined cases ECJ C-14/06 and C-295/06, European Parliament and Denmark v European Commission, OJ C 116 of 9.05.2008, p.2; http://curia.europa.eu

Environmental monitoring suggests still high concentrations of HBCD in the marine environment. This may indicate that releases still continue, but may also be due to the high persistency of the substance. While reductions from point sources have been achieved for PBDEs − which is reflected in national monitoring observations of downward trends of their occurrence in the marine environment − information about losses from products is very limited. A recent study of the Norwegian Pollution Control Authority estimated a total of 520 – 540 tonnes of BFR in waste in Norway in 2006, 90% of which has been attributed to waste electrical and electronic equipment (SFT, 2008). The study suggests that 80 − 100 tonnes of BFR escape controlled collection systems; nearly 70% of this relates to waste electrical and electronic equipment.

Environmental monitoring data indicate that discharges/releases of PentaBDE and OctaBDE are decreasing. However, some diffuse releases may remain due to illegal occurrence in imported products (plastics *etc*.).

Conclusions

SOME MAIN USES ARE STILL UNREGULATED

PBB is no longer used and PentaBDE and OctaBDE have been banned in the EU.

DecaBDE is still widely used in Europe, mainly due to the exemption from the ban of PBDEs in electrical and electronic appliances. While the exemption has now ceased with effect as of 30 June 2008, it is unclear whether the exemption will be reintroduced or not.

Uses of HBCD are not yet sufficiently regulated, although voluntary action has significantly reduced emissions from point sources. The European risk assessment for HBCD has been finalised and a number of uses proposed for risk reduction measures; so far no measures have been agreed. Current measures on releases from products are not adequate.

INFORMATION ON RELEASES IS INSUFFICIENT

There are insufficient or no data to quantify levels and trends of releases of brominated flame retardants in the OSPAR Convention area.

For some substances there are decreasing trends according to environmental monitoring data (PentaBDE and OctaBDE), and emissions are expected to have been reduced (although no data are available on emissions from products).

Environmental monitoring data for HBCD do not yet support conclusions on a similar decreasing trend of occurrence in the marine environment. This may indicate that emissions probably are still occurring. Emissions of HBCD in Europe have been heavily dominated by one point source production site, which has now been closed down. Total emissions have therefore probably gone down but emissions from products and materials (*e.g.* polystyrene) still exist.

There is indication of reduction in releases of PBDEs.

FURTHER MEASURES ARE NEEDED TO ACHIEVE THE CESSATION TARGET

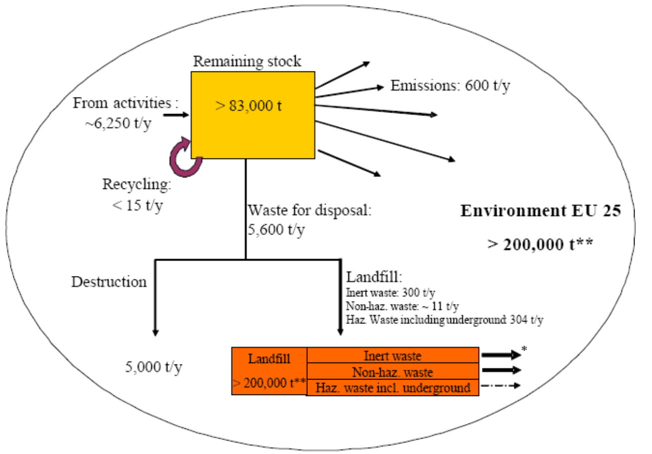
Achieving the cessation target for brominated flame retardants, especially DecaBDE and HBCD, will depend on decisions in the EU to take forward further risk reduction measures. Without further measures, the target will probably not be met. Full and effective implementation of Directive 2002/95/EC on the use of hazardous substances in electrical and electronic appliances and of the obligations under the Water Framework Directive for all brominated flame retardants is important to support progress towards the target.

4.2.5 Polychlorinated biphenyls (PCBs)

Polychlorinated biphenyls (PCBs) are produced by introducing elemental chlorine into biphenyls. They are toxic and, since they are hydrophobic, they bioconcentrate particularly in fatty tissues. They can adversely affect reproduction, and may affect immune systems so as to make disease epidemics worse. The higher levels of the food web, especially fish-eating birds and marine mammals, are particularly affected. PCBs were included on the OSPAR List of Chemicals for Priority Action in 1998.

Uses, production and sources

PCBs have been produced commercially since 1929, both for “closed” uses, for example as insulation and cooling fluids in transformers, dielectric fluid in capacitors and as hydraulic fluids, and for “open” uses, such as grouting, and sealants and as plasticisers in paints. Production in Europe stopped in the mid-1980s. Production may however still continue in Russia and China.



* The thickness of the arrow lines shall represent the release potential from the different landfill options

** The accumulated amounts of PCB in environment and landfills are estimated (note: they are equal by coincidence)

Figure 4.9 Major pathways and estimated amounts of PCB distributed in EU 25. Source: BiPRO, 2005

It has been estimated that some 700 000 tonnes of PCBs have been produced, of which 30% (at least 200 000 tonnes) are suggested to have been spilled to the environment (BiPRO, 2005). Quantities of remaining stocks have been estimated based on PCB mass flows, including large PCB containing equipment (transformers, capacitors, and hydraulic machinery), small capacitors in white goods, shredder residues and waste oils (Figure 4.9).

The main sources of PCB releases are PCB-containing units, waste disposal, re-mobilisation of PCB-containing sediments and, to an unknown extent, formation as by-products in various thermal and chemical processes.

Measures

OSPAR has specifically targeted pollution from PCBs mainly through Decision 92/3 which requires that all PCBs and hazardous PCB substitutes are phased out and destroyed in an environmentally safe manner. Decision 92/3 sets different deadlines for riparian states of the North Sea and other Contracting Parties. For Iceland and the North Sea states, the phase-out and destruction of PCBs should be achieved by 1995, or by the end of 1999 at the latest. Hazardous PCB substitutes shall be phased out within seven years after their identification. For the remaining Contracting Parties, the destruction target for PCBs is 2005, or by the end of 2010 at the latest. For hazardous PCB substitutes, it is between their identification and the year 2010 or seven years after their identification whichever date is later. As interim option, Decision 92/3 permits safe deep underground disposal in dry rock formation of capacitors and empty transformers. In 2005, most PCBs used in closed applications have been destroyed or were about to be destroyed by Contracting Parties (OSPAR, 2006d). PCBs used in open applications, such as in building materials, have been destroyed or will be removed in connection with reconstruction or demolition measures. While most Contracting Parties phased out their remaining stocks in equipment, some still have large stocks like Spain (90 150 tonnes) and France (33 462 tonnes) (BiPRO, 2005). Inventory information on remaining stocks and equipment in use from large PCB containing equipment (*e.g.* transformer, capacitors, hydraulic machinery) as reported by 11 Contracting Parties suggest that about 132 816 tonnes of liquid PCB stocks remain. Based on this information, best estimates suggest that up to 2010 an annual amount of about 4615 tonnes of PCBs in large equipments will be disposed of in the OSPAR Convention area (BiPRO, 2005).

The main uses of PCBs in products have been banned in the EU since 1986 (Directive 85/467/EEC). The implementation of Decision 92/3 and progress towards the cessation target for PCBs is further supported in the EU through Directive 96/59/EC on the disposal of PCBs, and the Community's Strategy on dioxins, furans and PCBs (COM(2001) 593 final). The Community Strategy addresses 'uncontrolled PCB applications' which are not covered by Directive 96/59/EC, *i.e.* large volumes with very low concentrations of PCBs, or products with a small volume of PCBs, non-industrial wastes, and 'historic pollutions'.

EC waste legislation addressing PCBs includes the restriction of use of hazardous substances in electrical and electronic equipment and the mandatory segregation of PCB-containing components in waste electrical and electronic equipment to ensure their adequate disposal (Directive 2002/96/EC). Directive 2006/12/EC on waste constitutes the general legal framework for Community policy on waste management and is relevant for the management of any PCB containing wastes not covered by any other specific legislation.

Requirements on the phase-out and destruction of PCBs, similar to those under Decision 92/3, are set out under the UN-ECE POP Protocol and the UNEP Stockholm POP Convention with targets for phase-out of use of equipment containing PCBs by 2025 and treatment and elimination by 2028. The Conventions are implemented in the EU through Regulation (EC) No. 850/2004, substituting considerable parts of Directive 96/59/EC, and the Community's Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (EC, 2007b).

PCBs are also listed for the Prior Informed Consent (PIC) procedure under the Rotterdam Convention, and listed in the proposed Water Framework Daughter Directive for review for possible identification as priority substances or priority hazardous substances.

Emissions to air and atmospheric deposition

The total emissions of PCBs to air reported by France, Germany, Sweden and the United Kingdom under the Convention on Long-Range Transboundary Transport of Pollutants to EMEP amounted to 1.1 tonne in 2005, a quarter of the emission levels in 1998. EMEP expert emission estimates confirmed total emissions of CB-153 from all OSPAR Contracting Parties in 2005 to be 1.5 tonne (OSPAR, 2008a). This is a decrease by 65% since 1998, reflecting reductions of emissions of the main contributors France and Spain (down 60% and 61%), Germany (down 71%) and the United Kingdom (down 31%) which together accounted for 92% of the total emissions in 2005.

EMEP model results estimate that the net anthropogenic input load of the congener CB-153 to the OSPAR maritime area in 2005 amounts to 0.24 tonne (compared to a total atmospheric deposition including re-suspension of 0.4 tonne) with highest deposition in Region V (Wider Atlantic) (0.11 tonne) and Region I (Arctic Waters) (0.08 tonne), and even a negative level in Region III (Celtic Seas) (-0.01 tonne) (OSPAR, 2008a). This suggests an overall decrease of CB-153 deposition of 62% in 1998 – 2005 with downward trends ranging from 56% - 69% in OSPAR Regions I, II, IV and V.

Discharges, losses and waterborne inputs

PCBs are not covered by EPER reporting. Data reported by Contracting Parties on riverine inputs and direct discharges under the OSPAR RID Study are too patchy for assessment. The few reported data however indicate that releases to water still continue. For 2006, Belgium, Germany, the Netherlands, Norway, Spain and the United Kingdom reported under the RID Study total riverine and direct inputs of PCBs[3] ranging from 72 kg (lower estimate) to 1256 kg (upper estimate) (OSPAR, 2008c).

For the dredged material dumped at sea in 2005 (117 million tonnes dry weight) in the OSPAR maritime area, Contracting Parties reported a total load of 1127 kg of PCBs. This is a significant higher load compared to the 647 kg in 2003 and 721 kg in 2004 for the 117 and 120 million tonnes (dry weight) of sediments dumped in those years respectively.

Conclusions

UNINTENDED PRODUCTION OF PCBS IS OF MAIN CONCERN

PCBs are banned for new products in all European countries since 1980s but PCBs may be produced by Russia and China. The treatment and elimination of remaining stocks is well regulated in the OSPAR Convention area, but less so for small volumes and non-industrial wastes. While waste streams seem well controlled, unintended production of PCBs as by-products in chemical processes remains to be of main concern.

GOOD PROGRESS ON PHASE-OUT OF STOCKS BUT RELEASES STILL CONTINUE

Substantial reductions in releases and good progress on the phase-out of remaining stocks have been achieved in the period 1998 – 2005 supporting a movement towards the cessation target for PCBs.

Releases of PCBs to air and water continue. Emissions to air from large point sources show a substantial downward trend. No trend information is available for discharges to water.

FURTHER EFFORTS NEEDED TO MOVE TOWARDS CESSATION

Yet the treatment and elimination of remaining stocks and so-called uncontrolled applications will provide a continued source for releases to the environment in the next years before their phase-out has been completed. More efforts are needed to address remaining releases of PCBs within the EC framework, especially concerning unintended production.

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[3] This is the sum of the seven PCBs congeners 28, 52, 101, 118, 153, 138, 180.

4.2.6 Polychlorinated dibenzodioxins and dibenzofurans

Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) are two groups of tricyclic, chlorine-substituted, organic compounds. The number of chlorine substituents on the benzene rings may range from one to eight, which means 75 theoretical possible PCDDs and 135 possible PCDFs congeners. They are identified in general by the name "dioxins". Dioxins are non-polar, lipophilic and persistent organic pollutants (POPs), which are able to biomagnify and bioconcentrate in the food web and cause a whole spectrum of potentially serious health problems. As toxicity of individual dioxin and furan congeners differ considerably, a toxic equivalent scheme (TEQ or I-TEQ, depending on calculation method) has been introduced to express the toxicity of, and risk associated with, dioxin mixtures.

Use, production and sources

Dioxins have no particular uses. They are not manufactured intentionally but are mainly formed as unintentional by-products in heating and combustion processes involving organic matter, chlorine compounds and a catalyst (*e.g.* copper) or in the production of certain chlorinated chemicals and pulp bleaching. Formation of trace concentrations of dioxins may take place in any fire or combustion process based on natural or man-made organic materials. The presence of chlorinated organic compounds, such as chlorophenols, chlorobenzenes, chlorodiphenyl ethers and polychlorinated biphenyls (PCBs) may accelerate the dioxin formation.

Dioxins may be released from industrial point sources and diffuse sources through the life cycle of products. The main dioxin pollution sources are considered to be:

To air:

- Incineration of different kinds of waste and sludge;
- Heating of houses and farms with biomass (straw, wood) and coal, including wood stoves;
- Metal industry, especially sintering processes, reclamation of metallic waste and shredding;
- Accidental and natural fires;
- Engines of ships.

To water:

- Paper and pulp industries using chlorine;
- Waste water from chloroorganic industries;
- Textile washing and bleaching using chlorine;
- Landfill leakage;
- Atmospheric deposition.

Measures

A number of OSPAR measures target sources of dioxins. Contracting Parties have taken various initiatives to minimise the amount of chlorinated compounds in used scrap (Recommendation 91/3). By 2005, OSPAR Contracting Parties had phased out processes using molecular chlorine in the bleaching of kraft and sulphite pulp in line with Decision 96/2. The vinyl chloride monomer (VCM) manufacturing industry has been discussed intensively as a dioxin source and OSPAR has adopted binding emission and discharge limit values for the manufacture of VCM including the manufacture of 1,2-dichloroethane (EDC) (Decision 98/4).

OSPAR actions are supported by EC legislation and actions. This includes waste incineration legislation (Directive 2000/76/EC) which sets strict limit values for PCDD/PCDF emissions and a requirement for waste incineration and co-incineration facilities to monitor dioxin concentrations in flue gas and waste water. When and if fully implemented, the Directive is expected to have reduced dioxin emissions within the Community from an annual 2400 grams in 1995 to only 10 grams in 2005. Furthermore, the IPPC Directive (2008/1/EC) covers many relevant industrial sectors that generate dioxins. The description of best available techniques in BAT Reference Documents (BREFs) associated with the relevant industries address dioxins explicitly. A review of BREFs to take into account new developments has started, including for the cement and lime, pulp and paper and iron and steel sectors. Finally, the EC Strategy on dioxins, furans and PCBs (COM(2001) 593 final) promotes further actions, for example, on emission control, research and international co-operation to reduce releases of dioxins to, and occurrence in, the environment.

Dioxins are included on the lists of the UN-ECE POP Protocol, requiring mandatory control measures and establishing emission limit values, and the UNEP Stockholm POP Convention requiring measures for reducing or preventing releases of dioxins to the environment. The European Community Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (POPCIP), adopted in 2007, addresses the issue of how to fulfil the legal obligations. It takes stock of actions taken and lays down a strategy and action plan for further Community measures. Dioxins are subject to release reduction and waste management provisions in the EU. Furthermore, dioxins are listed in the proposed Water Framework Daughter Directive for review for possible identification as priority substances or priority hazardous substances.

Emissions, discharges and losses

Waste is thought to be the dominant pathway for releases to the environment, and may outweigh emissions to air by a factor of two or more (BiPRO, 2005). Based on available data, it has been estimated that overall, in the EU, roughly 20 kg of PCDD/PCDF-TEQ are emitted unintentionally per year with about three quarters being discharged to waste and only one quarter emitted to air. Due to the extremely low water solubility, very low concentrations of dioxins are found in the water phase, but an accumulation in sediments and biota is detected.

