EUROPEAN
COMMISSION

Brussels, 16.9.2022
SWD(2022) 291 final

COMMISSION STAFF WORKING DOCUMENT

Union Synthesis Report on the application of Regulation (EC) No 850/2004 on persistent organic pollutants

Accompanying the document

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

on the application of Regulation (EC) No 850/2004 on persistent organic pollutants

{COM(2022) 463 final}

Table of contents

Tables

Figures

Preface

This document presents the European Union synthesis report on the application of Regulation (EC) No 850/2004[1] on persistent organic pollutants in accordance with Article 12(6). The report will also be the basis for the reporting by the Union required by the Stockholm Convention on Persistent Organic Pollutants (POPs), of which the European Union (the "Union") is a Party. As requested in Article 12(6) of Regulation (EC) No 850/2004, this report integrates the information available from the European pollutant release and transfer register (E-PRTR)[2], the CORINAIR Emission Inventory of EMEP[3] and the information provided by Member States under Article 12(1-3). Regulation (EC) No 850/2004 has been repealed and replaced by Regulation (EU) 2019/1021 on persistent organic pollutants as of 15 July 2019 (entry into force of Regulation (EU) 2019/1021), which has modified provisions on the monitoring of implementation.

Three previous synthesis reports were published:

In 2009 the first synthesis report[4], covering the period from 2004 to 2006.

In 2011 the second synthesis report[5], covering the period from 2007 to 2009.

In 2021 the third synthesis report[6], covering the period 2010 to 2012.

This document presents the fourth synthesis report, covering the period from 2013 to 2015. Due to the reporting period, the report is still based on the reporting obligations under Regulation (EC) No 850/2004 and includes the United Kingdom. The report includes the Member States' triennial reports for 2013-2015, Member States Annual reports for 2013, 2014, and 2015 as well as the most recent available data from E-PRTR and EMEP CORINAIR emission inventories (2013–2015).

A summary of this synthesis report is submitted to the European Parliament, to the Council and is made publicly available.

[1] In 2019 the POP Regulation was recast (EU 2019/1021) with changes made in particular to the reporting requirements of both the European Commission and Member States. This report covers the period from 2013-2015 to fulfil the reporting requirements of the original POP Regulation (EC 850/2004) for obligations under Article 12(6) which predate the recast.

[2] https://prtr.eea.europa.eu/

[3] Cooperative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe)

[4] https://ec.europa.eu/environment/chemicals/international_conventions/pdf/syntesis_report.pdf

[5] https://ec.europa.eu/environment/chemicals/international_conventions/pdf/syntesis_report2.pdf

[6] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021SC0053

1. 1. Introduction and background

Persistent Organic Pollutants (POPs) are chemicals that persist in the environment, bio-accumulate and pose a risk of causing significant adverse effects to human health or the environment. These pollutants are transported across international boundaries far from their sources and even accumulate in regions where they have never been used or produced. POPs pose a threat to the environment and to human health all over the globe, with the Arctic, Baltic and the Alpine regions being examples of EU sinks of POPs. Because of the concern posed by POPs, international agreements were established to address their emissions:

- The UNECE Protocol on POPs ("POPs Protocol"), adopted on 24 June 1998 in Aarhus as part of the Convention on Long Range Transboundary Air Pollution (CLRTAP)[7];and
- The Stockholm Convention[8] on POPs, adopted in 2001 and which entered into force in 2004.

The European Union (the "Union") adopted Regulation (EC) No 850/2004[9] (hereafter called the "POP Regulation") as a legal instrument for the implementation of both the Stockholm Convention and the POPs protocol[10].

The POP Regulation contains provisions regarding production, placing on the market and use of POPs, management of stockpiles and wastes and measures to reduce unintentional releases of POPs. Identified POPs are listed in three Annexes (Annex I – banned, Annex II – restricted, Annex III – unintentionally released POPs). The POP Regulation contains provisions requiring the setting up of emission inventories for unintentionally produced POPs, national and Union implementation plans and monitoring and information exchange mechanisms. It also includes provisions for waste management and the development of thresholds for POPs within waste, which are detailed in Annexes IV and V of the Regulation.

Since its creation, the POP Regulation has been amended a number of times, mainly to incorporate new substances into its Annexes.

- In 2009 Regulation (EC) 304/2009[11] amended the POP Regulation to update the accepted toxic equivalent factors used for dioxins and furans; and
- In 2010 Regulation (EC) 757/2010[12] amended the Annexes of the POP Regulation to include nine new substances, following their addition to the Stockholm Convention; this notably included poly brominated diphenyl ethers (PBDEs[13]) and perfluorooctane sulfonic acid and its derivatives (PFOS).

[7] http://www.unece.org/env/lrtap/pops_h1.html
[8] http://www.pops.int/
[9] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:158:0007:0049:EN:PDF
[10] The two international treaties covering POPs differ slightly on the set of named substances included within their Annexes. The key difference is that Poly Aromatic Hydrocarbons (PAHs) are covered under the POPs Protocol but not under the Stockholm Convention.
[11] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:096:0033:0036:EN:PDF
[12] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:223:0029:0036:EN:PDF
[13] Polybrominated diphenyl ethers are a family of chemicals with multiple different species included under the same title. The Stockholm Convention has recognised specific species within this family as meeting the requirements under Annex D of the Convention for inclusion within the Convention Annexes. Only these named species (tetra, penta, hexa and hepta) are recognised as POPs under both the Stockholm Convention and

- In 2012 Commission Regulation (EU) No 519/2012[14] further amended the Annexes to add another four substances, including endosulfan (as added to the Stockholm Convention) and hexachlorobutadiene, polychlorinated naphthalenes (PCNs) and short chained chlorinated paraffins (SCCPs) (as added to the POPs Protocol).
- In 2014 Commission Regulation (EU) No 1342/2014[15] amended Annex V to provide new details on the critical thresholds for POPs substances within waste.
- In 2015 Commission Regulation (EU) 2015/2030[16] amended Annex I to remove the exemption for SCCPs in conveyor belts.
- In 2016 Commission Regulation (EU) 2016/293[17] further amended Annex I to add hexabromocyclododecane to the POPs Regulation; and
- Also, in 2016, under Commission Regulation (EU) 2016/460[18] Annexes IV and V of the POPs Regulation were amended to add hexabromocyclododecane to the waste annexes, including a critical threshold.

Article 12 of Regulation (EC) 850/2004 covers the reporting requirements for Member States under the POP Regulation. Member States need to report annually, providing statistical data on the production and placing on the market of Annex I and Annex II substances. Every three years, Member States need to report to the European Commission summary information:

- From stockpiles notifications, received pursuant to Art. 5(2).
- From release inventories, established pursuant to Art. 6(1); and
- On dioxins furans and PCBs unintentionally released into the environment, compiled pursuant to Art. 9.

Such information, as received from Member States, is summarised in this report.

Note that the POP Regulation was recast in June 2019 (Regulation (EU) 2019/1021) of the European Parliament and of the Council[19]). The recast POP Regulation includes changes to the reporting requirements of the regulation. This report is provided to fulfil the reporting requirements under Regulation (EC) 850/2004 prior to the recast.

It should be noted that Regulation (EC) No 850/2004 contains a Commission specific reporting obligation under Article 12(6), which does not exist anymore, as there is no corresponding provision in Regulation (EU) 2019/1021. However, the Commission nonetheless considers appropriate to adopt a report covering the period 2013-2015 based on the Member States reporting in accordance with Regulation (EC) No 850/2004 since such report serves the objectives of Regulation (EU) 2019/1021 as regards the monitoring of the progress made in eliminating the use and releases of POPs.

EU POP Regulation. For the purposes of this report, the terms 'PBDEs' and 'polybrominated diphenyl ethers' refer only to those substances included within the Stockholm Convention and EU POP Regulation.

[14] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:159:0001:0004:en:PDF

[15] http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32014R1342&from=EN

[16] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015R2030&from=en

[17] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0293&from=GA

[18] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0460&from=EN

[19] https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:32019R1021

2. 2. Approach to update and structure of this document

2.1 2.1 Structure of the report

The POP Regulation covers the cradle to grave management of substances included in Annexes I, II and III of the Regulation. It adopts a life-cycle approach to systematically manage the POPs at each stage of their life. This includes administrative procedures for assessing the enforcement of the Regulation and exchange of information between different Member States.

Article 12 reporting requirements for Member States largely follow the order of the articles set out within the regulation. One possible exception is that the reporting requirements do not specifically ask about plans to avoid POPs within wastes as per Article 7 of the regulation. Instead, this information is captured more broadly within the reporting template for minimisation measures of Annex III substances and questions around the National Implementation Plan. In the past, POPs waste mostly covered the legacy of PCB-containing di-electric equipment, reported under the PCB directive 96/59/EC, as well as the final management options for obsolete pesticides. In recent years, the scope of POPs waste started to be enlarged due to the listing of new POPs.

Table 2.1 provides a description of the structure of this report. Each chapter refers to the main articles of the POP Regulation. This structure has been chosen to keep continuity with the previous synthesis reports for ease of review and comparison.

2.2 2.2 Sources of information

The main sources of information used to compile information for the period 2013-2015 include:

- Annual reports from 2013, 2014, 2015 by Member States;
- Triennial reports for the period 2013-2015 by Member States;
- National Implementation Plans by Member States;
- Notification of derogations (where relevant);
- Notification of penalties (where relevant);
- First, Second and Third synthesis reports;
- E-PRTR data;
- CORINAIR EMEP data;
- Monitoring data from EMEP and MSC-East;
- Monitoring data from the Arctic Monitoring and Assessment Programme (AMAP);
- EMEP Webdab data.

The information submitted by the Member States Competent Authorities (MSCAs) on an annual and triennial basis is the core of this report. The additional sources quoted above are used as supplementary information.

Table 2.2 provides a breakdown of the information provided by MSCAs and is used in the current synthesis report.

Table 2.1 Structure of this document

Article and title of Regulation	Chapter and title of Synthesis Report	Description of what each chapter contains
-	1. Introduction and background	Background to the POP Regulation and related international work
-	2. Approach to update and structure of this document	Structure of this document and key reference data used
Art. 3 Control of production, placing on the market and use	3. Production	Production of Annex I and Annex II substances
Art 4 Exemptions from control measures	4. Placing on the market	Placing on the market and use of Annex I and Annex II substances. Exemptions utilised as part of Article 4 of the regulation
Art. 5 Stockpiles	5. Stockpiles	Stockpiles of PCB in di-electric equipment, obsolete pesticides and phase out substances
Art. 7 Waste Management	6. Waste management and storage	Waste management options, contaminated land, and derogations under the regulation
Art. 6 Release reduction, minimisation, and elimination; Art 9 Monitoring	7. Environmental releases	Identification of sources, emission inventories, environmental monitoring programmes and environmental concentrations
Art. 8 Implementation plans	8. Control measures	Status of national implementation plans and action on POPs
Art. 10 Information exchange; Art 11 Technical assistance	9. Activities to promote knowledge exchange	Activities for knowledge exchange, public awareness and involvement and provision of technical and financial assistance
Art. 13 Penalties	10. Dissuasive measures: Law infringements and penalties	Infringements and penalties as part of enforcing the regulation in Member States
-	11 Conclusions and recommendations	Summary of the preceding sections and key findings

Table 2.2 Reports provided by Member States

Member State	Annual report 2013	Annual report 2014	Annual report 2015	Triannual report 2013-2015
(BE) Belgium	✓	✓	✓	✓
(BG) Bulgaria	✓	✓	✓	✓
(CZ) Czechia	✓	✓	✓	✓
(DK) Denmark	✓	✓	✓	✓
(DE) Germany	✓	✓	✓	✓
(EE) Estonia	✓	✓	✓	✓ (2012-2014)
(IE) Ireland	✓	✓	✓	✓
(EL) Greece				
(ES) Spain	✓	✓	✓	✓
(FR) France	✓	✓	✓	✓
(HR) Croatia	✓	✓	✓	✓
(IT) Italy				
(CY) Cyprus	✓	✓	✓	✓
(LV) Latvia	✓	✓	✓	✓
(LT) Lithuania	✓	✓	✓	
(LU) Luxemburg	✓	✓	✓	✓ (2012-2014)
(HU) Hungary				
(MT) Malta				
(NL) Netherlands	✓	✓	✓	✓ (2012-2014)
(AT) Austria	✓	✓		✓
(PL) Poland	✓	✓	✓	✓
(PT) Portugal	✓	✓	✓	✓
(RO) Romania	✓	✓	✓	✓
(SI) Slovenia	✓	✓	✓	✓
(SK) Slovakia	✓	✓	✓	✓
(FI) Finland	✓	✓	✓	✓
(SE) Sweden	✓	✓	✓	✓
(UK) United Kingdom	✓	✓	✓	✓ (2012-2014)

Alongside the Member States' reporting, the national implementation plans provide information on national issues on POPs and the actions foreseen at national level. The POP Regulation states in Article 8(2):

"As soon as a Member State has adopted its national implementation plan in accordance with its obligation under the (Stockholm) Convention, it shall communicate it both to the Commission and to the other Member States".