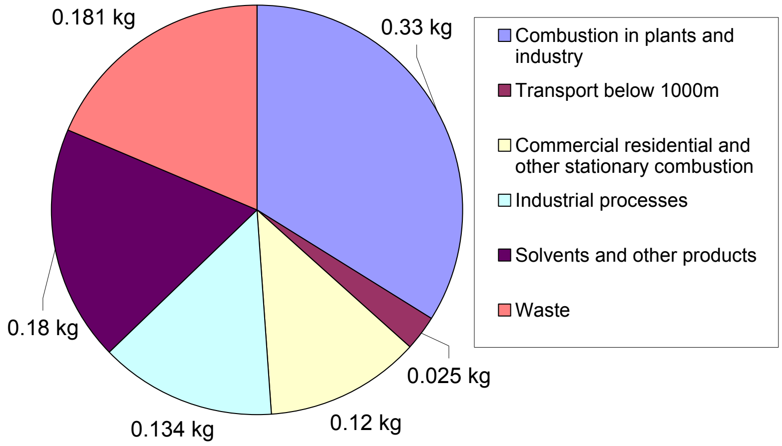

Figure 4.10 Relative contribution of main sources of dioxin emissions to air in 2005. Source: EMEP Webdab. Note: 'Transport below 1000m' is dominated by emissions from road transport but also includes emissions from civil aviation, railways, national navigation, and other mobile sources.

The data on emissions to air from IPPC facilities reported to EPER in 2001 and 2004 cannot be used to draw any conclusions on air emission, and does not hold data on discharges to water. The emission threshold for reporting on dioxins to the new European Pollutant Release and Transfer Register (E-PRTR) has been reduced compared to EPER reporting requirements by a factor of 10 to 0.1 g I-TEQ per year. This will ensure that more data on emissions of dioxins, especially in the metal industry sector, will be available from the year 2009 (publication of 2007 data) onwards.

The total emissions to air reported by Contracting Parties under their commitments under the Convention on Long-Range Transboundary Transport of Pollutants to EMEP amounted to 0.89 kg in 2005. This suggests that emissions have nearly halved compared to 1998. Reported data are not complete for all Contracting Parties or sectors and there are a number of uncertainties associated with some reported values. Overall the data suggest that most explicit reductions were achieved for combustion in power plants and industry (down by two thirds) and waste (nearly halved), which, in 2005, were still the two biggest sources contributing to emissions (Figure 4.10). The data suggest no clear trend in emissions from commercial, residential and other station combustion sources and from industrial processes, including the manufacturing industries.

Conclusions

CONTROLLING EMISSIONS FROM DIFFUSE SOURCES THE MAIN CHALLENGE

Measures regulating emissions and discharges from the main industrial sources are in place, but more is needed to control emissions from diffuse sources. According to the EC implementation plan for the Stockholm POP Convention, the industrial sources should continue to be addressed under the existing legislative framework, including the IPPC Directive (2008/1/EC) and the Waste Incineration Directive (Directive 2000/76/EC). Domestic sources, such as residential heating with wood and coal, are becoming increasingly important. The implementation plans for the Stockholm POP Convention at EC and national level and the EC Strategy for dioxins, furans and PCBs are means to promote further action.

RELEASES TO THE ENVIRONMENT HAVE DECREASED BUT EMISSIONS TO AIR ARE STILL OF CONCERN

Releases have declined over the last decade due to developments in technology and use of BAT, but releases of dioxins to the environment continue from all main point and diffuse sources. The limited available data indicate a continuous reduction in emissions to air in 1998 - 2005, but given the uncertainties associated with those data, it is not possible to confirm an overall or sector specific trend. In the absence of data, no quantification or trend statement can be made for discharges to water.

NO CLEAR TREND TOWARDS CESSATION TARGET

There should be a move towards the cessation target but whether it will be achieved cannot currently be confirmed. The proper and timely implementation and enforcement of the IPPC Directive remains a key priority in order to ensure the necessary reduction of emissions from major industrial sources.

4.2.7 Short chained chlorinated paraffins (SCCPs)

Chlorinated paraffins are a complex mixture of polychlorinated n-alkanes and are divided according to the length of their carbon chain ranging from 10 to 36 atoms. The distinction is important when considering toxicity and environmental effects. Short chained chlorinated paraffins (SCCPs) are the most hazardous of the paraffins, containing 10 to 13 carbon atoms and a degree of chlorination of more than 48% by weight. They are toxic to aquatic organisms, carcinogenic in tests on mice and rats, very persistent and not biodegradable, and can be found in the environment worldwide. SCCPs adsorb strongly to sludge and sediments.

Use, production and sources

In 1998, the volumes used amounted to 4075 tonnes a year in Europe (down from 13 000 tonnes in 1994) and the main use was still in metal working fluids (approximately 50%). Following restrictions of the use of SCCPs in metal and leather working fluids, the total use of SCCPs today is less than 1000 tonnes a year and the main remaining uses are, based on figures for 2005 and 2006, continuously decreasing. Remaining uses are as rubber flame retardants (more than 50%), and, in decreasing order, as plasticisers or additives in sealants, adhesives, paints and in textile waterproofing (Euro Chlor, 2008).

Total world production of all chlorinated paraffins is estimated to amount to 300 000 tonnes a year (Euro Chlor, 2005). Of the total chlorinated paraffins produced in the EU, SCCPs represent 1% of the production. There are two producers of SCCPs in the OSPAR Convention area which have been producing SCCPs for several years in amounts of less than 1000 tonnes per year. Based on figures for 2005 and 2006, production is continuously decreasing (Euro Chlor, 2008). This indicates a significant decrease compared to estimates of total production of SCCPs in Europe in 1994 of around 15 000 tonnes.

With decreasing production of SCCPs and use restrictions in metal and leather working fluids, it is estimated that the importance of production sites, sites for the formulation of metal and leather working fluids and metal working and leather finishing plants as sources for releases of SCCPs has been decreasing since 1998. Remaining sources include rubber working plants with emissions to air, water and soil, emissions from surfaces treated with SCCP-containing paints, and releases from products in waste streams. SCCPs could be a possible source of PCB formation in incineration of waste. Reports of high levels of SCCPs in biological samples from the Arctic indicate that these chemicals are effectively transported over long distances.

Measures

OSPAR adopted Decision 95/1 which requires Contracting Parties – except the United Kingdom who has a reservation on the measure – to phase out the use of SCCPs as plasticiser in paints, coatings and sealants; as flame retardants in rubber, plastics and textiles; and in metal working fluids. The phase-out should be achieved by 31 December 1999, except for uses as plasticiser in sealants in dams and as flame retardant in conveyor belts for the exclusive use in underground mining which should be phased out by 31 December 2004. The Decision initiates further study of other uses of SCCPs which lead to diffuse discharges to the aquatic environment and the exchange of information on acceptable substitutes for SCCPs.

Decision 95/1 is partly implemented in the EC through Directive 2002/45/EC amending Directive 76/769/EEC and setting out restrictions of uses of SCCP in metal working fluids and fat liquoring of leather with effect from 2004 and a review of remaining uses of SCCPs in 2003. By 2006, SCCPs were broadly phased out or banned in most OSPAR Contracting Parties, at least for those uses covered by Directive 2002/45/EC. The Netherlands and Norway have in place a ban of all uses of SCCPs listed in Decision 95/1. Production of SCCPs has been reduced or ceased in other Contracting Parties (OSPAR, 2006e).

Decision 95/1 has been supported by a voluntary agreement of the two producers of SCCPs in the OSPAR Convention area on the phase-out of SCCP production and substitution of SCCPs in formulations. Medium and long chained chlorinated paraffins (MCCPs and LCCPs) have been used as substitutes for SCCPs in metal and leather working fluids (INERIS, 2005). The recent EU risk assessment for MCCPs suggests that risk reduction measures for MCCPs may be required for those and other uses (EC, 2005a). Information reported by Contracting Parties in 2002 indicates that efforts are being made towards the use of non-halogenated substitutes for SCCPs in different products including antimony trioxide, aluminium hydroxide, synthetic and natural esters, calcium sulfonates, alkyl phosphate esters and sulfonated fatty acid esters.

An assessment of further information on environmental exposure and biodegradability of SCCPs in the context of EC risk assessment work has recently been completed (EC, 2008d). The assessment suggests that there is no need for additional risk reduction measures on remaining uses for the purpose of protecting the marine environment. This and the 2005 EC risk assessment of MCCPs may inform any discussion in the EC on the need for any additional measures on remaining uses.

SCCPs are priority substances under the Water Framework Directive and have been nominated as candidate substance for authorisation under the REACH Regulation. SCCPs are also proposed for inclusion under the UNEP Stockholm POP Convention and the UN-ECE POP Protocol.

Emissions, discharges and losses

The pathway for SCCPs to the marine environment is via rivers and the atmosphere. The main releases occur to sediments and surface waters in rivers, air, and soil spread with sewage sludge.

Under the reporting requirements of the IPPC Directive, SCCPs discharge data were reported to EPER only by Germany in 2001 for direct discharges (0.01 tonne) from the basic inorganic chemicals or fertilisers industries; and by Spain in 2001 and 2004 for indirect discharges of 0.026 tonne and 0.015 tonne respectively from the basic organic chemicals industry and, in 2004, from installations for surface treatment. The reported information seems to indicate that only few point sources discharging SCCPs to water remain and that the level of discharges is low.

Under the Convention on Long-Range Transboundary Transport of Pollutants, data on emissions to air have been reported to EMEP only by the United Kingdom, showing a decrease in emissions of 99% from 7.6 tonnes in 1998 to 105 grammes in 2005. For the same period, Germany, Norway and Sweden reported that no emission estimates have been made for existing emission sources. Denmark and Iceland did not report in that period. The information from the EMEP database seems to indicate that only few point sources of SCCP emissions to air remain in the OSPAR Convention area and that the level of emissions is low.

There is indication that releases from waste streams and uses, for example releases to air from surfaces treated with SCCP-containing paint, can be significant (EC, 2000). The recent updated EC risk assessment estimates – based on quantities of SCCPs used in the EU in 2001 – that total releases in the EU from products containing SCCPs over their lifetime amount to about 2.6 – 9.5 tonnes per year to air and 39.3 – 106.9 tonnes per year to waste water. Total releases from waste remaining in the environment was estimated to amount to 9.8 – 19.4 tonnes per year to surface water and 0.039 – 0.078 tonne per year to air (EC, 2008d). These estimates are subject to great uncertainty and do not reflect the reduction since 2001 in quantities of SCCPs used.

Conclusions

MAIN SOURCES ARE REGULATED

The main sources of SCCP releases have been regulated through use restrictions and phase-out commitments. The current remaining uses as flame retardant in rubber and plasticisers or additives in sealants, adhesives, paints and in textile waterproofing are not regulated.

RELEASES FROM MAIN SOURCES HAVE DRASTICALLY DECREASED

Production of SCCPs is slowly being phased out and restriction of uses in metal and leather working fluids has resulted in a significant decrease of discharges and emissions of SCCPs from point sources. There are however still remaining applications in Europe which may contribute significant releases to the environment, including through waste streams.

CESSATION TARGET LIKELY TO BE MET

There has been good progress in moving towards the cessation target. The implementation of the phase-out of all uses as required by Decision 95/1 is under way in some Contracting Parties; a phase-out in other Contracting Parties would support the cessation target. Monitoring of SCCPs as priority hazardous substances under the Water Framework Directive will provide a tool for measuring future progress. The inclusion of SCCPs under the Stockholm POP Convention and the UN-ECE POP Protocol would support the cessation target.

4.3 Organic nitrogen compound: 4-(dimethylbutylamino) diphenylamin (6PPD)

6PPD is an aromatic amine and is used in high production volumes as a protective agent (anti-ozonant and anti-oxidant) in the rubber industry.

Once in the environment, 6PPD shows transformation by hydrolysis and photodegradation in water, while biodegradation is slow. For both biotic and abiotic degradation the half-life of 6PPD in freshwater is lower than 40 days. On lighted surfaces and in the air, 6PPD will undergo direct photolysis due to absorbance of environmental UV light. However, persistence in sediment and soil may be anticipated. 4-hydroxydiphenylamine, N-phenyl-p-benzoquinone monoimine and 1,3-dimethylbutylamine are formed as degradation products. These metabolites have a lower tendency for adsorbance than the parent substance and biodegradation appears to be possible. Therefore, as long as no further evidence on the biodegradability of 6PPD in sediment and soil as well as on the fate of the metabolites is available, the OSPAR criterion for persistence of hazardous substances is considered fulfilled.

6PPD has a potential for bioaccumulation, but considering its rapid dissipation from water and the low potential for bioaccumulation of major degradation products, the OSPAR criterion for bioaccumulation is considered not to be fulfilled. 6PPD fulfils the OSPAR criterion for toxicity, but does not present adverse carcinogenic, mutagenic or reprotoxic properties. 6PPD was selected as a substance for priority action by OSPAR in 2002. However, the Background Document on 6PPD comes to the conclusion that 6PPD is not a PBT substance. The risk to the marine environment can be considered low because 6PPD is not stable in water and rapidly degrades on lighted surfaces and in air. Nevertheless, 6PPD is a high production volume chemical, and this justifies a continuous attention towards this substance.

Uses, production and sources

The main area of use of 6PPD is as antiozonant in the rubber industry, mainly for production of tyres. It may also be used in other consumer products, *e.g.* seals of pressure cookers. The main pathway of 6PPD to the environment is through tyre abrasion.

Global production of 6PPD in 2001 was estimated as being around 130 000 tonnes. 6PPD is manufactured at one facility in Germany with a volume ranging from 10 000 to 25 000 tonnes per year. No other production sites are known in the OSPAR Convention area.

Sources for release of 6PPD are manufacturing processes in the rubber industry, waste streams and emissions during use of rubber products.

Measures

The IPPC Directive (2008/1/EC) applies to production sites and processes of 6PPD. There are no specific OSPAR or EU measures regulating use and releases of 6PPD. However, BAT is applied at the known manufacturing site in the OSPAR Convention area to reduce releases via air emissions and waste streams.

The substance is included in the list of existing substances produced or imported within the European Community in quantities exceeding 1000 tonnes per year (Regulation (EEC) No. 793/93). Based on this a SIDS (Screening Information Data Set) Initial Assessment Report (SIAR) evaluated 6PPD under the OECD Existing Chemicals Programme and recommended an exposure assessment and, if necessary, a risk assessment (OECD, 2004).

Emissions, discharges and losses

There is no routine monitoring or any data from national surveys of 6PPD releases. The production and manufacturing of 6PPD at the known facility in the OSPAR Convention area takes place in a closed system in the plant. Exhaust is treated in an exhaust purification plant, and waste water is treated in a waste water treatment plant.

In a worst case scenario for new tyres, it was estimated that rubber particles containing up to 800 tonnes of 6PPD were released in Germany in the year 2000 (OECD, 2005b). It was also estimated that around 3000 tonnes of 6PPD were transferred to dumps in 1990 in Germany. The amount of rubber products deposited has decreased considerably since then due to recycling and waste incineration. There are no recent estimates for the amount of rubber deposited in Germany or other European countries.

Conclusions

NO SPECIFIC REGULATIONS IN PLACE

There are no specific measures directed at regulating or reducing the use and releases of 6PPD. There is insufficient information on the exposure and risk of the substance.

RELEASES TO THE ENVIRONMENT TAKE PLACE

6PPD is used as additive to rubber products. It may be widely released from these matrices, mainly tyres, by migration and abrasion. Since it is a high production volume chemical, it will enter the environment in considerable amounts. Discharges from production via air and waste water are considered to be negligible. There is not sufficient information to quantify releases or to indicate a trend.

INSUFFICIENT INFORMATION TO CONCLUDE ON PROGRESS TOWARDS CESSATION TARGET

6PPD has remained an OSPAR priority chemical because the substance or its metabolites might be persistent in sediments. Further information might lead to the conclusion that 6PPD is not a hazardous substance and could be removed from the OSPAR List of Chemicals for Priority Action.

The available information does not allow to draw conclusions on progress towards the cessation target for discharges, emission and losses. Updated information on the use of 6PPD in tyres, an estimation of the emissions from tyre abrasion, and on possible contamination of splash water and roadside soils, as recommended in the monitoring strategy for 6PPD, would be useful to indicate progress.

4.4 Pesticides and biocides

4.4.1 Overview

Pesticides and biocides are substances which are capable of killing living organisms. They are used, or have been used in the past, on plants to repel, kill or control pests (*e.g.* weeds, insects, rodents, fungi, bacteria *etc*.) or otherwise in medicine, agriculture, forestry or other applications to kill, and protect against, for example, germs, bacteria, viruses, parasites, fungi *etc*. For the purpose of EC legislation, the distinction between pesticides and biocides may be described in general terms as agricultural uses on plants (pesticides) and non-agricultural uses (biocides). OSPAR identified the pesticides and biocides dicofol, endosulfan, hexachlorocyclohexane (namely lindane), methoxychlor, pentachlorophenol (PCP) and trifluralin for priority action.