Moreover, in Article 7(1)b the Stockholm Convention states that parties will develop a national implementation plan and communicate it to the Secretariat of the Convention within two years of entry into force[20]. Subsequent updates of the national implementation plan are required, but the frequency is not specifically indicated in the POP Regulation or in the Stockholm Convention.

The inclusion of nine new substances in the annexes of the POP Regulation in 2010 (Regulation (EC) 757/2010) highlighted the importance of updating the national implementation plans. This is important because the majority of the original 12 POPs included in the Convention and in the POP Regulation are obsolete pesticides, while the new substances added in 2010 are mainly industrial chemicals. In 2012 a further four substances were added to the annexes of the POP Regulation, including two pesticides and two industrial chemicals.

Table 2.3 provides the details of the current status of the national implementation plans, as reported to the Stockholm Convention. This information is used in this report to supplement the information in the Member State annual and triannual reports. For those Member States that have not provided reports under Article 12 of the POP Regulation, the national implementation plans have been used as the key reference for their activities on POPs.

This triannual report focuses on the timeframe 2013-2015. The latest available version of the NIP is indicated within the table, even if this is outside of the indicated timeframe. Information from the NIPs has been used to develop this report based on the POPs identified under the POP Regulation as of the end of 2015.

[20] Note that the POP Regulation EC 850/2004 implements the requirements of the Stockholm Convention into Union legislation. This includes the requirement to develop national implementation plans and communicate these to the European Commission as well as the Secretariat of the Convention.

Table 2.3 Status of National Implementation Reporting

Member State	Update of the National Implementation Plans	If Yes, date of update	If No, date of original NIP
Belgium	Yes	2019	-
Bulgaria	Yes	2012	-
Czechia	Yes	2017	-
Denmark	Yes	2018	-
Germany	Yes	2017	-
Estonia	Yes	2019	-
Ireland	Yes	2019	-
Greece	No response received	No response received	No response received
Spain	Yes	2019	-
France	Yes	2012	-
Croatia	Yes	2016	-
Italy	No response received	No response received	No response received
Cyprus	Yes	2019	
Latvia	No	-	2007
Lithuania	Yes	2018	-
Luxembourg	No	-	2006
Hungary	Yes	2015	-
Malta	No response received	No response received	No response received
Netherlands	Yes	2011	
Austria	Yes	2012	-
Poland	Yes	2017	
Portugal	No	-	2006
Romania	Yes	2012	-
Slovenia	No	-	2010
Slovakia	Yes	2013	-
Finland	Yes	2012	-
Sweden	Yes	2018	-
United Kingdom	Yes	2018	-

3. 3. Production

Production covers all activities involved in the manufacture of chemical substances, or articles that contain chemical substances, for the substances in Annexes I and II of the POP Regulation. POP Regulation requirements on production are listed under Articles 3 and 4, shown in the information box below:

Article 3 of the POP Regulation foresees that:

3.1 The production, placing on the market and use of substances listed in Annex I, whether on their own, in preparations or as constituents of articles, shall be prohibited.

3.2 The production, placing on the market and use of substances listed in Annex II, whether on their own, in preparations or as constituents of articles, shall be restricted in accordance with the conditions set out in that Annex.

3.3 Member States and the Commission shall, within the assessment and authorisation schemes for existing and new chemicals and pesticides under the relevant Community legislation, take into consideration the criteria set out in paragraph 1 of Annex D to the Convention and take appropriate measures to control existing chemicals and pesticides and prevent the production, placing on the market and use of new chemicals and pesticides, which exhibit characteristics of persistent organic pollutants

Article 4 presents the derogations to the rules stated in article 3:
4.1 Article 3 shall not apply in the case of:

(a) a substance used for laboratory-scale research or as a reference standard.
(b) a substance occurring as an unintentional trace contaminant in substances, preparations, or articles.

4.2 Article 3 shall not apply in respect of substances occurring as a constituent of articles produced before or on the date of entry into force of this Regulation until six months after the date of its entry into force.

Article 3 shall not apply in the case of a substance occurring as a constituent of articles already in use before or on the date of entry into force of this Regulation. However, immediately upon becoming aware of articles referred to in the first and second subparagraph, a Member State shall inform the Commission accordingly. Whenever the Commission is so informed or otherwise learns of such articles, it shall, where appropriate, notify the Secretariat of the Convention accordingly without further delay.

4.3 Where a substance is listed in Part A of Annex I or in Part A of Annex II, a Member State wishing to permit, until the deadline specified in the relevant Annex, the production and use of that substance as a closed-system site-limited intermediate shall notify accordingly the Secretariat of the Convention. However, such notification may be made only if the following conditions are satisfied:

(a) an annotation has been entered in the relevant Annex expressly to the effect that such production and use of that substance may be permitted.
(b) the manufacturing process will transform the substance into one or more other substances that do not exhibit the characteristics of a persistent organic pollutant.
(c) it is not expected that either humans or the environment will be exposed to any significant quantities of the substance during its production and use, as shown through assessment of that closed system in accordance with Commission Directive 2001/59/EC.

Member States reported under Article 12 the following information on production:

Germany reported the manufacture of PFOS in volumes around 9 tonnes per annum. Quantities were exported annually, although a declining trend is indicated, falling from 5.8t in 2013, to 2.4t in 2014 and no further exports in 2015. For 2013 and 2014, almost all of the PFOS exported was to non-EU countries. A small quantity (200g) was shipped to Switzerland (EFTA country) in 2013. The remaining quantities have been used in Germany.

No other Member States have reported the intentional production of POPs during the 2013-2015 period.

Article 3(3) of the POP Regulation requires that Member States prevent the production of new chemicals and pesticides which exhibit the characteristics of POPs as defined in Annex D of the Stockholm Convention. The EU Regulations that help to control substances with POPs characteristics are summarised below.

Regulation (EC) No 1907/2006 on Registration, Evaluation, Authorisation, and restriction of Chemicals (REACH) requires that all parties producing or importing chemicals in the Union submit a registration dossier to the European Chemicals Agency (ECHA). This dossier has sections covering the assessment of substances for persistence, bioaccumulation, and toxicity (PBT) properties. The criteria for PBTs identification are detailed in Annex XIII of REACH. These criteria largely follow those of Annex D of the Stockholm Convention. However, for bioaccumulation, Annex XIII sets the bioconcentration criterion (Bioconcentration Factor (BCF) greater than 2000) at a lower level than the Stockholm Convention (BCF greater than 5000). Moreover, REACH is stricter on toxicity and refers to thresholds based on No Observed Effect Concentrations (NOEC), classification as a Carcinogenic, Mutagenic, or Reproductive toxicant (CMR), and other toxicological classification.