Measures in OSPAR and the EU

Specific actions taken by OSPAR towards cessation of emissions, discharges and losses of pesticides include the elaboration of national action plans promoting the use of Best Environmental Practice (BEP) for the reduction of inputs to the environment of pesticides from agricultural use (Recommendation 2000/2). OSPAR recommends that national authorities provide guidance on best environmental practice and adoption of integrated crop management practices and techniques (Recommendation 2000/1). Each country is actively implementing these measures through a wide range of initiatives designed to promote integrated crop management (OSPAR, 2007c). The integration of these lines of action into national policies is expected to reduce the amount of pesticides which could adversely affect the marine environment.

EU and EEA Member States can only authorise the marketing and use of pesticides and biocides if an active ingredient is listed in Annex I of the Pesticides Directive (91/414/EEC) or the Biocides Directive (98/8/EC) respectively. Dicofol, endosulfan, HCH/lindane, methoxychlor and PCP were identified as relevant substances for the purposes of the Biocides Directive, but were not notified for inclusion in Annex I. The ultimate date for the phase-out of the use of those substances as biocides was 1 September 2006 (Regulation (EC) No. 1048/2005). The regulatory situation of uses of OSPAR priority chemicals as pesticides under the Pesticides Directive is shown in Table 4.3. National regulations similar to those of the Pesticides and Biocides Directives apply in Switzerland.

Table 4.3 Overview of the regulatory situation of uses of OSPAR priority chemicals as pesticides under the Pesticides Directive (91/414/EEC)

Pesticide	Regulatory status under Directive 91/414/EEC, Annex I
Dicofol	Proposed for non-inclusion. Decision expected in 2008. Authorised and used in France
Endosulfan	Non-inclusion, Commission Decision 2005/864/EC All uses ceased end of 2007
Lindane/HCH	Non-inclusion, Commission Decision 2000/801/EC All uses ceased June 2002
Methoxychlor	Non-inclusion, Commission Regulation (EC) No. 2076/2002 All uses ceased end of 2007
PCP	Non-inclusion, Commission Regulation (EC) No. 2076/2002 All uses ceased end of 2007
Trifluralin	Non-inclusion, Commission Decision 2007/629/EC Period of grace until 20 March 2009

All uses (biocide, pesticide, pharmaceutical) of lindane ceased by end of 2007 in the EU as a result of the implementation in the EU of the UN-ECE POP Protocol (Regulation (EC) No. 850/2004). Actions are considered or have been taken for the most harmful pesticides and biocides under the Stockholm POP Convention and the UN-ECE POP Protocol.

The production of pesticides is covered by the IPPC Directive (2008/1/EC) and the BREF document for production of organic fine chemicals (EC, 2006). Reduction of emissions, discharges and losses of the pesticides/biocides identified by OSPAR for priority action is further supported by the Water Framework Directive. The proposed revised list of priority substances in Annex X of the WFD has confirmed the status of trifluralin and PCP as priority substances and HCH as a priority hazardous substance. Endosulfan has been attributed the status of a priority hazardous substance.

Monitoring in environment and food

Except for lindane, none of the pesticides/biocides identified by OSPAR for priority action are included in OSPAR monitoring programmes. Lindane is measured as a mandatory parameter under the OSPAR Coordinated Atmospheric Monitoring Programme (CAMP) and the Comprehensive Study of Riverine Inputs and Direct Discharges (RID), and Contracting Parties monitor and report on a voluntary basis monitoring data on concentrations in marine sediment and biota.

The Arctic Monitoring and Assessment Programme (AMAP) under the Arctic Council monitors contaminants in all compartments of the Arctic environment and have detected several pesticides, including endosulfan, methoxychlor and trifluralin. In addition, national monitoring and surveys are conducted.

All the pesticides on the OSPAR List of Chemicals for Priority Action are included in national monitoring programmes for residues in food. In addition, dicofol and endosulfan were included in the EU-wide food monitoring programme, co-ordinated by the European Commission. The latest annual report on food monitoring in the EU, Norway and Iceland was published in 2005 (EC, 2007c). In the absence of monitoring data for emissions, discharges and losses, this information provides some indication of possible continued uses and associated releases to the environment:

- Dicofol was found in concentrations at or below the maximum residue limit (MRL) in 1.5% of the samples, while 0.1% of the samples exceeded the MRL. Residues were found in mandarins and beans.
- For endosulfan, 1.3% of the samples had residues at or below the MRL. 0.31% of the samples exceeded the MRL; this was in cucumber, beans, spinach, potatoes, oranges and mandarins.
- Lindane and trifluralin were detected in less than 1% of the samples, and none exceeded MRLs.
- Methoxychlor and pentachlorophenol were not detected in any samples.

4.4.2 Dicofol

Dicofol is a chlorinated hydrocarbon. Its chemical structure is related to dichloro-diphenyl-trichlorethane, known as DDT, and it has similar properties. DDT appears as an intermediate in the production process. Dicofol is very toxic to aquatic organisms, highly bioaccumulative and degrades moderately slowly in soil and sediments. It also possibly has endocrine-disrupting properties. Dicofol was included in the OSPAR List of Chemicals for Priority Action in 2000.

The main source of dicofol in the environment has been its use as a miticidal and acaricidal pesticide on a wide variety of fruits, vegetables, ornamentals and field crops. There is an indication that dicofol may be transported by air, although no information is available on dicofol levels in remote areas. Therefore, existing use of dicofol outside the OSPAR Convention area may cause pollution of the North-East Atlantic.

Production of dicofol in the OSPAR Convention area took place in Spain. The dicofol produced in Spain in a closed system was sent to Italy to be purified and manufactured. The production of dicofol in Spain had significantly decreased since 1998 and ceased in June 2006, when the plant’s production and discharge permit was not renewed under the IPPC Directive.

The dicofol market has been in decline for several years as new alternative products and technologies have been introduced. Dicofol is marketed in the EU mainly by an Israeli company who sells dicofol formulated in Italy. There might also be some import from other parts of the world.

Dicofol had been widely in use in Europe in the past, but most registrations were revoked during the late 1990s. In 2008, it is still authorised and used in France as acaricide and insecticide on different crops including fruit trees (*e.g.* apples, pears), flowers, small fruit (strawberries) and a number of vegetables. Spain used about 90 tonnes in 2006 but use may have ceased since then.

There are no data available on emissions, discharges or losses of dicofol in the OSPAR Convention area.

Conclusions

The main source of releases of dicofol to the environment is its agricultural use which is well regulated under the Pesticides Directive (91/414/EEC) and corresponding Swiss measures. A non-inclusion decision under the Pesticides Directive (91/414/EEC) is expected in 2008, and remaining uses will cease following a transitional period. Dicofol is listed in the proposed Water Framework Daughter Directive for review for possible identification as a priority substance or a priority hazardous substance. In light of this, it is anticipated that the cessation target will be achieved well before 2020. Input from long-range transport due to uses outside the OSPAR Convention area is still a threat.

4.4.3 Endosulfan

Endosulfan is an insecticide from the group of chlorinated hydrocarbons (synthetic cyclodiens) and was included in the OSPAR List of Chemicals for Priority Action in 2000. It is considered to be a PBT substance because of its persistence and the persistence of the metabolite endosulfan sulphate in soil in particular. Endosulfan is very bioaccumulative at constant exposure and very toxic to all organisms. Endosulfan and its metabolite endosulfan sulphate are potentially endocrine disrupting chemicals.

The main entry route of endosulfan to the environment is a result of its use as an insecticide. Endosulfan has been used and produced in Europe, but its main regions of uses are the sub-tropic and tropic climatic zones. The concern for the OSPAR Convention area is mainly directed towards long-range transport of endosulfan from those warmer climatic regions, and less towards emissions, discharges and losses from within Europe.

The consumption of endosulfan in Europe declined during the 1990s. In 1999, the uses of endosulfan were 38 tonnes in northern Europe and 431 tonnes in southern Europe. Since then, uses of endosulfan have completely ceased in Europe. In 2000, endosulfan was produced in Italy and Germany. In 2003, only one producer remained within the European Union, manufacturing endosulfan at one single production site in Frankfurt-Griesheim (Germany). The majority of the production volume was exported. Following closure of this site in the first half of 2007, endosulfan is no longer produced in the European Union.

Endosulfan was not included in Annex I of the Pesticides Directive (91/414/EEC) (*cf.* Commission Decision 2005/864/EC) and therefore authorisations for plant protection products containing endosulfan as an active substance were withdrawn by 2 June 2006. Exemptions for certain Member States also expired on 31 December 2007. As a consequence, the use of endosulfan in Europe, in particular as an active substance in plant protection products, effectively ceased at the end of 2007.

Endosulfan has been attributed the status of a ‘priority hazardous substance’ under the Water Framework Directive.

In 2007, the European Community proposed endosulfan for inclusion under the Stockholm POP Convention and the UN-ECE POP Protocol. A conclusion on the listing of endosulfan under the Stockholm POP Convention to globally eliminate its future uses is expected by end of 2008.

Emissions to air and atmospheric deposition

In 2006, Norway monitored endosulfan in air at two of the Norwegian stations of the OSPAR CAMP monitoring network: Birkenes in southern Norway and Ny-Ålesund at Spitsbergen. The concentration of endosulfan measured in air samples was in the range of 3.4 to 25 pg/m³ at Birkenes and of 5.2 to 13.2 pg/m³ at Ny-Ålesund. These observations and the correlation of the concentration with the origin of the air masses give strong indication of airborne long-range transport of endosulfan (NILU, 2007).

These conclusions are supported by Swedish monitoring of pesticides in atmospheric deposition initiated in 2002 (Kreuger and Adielsson, 2007). The results showed that endosulfan was subject to long-range transport to Sweden, and that transport occurred throughout the year with a higher deposition of endosulfan during the early summer and with higher concentrations at sites closer to continental Europe.

These findings are further supported by evidence of the occurrence of endosulfan in the marine environment in remote areas. Several Norwegian publications report findings of organic pollutants in arctic animals; endosulfan was detected in polar bears, although at low concentrations (SFT, 2004). Endosulfan was among the top five pesticides in air measurements from arctic Canada (AMAP, 2004). Furthermore, endosulfan is widespread in arctic seawater, with no observed geographical trends. A review within UNEP of the occurrence of endosulfan in the arctic environment indicates that there is no significant correlation between its occurrence and geographical latitude (UBA, 2007). Based on this, it has been concluded that endosulfan is not as volatile as other POPs and tends to remain near its source region (i.e. the southern hemisphere where it is still in use).

Discharges to water and waterborne inputs

Germany has carried out a national one-off survey of surface waters of the North and Baltic Seas. The observed concentrations and distribution patterns of endosulfan are best explained by a low general background load by *e.g.* atmospheric deposition or only minor local sources (Oehme *et al.*, 2005).

Monitoring data for endosulfan from European rivers were collected as basis for the selection process for hazardous substances (COMMPS) under the Water Framework Directive. Although many measurements resulted in findings below the detection limit, endosulfan was detected in samples from sites where it was expected due to its uses. The main entry routes into the rivers were by drift and run-off from treated areas. It is very unlikely that deposits exist in soil and sediment which may release endosulfan into surface water (EC, 1999).

Conclusions

As a consequence of the regulatory situation, the use of endosulfan in Europe, in particular as an active substance in plant protection products, has effectively ceased at the end of 2007. Since use of endosulfan has ceased, and the only production site in Europe has closed, it is not expected that any more releases of endosulfan will take place in Europe.

Input from long-range transport due to uses outside the OSPAR area is still a problem. OSPAR Contracting Parties should support the ongoing activities under the Stockholm POP Convention with the aim of achieving a global ban on endosulfan.

4.4.4 HCH isomers (lindane)

Lindane is the common name for the γ-isomer of hexachlorocyclohexane (HCH), a chlorinated hydrocarbon used as an insecticide. The other isomers of HCH are by-products or waste from lindane production, with similar hazardous properties; since they are only by-products, OSPAR actions have focused on lindane. Lindane is persistent and is frequently found in environmental compartments. Due to its physico-chemical properties it has the potential for long-range transport. It is bioaccumulative, ecotoxic and has acute and chronic adverse effects on humans. OSPAR included the group of HCH isomers on the List of Chemicals for Priority Action in 1998.

Use, production and sources

The main uses of lindane were in agriculture and forestry for seed treatment and soil application, and in household biocidal products as textile and wood preservative. Lindane was also used to treat ectoparasites in human and veterinary medicine. Lindane has been intensively used for many years since 1949 but has been replaced in most applications by pyrethroids and other insecticidal chemicals. All uses of lindane, including technical HCH for use as intermediate in chemical manufacturing, have dropped to low levels in Europe by the end of the 1990s.

Lindane was previously produced in Germany and Switzerland. The IUCLID database from 2000 contains no information on production, so production in the EU seems to have ceased. With all uses and production of lindane in the EU now being phased out, there is still production and use outside of the OSPAR Convention. Worldwide, production of lindane seems to be declining with only a few producing countries remaining. In addition, the remaining uses of lindane are decreasing (UNEP, 2006). Imported textiles treated with lindane may provide a source of releases in the EU. Yet, historic production and use sites in the OSPAR Convention area and elsewhere can also be a source, in particular for α- and β-HCH. Recent global monitoring data clearly demonstrate the potential for long-range atmospheric transport of lindane (UNEP, 2006).

Measures

Lindane was not included in Annex I of the Pesticides Directive (91/414/EEC) (*cf.* Commission Decision 2000/801/EC) and therefore authorisations for plant protection products containing endosulfan as an active substance were effectively withdrawn at the latest by June 2002. With the implementation of the UN-ECE POP Protocol at European Community level, the production, placing on the market and the use of HCH, including lindane, are now prohibited. This means that with the expiry of the transitional periods for certain derogations, all uses of HCH and lindane (as biocide, pharmaceutical, technical intermediate *etc.*) have ceased by end of 2007 in the EU and the EEA.

HCH isomers, including lindane, are listed for the Prior Informed Consent (PIC) procedure of the Rotterdam Convention and several OSPAR Contracting Parties have prohibited their import.

Lindane is also listed under the UN-ECE POP Protocol and was proposed in 2005 for inclusion in the Stockholm POP Convention. The risk management evaluation on lindane proposed to eliminate uses of lindane worldwide except as human health pharmaceutical for the control of head lice and scabies but restrictions and alternative products are recommended (UNEP, 2006). A conclusion on the listing of lindane for global elimination is expected in May 2009.

α-HCH and β-HCH were also proposed in 2006 for inclusion under the Stockholm POP Convention with the reasoning that 6 – 10 tonnes of other HCH-isomers need to be disposed of or otherwise managed for each tonne of lindane that is produced. If those substances were accepted for global elimination, it would result in substantial reductions of emissions of other HCH-isomers.

HCH has been attributed the status of a ‘priority hazardous substance’ under the Water Framework Directive.

Emissions to air and atmospheric deposition

An assessment of monitoring data for lindane collected under the OSPAR Comprehensive Atmospheric Monitoring Programme from stations in Iceland, Norway (precipitation and aerosols) and Sweden (aerosols) shows downward trends in concentrations in precipitation and air for the period 1990 – 2002 (OSPAR, 2005a). This is consistent with results achieved in the Netherlands and is expected, given the increasing controls on the use of the substance. CAMP measurement of lindane in other parts of the OSPAR maritime area is patchy and concentrations in samples (if any) are below detection limit.

EMEP records officially reported emission data from Belgium, Spain and the United Kingdom. These suggest a continuous downward trend of more than 50% for emissions of HCH to air from the United Kingdom over the period 1998 – 2005. Emissions from Belgium and Spain are lower than those from the United Kingdom. The latest expert estimate is from 2000 and gives a total of 110 tonnes (including Eastern Europe and Turkey). Reliable emission data for 2004 are available from the United Kingdom (13 tonnes), while other major emissions (France 40 tonnes, Turkey 12 tonnes, Spain 10 tonnes, Portugal 7.7 tonnes) are simply repetitions of the figures from 2000. Based on officially reported emissions, information on use of lindane and latest expert estimates from 2000, recent EMEP estimates suggest emissions of 26 tonnes in 2005 for the entire OSPAR Convention area and suggest a reduction in the area of more than 80% from 148 tonnes in 1998 (OSPAR, 2008a). There are, however, significant uncertainties associated with lindane emission estimates, especially before 2001 which can range by a factor from 2 to 5. These and additional uncertainties relating to temporal variability in deposition are reflected in EMEP modelled estimates of atmospheric net inputs of lindane in the OSPAR maritime area; these suggest a net input level of 4.9 tonnes in 2005. With the important reduction of emissions achieved so far, the influence of re-emission of lindane from water can be substantial for the total atmospheric input load to a number of sub-regions of the Greater North Sea.

Discharges, losses and waterborne inputs

Data reported by six Contracting Parties under the OSPAR RID Study for total riverine and direct inputs of lindane for 2005 indicate continued releases of lindane to surface water. The sum of direct and riverine discharges of lindane from these countries together was estimated to be in the range of 477 − 958 kg. The Netherlands reported that the total figure for lindane in sewage effluents is already very low (< 0.07 kg/Yr), and that the contribution of the part of sewage effluents that is discharged directly into the sea is negligible compared to the riverine inputs (OSPAR, 2007d). The source of lindane releases to water may be historic uses of lindane as wood preservative or washing of imported textiles preserved with lindane.

The total amount discharged to water from the basic organic chemical industry was 20 kg in 2004, as reported by the EU Member States to the European Pollutant Emission Register.

Conclusions

Lindane is no longer in use in the OSPAR Convention area. Long-range atmospheric transport and possibly import of treated textiles are the remaining sources of inputs to the OSPAR maritime area. Monitoring data show a downward trend in inputs of lindane to the sea.

The EU measures in the field of pesticides, biocides, pharmaceuticals and water policy are effective to support a complete cessation of open uses of lindane and HCH in Europe. This and the anticipated inclusion of lindane and HCH for elimination under the Stockholm POP Convention provide a basis for the cessation target for releases of lindane to be met.

Pending the decision to list α- and β-HCH, which are by-products or waste of former lindane production, for elimination under the Stockholm POP Convention, OSPAR should continue to keep such wastes under surveillance, since elimination has to be actively promoted. OSPAR should continue to consider environmental monitoring data, in particular the ratio of α-HCH to γ-HCH, and should keep under review developments and actions regarding HCH isomers within the POP review in the UNEP framework.

4.4.5 Methoxychlor

Methoxychlor is a chlorinated hydrocarbon. It is persistent, bioaccumulative and very toxic to aquatic organisms. It has potentially endocrine-disrupting properties and was included in the OSPAR List of Chemicals for Priority Action in 2000.

Methoxychlor has been used in the past mainly as a plant protection product (insecticide) but also as a veterinary medicinal product and biocide. The use of methoxychlor ceased in most countries around 1990; the United Kingdom prohibited its use already in the 1970s. The latest decisions on its prohibition were taken in 1995 in Germany and in 2000 in Belgium; the use in Spain for some specific applications in forestry ceased in 2003. All uses of methoxychlor as a pesticide ceased by the end of 2007 with the decision in the EU (Regulation (EC) No. 2076/2002) not to include it in Annex 1 of the Pesticides Directive (91/414/EEC). Methoxychlor is not authorised in the EU for use as a biocide (Directive 98/8/EC). Based on the information obtained from eight OSPAR Contracting Parties and the European Agency for the Evaluation of Medicinal Products, methoxychlor is not used in veterinary medicines in Europe. There is no available information on use of methoxychlor in other parts of the world, but the physico-chemical properties of the substance suggest a small risk of long-range air transport.

Information from the manufacturing industry, collected through the European Crop Protection Association (ECPA), indicates that there is no more production, manufacturing or sales of methoxychlor in Europe.

Results from surveys of methoxychlor in surface water and in groundwater in Belgium, France and the United Kingdom in the late 1990s showed very low concentrations. There is no new information on discharges or presence of methoxychlor in the environment.

Conclusions

There is no production or use of methoxychlor in the OSPAR Convention area. Given this, the prohibition in the EU of its use as pesticide and the small risk of long-range air transport, it is expected that the cessation target will be met.

4.4.6 Pentachlorophenol (PCP)

Pentachlorophenol (PCP) is a chlorinated hydrocarbon used as a biocide. Its salt, sodium pentachlorophenate (NaPCP), is used for similar purposes and readily degrades to PCP. The ester, pentachlorophenyl laurate (PCPL), is also used. All three substances are toxic, persistent and liable to bioaccumulate. During the production of PCP and its derivatives, dioxins and furans are formed as by-products. Pentachlorophenol (PCP) was prioritised for action by OSPAR in 1998.

Uses, sources and production

The predominant use of pentachlorophenol-containing chemicals has been as a preservative of wood and freshly cut timber from fungal rot (blue-stain) and as a preservative for heavy-duty textiles. It has also been used as additive and preservative in various chemicals and building material.

The main source of PCP and its derivates has been the treatment of wood and textiles. Discharges to water and emissions to air are possible from the use of PCPL (and PCP)-treated textiles. Textiles treated in Europe are heavy-duty textiles for outdoor use where they may be in contact with rain, surface water or sea water. In addition to textiles treated in Europe, imported textile and leather are a source of releases. In practice, the control of the import of treated wood products and textiles is difficult. Other sources of releases are production and formulation of substances, disposal of PCP containing wastes and burning processes. There is still a potential for PCP releases from reservoirs such as sediment, soil, sludge, wood constructions and landfills.

Production of PCP and NaPCP ceased in the EU in 1992. After that, these chemicals have been imported to the European market from the USA. In 1996, a total of 378 tonnes of NaPCP and 30 tonnes of PCP were imported into the EU. More recent figures are not available. There is unconfirmed information that additional NaPCP may be imported from South-East Asia. No import of PCPL takes place, but PCPL was produced from PCP by one plant in the United Kingdom. According to EC Directive 1999/51/EC, placing on the market and use of PCP is not permitted as a synthesising and/or processing agent in industrial processes from 1 September 2000. As a consequence, the production of PCPL has ceased.

Measures

OSPAR has recommended the application of BAT and BEP for wet processes in the textile processing industry with the aim of improving the environmental impact resulting from these activities (Recommendation 94/5). Reference values for discharges from the textile industry are set for metals, biocides and halogenated substances (Recommendation 97/1). Implementation reporting in 2005 showed that each Contracting Party emphasised different measures in order to reach an overall environmental benefit. Because of the variety of measures, it was difficult to draw simple conclusions on their implementation. Data reported on discharges of hazardous substances from the textile industry according to Recommendation 97/1 did not specify the biocides.

The marketing and use of pentachlorophenol, NaPCP, and PCPL in preparations have been restricted in the European Union since the adoption of Directive 91/173/EC, with four exceptions on use in industrial installations. In 1999, further restrictions on the use of PCP and its salts and esters were adopted (Directive 1999/51/EC). By way of derogation until 31 December 2008, France, Ireland, Portugal, Spain and the United Kingdom may choose not to apply this provision to substances and preparations intended for use in industrial installations not permitting the emission and/or discharge of PCP in quantities greater than those prescribed by existing legislation. Spain chose this option. It is not known whether the other relevant Contracting Parties have done the same.

Following the non-inclusion of PCP in Annex 1 of the Pesticides Directive (91/414/EEC), all uses as pesticide phased out by end of 2007. The substance was not notified under the Biocides Directive (98/8/EC) as a result of which uses should no longer occur after 1 September 2006. This means that all uses of PCP, NaPCP and PCPL have ended in the EU.

In Switzerland, the production, marketing, import and use of PCP, its salts and preparations was prohibited in 1986. The prohibition also includes the import of PCP-treated textiles, leather products and wood. Prohibition does not include the use of PCP for scientific research. Norway reported that it is prohibited to produce, import, export and market PCP, NaPCP and PCPL or chemical compounds containing this substance with a content of 0.1 weight percentage or higher. It is also prohibited to produce, import, export and market textiles and leather products containing more than 5 ppm PCP, NaPCP and PCPL.

PCP is also listed for the Prior Informed Consent (PIC) procedure of the Rotterdam Convention relating to imports.

Emissions to air

Some data on emissions to air have been reported to EMEP. The Netherlands, Spain, and the United Kingdom have reported emissions since 1998, Belgium since 2000. Germany has reported that they have no emissions. The total air emissions from Belgium, the Netherlands, Spain and the United Kingdom have been reduced from 629 tonnes in 2000 to 472 tonnes in 2005, a reduction of 25%.

Discharges to water

PCP is not included in OSPAR monitoring programmes, but data from the 1990s from some Contracting Parties and from the chlorine industry, presented in the OSPAR Background Document for PCP, show that PCP has been detected in air, soil, water and sediments as well as in a large number of aquatic organisms. The samples have mainly been taken near known sites of discharges. These data showed that the mean concentrations of PCP have decreased both in sea and river waters in the regions for which monitoring data were available.

Recent monitoring information reported by several Contracting Parties in 2008 indicate that, in general, the concentrations of PCP in water are very low and lower than the maximum concentration allowed in drinking water:

- In Denmark, PCP is included in national aquatic and terrestrial monitoring programme (NOVANA). The programme includes monitoring of point sources and open media.
- Spain informed OSPAR about several annual programmes, covering the North-East basin of Spain, the same region in which the use of PCP was indicated according to the OSPAR Background Document. These programmes measure, among other hazardous substances, PCP levels in biota, water and sediments. All data measured in 2005 were less than 1 ng/g (dry weight) in sediment and less than 0.1 ng/g (fresh weight) in biota.
- PCP has been screened in waste water from sewage treatment plants, surface waters and sediments in the vicinity of ten cities in Finland in 2003 − 2004. All waste water and surface water concentrations were between less than 0.02 and 0.05 µg/l, but the total number of samples was only around 50. All sediment samples were below 50 µg/kg (dry weight).
- Norway has screened priority substances under the Water Framework Directive, including PCP in three locations. The concentrations were very low or below the detection limit.
- PCP is measured several times a year in several rivers in the Brussels area. Concentrations are always below the detection limit.

Conclusions

All marketing and use of PCP and its derivatives in the OSPAR Convention area ceased by the end of 2007. Import of textiles treated with PCP, and landfills/waste treatment are the main remaining sources of releases to the environment in the OSPAR area.

4.4.7 Trifluralin

Trifluralin is a dinitroaniline herbicide used to control a wide spectrum of annual grasses and broadleaf weeds in agriculture, horticulture, viticulture, amenity and home garden. Trifluralin dissipates rapidly from water, but persistence is high in soil and sediment when considering bound residues and low mineralisation. Trifluralin is bioaccumulative and very toxic to aquatic organisms. Trifluralin was added to the OSPAR List of Chemicals for Priority Action in 2002.

The main pathway of trifluralin to the environment results from its use as a herbicide in agriculture. Transport to the marine environment is unlikely. Under the intended conditions of use, trifluralin will adsorb to soil and sediment rapidly. Desorption from the sediment to water appears to be low. Model calculations indicated a persistence of 18 days and a transport distance of approximately 30 km. Inputs to the marine environment through adsorption to sediment, although a theoretical risk, are not considered relevant. Trifluralin may evaporate from water, while volatilisation from soil after incorporation is low. Nevertheless, trifluralin is rapidly degraded in air.

Production

Based on recently confirmed information from around the year 2000, trifluralin is only manufactured in one plant in the European Union (northern Italy), which supplies trifluralin exclusively to one company for marketing in the EU. In addition, trifluralin is imported by an Israeli company for marketing in the EU. Production volume in Italy has been fairly constant at around 6000 tonnes per year. Formulation of products containing trifluralin intended for the European market takes place at a plant at Drusenheim in the North-East of France, in the Rhine catchment area. No discharges are permitted into any nearby watercourses from the Drusenheim facility. Formulation also takes place at six plants in Spain. All of them produce in a closed system process and apply BAT. A decrease in the number of formulators and marketing of formulations has been observed during the last years. This tendency is expected to continue in future.

Measures

In the Hague Declaration of the 3rd North Sea Conference, trifluralin was put on the list of priority hazardous substances with the target of a 50% reduction of inputs via rivers and estuaries; the atmospheric pathway for trifluralin was not included. Regardless of difficulties in reporting as response to the Hague Declaration, the 5th North Sea Conference (ICPNS, 2002) indicates the countries in which the 50% reduction target has not been achieved between 1985 and 1999/2000 (current sales/use data): Belgium (15.1 t/Yr), France (1600 t/Yr), Switzerland (0.5 t/Yr) and United Kingdom (657 t/Yr). In addition to the Progress Report to the 5th North Sea Conference, Switzerland reported a 100% reduction of discharges to water. A 50% reduction was achieved in Germany (< 102 t/Yr) and application of trifluralin was discontinued (or was never in use) in Norway, Sweden and the Netherlands. Trifluralin has been banned in Denmark since 1997, but a derogation for use in seed production was in force from 1999 to 2004.

Trifluralin is a priority substance under the Water Framework Directive. Its status has not been changed in the review of Annex X to the Water Framework Directive (COM(2006) 397 final).

Trifluralin was not included in Annex I of the Pesticides Directive (91/414/EEC) (*cf.* Commission Decision 2007/629/EC). Current authorisations of plant protection products containing trifluralin must be withdrawn by 20 March 2008; any period of grace granted to EU Member States shall be as short as possible and shall expire on 20 March 2009 at the latest. The decision is mainly based on the PBT properties of the substance and the possible risk for the environment. Since agricultural use is the only use of trifluralin, non-inclusion in Annex I of the Pesticides Directive (91/414/EEC) will lead to complete cessation of use at the latest by 2009. Yet, the European producers of trifluralin challenged the non-inclusion decision of the Commission and brought annulment actions in the EC Court of First Instance[4], which are still pending.

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[4] Case T-475/07 Dow AgroSciences and Others v Commission of 31 December 2007, OJ C 51 of 23.02.2008, p. 54. The request for interim measures suspending the non-inclusion decision was dismissed by Order of the Court of First Instance of 16 June 2008.

Emissions, discharges and losses

The combined monitoring-based and modelling-based priority setting (COMMPS) was applied in the selection process of the proposed priority substances under the Water Framework Directive. In this context, releases to the environment as consequence of widespread agricultural use in the 1990s were evaluated from monitoring data from European rivers (EC, 1999). This evaluation yielded a 90th percentile concentration of 0.0306 µg/l. In total, trifluralin was detected in 1.5% of over 30 000 samples from over 4500 sites collected over several years. Of these, concentrations above 0.1 µg/l (the EC standard for drinking water) were found in nine samples (0.03%). Although a rapid partition of the substance to the sediment is known to occur, only few sediment samples were analysed for trifluralin. From these few data the potential risk in sediment cannot be evaluated, whereas the risk potential in the water phase seems to be low, as indicated from the monitoring data.

Discharges, emissions and losses, *e.g.* from production or formulation sites, are negligible. Monitoring data of the late 1990s, when trifluralin was still intentionally used as agricultural pesticide, indicate a 90th percentile level in the range of the environmental quality standard set under the Water Framework Directive in a small number of samples. No new monitoring data are available and there are no data on inputs to the marine environment.

Conclusions

The non-inclusion of trifluralin in Annex I of the Pesticides Directive (91/414/EEC) means that, subject to the pending annulment action in the EC Court of First Instance, uses as pesticide and associated releases of trifluralin to the environment will cease. While this is an important step towards the cessation target, it is not clear whether this ban will have an influence on the remaining production and formulation of products in Europe and the OSPAR Convention area, and related discharges, emission and losses.

4.4.8 Overall conclusions on pesticides and biocides

ALL MAIN USES ARE PHASED OUT

The main source for releases of dicofol, endosulfan, HCH, methoxychlor, and trifluralin has been their use as pesticides in agriculture. Except for dicofol, these uses have been phased out under EC legislation. A decision to cease pesticidal uses of dicofol is anticipated. The biocidal uses of HCH and PCP as textile and wood preservatives also ceased under EC legislation. None of the chemicals are produced in the OSPAR Convention area although trifluralin is still produced in the EU (Italy); formulation of products still takes place in France and Spain. Releases of the chemical industry are regulated under the IPPC Directive (2008/1/EC) and the formulating sites in the OSPAR Convention area are not permitted any discharges.

With these instruments in place, the main concern is sources of pesticide and biocide production and use outside the OSPAR Convention area and imports of products containing such substances into the OSPAR Convention area. While lindane is listed under the UN-ECE POP Protocol, lindane, α- and β-HCH isomers and endosulfan have been proposed for elimination and restrictions under the Stockholm POP Convention; discussions in the EU to propose triflurin too are still underway. HCH isomers, including lindane, and PCP are listed for the Prior Informed Consent (PIC) procedure under the Rotterdam Convention.