The REACH Regulation also sets out provisions for those substances termed 'substances of very high concern (SVHC)' (which includes CMRs) and 'very persistent very bioaccumulative (vPvB)', which typically meet the PBT criteria. SVHCs and vPvBs are subject to further review and restriction as part of the Authorisation process, which ultimately aims to remove the use of all SVHCs and vPvBs from the Union market. As of the end of 2015, 168 substances were listed on the SVHC candidate list for further review[21].

Regulation (EC) No 1107/2009 lays down rules for the placing on the market and use of plant protection products (PPPs), including for their approval. It states that an active substance, which fulfils the POP, PBT or vPvB criteria, shall not be approved to be placed on the market. Similarly, Regulation (EU) No 528/2012 on the placing on the market of biocidal products stipulates that active substances that meet the PBT or vPvB criteria shall not be approved.

The mechanisms and processes of the Stockholm Convention, POP Regulation, REACH Regulation and PPP Regulation are ongoing, and it is possible for specific substances to be under review within the different systems at the same time. This requires attention to ensure consistency. A recent example of such a case is the brominated flame retardant hexabromocyclododecane (HBCDD). In 2012, the POPs Review Committee, acting under the auspices of the Stockholm Convention, recommended including HBCDD in the Convention's Annex A for elimination and to remove it from the global market in order to protect human health and the environment[22]. The 2013 Conference of the Parties agreed to include HBCDD in Annex A of the Convention. Under REACH, HBCDD was identified as SVHC and added to the candidate list in 2008 and subsequently to the list of substances subject to authorisation (Annex XIV) in 2011.

The addition of HBCDD to the Stockholm Convention (which was taken over to the POP Regulation) included clauses to allow the continued use of HBCDD as per the requirements and obligations of the REACH Regulation in Europe. Under the REACH Authorisation procedure, the sunset date for HBCDD was August 2015. Applications for authorisation to continue with two uses of HBCDD were submitted and authorisations were granted[23].

Finally, it is worth noting that on 17 April 2013, PFOS and PFOS-related substances were also listed as a priority substances in the Water Framework Directive. In 2027 Member States will have to meet the standards derived for these substances.

[21] European Chemicals Agency, SVHC candidate list: https://echa.europa.eu/candidate-list-table

[22] http://chm.pops.int/Implementation/PublicAwareness/PressReleases/HBCDcontrolunderglobal chemicalstreaty/tabid/2895/Default.aspx

[23] The review period for the authorisation expired on 21 August 2017 and no re-application was submitted.

4. 4. Placing on the market of Annex I and Annex II substances, use and export

4.1 4.1 Introduction

The POP Regulation (Article 3) foresees that the production, placing on the market and use of substances listed in Annex I is prohibited. The production, placing on the market and use of substances listed in Annex II of the Regulation are restricted. According to Article 4 of the POP Regulation, certain substances can be produced and used as closed-system site-limited intermediates, provided they meet the criteria set out in that Article. The POP Regulation also states that if an article containing restricted substances is already on the market or in use at the time of the inclusion of the constituent(s) in the Regulation's annexes, then its use can continue. The Member State has to notify the use to the Commission, which in turn will notify the Secretariat of the Stockholm Convention. The POP Regulation also follows the provisions of the Stockholm Convention for the so-called 'specific exemptions' for some POPs in Annex I and Annex II. For the period 2013 – 2015, the substances with specific exemptions were PFOS and SCCPs[24]. Endosulfan, hexachlorobutadiene, polychlorinated napthalenes and polychlorinated biphenyls had exemptions in place for goods that had already been produced at the time of listing, with planned phase-out dates.

Based on the Article 12 submissions from the Member States, POPs that were placed on the market, used, or were exported are dominated largely by PFOS and SCCPs along with a number of other POPs that were produced in small quantities for research purposes. Since PFOS in particular has a large number of exemptions under the POP Regulation and also under the Stockholm Convention, this section of the report will focus on this substance, with substances other than PFOS discussed at the end of the chapter.

4.2 4.2 PFOS – placing on the market, use and export

4.2.1 4.2.1 Introduction and background on the substance

The PFOS definition includes a group of chemical substances used as surfactant, with the major uses as stain repellent, in metal plating and fire-fighting foams. In 2009 PFOS was included in Annex B of the Stockholm Convention and in Annex I of the POP Regulation in 2010.

The following exemptions are applicable in the POP Regulation:

1. For concentration of PFOS equal to or below 10 mg/kg in substances or preparations.
2. For semi-finished products or articles or parts thereof if the concentration of PFOS is lower than 0.1% by weight; and
3. For textiles or coated materials, if the amount of PFOS is lower than 1µg/m^2 of the coated material.

For articles already in use before 25 August 2010 and fire-fighting foam placed on the market before December 2006, the use was allowed until 27 June 2011. In addition, Member States are required to report every four years on progress made in eliminating PFOS.

[24] Noting that a specific exemption for SCCPs was revoked in December 2015 for new use, although for use in conveyor belts and dam sealants, if these products were already in use before 4 December 2015, use is permitted to continue.

Additionally, under Annex I (part A) of the POP Regulation for PFOS, item 5 states that the following applications have specific exemptions:

4. Wetting agents for use in controlled electroplating systems.
5. Photoresists or anti-reflective coatings for photolithography processes.
6. Photographic coatings applied to films, papers, or printing plates.
7. Mist suppressants for non-decorative hard chromium plating in closed loop systems; and
8. Hydraulic fluids for aviation.

These uses were permitted until August 2015, providing that the quantity released into the environment was minimised. The POP Regulation also foresees that the use of PFOS is to be phased out as soon as the use of safer alternatives is technically and economically feasible[25].

The exemption for wetting agents used in controlled electroplating systems expired in 2015. After this date the only specific exemption for use of PFOS in electroplating applied to 'mist suppressants for non-decorative hard Cr(VI) plating in closed loop systems'[26].

In the Union, it is obligatory to apply a closed-loop system when using PFOS-related substances as mist suppressants for non-decorative hard Cr(VI) metal plating. In addition, the European Industrial Emissions Directive (2010/75/EU) is applicable to installations for surface treatment of metals or plastic materials using an electrolytic or chemical process where the volume of the treatment vats exceeds 30 m^3. These installations must apply best available techniques (BAT) for the prevention and minimisation of emissions of PFOS described in the relevant BREF.