RELEASES RESULTING FROM GLOBAL SOURCES AND IMPORTED GOODS MAY CONTINUE

The use of dicofol and trifluralin in agriculture is a source of releases to the environment, but because of its properties, trifluralin is not expected to reach the marine environment. The production of trifluralin is not expected to result in releases.

As long as lindane, endosulfan and dicofol are used in other parts of the world, inputs from long-range air transport to the OSPAR maritime area are possible. Releases of lindane may also continue from historic production and use sites in the OSPAR Convention area.

Import of textiles and wood treated with lindane and PCP may result in continued inputs of those substances to the OSPAR maritime area through waste streams and losses from contaminated sites and landfills.

Data on discharges, emissions and losses are scarce for those pesticides and biocides, and good time series are not available. The limited data available indicate however a downward trend and low concentrations for all substances concerned.

CESSATION TARGET EXPECTED TO BE MET

Discontinued use of dicofol, endosulfan, HCH, methoxychlor, PCP and trifluralin as pesticides and biocides is a large step towards the cessation target. It is anticipated that with the existing efforts the cessation target will be reached for those substances.

4.5 Pharmaceutical: Clotrimazole

Clotrimazole is a pharmaceutical which has many ecotoxicological properties in common with a range of fungicides used in agriculture. Clotrimazole is a persistent substance with bioaccumulative and toxic properties which are considered a borderline case under the OSPAR criteria for bioaccumulation and toxicity. Clotrimazole was included on the OSPAR List of Chemicals for Priority Action in 2002. However, clotrimazole is not a PBT chemical according to the PBT criteria of the EU Technical Guidance Document. In addition, the result of the OSPAR risk assessment in the OSPAR Background Document on clotrimazole indicates that there is at present no risk for the marine environment due to the use of clotrimazole.

Use, production and sources

Clotrimazole is mainly used for treatment of dermatological and gynaecological fungal infections in humans. It is synthesized in closed systems. Several companies offer clotrimazole products on the European market, one of which is Bayer. Bayer produces clotrimazole active ingredient at one production site in the EU (Spain). The finished products (cream, vaginal tablets, solution, spray and powder) are made at several formulation sites in Spain, Germany and other European countries. The amount of clotrimazole active ingredient brought on the European market by Bayer was about 10 tonnes in 2007. The United Kingdom (about 3 tonnes), Italy and Spain (both about 2 tonnes) are the most important European markets for Bayer. The total amount of clotrimazole active ingredient sold by other companies on the European markets is estimated to be 10 to 15 tonnes per year. With regard to total market volume of clotrimazole products (packages sold), Germany and the United Kingdom have the biggest markets in Europe. These figures indicate that the use of clotrimazole in Europe remained stable with only small changes compared to figures reported earlier to OSPAR.

Measures

OSPAR has recommended that, to enhance environmental protection, package leaflets (patient information leaflets) should include the following general statement: “Medicines no longer required should not be disposed of via waste water or the municipal drainage system. Return them to a pharmacy or ask your pharmacist how to dispose of them in accordance with the national regulations. These measures will help to protect the environment”. This text has been included in the European Medicines Agency (EMEA) Guideline on the Environmental Risk Assessment of Medicinal Products for Human Use, which entered into force in December 2006 (EMEA, 2006) as follows: “Medicines should not be disposed of via waste water or household waste. Ask your pharmacist how to dispose of medicines no longer required. These measures will help to protect the environment.” The company formulating clotrimazole (Bayer) has started to include the text of the EMEA Guideline in their product information leaflets for clotrimazole in EU countries. Using the EMEA Guideline methodology, Bayer has conducted an environmental risk assessment on a new clotrimazole formulation. According to Bayer, no risk for the different environmental compartments could be identified.

Under EC legislation, Regulation (EC) No. 2309/93 and Directive 2001/83/EC regulate the authorisation of marketing of pharmaceuticals and require the applicant to indicate any potential environmental risks exhibited by the medicinal product. It should be noted that Directive 2001/83/EC relates to those risks to the environment arising from use, storage and disposal of the medicinal product. The IPPC Directive (2008/1/EC) regulates the manufacture of the product.

Emissions, discharges and losses

Releases during the production in closed systems are not expected in a normal situation. Air-filtration systems are available in the whole formulation process. Therefore releases to the different environmental compartments from production and formulation processes are considered to be negligible.

Almost all the clotrimazole will be washed into the waste water through normal body hygiene procedures. The main potential source of clotrimazole to the environment is therefore discharges from municipal waste water treatment plants as a result of waste water from households and hospitals.

There is no routine monitoring of clotrimazole releases to air or water, but the occurrence of clotrimazole in water has been investigated in projects in the United Kingdom and Germany. Clotrimazole was not detected in any of the 43 samples in a German survey for pharmaceutical substances in the river Elbe in 1999 and 2000 (Wiegel *et al*., 2003). Conversely samples taken in 2002 from five estuaries in the United Kingdom detected clotrimazole in 59% of the samples (Thomas and Hilton, 2004). In a further survey in 2004 of the waste water treatment plant effluent and surface waters of the lower river Tyne in the United Kingdom, clotrimazole was detected in all the samples (Roberts and Thomas, 2006). These studies show that clotrimazole may reach the marine environment even after passage through a tertiary waste water treatment plant. Further studies conducted by Bayer in 2006 showed that clotrimazole could hardly be detected in riverine waters in Germany and in the Tyne estuary due to its high adsorption potential to particulate matter (Peschka *et al*., 2007). The level of clotrimazole found in these studies is in the range of nanogramme per litre. This recent information about detection of clotrimazole in riverine and marine sediments has not yet been assessed by OSPAR.

Conclusions

The use of clotrimazole is regulated as a pharmaceutical. The main potential source of releases of clotrimazole to the environment is discharges from municipal waste water treatment plants, linked to the use of clotrimazole to cure for example topical fungal infections. Releases from the production and the formulation steps and emissions to air are considered negligible.

There is no information available to assess trends in discharges, but the few surveys that have been reported to OSPAR show that the substance can be detected in riverine waters in low concentrations.

In order to get a better basis for conclusions on progress towards the cessation target, trends in production, sales and use should be monitored and a one-off survey or screening of effluents from municipal and hospital sewage treatment plants should be conducted.

4.6 Phenols

The three alkylphenols on the OSPAR List of Chemicals for Priority Action – 2,4,6-*tri-tert*-butylphenol, nonylphenol and octylphenol – are intermediates in production of other chemicals. There is little information about production and use and releases to the environment.

Alkylphenols are not used by the offshore industry, but are natural constituents of petroleum oil and may be found in produced water discharged from offshore oil and gas installations. Alkylphenols are reacted with formaldehyde to produce polymers called alkylphenol (formaldehyde) resins. Due to their unique properties, alkylphenol (formaldehyde) resins are widely used in the offshore oil and gas industry for crude oil demulsification. OSPAR had concern that the resins might contain residual alkylphenol ethoxylates or parent alkylphenols which are suspected of having endocrine disrupting properties. Information presented to the OSPAR Offshore Industry Committee in 2005 and 2006 concluded that the resins did not contain traces of base products such as octylphenol and 2,4,6-*tri-tert*-butylpheol and did not exhibit endocrine disrupting potential.

4.6.1 2,4,6-tri-tert-*butylphenol* (2,4,6-TTBP)

2,4,6-tri-tert-butylphenol (2,4,6-TTBP) was included on the OSPAR List of Chemicals for Priority Action in 2000. The substance is likely to be a PBT substance, and studies also indicate that it meets the EU criteria for being very persistent (vP) and very bioaccumulative (vB).

Uses, production and sources

There is uncertainty about the precise use pattern of 2,4,6-TTBP and associated sources for its release to the environment. The following potential uses and release sources have been suggested:

- the only intentional use reported by industry is as a chemical intermediate for the production of antioxidants used in rubber and plastic;
- it appears possible that the substance may be present (as a substance rather than a derivative) in lubricant antioxidant products. Yet, it is not clear whether this is as an impurity or as an intentional component. The extent to which such products containing 2,4,6-TTBP are currently used is also not clear, nor whether the substance is imported (either as the substance or in products);
- the substance may be formed as an intended by-product in the production of 4-tert-butylphenol;
- it may be used as an additive for gasoline and fuel oil distillates.

The data on production, uses and import are scarce. The substance is believed to be a low tonnage chemical with total production volume in the EU of less than 10 tonnes per year. Information from Denmark in 2001 indicated possible uses of around 33 tonnes, suggesting a higher usage in products, possibly through importation. In 2007, OSPAR Contracting Parties reported on the use of 2,4,6-TTBP as an intermediate in plants. While Denmark, Ireland, Luxembourg, Portugal and Switzerland reported no information, all other countries reported that they were not aware of any plants in their country using this chemical as intermediate. Two countries reported however the import and use of less than 10 tonnes per year (Finland) and 1 tonne per year (Norway) in the years 2004 and 2005 by companies in their territory for use as fuel additive, and also as lubricant additive (in Norway). The United Kingdom reported one company in its territory manufacturing 2,4,6-TTBP.

Measures

There are no specific OSPAR or EC measures to control the use or discharge of 2,4,6-TTBP. The substance is not on the list of priority substances under the Water Framework Directive and there are no marketing or use restrictions.

Emissions, discharges and losses

There are no data available on emissions, discharges and losses of 2,4,6-TTBP to the environment. If used as an intermediate, it is likely that the substance reaches the marine environment via a single main route: This is the discharge of waste water from the limited number of land-based production processes where the substance is produced or formulated/processed into products. The substance has been detected in a survey analysing a few sediment samples in estuaries off industrial sites in the United Kingdom. The use as additive to fuel and lubricants may be a potential source for releases to the environment. Given its low vapour pressure and that its lifetime in the atmosphere is predicted to be very short, it is unlikely that any 2,4,6-TTBP, once released to the environment, is transported a long distance from its point of emission. Due to its tendency to adsorb to soils and sediments, it can be expected that atmospheric concentrations will be low.

Conclusions

RELEASES TO THE MARINE ENVIRONMENT MAY BE LIMITED

Information from 2007 indicates that there might be only limited production and no use as intermediate in plants in OSPAR Contracting Parties. If any production or uses in industrial processes occur, it is unlikely that it would be in sufficient quantities to pose a risk to the open sea and is only likely to cause local problems if indeed discharges occur. Expert judgement based on the scarce data available on production, use and import suggests that the substance is still in use for example as an additive to fuel or lubricants, and therefore may be released to the environment.

MORE INFORMATION IS NEEDED TO CONCLUDE ON PROGRESS TOWARDS CESSATION TARGET

There is not sufficient information available to draw any conclusions on progress towards the target of cessation of discharges, emissions and losses. More information on production and use is needed in order to assess whether there is need for additional action by OSPAR.

4.6.2 Nonylphenol and nonylphenol ethoxylates

Nonylphenol ethoxylates (NPEs) are part of the alkylphenol ethoxylate group of non-ionic surfactants. NPEs degrade relatively easily to form short-chained NPEs and nonylphenol (NP). NP and short-chained NPEs are toxic to aquatic organisms. Since they are lipophilic, they accumulate in sewage sludge and sediments, and bioaccumulate in aquatic species. NP/NPEs may also have endocrine-disrupting properties. NP/NPEs were included in the OSPAR List of Chemicals for Priority Action in 1998.

Uses, production and sources

NP is used almost exclusively as an intermediate in the production of various NP derivatives, mostly ethoxylates. Nonylphenol ethoxylates have been used in large tonnages for some decades as emulsifiers, dispersive agents, surfactants and/or wetting agents, and gave rise to a high degree of exposure to the aquatic environment. The main users have been the industrial, institutional and domestic cleaning sectors, but NPEs have been banned for the cleaning of domestic houses and professional buildings. Detergents not marketed for such purposes may therefore still be used, if they comply with the Detergents Regulation ((EC) No. 648/2004). Other significant sectors are emulsion polymerisation, textiles, chemical synthesis and leather. The EU production of NPEs has been estimated to amount to 118 000 tonnes in 1997. Around 77 600 tonnes of NPEs were used in Europe in 1997.

Measures

Extended work to phase out the use of NP/NPEs and related substances have been proposed within OSPAR, but postponed to allow account to be taken of measures taken in the EU and other international forums. According to interim targets, the use of NP/NPEs as cleaning agents for domestic uses should have been phased out by the year 1995 and for industrial uses by the year 2000 (Recommendation 92/8).

The overview assessment of implementation of Recommendation 92/8 shows a nearly complete phase-out of domestic uses of NP/NPEs as cleaning agents by Contracting Parties already in 1997. In 2005, Contracting Parties reported considerable reductions in industrial uses of NP/NPEs as cleaning agents. Norway and Sweden reported that industrial uses in 2005 were estimated to have reached zero. The Netherlands reported almost total reductions as early as 2001. Finland has phased out all uses. There were still some remaining uses in the Convention area (OSPAR, 2006f).

The EU assessed the environmental risk of NP/NPEs and agreed a risk reduction strategy under the Existing Substances Regulation (EEC) No. 793/93. Following this, the production and use of NP/NPEs have been strictly regulated through EU and EEA measures. Switzerland prohibited all uses of NP/NPEs from 1 August 2006. The main EC legislation relevant for the control and reduction of inputs of nonylphenol and nonylphenol-ethoxylates to the marine environment are:

- Marketing and use restrictions under Directive 76/769/EEC. NP/NPEs may not be placed on the market or used as a substance or constituent of preparations in concentrations ≥ 0,1% by mass for a number of purposes, such as industrial and domestic cleaning, textiles and leather processing, metal working, manufacturing of pulp and paper, cosmetic products (Directive 2003/53/EC).
- Regulation (EC) No. 648/2004 of the European Parliament and of the Council on detergents. This regulates the use of surfactants in detergents for both consumer use and professional applications. In general, NPEs and NP are not readily biodegradable using standard test methods, although substantial biodegradation will occur after a period of microbial acclimation. According to Regulation (EC) No. 648/2004, surfactants should be ultimately biodegradable; this would disqualify the use of NPEs and similar alkylphenol ethoxylates in such applications.
- NP is classed as a priority hazardous substance under the Water Framework Directive, and this status has been confirmed in the draft daughter directive (COM 2006) 397 final).
- The IPPC Directive (2008/1/EC) applies to plants using NP as an intermediate.
- Use of nonylphenol as an ingredient in plant protection products was banned with effect from 2004 following the decision not to include NP in Annex I to the Pesticides Directive (91/414/EEC) (Commission Regulation (EC) No. 2076/2002). Use in biocidal products was banned from 1 September 2006 (Commission Regulation (EC) No. 1048/2005).

Emissions, discharges and losses

Releases of NP from production processes are estimated to be very low. As a result, very little NP is expected to enter directly into the environment. The primary source for releases of NP to the environment is rather considered to be via NPEs, which can break down into NP after being released into the environment during their production, their formulation into various other products, and the use of such products.

No data are available on riverine loads or atmospheric inputs of nonylphenol to the OSPAR maritime area. Considering its low vapour pressure and tendency to adsorb to soils and sediments it can be expected that atmospheric concentrations will be extremely low. There is no OSPAR monitoring or other international monitoring of discharges and losses of NP, but recent national monitoring data from Sweden and the United Kingdom indicate that releases from diffuse sources, such as from the washing of imported textiles, still continue, and might explain some of the occurrence of NP in the environment.

Conclusions

IMPORTANT SOURCES ARE REGULATED

Implementation of OSPAR and EC measures have led to a nearly complete phase-out of domestic uses of NP/NPEs as cleaning agents and considerable reductions in industrial uses. The main source of releases to the environment is industrial waste water from different land-based industrial activities where it is used as an intermediate. The classification as a priority hazardous substance under the Water Framework Directive implies the development of appropriate measures to phase out discharges, emissions and losses of nonylphenols.

RELEASES MAY STILL CONTINUE – MORE INFORMATION IS NEEDED ON PROGRESS TOWARDS CESSATION TARGET

Quantitative information on releases is very scarce and trend statements cannot be made. However, expert judgement based on information on use indicates that NP/NPEs may still be released to the environment. The existing measures seem to support moving towards the OSPAR cessation target. Further information is necessary to inform of any need for additional efforts to meet the cessation target.

4.6.3 Octylphenol

There are many different potential octylphenol isomers. Commercially, 4-tert-octylphenol is the most important isomer. Octylphenol is very toxic to aquatic organisms, does not easily degrade in the environment, and has the potential to cause significant endocrine disruption effects. It is not bioaccumulative according to the criteria of the EU Technical Guidance Document, but fulfills the PBT criteria used for prioritisation of substances by OSPAR and was included on the OSPAR List of Chemicals for Priority Action in 2000.

Uses, production, and sources

Octylphenol is mainly used as an intermediate in the production of phenol/formaldehyde resins (98% of use) and in the manufacture of octylphenol ethoxylates (2% use). A small amount of the ethoxylates is used to produce ether sulphates. The end uses from the manufacture of these resins, ethoxylates and ether sulphates are various and include for example: tackifier in rubber for tyres, water-based paints, pesticide formulations, and ethoxylated resins used in the recovery of oil in offshore processes.

4-tert-octylphenol is manufactured in the EU at quantities of around 23 000 tonnes per year (Table 4.4). The bulk of this tonnage is used within the EU with only a small percentage being exported. Production is currently carried out at six sites in Europe. Production plants are located in Belgium, France, Germany, Switzerland and the United Kingdom.

Table 4.4 European production volume, exports and imports. The data source is from the OSPAR Background Document on octylphenol.

	Amount (tonnes/year)				
	1997	**1998**	**1999**	**2000**	**2001**
Production volume	17 520	18 259	19 626	22 215	22 633
Exports	234	104	6	0	150
Imports	1 035	1 337	1 240	1 308	375
Tonnage used	**18 051**	**19 492**	**20 928**	**23 523**	**22 858**
Captive use*	14 969	16 074	17 592	19 910	20 060

* used on-site to produce other substances

It is not clear to which extent octylphenol from products reaches the environment. Octylphenol is likely to reach the marine environment via one main route, namely industrial waste waters from different land-based industrial activities where it is used as an intermediate. Other likely pathways investigated are the use of resins produced using octylphenol, the breakdown of ethoxylates to produce octylphenol, and the presence of octylphenol as an impurity in commercially produced nonylphenol.

Measures

There are no specific OSPAR measures or EC measures regulating use or releases of octylphenol. Measures aimed at reducing production and use of NP and NPEs will also have an effect on releases to the environment of octylphenol compounds which may be present as impurities in NPEs. The Detergent Regulation ((EC) No. 648/2004) restricts the use of alkylphenol ethoxylates in detergents (see Section 4.6.2). Octylphenol is classified as a priority substance under the Water Framework Directive; this status was confirmed in the review of Annex X to the Directive (COM 2006)397 final). Use of octylphenol as an ingredient in plant protection products was banned with effect from 2004 by the Commission's decision not to include phenols in Annex I of the Pesticides Directive (91/414/EEC) (Commission Regulation (EC) No. 2076/2002). The Swiss regulation in line with Directive 2003/53/EC on marketing and use restriction for NP/NPEs (see Section 4.6.2) also includes octylphenol and its ethoxylates.

Emissions, discharges and losses

There is no OSPAR monitoring of releases of octylphenol to water or air. There is evidence from national monitoring that the substance has been detected in rivers. Considering its low vapour pressure and tendency to adsorb to soils and sediments it can be expected that atmospheric concentrations will be extremely low.

Conclusions

The main sources are industrial waste water from different land-based industrial activities where it is used as an intermediate. The IPPC Directive (2008/1/EC) applies to production plants. The implementation of measures to control discharges, emissions and losses through the implementation of the Water Framework Directive and marketing and use restrictions agreed for NP/NPEs will also address any octylphenol, but this will not be sufficient to effectively eliminate releases of octylphenol to the environment, namely via industrial waste water. The cessation target will not be met with the existing measures.

4.7 Phthalate esters: dibutylphthalate (DBP), diethylhexyl-phthalate (DEHP)

Phthalates or phthalate esters are aromatic dicarboxylic acids. Dibutylphthalate (DBP) and diethylhexyl-phthalate (DEHP) were added to the OSPAR List of Chemicals for Priority Action in 1998 as part of the group “certain phthalates” which also covered butylbenzyl (BBP), di(isonyl) phthalate (DINP) and di(isodecyl) phthalate (DIDP). Further examination by OSPAR of information about these substances concluded that none of the five phthalates met the OSPAR criteria for PBT substances and that, in general, they did not present a risk to the marine environment with the present level of exposure. However, DBP has the potential to cause endocrine disrupting effects, and DEHP is suspected to have similar properties. DEHP, DBP and BBP are classified in the EU as category 2 carcinogenic, mutagen and reprotoxic (CMR) substances. There is no classification or labelling requirement for DINP and DIDP. Another factor in prioritising DEHP was its extensive use and spread in the environment. The most widely used phthalate plasticisers, DINP and DIDP, were removed from OSPAR’s List of Chemicals for Priority Action and the List of Substances of Possible Concern in 2006 since they are not PBT and there were no indication of endocrine disrupting effects.

Uses, production and sources

Phthalates are used as softeners, adhesives or solvents by a variety of industries. They are mainly used in the polymer industry as plasticizer in PVC and to a lesser extent in the non-polymer industry for different consumer products (sealants, paints, printing inks, cosmetics, coatings of different products such as cars, coils, cables or fabrics *etc*.). Phthalates have been used for decades in very large volumes, of which DEHP made up a major fraction. The market for DEHP has declined very significantly since it has been classified as a category 2 CMR substance. Last year it accounted for only 18% of plasticiser consumption in Europe (Table 4.5).

DBP was produced at three production sites in the EU in 1998 (Germany, the United Kingdom and Italy). It is now thought to be only two European production sites (one in Belgium and one in the Czech Republic). There is no significant import of DBP. There was a clear decreasing trend in the production of DBP from 49 000 tonnes per year in 1994 to 26 000 tonnes in 1998. No updated figures are available for this substance since none of the members of the European Chemical Industry Council (CEFIC) produce it anymore. It is expected that use of this plasticiser may have declined significantly, similar to DEHP, following its classification as a category 2 CMR substance.

DEHP was produced at 18 EU sites in 1998 and at nine sites in 2007. There is no information on the amounts of DEHP imported into or exported from the EU in polymer products (and semi-manufactured products) or in other products.

Table 4.5 Production and consumption in western Europe. Data for 1997/1998 from the OSPAR Background Document. Data for 2007 from ECPI/CEFIC

Substance	**Production, tonnes**		**Consumption, tonnes**	
	1997/1998	**2007**	**1997/1998**	**2007**
DEHP	595 000	173 000**	476 000	140 000
DBP	26 000	NA	18 000	9 000
Total phthalates			900 000*	963 000

* Average annual consumption in 1990 - 1995
** Estimated

Measures

OSPAR is following the development on work on endocrine disruptors in the EU and the OECD. Any potential risk of these chemicals with regard to endocrine disruption will be evaluated in the context of a general approach to endocrine-disrupting substances, which will be based on the outcome of work particularly under the European Community Strategy for Endocrine Disrupters and OECD programmes on testing of chemicals.

DEHP production and releases from production plants is regulated under the IPPC Directive (2008/1/EC). Best available techniques are described in the EC BREF Document on Large Volume Organic Chemical Industry (EC, 2003b).

EC measures regulating the use of phthalates are focused on protection of human health. The EU has restricted the use of phthalates in toys and childcare articles (Directive 2005/84/EC). The concentration of DEHP, DBP and BBP combined should not be higher than 0.1% by mass of the plasticised material in these articles. This is in effect a ban since, in order to plasticise toy or childcare articles, concentrations of phthalates of more than 10% are needed.

The EU risk reduction strategy recommends restricting the use of DEHP in packaging material for food and to consider restricting the use in medicinal devices, in industrial installations for processing polymers, and for producing sealants, adhesives, paints and lacquers (with certain exemptions). It was also concluded that there is a need to limit the risk to aquatic ecosystems and to consider the need for restrictions due to emissions to water from products containing DEHP (EC, 2008e)

The conclusions following the EU risk assessment report under the Existing Substances Regulation (EEC) No. 793/93 for DBP were that no further risk reduction measures were needed.

DBP and DEHP have been nominated for inclusion in the candidate list for authorisation under the REACH Regulation ((EC) No. 1907/2006).

DEHP is confirmed as a priority substance under the EC Water Framework Directive, and as such will be subject to measures to reduce discharges, emissions and losses.

Emissions, discharges and losses

Due to the large quantities used annually and the use pattern in many articles with long service life, large amounts of DEHP are diffusely spread in the environment. DEHP is therefore found in all environmental compartments and in remote areas.

There is no monitoring of discharges or emissions of phthalates. Based on measurements of effluent water from various sources in the late 1990s, including sewage treatment plants, it has been estimated that the total releases to the marine environment of DBP was about 800 tonnes per year, corresponding to 4.5% of the annual consumption in the EU. The total releases of DEHP into the marine environment in 2007 was estimated to be in a range of 1557 to 2768 tonnes per year, reflecting approximately 1 − 2% of the total DEHP consumption in the EU.

Conclusions

A NUMBER OF USES IN CONSUMER PRODUCTS ARE NOT REGULATED

The main concern of OSPAR regarding the phthalates DBP and DEHP is their potential for endocrine disruption. The main source of their releases to the environment is diffuse losses from their use as plasticiser in consumer products. Regulation at EU level has focused on the protection of human health, and only some consumer products have been targeted. Considerations on further restrictions on marketing and use are ongoing in the EU.

MORE INFORMATION IS NEEDED TO CONCLUDE ON PROGRESS TOWARDS CESSATION TARGET

There is lack of data on releases to the environment. Consumption of DBP and DEHP has decreased significantly since 1998, but consumption rates, particularly in respect of DEHP, should continue to be observed in order to monitor progress towards the cessation target.

4.8 Polycyclic aromatic compounds: Polycyclic aromatic hydrocarbons (PAHs)

Polycyclic aromatic hydrocarbons (PAHs) are natural components of coal and oil. They are a group of organic chemicals consisting of molecules with three or more fused benzene rings. They are toxic, persistent and bioaccumulate, especially in invertebrates. Although vertebrates metabolize them, PAHs are reactive compounds, and some are carcinogenic. They were included on the OSPAR List of Chemicals for Priority Action in 1998.

Uses, production and sources

There are only few intended uses of some PAHs as intermediates or in final products. Naphthalene for example serves as intermediate in the chemical industry mainly for insecticides, stabilisators, pharmaceuticals, cosmetic additives and plasticiser. Anthracen is an intermediate product in the manufacturing of paints and plastics. PAHs are also used in certain products for example plastic or rubber handles of tools or in household materials and appliances which are based on polymers. PAHs are also contained in tar which has been widely used in asphalt works, floorings and floor coatings in the past. PAHs containing creosote are used as a wood preservative.

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.

The dominant diffuse sources of inputs to the sea are wood preservatives (creosote-treated timber), 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. 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.

Measures

Specific OSPAR measures targeting emissions, discharges and losses of PAHs focussed on the main industrial PAH sources (see Table 3.1). This includes a suite of Recommendations promoting best available techniques and practices and setting emission and discharge limits for PAHs from aluminium plants, the iron and steel industry, and refineries. Most Contracting Parties reported compliance with those requirements and with recommended Best Available Techniques or BAT described by the EC IPPC BREF documents for those sectors and associated even higher pollution reduction rates and limit values. Latest implementation reporting on OSPAR measures in the aluminium sector for example showed that following closure of facilities and improvement of technology, only four out of the 22 aluminium plants operating in the OSPAR Convention area in 2006 were still using Søderberg technology, the most problematic technique in terms of releases of PAHs; the majority of plants (16) used prebake techniques; two installations used a combination of Søderberg and prebake techniques (OSPAR, 2008d).

OSPAR has also recommended the phase-out of the use of one-component coating systems on inland ships (Recommendation 96/4). Those systems are based on preparations from coal tar pitch and coal tar distillates, containing considerable quantities of PAHs, which have been used in large tonnages for protecting hulls of inland ships from which the substance leached to the marine environment. By 2006, Contracting Parties reported that the use of one-component coal tar systems is almost banned. There are still 12% of inland ships in the Netherlands using such systems which have been obtained abroad and the United Kingdom is making additional efforts to speed up the replacement of one-component systems (OSPAR, 2006g). The measure does not apply in Belgium.

Relevant, but less specific OSPAR measures are the description of Best Available Techniques for large combustion plants and the organic chemical industry to reduce emissions, discharges and losses of hazardous substances, including POPs in general. This is supported by the UN-ECE POP Protocol to the Convention on Long-Range Transboundary Atmospheric Pollution, recommending reducing emissions of PAHs from mobile sources including emission limit values for new vehicles and for fuels, and the UNEP Stockholm POP Convention. Both Conventions have been implemented in the EU by Regulation (EC) No. 850/2004.

Other measures in the EU framework which support the OSPAR cessation target for PAHs, include maximum contents of PAHs in tyres and parts of tyres, and restriction of the use of creosote treated timber and wood in a number of products (*e.g.* for any purpose inside buildings, in toys, playgrounds, parks and outdoor recreational facilities, manufacture of garden furniture and the manufacture, use and treatment of certain containers and packaging material in contact with raw material) (Directive 76/769/EEC). The use of creosote as wood preservative is at present under evaluation under the Biocides Directive (98/8/EC) and a proposal for a non-inclusion decision, triggering the phase-out of this use, is being discussed. Directive 98/70/EC on the quality of petrol and diesel fuels sets a limit value on the content of PAHs in diesel fuels of 11% (wet weight) from 2005. Four product standards for residual solid fuel burning appliances (CEN standards) have been adopted to address emissions of PAH from domestic combustion appliances. EC waste legislation for example on waste incineration, landfill and hazardous wastes is relevant but does not specifically regulate emissions and discharges of PAHs. The status of PAHs as a group and anthracene as priority hazardous substances under the Water Framework Directive (2000/60/EC) has been confirmed in the review of the Annex X to the Water Framework Directive (COM(2006) 397 final).

Emissions to air and atmospheric deposition

Under the UN-ECE POP Protocol, PAHs should be reported as sum of the following four indicator compounds: benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluaranthene, and indeno[1,2,3-cd]pyrene. It is not clear whether this has been consistently followed by Contracting Parties in reporting their emissions to EMEP. The officially reported data suggest additional uncertainties due to missing emission data from Portugal, considerable fluctuations for some time series, and indication that not all sector emissions have been fully and correctly divided up by Contracting Parties for the sub-sectors. The officially reported data need therefore to be interpreted with caution. Against this background, the data suggest total air emissions of PAHs of 1080 tonnes for 2005 with commercial, residential and other stationary combustion (22%), industrial processes (17%) and transport (below 1000 m) (11%) as the main contributors. While the uncertainties in data do not allow a trend analysis, there is still indication that emissions show a diffuse picture and no clear trend, and that emissions might have stagnated or even increased for some Contracting Parties and sectors in the 1998 − 2005.

Atmospheric deposition of PAHs from combustion processes is an important pathway to the North-East Atlantic. Hardly any data on concentrations of PAHs in precipitation have been reported by Contracting Parties as voluntary component of the OSPAR CAMP Programme and a quantification or trend statement cannot be made. A study in 2005 of the available PAH data for 1996 – 2002 showed that concentrations of PAHs in precipitation are characterised by strong variations over the years caused mainly by the variation of meteorological conditions (OSPAR, 2005a).

Discharges, losses and waterborne inputs

The total discharges of PAHs reported by Contracting Parties to EPER under their commitments under the IPPC Directive in 2001 and 2004 are 26.6 and 13.2 tonnes respectively. The reported discharges relate mainly to the metal and the textile industries. While uncertainties in the exact discharge figures for 2001 and 2004 exist due to inconsistencies in reporting and do not allow conclusions on trends, the discharge data still give an indication that discharges from heavily regulated point sources continue.

Riverine inputs of PAHs is an important pathway but hardly any data have been reported by Contracting Parties as voluntary parameter under the OSPAR RID Study and a quantification and trend statement cannot be made.

Data reported by Contracting Parties on the load of PAHs[5] from dumped dredged sediments is incomplete. The reported loads of 29 tonnes, 172 tonnes and 192 tonnes of PAHs for dumped sediments in 2003 – 2005 therefore can only give a very rough indication of magnitudes.

In the offshore industry, PAHs are discharged with produced water, which is water extracted from the reservoir with oil and gas. The water contains various components of the crude oil, including PAHs and any chemicals added during the production/treatment process. In 1998, approximately 26 tonnes of PAHs were discharged with produced water from offshore activities in Norway, of which 24 tonnes were naphthalene. The United Kingdom reported discharges of approximately 64 tonnes of PAHs (including naphthalene) to the sea for 1998. In 2006, discharges of PAHs from offshore activities in Norway were approximately 67 tonnes, of which 63 tonnes were naphthalene. This increase must be seen in relation to the steady increase in the amount of produced water in the offshore industry.