The definition of a closed-loop system has been much discussed in recent years, however, so far, there is no harmonised definition for a closed-loop system regarding PFOS or Cr(VI). A recent industry survey commissioned by the German Environment Agency[27] documented that there is a variety of processing equipment and manufacturing processes, such that a "one fits all" definition for closed-loop-system does not exist for metal plating. UBA [2017] comment that a closed-loop system shows the following characteristics:

- Process tanks with more efficient extraction to minimise the releases of chromium-VI aerosols, if required, encapsulated transporters with extraction system.
- Dedicated exhaust air scrubbers with recirculation of the washing solution into the process solution.
- Exclusively documented PFOS dosage, related to throughput and demand.
- Recovery of the PFOS-containing chrome electrolyte by rinsing the plated products / components directly above the process baths.

[25] It is of note that the POPRC carried out a study to assess alternatives to PFOS and provided results at the 10th POPRC meeting held in October 2014.

[26] During hard metal plating, a significant amount of gases may be released from the process tanks. The generated gases rise to the surface as bubbles and form aerosols. If no mist suppressant agents or other technology is used, aerosols consisting of process liquids containing for instance chromic acid may expose workers and the environment. Therefore, a closed-loop system needs to be utilized when using PFOS or PFOS-related substances as mist suppressants.

[27] UBA (2017) German Environment Agency (UBA). Use of PFOS in chromium plating – Characterisation of closed-loop systems, use of alternative substances. Project No. 55 567, Report No. (UBA-FB) 002369/ENG

- Using multistage cascade rinsing for extensive recovery of dragged-out PFOS to achieve a high rinsing ratio with a minimum amount of excess water.
- Using an evaporator to concentrate the rinsing solution and recovery of the dragged-out process solution while also using the excess heat of the process.
- Return of high-concentration rinsing water to compensate for evaporation losses of the electrolytes.
- Extending working lifetime of the PFOS containing chrome electrolyte by using a cation exchange technique to remove accumulated impurities such as contaminating metals and Cr (III) (regeneration of cationic exchanger resins with sulphuric acid and their reuse in the wastewater treatment process).
- Treatment of PFOS-containing wastewater partial flows with PFOS specific ion exchangers.

Due to the space requirements of the necessary processing equipment, implementing all techniques and/or retrofitting all existing metal plating installations is most likely not suited. In addition, cost considerations and affordability factors may play an important role[28]. Further, according to UBA (2017), only one out of the five assessed electroplating facilities was found to apply, in principle, all nine measures listed above. The other companies were found to apply the measures only in part in an effort to close the loop for PFOS and Cr(VI).

The Assessment of PFOS compounds (European Commission, 2015[29]) presented at the 13th Competent Authority meeting for POPs provided further detail on which Member States were using PFOS for specific applications. Table 4.1 provides details of these uses.

Table 4.1 Summary of PFOS applications in the Union

Uses identified under the Convention (included in the POP Regulation)	PFOS was/is in use	PFOS was/is not used	Information not available
Wetting agents for use in controlled electroplating systems		Belgium Denmark Ireland Sweden Norway	Germany France Romania Finland United Kingdom
Photoresists or anti-reflective coatings for photolithography processes	Ireland	Denmark Germany Ireland Poland Sweden United Kingdom	Belgium Estonia France Romania Slovenia Finland Norway
Photographic coatings applied to films, papers, or printing plates		Denmark Germany Ireland Poland	Belgium France Romania Norway

[28] UNEP (2017) United Nations Environment. Guidance on best available techniques and best environmental practices for the use of perfluorooctane sulfonic acid (PFOS) and related chemicals listed under the Stockholm Convention on Persistent Organic Pollutants, Updated January 2017.
[29] European Commission (2015), 'Assessment of PFOS compounds', report presented to the 13th Competent Authority meeting for POPs March 2015.

Uses identified under the Convention (included in the POP Regulation)	PFOS was/is in use	PFOS was/is not used	Information not available
		Finland Sweden United Kingdom	
Mist suppressants for non-decorative hard chromium plating in closed loop systems	Denmark Slovenia Finland Sweden Norway	Belgium Ireland Poland	Germany Spain France Romania United Kingdom
Hydraulic fluids for aviation	Norway	Denmark Ireland Poland Sweden	Belgium Spain France Romania Slovenia Finand

4.2.2 4.2.2 Article 12 information provided by Member States for PFOS

Placing of PFOS on the market

The information submitted by the Member States under Article 12 includes data, both for placing PFOS on the market as well as PFOS within applications following the specific exemptions set out under the POP Regulation. Details of the further information provided by Member States on the placing of PFOS on the market included:

9. Austria indicated that, in 2013 and 2014, PFOS was used as a mist suppressant and as a photo resist lacquer by a semiconductor company, using approximately 0.3 kg per year. No further update was received in 2015 but Austria indicated that use was continually being reduced.
10. Belgium reported in 2013 that, in accordance with the PIC regulation, a mixture containing PFOS (at 0.4%) was imported from Japan for use as anti-reflective coating for lithographic processes. Quantities were as follows: Heptadecafluorooctanesulfonic acid (CAS 1763-23-1) = 0.076 kg and CAS 380886-84-0 = 0.12 kg. However, no PFOS was placed on the market in 2014 or 2015.
11. Denmark indicated that 40 kg of PFOS had been placed on the market in 2014. This originated from a Member State for non-decorative hard chromium plating.
12. Finland indicate that two PFOS-containing products may have been imported in 2013. However, due to the number of importing companies the amounts or the country of origin cannot be disclosed. The annual use is in the range of tens of kgs. The substances in question have been registered for use in metal plating (CAS 56773-42-3) and manufacture of computers, electronic and optical devices (CAS 2795-39-3). This same information was provided in 2014 (although still quoting 2013 as the date placed on to the market) however, in 2015 Finland indicate that PFOS containing substances were being used in industry, although alternatives were being phased in. The amounts are small enough for the companies to not import them every year and thus the annual import rates vary. As in 2013, the substances in question have been registered for use in metal plating (CAS 56773-42-3) and manufacture of computers, electronic and optical devices (CAS 2795-39-3).

13. Germany indicated that 9,000 kg of PFOS were manufactured annually between 2013 and 2015, with a proportion exported (largely to non-EU countries) and the remainder used in Germany. No further indication is provided to elaborate on which specific sectors would make use of the PFOS retained for use in Germany, but the dominant application across Europe has been for use in chrome metal plating industries, and it can be expected that a significant proportion use in Germany would likely be for this purpose.
14. The Netherlands PFOS inventory showed that in 2013 about 150 kg PFOS was being used, mainly for hard chromium plating. The export database did not show any export of PFOS from the Netherlands. The same information was submitted in reports for 2014 and 2015, still referencing the 2013 inventory, so no further update on use is available.
15. Spain reported that PFOS was used in 2013, 2014 and 2015 for electro/chrome plating, with the PFOS received from Germany. Quantities were 2013: 2,065l of 3.15% PFOS, 2014: 2,470l of 3.06% PFOS, 2015: 85l of 3% PFOS. This was used by one company who have stated that they have since moved to PFOS-free alternatives.
16. Sweden indicated that PFOS and perfluorinated alkanes (PFOA) in preparations were placed on the market between 2013 and 2015. In 2013, this included 140 kg of PFOS (CAS numbers 56773-42-3, 2795-39-3, 70225-14-8). In 2014, ~ 79 kg of tetraethylammonium perfluorooctane sulfonate (CAS 56773-42-3) was received from and ~ 2 kg sent to other Member States. Finally, in 2015 ~ 55 kg of tetraethylammonium perfluorooctane sulfonate (CAS 56773-42-3) was received and ~ 1 kg sent off. All related preparations originated from other Member States.

Table 4.2 provides the quantities of PFOS placed on the market between 2013 and 2015. This data are for a small number of Member States (Austria, Denmark, Finland, Germany, Netherlands, Spain, and Sweden), who have reported total quantities of PFOS use for the Union of up to 6,200 kg/yr in 2013 and up to 2,800 kg/yr in 2014. Most of this is within one Member State (Germany).

Table 4.2 Summary of PFOS being imported during the 2013-2015 period

Year	Member State	Quantity (kg)	Exported to
2013	Belgium	0.2	
2014	Denmark	40	-
2013	Germany	5,767	Switzerland (0.2 kg) and other non-EU countries
2014	Germany	2359	Multiple non- EU countries
2013	Spain	2065l of 3.15% PFOS	-
2014	Spain	2470l of 3.06% PFOS	-
2015	Spain	85l of 3% PFOS	-
2013	Netherlands	~150	-

Year	Member State	Quantity (kg)	Exported to
2014	Netherlands	~150	-
2015	Netherlands	~150	-
2013	Austria	~ 0.3	-
2014	Austria	~ 0.3	-
2013	Finland	Tens of kg	-
2014	Finland	Tens of kg	-
2013	Sweden	PFOS (56773-42-3, 2795-39-3, 70225-14-8): 140 kg.	Within EU
2014	Sweden	Tetraethylammonium perfluorooctane sulfonate (CAS 56773-42-3): ~ 79 kg imported and about 2 kg exported	Within EU
2015	Sweden	Tetraethylammonium perfluorooctane sulfonate (CAS 56773-42-3): ~ 55 kg imported and about 1 kg exported.	Within EU

Use of PFOS within the Union

The uses reported within the Article 12 submissions for PFOS are in the metal plating industry, in the photographic industry and the semiconductor industry. No mention is made of its use in hydraulic fluids in the aviation industry. Germany has reported using the most PFOS in both 2013 and 2014 (but provide no indication of use in 2015), followed by the Netherlands and Sweden which reported using 150 kg and 140 kg respectively in 2013. During the 2013-2015 reporting period, use has fallen in Sweden; however, the Netherlands has report has not been updated since 2014 so present use is unknown, but it would appear to have decreased since 2009 (~390 kg).

Table 4.3 provides a further overview of the uses of PFOS reported within the Article 12 reports, and details of the quantity of PFOS used in different applications.

Table 4.3 Summary of PFOS reported in 2013-2015 and their uses.

Year	Member State	Quantity (kg/annum)	Comments
2013	Belgium	Heptadecafluorooctanesulfonic acid (CAS 1763-23-1) = 0.076 kg and CAS 380886-84-0 = 0.120 kg.	Imported for use as an antireflective coating for lithographic processes
2014	Denmark	40	Received in preparation from EU
2013	Germany	3200 (9t produced minus 5767kg export quantity)	For use in surface refinement by surface treatment industry
2014	Germany	6600 (9t produced minus 2359kg export quantity)	For use in surface refinement by surface treatment industry
2015	Germany	0	

Year	Member State	Quantity (kg/annum)	Comments
2013	Netherlands	~150	Mainly used in hard chromium plating
2014	Netherlands	~150	Mainly used in hard chromium plating
2015	Netherlands	~150	Mainly used in hard chromium plating
2013	Austria	~ 0.3	Used in metal plating as a mist suppressant and as a photo resistant lacquer
2014	Austria	~ 0.3	Used in metal plating as a mist suppressant and as a photo resistant lacquer
2013	Finland	Tens of kg's	Used in metal plating (CAS 56773-42-3) and manufacture of computers, electronic and optical devices (CAS 2795-39-3).
2014	Finland	Tens of kg's	Used in metal plating (CAS 56773-42-3) and manufacture of computers, electronic and optical devices (CAS 2795-39-3).
2013	Sweden	140	Received in preparation only
2014	Sweden	Tetraethylammonium perfluorooctane sulfonate: 79	Received in preparation only
2015	Sweden	Tetraethylammonium perfluorooctane sulfonate: 55	Received in preparation only

A review of the Member States' National Implementation Plans provides further information on the usage of PFOS:

In the most recent Czechia NIP (published in 2017) the exemption for the photographic industry is used by one company, and the PFOS consumption for 2013-2015 was in the range of several tens of kg/year. However, use was expected to terminate by 2017.

Lithuania indicates in their most recent NIP (2017) that less than 1 kg of PFOS could be in use in the semiconductor industry, with small scale usage in the photographic industry and an unknown quantity in use within aviation hydraulic fluids. These uses would also have been active in the 2013-2015 period.

Sweden further reports that the use of PFOS has decreased since 2015 (55 kg), to 25 kg in 2016 (Swedish Chemicals Agency's Product Register, 2017 Sweden NIP). The volume refers to one product used in hard chrome plating industry. Two of the three industry operators have indicated that since 2016 they no longer use PFOS in their process.

In the United Kingdom 2018 NIP, PFOS-containing stockpiles have been notified for use as a wetting agent and mist suppressant in non-decorative hard chrome plating. In 2014 a total 33,837 kg of PFOS-containing material equating to 135 kg of PFOS were notified by six companies.

Based on the data provided and reviewed, the dominant usage for PFOS within the Union in 2013-2015 was for metal plating, in particular as a mist suppressant for hard chrome plating, which, based on the data from Article 12 reports and Member State NIPs. Photographic applications are another, minor, use.

4.3 4.3 Substances other than PFOS – placing on the market, use and export

4.3.1 4.3.1 Substances placed on the market (excluding PFOS)

Article 12 reports from Member States highlighted that PFOS was the most commonly reported POP placed on the market and used within the Union. Additionally, some other POPs substances were also placed on the market and used during 2013–2015.