Conclusions

COMBUSTION REMAINS A SOURCE OF CONCERN

The majority of PAHs are released by incomplete combustion of fossil fuels and wood. Sources in industry are the manufacture of aluminium and coke ovens. Emissions may also occur via evaporation or leaching from PAH-containing materials. Point sources have been regulated, but total elimination of PAH releases is impossible. Restriction on the use of creosote treated wood has reduced the importance of this source for diffuse releases of PAHs.

DIFFUSE PICTURE OF TRENDS IN RELEASES

There are still substantial releases to air and water. Data on discharges, emissions and losses of PAH are of poor quality for various reasons. It is not possible to give an overall trend in releases. However, for some sources, reductions have been achieved due to technical improvements *e.g.* in the aluminium production. There is indication that in some sectors and for some Contracting Parties emissions to air might be stagnant or even increasing.

DOUBT OVER WHETHER CESSATION TARGET CAN BE ACHIEVED

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. However, 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. It is therefore doubtful that the cessation of releases can be achieved.

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[5] PAHs are reported as ΣPAH_9 including the following PAHs: anthracene; benzo[a]anthracene; benzo[*ghi*]perylene; benzo[a]pyrene; chrysene; fluoranthene; indeno[1,2,3-*cd*]pyrene; pyrene; phenanthrene.

4.9 Synthetic musks: Musk xylene

Musks are volatile organic substances with a musky scent. They are used as fragrances in cosmetics, detergents, fabric softeners, cleaning products and other household products. Synthetic musks are generally divided into three groups of substances with similar properties but different chemical structures: nitro musks, polycyclic musks and macrocyclic musks. The main nitro musks are musk xylene and musk ketone. The main polycyclic musks are HHCB and AHTN. Musk xylene is a PBT substance according to the OSPAR criteria. Recently, it has been proposed as a very persistent and very bioaccumulative (vPvB) substance under Annex XV of the REACH Regulation (EC) No. 1907/2006. The other synthetic musks are not considered to be PBT substances and the marine risk assessments indicate that musk ketone and the polycyclic musks appear to pose low risks for the marine environment (EC, 2006b; EC, 2008f; EC, 2008g). Musk xylene was added to the OSPAR List of Chemicals for Priority Action in 1998.

Uses, production and sources

Nitro musks are not produced in Europe and production of the polycyclic musks AHTN and HHCB is concentrated at one plant in the EU for each substance. There are significant imports and exports of synthetic musks to and from the OSPAR Convention area, both as pure substances and in finished products. Point source releases from the formulation of products are negligible in relation to the overall diffuse release to the marine environment due to the widespread dispersive use of consumer products containing these substances.

Since the publication of the Background Document on musks in 2000 the International Fragrance Association (IFRA) committed itself to report to OSPAR on the use volumes of the various musk fragrance ingredients with a view to ensuring that the volumes used do not increase in future. Such reporting takes place every 4 years. Currently, musk ketone, musk xylene, HHCB and AHTN represent about 95% of the market in Europe for all nitro musks and polycyclic musks. Overall there is a downward trend in the use of musks, but the volume of musk xylene used as an ingredient in fragrances has been stable in Europe since 1998 (Table 4.6).

Table 4.6 European use of nitro musks and polycyclic musks in tonnes 1995 – 2004.

Substance	**1995**	**1998**	**2000**	**2004**
Musk xylene	110	86	67	83.5
Musk ketone	61	40	35	26
HHCB	1482	1473	1427	1307
AHTN	585	385	358	247
Sum	2238	1984	1887	1663.5

Measures

The use of the musks musk ambrette, tibetane, moskene and AETT has been banned under the Cosmetics Directive (76/768/EEC). Maximum authorised concentrations have been introduced for other nitro musks, including musk xylene, in several finished cosmetic products (1.0% in fine fragrance, 0.4% in eau de toilette, 0.03% in other products). Many manufacturers have withdrawn nitro musks from their products.

The EU risk assessment report and risk reduction strategy for musk xylene, performed in accordance with the Existing Substances Regulation ((EEC) No. 793/93), concluded that more testing was needed before any conclusions on actions could be drawn (EC, 2005b). Musk xylene is listed in the proposed Water Framework Daughter Directive for review for possible identification as a priority substance or a priority hazardous substance. Musk xylene was proposed as a vPvB substance under Annex XV for authorisation under the REACH Regulation ((EC) No. 1907/2006) in August 2008. A decision as to whether musk xylene is actually a candidate for authorisation is expected soon.

Following the discussions on the draft EU risk assessment for the two polycyclic musks AHTN and HHCB a research programme was carried out to generate monitoring data from specific regions as well as toxicity data for sediment organisms and marine organisms. The results were incorporated in the risk assessment reports leading to the final conclusion that “there is at present no need for further information and/or testing and no need for risk reduction measures beyond those which are being applied already”. In its comments the Scientific Committee on Health and Environmental Risks (SCHER) agreed to these conclusions.

Emissions, discharges and losses

Discharges, losses and waterborne inputs

Diffuse discharges to domestic waste water due to the use of musks in consumer products are by far the most important source and can be considered as the only relevant source. The main pathway is via the sewerage system and sewage treatment plants.

A number of surveys of musks in influents and effluents from sewage treatment plants and in sewage sludge in Germany, the Netherlands, Switzerland and the United Kingdom were conducted in 1995 − 2000. Musk xylene was at or below the detection limit in all effluent samples. Long time series are available from Hessen (Germany), showing that the concentrations of musks in effluents and sludge from sewage treatment plants were steadily decreasing over the years 1995 − 2000. The EU risk assessment report on the polycyclic musks AHTN (EC, 2008g) and HHCB (EC, 2008f), reviewing data up to 2007, confirm this trend. A survey in 15 sewage treatment plants in Spain, Italy and Greece in 2004 showed that the levels in these southern European countries were below the earlier levels reported in northern Europe between 1995 and 2000. Occurrence of musk xylene is seldom reported in recent monitoring programmes.

Aquatic inputs to the marine environment

No data are available on emissions and atmospheric loads of musk xylene and other musk fragrance ingredients entering the OSPAR maritime area. Sewage treatment plants remove 90 to 95% of the influent musks and, with further removal from the water phase during its way to the sea, the fraction entering the marine environment will be very low. Musks were detected in surveys of surface waters in Germany, Switzerland, the Netherlands and the United Kingdom in the period 1994 − 2000. The concentrations were highly variable, with higher concentrations clearly related to samples in close proximity to sewage treatment plant discharge points. The concentrations of musk xylene were very low, or below detection limit. This explains the lack of newly published data. Data from Hessen in Germany indicated downward trends in other musks. This was confirmed in the recent EU risk assessment reports on AHTN and HHCB. Recent environmental surveys support the findings of low inputs to the sea indicate that the substance was not detected or only incidentally found at low levels in marine mammals and predatory fish (Wan *et al*.; 2007, Nakata, 2005).

Emissions to air and atmospheric inputs

No data are available on emissions to air and regional atmospheric inputs of musk xylene or other musks. Considering the low vapour pressure and the tendency to adsorb to soils and sediments, atmospheric concentrations are expected to be extremely low.

This is supported by the results of a survey, carried out by TNO (Netherlands Organisation for Applied Scientific Research) on behalf of Greenpeace, of musks in rainwater (actual deposition) from 47 locations in the Netherlands, 2 locations in Germany and 1 in Belgium (Peters, 2003). Musk xylene was not detected in any of the samples (< 2 ng/l). The polycyclic musks HHCB and AHTN were found in almost all samples with concentrations ranging from 7 to 25 ng/l and from < 2 to 19 ng/l respectively.

A screening project of synthetic musk compounds in various environmental compartments in the Nordic countries was carried out in the second half of 2002. Musk compounds were generally not detected in rainwater. Polycyclic musks were detected more frequently and at higher concentrations than the nitro musk compounds (Mogensen *et al*., 2004).

Conclusions

MEASURES ARE STILL UNDER DEVELOPMENT

Musk xylene has been nominated for inclusion in the candidate list for authorisation under the REACH Regulation and listed in the proposed Water Framework Daughter Directive for review for possible identification as a priority substance or a priority hazardous substance.

Based on EC's risk assessments on the polycyclic musks AHTN and HHCB, there is at present no need for further information and/or testing and no need for risk reduction measures for these substances beyond those which are being applied already.

RELEASES TO THE ENVIRONMENT MAY STILL OCCUR

Quantitative information on releases of musk xylene is very scarce and trend statements cannot be made. However, expert judgement based on data on uses suggests that musk xylene still may be released to the environment. Musk xylene is only rarely detected in environmental samples. Environmental observations and information on use volumes for the polycyclic musks AHTN and HHCB in Europe indicate a downward trend, but the reasons for this still need to be established: reasons could include improved sewage treatment or reduced use of musks.

MORE INFORMATION IS NEEDED TO CONCLUDE ON PROGRESS TOWARDS CESSATION TARGET

The limited data available on releases and use of musk xylene do not indicate whether or not the cessation target will be achieved. The outcome of the evaluation of the Annex XV dossier under the REACH Regulation will determine whether marketing and use restrictions are needed for musk xylene. For the other musks, no further information needs were identified except for the continued reporting of use volumes.

5. Conclusions and recommendations

A. Releases to the environment still exist – in general no clear trend statements can be made for the assessment period 1998 – 2006.

The **overall conclusion** is that most hazardous substances that OSPAR identified for priority action (and where, in the past, there was concern that they may reach the marine environment) are or may still be released to the environment. However, for none of these substances, a complete quantitative picture can be presented covering all relevant sources and pathways for the whole Convention area. In most cases, conclusions are based only on qualitative expert judgement (Table 5.1).

For **heavy metals** (cadmium, mercury and lead) quantitative information on atmospheric deposition, riverine inputs, dumping and releases from industrial installations is available. Based on this, it can be concluded that releases of these substances still continue from various sources and they are carried via related pathways to the marine environment. This is not only due to actual production and use but also to production and uses in the past. While overall, trends in releases to air point down or stay at a stable level, emissions of heavy metals in some sectors or for some Contracting Parties are going up. Trends in direct and riverine inputs of heavy metals show substantial decreases with direct discharges forming in general the smaller and diminishing component of overall waterborne inputs. There is indication that through long-range air transport, sources outside the OSPAR Convention area gain relative importance in contributing to airborne inputs to the sea.

The type of information sources on releases for **PAHs** is similar to those for heavy metals, except that no riverine input data are available. Substantial releases of PAH to both air and water continue. There is a diffuse picture of trends in releases and indication that in some sectors and for some Contracting Parties emissions to air from large industrial installations might be stagnant or even increasing.

For **organic tin compounds**, quantification of releases is difficult as there are insufficient data. There is an indication of some minor remaining releases of TBT to water from land-based sources and leaching from antifouling on seagoing ships' hulls. TBT is still present in dredged material dumped into the sea. Releases of organic tin compounds from industrial processes and products also continue.

PCBs and dioxins are still present in emissions to air and in atmospheric deposition despite reductions achieved in the last decade. No or little data are available on PCB and dioxin discharges and losses to the aquatic environment.

For the **other organohalogens** (PFOS, tetrabromobisphenol-A, trichlorobenzenes, brominated flame retardants, and short chained chlorinated paraffins) as well as for **6PPD**, quantitative information on releases is very scarce and trend statements cannot be made. Yet, expert judgement on sources and related measures, and observations of concentrations in the marine environment suggest that releases from the listed organohalogens still take place. For trichlorobenzenes, this judgement is supported by information on the use of the substance in industrial processes. For the brominated flame retardants, the ban of DecaBDE and OctaBDE in the EU and its anticipated worldwide elimination point to expected downward trends of future releases. Similar conclusions can be drawn for PFOS based on the regulatory situation in the EU and worldwide.

Data on releases are scarce for **pesticides** (dicofol, endosulfan, lindane, methoxychlor, PCP and trifluralin), and good time series are not available. Since uses of these substances are either banned or restricted, monitoring of these substances takes place to a limited extent, mainly looking at long-range air transport. The limited data available indicate a downward trend and low concentrations in the samples. Present remaining uses of dicofol and trifluralin in Europe result in releases to the environment. Long-range air transport of lindane, endosulfan and dicofol used in other parts of the world account for inputs to the North-East Atlantic. Import into the OSPAR Convention area of textiles and wood treated with lindane and PCP is also a remaining source of releases via waste streams.

For **pharmaceuticals** (clotrimazole), **phenols** (2,4,6-tri-tert-butylphenol, nonylphenols and octylphenol), **phthalates** and **musk xylene**, quantitative information on releases is very scarce and trend statements cannot be made. However, expert judgement based on limited data on use, sales and import and export suggests that those substances still may be released to the environment. For **neodecanoic acid, ethenyl ester** no information has been collected and no assessment has been made so far by OSPAR; an OSPAR background document is expected in 2009.

OSPAR's List of Chemicals for Priority Action also includes **substances which are intermediates in closed systems and/or for which there is no current production and use interest**. These substances have rankings in terms of persistency, liability to bioaccumulate and toxicity which are of equal concern as the other substances on the list. To the best of OSPAR's knowledge, on the basis of information from industry, OSPAR confirms in 2008 that these substances

1. are still produced and used exclusively as an intermediate in closed systems in the production of other substances, under conditions where the safeguards applied are sufficient to avoid reasonable concerns that discharges, emissions or losses of the substance could reach the marine environment.

or

2. that there is no current production or use in the OSPAR Contracting Parties.

B. The cessation target has not been achieved yet – efforts are necessary to (further) implement existing measures.

As releases of all chemicals of Part A of the OSPAR List of Chemicals for Priority Action are still observed, **it can be concluded that the 2020 cessation target for their emissions, discharges and losses has not yet been achieved.** Since 1998, several measures have been adopted and are (further) implemented to address releases to the environment. This includes measures adopted by OSPAR and, in recent years, more and more measures developed within the EU framework. These measures address releases to air and water from large industries and the marketing and use of various products containing hazardous substances. Important measures taken in other international frameworks include for example the UNEP Convention on Persistent Organic Pollution, the IMO Convention on antifouling systems banning the use of organotins on ships, and the Rotterdam Convention on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade.

There are various reasons for not yet having achieved the OSPAR cessation target. **Measures** are not always meant to achieve full cessation of releases (*e.g.* application of BAT by large industrial installations is meant to reduce and not fully ban releases). Furthermore, some measures are **not yet fully implemented**. In a few cases, it is judged that the existing measures do **not address all relevant (diffuse) sources** (mainly heavy metals, organohalogens and PAHs). For some substances, marketing and use measures are **still under development within the EU framework** as risk assessments have only recently been finalised (*e.g.* organotins in consumer products, some phthalates and musk xylene). Where restrictions are agreed, releases from products may go on for many more years due to the long life-time of products containing these substances. Therefore, attention is needed in OSPAR and EU legislation for addressing these substances in **waste** streams (*e.g.* waste (water) treatment, incineration, overflows, dredged material).

Releases of at least nine (groups of) OSPAR priority chemicals are also subject to the cessation target laid down in the **EU Water Framework Directive** (2000/60/EC) and releases of seven other (groups of) OSPAR priority chemicals are subject to further substantial reduction under the same Directive. Moreover, all OSPAR substances are addressed through the Water Framework Directive requirement to achieve good status in water bodies. The full implementation of the Water Framework Directive will therefore considerably contribute to the achievement of OSPAR's cessation target. Where OSPAR substances are not subject to the reduction and cessation objectives of the Water Framework Directive, attempts should be made to bring these substances to the attention of the EU in the review process of the list of priority (hazardous) substances of the Water Framework Directive.

As a consequence of action and regulations within the EU, marketing and use have ceased or will cease for all **pesticides and biocides** on the OSPAR List of Chemicals for Priority Action. Therefore, it can be anticipated that the cessation target will be reached for those substances.

For three substances – **6PPD, 2,4,6 *tri-tert*-butylphenol and neodecanoic acid, ethenyl ether** - no action is yet foreseen outside OSPAR for the development of regulatory or control measures. For these three substances, more information needs to be collected and assessed by OSPAR to find out the right direction of action within OSPAR and in other relevant organisations.

C. How to achieve the cessation target by 2020 – recommendations for further efforts

It is expected that, based on the implementation of existing measures, the cessation target is likely to be met for eight OSPAR priority chemicals by 2020, i.e. for the six pesticides, the short chained chlorinated paraffins and the nonylphenol ethoxylates. For all other substances, further efforts are necessary to assess and achieve the cessation target (Table 5.1), since (implementation of) existing measures do not automatically result in the cessation of releases and/or no adequate measures exist.