Austria reported that several POPs substances had been placed on the market during 2013 and 2014 but did not provide specific chemical names. In 2013, Austria report that minimal quantities of these substances were exported to Macedonia, Belize, and Kyrgyzstan as laboratory reference materials.

Belgium reported in 2013, that HCB was detected in illegal fireworks imported from China (concentrations identified were 3,302 ppm and 2,504 ppm). Belgium also imported lindane (0.005 kg) as a laboratory reference standard in 2013 and exported 0.0003 kg of PCB to Bangladesh in 2015 for research and analysis.

Denmark imported two substances including SCCPs (14.7 t in 2013, 4.93 t in 2014) and HBCDD (1.14 t in 2014) in preparations.

Spain exported small amounts of two substances in 2015 for research and analysis purposes, both to Angola: 0.5 kg of Endrin and 1.5 kg of Heptachlor.

Finland also reported in 2015 that an unknown quantity of HBCDD was imported but the companies that previously used this substance are phasing out the use.

France exported a number of substances to Mali making use of the provisions under article 14.2 for research purposes in 2014 and 2015. Prior to that, in 2013, 40 kg of Dieldrin was exported to Egypt.

Poland imported and exported a number of substances for laboratory use as reference standards in 2015 (see Table 4.4) all below 1 kg. However, 20 kg of mixtures and preparations containing polychlorinated biphenyls (PCBs), polychlorinated terphenyls (PCTs) or polybrominated biphenyls (PBBs) were exported to Sweden in 2015.

Sweden indicated that 2,800 kg of chloroalkanes C10-13 were received in preparations from other Member States in 2013.

Table 4.4 summarises the information reported on placing of POPs on the market and the quantities indicated by Member States, other than PFOS.

Table 4.4 Summary of substances reported as being placed on the market or exported during the 2013-2015 period (excluding PFOS)[30]

Substance	Year	Member State	Placed on the market in the EU	Exported	Quantity (kg)	Exported to
PCBs	2014	Belgium	No	Yes	0.0003 for research and analysis	Bangladesh
Endrin, Heptachlor	2015	Spain	No	Yes	0.5 (Endrin), 1.5 (Heptachlor) for research and analysis	Angola
Dieldrin	2013	France	No	Yes	40	Egypt
Aldrin (Aldrine, Chlordane and Heptachlor)	2014, 2015	France	No	Yes	1kg for research and analysis	Mali
Aldrin	2013	Austria	No	Yes	n.a. (minimal)	Macedonia
Aldrin, Lindane, Dieldrin, Endrin, DDT	2013	Austria	No	Yes	n.a. (minimal) Laboratory reference material	Belize
HCB	2013	Austria	No	Yes	n.a. (minimal) Laboratory reference material	Kyrgyzstan
Aldrin, Dieldrin, Endrin, HCB, DDT, HCH, Endosulphan, Hexachlorobutadine	2015	Poland	Yes	Yes (see rows below)	(minimal) Laboratory standards Aldrin=2g, Dieldrin=0.5g, Endrin=1g, HCB=1g, DDT=2.5g, HCH=3.75g, Endosulphan=3g, Hexachlorobutadine=0.5g	Not applicable.
Aldrin (ISO), chlordane (ISO) and heptachlor (ISO)	2015	Poland	-	Yes	<0.5	Armenia, Kyrgyzstan, Russia

[30] The data in this table relates to the annual reports under Article 12 reporting, specifically question 2.2 under section II on control on production, placing on the market.

Substance	Year	Member State	Placed on the market in the EU	Exported	Quantity (kg)	Exported to
Hexachlorobenzene (ISO) in DDT (ISO) (clofenotane (INN), 1,1,1-trichloro-2,2-bis (p-chlorophenyl) ethane)	2015	Poland	-	Yes	<0.5	Kyrgyzstan, Russia, Ukraine
Dieldrin	2015	Poland	-	Yes	<0.5	Russia
Mixtures and preparations containing polychlorinated biphenyls (PCBs), polychlorinated terphenyls (PCTs) or polybrominated biphenyls (PBBs)	2015	Poland	-	Yes	20	Sweden
Chloroalkanes C10-13	2013	Sweden	yes	No	2,800	Not applicable

4.3.2 4.3.2 Use of POPs substances within the Union (excluding PFOS)

The third POPs synthesis report (2013) indicated that most of the POP substances and articles that were used were under general exemptions such as uses for research purposes. This was also observed for the current (2013-2015) reporting period where the uses reported are either for research and calibration purposes or other unknown uses. France notes some additional substances are known to be placed on the market/used, but it is not clear which ones and for what purpose. Belgium, Croatia, Denmark, and Sweden provide less detail on the exact use of substances imported/exported. The position of those Member States that did not provide Article 12 reports is unknown and not commented upon further here. Detailed information on the uses reported by Member States is shown in Table 4.5.

Table 4.5 Summary of uses reported by Member States for substances in 2013-2015 period (excluding PFOS)

Substance	Member State reporting the use	Use reported
Lindane	Belgium	Research and calibration
SCCP, HBCDD	Denmark	Substances imported in preparations only, no further details included
HBCDD	Finland	No further details included
Chloroalkanes C10-13	Croatia, Sweden	Import in preparation only, no further details included
Aldrin, Chlordane, Heptachlor, Hexachlorobenzene and DDT, Dieldrin, Mixtures and preparations containing polychlorinated biphenyls (PCBs), polychlorinated terphenyls (PCTs) or polybrominated biphenyls (PBBs)	Poland	Import for research and calibration

4.4 4.4 Export of goods

Export of hazardous chemicals for the period 2013–2015 was controlled by the prior informed consent regulation (EC) No 689/2008, on the export and import of dangerous chemicals. This was superseded by Regulation (EU) No 649/2012, which entered into force on 1 March 2014. Regulation EU No 649/2012 carries the same provisions as Regulation (EC) 689/2008 but better aligned with the REACH Regulation.

Both the PIC Regulation and its predecessor prohibit the export of POP substances listed in Annexes A and B of the Stockholm Convention[31]. Furthermore, the PIC Regulation implements, within the EU, the Rotterdam Convention on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade. Finally, the

[31] These are: aldrin, chlordane, dieldrin, DDT, endrin, heptachlor, hexachlorobenzene, mirex, toxaphene and polychlorinated biphenyls.

parties to the Basel Convention on transboundary movement of hazardous waste and its disposal are required to submit annual information on movement of hazardous wastes, including POP substances.

The European Chemicals Agency (ECHA) keeps a record of exports and imports of PIC substances. This data is provided on a quarterly basis. Exporters and importers of PIC chemicals are required to provide details to their national competent authority with the information regarding the exact quantities of the chemical (as a substance or contained in articles or mixtures) which is shipped to or from each non-EU country during the preceding year.