During the last decade, frameworks and instruments have been developed within the EU to address pollution from (land-based) sources in an adequate and legally binding way. Therefore, further efforts on measures mainly concern the support by OSPAR Contracting Parties of development and adoption of such measures within the EU and the EEA and their proper implementation. OSPAR's role here is a watching brief on EU developments contributing to OSPAR's cessation target. Developments that need to be assessed are:

- the implementation of the Water Framework Directive, especially the adoption of the Daughter Directive on priority substances and the review of the list of priority substances;
- the implementation of Marine Strategy Framework Directive;
- the implementation of the REACH Regulation and adoption of related marketing and use restrictions;
- the further implementation of the IPPC Directive addressing releases from large industrial installations;
- the EU Strategy on dioxins and PCBs;
- the further refinement and implementation of waste regulation;
- the implementation of (revised) pesticide regulations;
- the implementation of directives on air quality and emission ceilings;
- further development and implementation of the European Pollution Release and Transfer Register (E-PRTR).

Developments in the UN frameworks addressing antifoulings (under IMO) and POPs (under UNEP and UN-ECE) should also be followed and assessed.

As already indicated, more effort is also needed to collect and assess further information (within and outside OSPAR) to be able to check progress in achieving the cessation target via the further implementation of the OSPAR monitoring strategies for the OSPAR priority chemicals. For three substances, it is still necessary to collect and assess basic information to find out the right direction of action for moving towards the cessation target.

Table 5.1 Summary of conclusions for each OSPAR priority chemical on continued releases to the marine environment, expected effectiveness of existing measures and additional efforts needed to achieve the cessation target by 2020.

Conclusions on continued releases to the environment are based on:
● = quantitative data and expert judgement of qualitative information; ⦿ = expert judgment of qualitative information.

Expected delivery of the cessation target through existing efforts by 2020:
Yes:: existing measures fit to enable meeting the cessation target without major additional efforts;
No: achieving the cessation target depends on considerable efforts to strictly and fully implement measures and to adopt additional measures, mainly within the EU framework;
? = more information needed to inform right direction of action within OSPAR and in other international organisations.

Substance	**Conclusions on continued releases based on:**	**Are existing efforts expected to deliver the cessation target?**	**Conclusions and recommendations: What to do next?**
Cadmium	●	**No**	▪ Implement EC Water Framework Directive for heavy metals ▪ Improve technology to support further reductions *e.g.* in combustion processes. ▪ Assess uses in products not yet regulated and the need for action
Lead and organic lead compounds	●	**No**	
Mercury and organic mercury compounds	●	**No**	
Organic tin compounds	⦿	**No**	▪ Complete implementation of IMO Convention on antifouling systems ▪ Implement EC Water Framework Directive for TBT ▪ Adopt measures as follow-up to EU risk assessment on organotins in consumer products
Neodecanoic acid, ethenyl ether		?	▪ No assessment made yet (preparation of OSPAR background document with agreed actions in progress)
PFOS	⦿	**No**	▪ Implement recently adopted EU marketing and use measures ▪ Assess effectiveness of those measures to inform direction of further actions ▪ Support measures under the Stockholm POP Convention and the UN-ECE POP Protocol
Tetrabromobisphenol-A	⦿	**No**	▪ Support EU marketing and use measures currently under development
Trichlorobenzenes	⦿	**No**	▪ Assess effectiveness of EU marketing and use measures to inform direction of further actions ▪ Implement EC Water Framework Directive for trichlorobenzenes
Brominated flame retardants	⦿	**No**	▪ Implement EC Water Framework Directive for all brominated flame retardants ▪ Promote additional measures in the EU on DecaBDE and HBCD ▪ Implement of Directive 2002/95/EC on the use of hazardous substances in electrical and electronic appliances ▪ Support measures under the Stockholm POP Convention and the UN-ECE POP Protocol
Polychlorinated biphenyls (PCBs)	●	**No**	▪ Address remaining releases (*e.g.* unintended production) within EU framework
Polychlorinated dibenzodioxins and dibenzofurans (PCDDs, PCDFs)	●	**No**	▪ Address remaining releases through EU Strategy on dioxins and PCBs
Short chained chlorinated paraffins	⦿	**Yes**	
4-(dimethylbutylamino) diphenylamine (6PPD)	⦿	?	▪ Collect and assess information to inform right direction of actions
Dicofol	⦿	**Yes**	
Endosulfan	⦿	**Yes**	
HCH isomers (lindane)	⦿	**Yes**	
Methoxychlor	⦿	**Yes**	
Pentachlorophenol (PCP)	⦿	**Yes**	
Trifluralin	⦿	**Yes**	
Clotrimazole	⦿	**No**	▪ Implement the EC regulatory framework ▪ Assess effectiveness of measures by means of a one-off survey in effluents of waste water treatment plants to inform right direction of actions
2,4,6-tri-*tert*-butylphenol	⦿	?	▪ Collect and assess information to inform right direction of actions
Nonylphenol-ethoxylates	⦿	**Yes**	
Octylphenol	⦿	**No**	▪ Assess whether measures for nonylphenol-ethoxylates will result in the cessation of octylphenol to inform right direction of actions
Phthalates: dibutylphthalate (DBP), diethylhexyl-phthalate (DEHP)	⦿	**No**	▪ Implement EC Water Framework Directive for DEHP ▪ Support marketing and use measures for DEHP in EU ▪ Collect and assess recent information on production, sales, import and export for DEHP and DBP to inform direction of actions
Polycyclic aromatic hydrocarbons (PAHs)	⦿	**No**	▪ Additional effort necessary as present measures do not automatically lead to cessation by 2020, especially the increase of emissions to air needs to be addressed. ▪ Full implementation of Water Framework Directive obligations for PAHs
Musk xylene	⦿	**No**	▪ Need to assess: ▪ effectiveness of EU marketing and use measures in development ▪ outcome of the evaluation of the REACH Annex XV dossier ▪ effectiveness of the outcome of the evaluation under the EQS Directive (under WFD) by one-off survey in effluents of waste water treatment plants.

6. References

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6.2 OSPAR Background Documents on substances on the list of chemicals for priority action

OSPAR Background Document on:

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- certain brominated flame retardants – polybrominated diphenylethers, polybrominated biphenyls, hexabromo cyclododecane (2004 update). OSPAR Commission, London. Publication 135/2001, 24 pp.
- clotrimazole (2005). OSPAR Commission, London. Publication 199/2005, 38 pp.
- dicofol (2004 update). OSPAR Commission, London. Publication 150/2002, 28 pp.
- endosulphan (2004 update). OSPAR Commission, London. Publication 149/2002, 42 pp.
- lead including (1) OSPAR Background document on possibilities of reducing lead in paints (published 2003), (2) OSPAR Background document on possibilities of reducing lead in PVC (published 2003) (2004 update). OSPAR Commission, London. Publication 148/2002, 24 pp.
- lindane (2004 update). OSPAR Commission, London. Publication 153/2002, 44 pp.
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7. Glossary and acronyms

ABS	Acrylonitrile-Butadiene-Styrene
AFS Convention	2001 IMO International Convention on the Control of Harmful Antifouling Systems on Ships. Entry into force on 17 September 2008. (http://www.imo.org)
acaricide	Chemicals which kill and control mites and ticks
barite	A nonmetallic mineral used primarily as a weighting agent in drilling muds in the oil and gas industry
BAT	'Best Available Techniques' means the latest stage of development (state of the art) of processes, of facilities or of methods of operation which indicate the practical suitability of a particular measure for limiting discharges, emissions and waste
BEP	'Best Environmental Practice' means the application of the most appropriate combination of environmental control measures and strategies
bioaccumulation	The accumulation of a substance within the tissues of an organism. This includes 'bioconcentration' and uptake via the food chain.
biocide	Chemical used to kill living organisms for other purposes than for plant protection
Biocides Directive	Directive 98/8/EC of the European Parliament and of the Council of 16 February 1998 concerning the placing of biocidal products on the market, OJ L 123, 24.4.1998, p. 1, as amended (*cf.* http://eur-lex.europa.eu for latest consolidated version)
BFR	'Brominated Flame Retardants' covers a range of brominated chemicals used for example in plastics and other products to reduce the potential for burning
BREF	'Background reference Document' describing BAT in relation to activities covered by the EC Integrated Pollution Prevention and Control (IPPC) Directive (91/61/EEC, recently codified as 2008/1/EC)
BSEF	Bromine Science and Environmental Forum (http://www.bsef.com)
CAMP	OSPAR Comprehensive Atmospheric Monitoring Programme (OSPAR agreement 2001-7, as amended)
CEMP	OSPAR Co-ordinated Environmental Monitoring Programme (lasted update OSPAR agreement 2008-8)
CEFIC	European Chemical Industry Council (http://www.cefic.be)
CMR	Chemicals which are 'Carcenogenic, Mutagen and Retrotoxic'
COMMPS	Combined Monitoring-Based and Modelling-Based Priority Setting
Contracting Parties	The 16 OSPAR Contracting Parties comprise the states Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom, and the European Community
Cosmetics Directive	Council Directive 76/768/EEC of 27 July 1976 on the approximation of the laws of the Member States relating to cosmetic products, OJ L 262, 27.9.1976, p. 169, as amended (*cf.* http://eur-lex.europa.eu for latest consolidated version)
demulsification	To break down (an emulsion) into separate substances incapable of re-forming the emulsion that was broken down
EBFRIP	European Brominated Flame Retardant Industry Panel (http://www.ebfrip.org)

EEA	'European Economic Area' was created by Agreement entering into force on 1 January 1994. It associates the EFTA States Iceland, Liechtenstein and Norway with the European Community to participate in the Internal Market on the basis of the application of the relevant *acquis communautaire*. All new relevant Community legislation is dynamically incorporated into the Agreement and thus applies throughout the EEA
EC	European Community
ECPI	European Council for Plasticisers and Intermediates (http://www.ecpi.org)
EMEP	Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe
endocrine disrupting properties	An exogenous substance that causes adverse health effects in an intact organism, or its progeny, consequent to changes in endocrine function. In applying this definition to the marine environment it will be necessary to consider substances that are likely directly or indirectly to affect the hormonal regulation in whole organisms by the mimicking of hormones or by affecting enzyme systems responsible for hormone equilibria
EPER	'European Pollutant Emission Register' set up by Commission Decision 2000/479 to meet the requirements of the EC Integrated Pollution Prevention and Control (IPPC) Directive. EPER will be replaced by E-PRTR.
E-PRTR	'European Pollutant Release and Transfer Register' set up by Regulation (EC) No. 166/2006 in order to implement the requirements of the UN-ECE Protocol on Pollutant Release and Transfer Registers
EU	European Union
HCB	Hexachlorbenzol
hazardous substances	For the purpose of the OSPAR Hazardous Strategy, substances which fall into one of the following categories: (i) substances or groups of substances that are toxic, persistent and liable to bioaccumulate; or (ii) other substances or groups of substances which are assessed by OSPAR as requiring a similar approach as substances referred to in (i), even if they do not meet all the criteria for toxicity, persistence and bioaccumulation, but which give rise to an equivalent level of concern
hypothyroidism	Occurs when the thyroid gland does not produce enough thyroid hormones
IMO	International Maritime Organisation (http ://www.imo.org)
IPPC Directive	Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control (codified version), OJ L 24, 29.1.2008, p. 8. This codifies the IPPC Directive (91/61/EEC)
IUCLID	International Uniform Chemical Information Database
JAMP	OSPAR Strategy for a Joint Assessment and Monitoring Programme (OSPAR agreement 2003-22)
LRTAP	1979 UN-ECE Convention on Long-Range Transboundary Air Pollution. Entry into force in 1983. (http://www.unece.org)
Marine Strategy Framework Directive	Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive), OJ L 164, 25.6.2008, p. 19, as amended (*cf.* http://eur-lex.europa.eu for latest consolidated version)

Marketing and Use Directive	Council Directive 76/769/EEC of 27 July 1976 on the approximation of the laws, regulations and administrative provisions of the Member States relating to restrictions on the marketing and use of certain dangerous substances and preparations, OJ L 262, 27.9.1976, p. 201, as amended (*cf.* http://eur-lex.europa.eu for latest consolidated version)
MRL	Maximum Residue Limit
NaPCP	sodium pentachlorophenate
OECD	Organisation for Economic Co-operation and Development (http://www.oecd.org)
OECD HPV Chemicals Programme	Initial assessment of high production volume chemicals to screen them and agree on the need for further work under the OECD
organohalogens	Substances in which an organic molecule is combined with one or more of the halogen group of elements (i.e. fluorine, chlorine, bromine, iodine)
OSPAR Convention	Convention for the Protection of the Marine Environment of the North-East Atlantic, was opened for signature on 22 September 1992 and entered into force on 25 March 1998. It replaces the Oslo Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft signed in Oslo on 15 February 1972, and the Paris Convention for the Prevention of Marine Pollution from Land-based Sources, signed in Paris on 4 June 1974
OSPAR maritime area	The maritime area of the OSPAR Convention is divided into five regions: Region I – Arctic Waters, Region II – Greater North Sea, Region III – Celtic Seas, Region IV – Bay of Biscay and Iberian Coast and Region V – Wider Atlantic
OSPAR priority chemicals	Substances listed on the OSPAR List of Chemicals for Priority Action (OSPAR agreement 2004-12)
PARCOM	Paris Commission established under the Paris Convention for the Prevention of Marine Pollution from Land-based Sources. Decisions and Recommendations of the Paris Commission form an integral part of the *acquis* of the OSPAR Convention
PBT criteria	The intrinsic properties of individual substances, specifically whether they are persistent (P), toxic (T) or liable to bioaccumulate (B), determine whether they fall within the definition of hazardous substances given in the OSPAR Strategy with regard to Hazardous Substances
PCP	pentachlorophenol
PCPL	pentachlorophenyl laurate
PERFORCE	PERFluorinated Organic Chemicals in the European environment, research project under the 6th EC framework programme (2004 – 2006); http://www.science.uva.nl.perforce
PFOS	perfluorooctane sulphonate
pesticide	Chemicals used to kill pests on plants
Pesticides Directive	Council Directive 91/414/EEC of 15 July 1991 concerning the placing of plant protection products on the market, OJ L 230, 19.8.1991, p. 1, as amended (*cf.* http://eur-lex.europa.eu for latest consolidated version)
pg	pico gramme (10^{-12})
PIC	Prior Informed Consent procedure (Rotterdam Convention)
POP	Persistent Organic Pollutants
ppm	parts per million; unit used for relative concentrations
pyrethroids	Insecticidal chemicals

REACH Regulation	Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, OJ L 136, 29.5.2007, p. 3, as amended (*cf.* http://eur-lex.europa.eu for latest consolidated version)
RID	OSPAR Comprehensive Study on Riverine Inputs and Direct Discharges (OSPAR agreement 1998-5)
Rotterdam Convention	1998 Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. Entry into force on 24 February 2004. (http://www.pic.int)
Stockholm POP Convention	2001 UNEP Stockholm Convention on Persistent Organic Pollutants. Entry into force 18 February 2004. (http://www.pops.int)
TBBP-A	tetrabromobisphenol-A
TBT	tributyltin
TEQ	Toxic EQuivalent scheme
Technical Guidance Document	The Technical Guidance Document provides technical and scientific support for EU Member States and industry in assessing the risks of new and existing chemical substances to humans (workers, consumers, man indirectly exposed via the environment) and the environment (aquatic and terrestrial, micro-organism and predators)
TNO	Netherlands Organisation for Applied Scientific Research (http://www.tno.nl)
TPT	triphenyl tin
UN-ECE	United Nations Economic Commission for Europe (http://www.unece.org)
UN-ECE POP Protocol	1998 Protocol on Persistent Organic Pollutants, which was adopted as a protocol to the Convention on Long-Range Transboundary Air Pollution. Entry into force on 30 December 2003. (http://www.unece.org)
UNEP	United Nations Environmental Programme (http://www.unep.org)
VECAP	Voluntary Emissions Control Action Programme of the brominated flame retardant industry (http://www.bsef.com)
Veterinary Medicines Directive	Directive 2001/82/EC of the European Parliament and of the Council of 6 November 2001 on the Community code relating to veterinary medicinal products, OJ L 311, 28.11.2001, p. 1, as amended (*cf.* http://eur-lex.europa.eu for latest consolidated version)
Water Framework Directive	Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, OJ L 327, 22.12.2000, p. 1, as amended (*cf.* http://eur-lex.europa.eu for latest consolidated version)

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OSPAR's vision is of a clean, healthy and biologically diverse North-East Atlantic used sustainably

ISBN 978-1-905859-93-1
Publication Number: 354/2008