Article 12 of the POP Regulation on reporting asks Member States to provide annual data on chemicals listed in Annex I or II of the POP Regulation produced or placed on the market during the period covered.

As already described earlier, the largest export concerns PFOS (5,767 kg in 2013), exported mainly from Germany, which includes:

17. Australia 100 kg.
18. Brazil 390 kg.
19. Hong Kong 225 kg.
20. India 25 kg.
21. Republic South Korea 1,576 kg.
22. Singapore 150 kg.
23. South Africa 350 kg.
24. Switzerland 0.2 kg.
25. Taiwan 250 kg.
26. Thailand 0.1 kg.
27. Turkey 700 kg; and
28. USA 2,000 kg.

Other POP substances were exported as part of articles and waste for final elimination. In the second synthesis report, some Member States only considered the export of commercial goods, excluding the export of waste for final destruction. It is unclear from the Article 12 reports submitted for 2010-2012 if there is now a common interpretation of export or if some Member State have again not reported waste. More information on POPs in waste is reported under ‘stockpiles’ (chapter 5).

5. 5. Stockpiles

The POP Regulation includes provisions for POPs or products that contain POPs already manufactured and sold but no longer permitted for use. These are considered as 'stockpiles' of materials which have to be managed before their final destruction in order to prevent release to the environment. Article 5 of the POP Regulation covers provisions for stockpiles as detailed in the information box below:

Article 5 of the POP Regulation foresees that:

5.1 The holder of a stockpile, which consists of or contains any substance listed in Annex I or Annex II, for which no use is permitted, shall manage that stockpile as waste and in accordance with Article 7.

5.2The holder of a stockpile greater than 50 kg, consisting of or containing any substance listed in Annex I or Annex II, and the use of which is permitted shall provide the competent authority of the Member State in which the stockpile is established with information concerning the nature and size of that stockpile. Such information shall be provided within 12 months of the entry into force of this Regulation and of amendments to Annexes I or II and annually thereafter until the deadline specified in Annex I or II for restricted use. The holder shall manage the stockpile in a safe, efficient and environmentally sound manner.

5.3 Member States shall monitor the use and management of notified stockpiles.

The following main types of stockpiles were reported by Member States during the 2013-2015 reporting period:

- PCBs in di-electric equipment.
- Obsolete pesticides; and
- PFOS in fire-fighting foams and for surface finishing.

While the purpose of this report is to analyse the responses from Member States to annual and triennial reports covering the 2013-2015 period, reference has been made to the NIPs in order to obtain additional details.

5.1 5.1 Stockpiles of PCB-containing equipment

PCBs were commercially produced world-wide on a large scale between the 1930s and 1980s. Given their extraordinary chemical stability and heat resistance, they were extensively employed as components in electrical equipment, hydraulic equipment, paints, and lubricants. However, since 1985, the marketing and use of PCBs in the Union has been very heavily restricted and eventually banned.

Directive 96/59/EC on the disposal of PCBs and PCTs covers the safe and complete disposal of PCBs and equipment containing PCBs and PCTs. Member States are required to develop a register of larger size equipment containing PCBs (i.e., over >5 kg) and have to adopt a plan for disposal of inventoried equipment. In addition, they have to define processes for the collection and disposal of non-inventoried equipment (e.g., small electrical equipment that can be present in household appliances). Member States were required to dispose of larger equipment by the end of 2010. However, for the period 2013-2015 this work was still ongoing in many cases.

Following the requirements of directive 96/59/EC, PCB registers must include the following data:

- The names and addresses of the holders.
- The location and description of the equipment.
- The quantity of PCBs contained in the equipment.
- The date and types of treatment planned; and
- The date of the declaration.

Any equipment which is subject to PCB registers must be labelled. Moreover, Member States must take the necessary measures to ensure that:

- PCBs, used PCBs and equipment containing PCBs which are subject to inventory are transferred to licensed undertakings, at the same time ensuring that all necessary precautions are taken to avoid the risk of fire.
- All undertakings engaged in the decontamination and/or the disposal of PCBs, used PCBs and/or equipment containing PCBs obtain permits; and
- Transformers containing more than 0.05% by weight of PCBs are decontaminated under the conditions specified by the Directive.

Furthermore, in 2001, the Commission adopted a Strategy on Dioxins, Furans and PCBs[32] aimed at reducing the release of these substances in the environment and their introduction in the food chains.

The Article 12 information reported by Member States on stockpiles of PCB-containing equipment is summarised in Table 5.1 shown below.

Table 5.1 Overview of stockpiles of PCBs

Member State	Year	Type of equipment	Number of pieces of equipment	Content mg/kg	Quantity / Volume
Ireland	2013	Suspect or confirmed PCB-contaminated liquid	-	50-500	24,328 litres [liquid containing PCB]
Ireland	2014	Suspect or confirmed PCB-contaminated liquid	-	50-500	21,714 litres [liquid containing PCB]
Ireland	2015	Suspect or confirmed PCB-contaminated liquid	-	50-500	13,907 litres [liquid containing PCB]

[32]http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=URISERV:l21280&qid=1429105530555&from=EN

Member State	Year	Type of equipment	Number of pieces of equipment	Content mg/kg	Quantity / Volume
Spain	2014	PCB containing equipment	-	Not specified	177 tonnes [equipment]
Spain	2014	PCB contaminated equipment	-	Not specified	25,634 tonnes [equipment]
Spain	2014	Suspected PCB containing equipment	-	Not specified	939 tonnes [equipment]
Croatia	2013	PCB containing equipment	-	>50	291 tonnes [equipment]
Croatia	2014	PCB containing equipment	-	>50	227 tonnes [equipment]
Croatia	2015	PCB containing equipment	-	>50	190 tonnes [equipment]
Croatia	2015	Not permitted PCB containing equipment	956 capacitors and 16 transformers	Not specified	44.6 tonnes [equipment]
Latvia	2013-2015	PCB containing equipment	1,300 capacitors	Not specified	66.3 tonnes [equipment]
Latvia	2013-2015	Not permitted PCB containing equipment	200 transformers	Not specified	9.2 tonnes [equipment]
Luxembourg	2014	PCB containing equipment	853 transformers	≤50	22.8 kg [PCB]
Luxembourg	2014	Not permitted PCB containing equipment	23 transformers	51-500	1.0 kg [PCB]
Luxembourg	2014	Not permitted PCB containing equipment	2 transformers	501-5,000	1.3 kg [PCB]
Romania	2013	Transformers - in use	563	Not specified	689,502 litres [liquid containing PCB]
Romania	2013	Capacitors - in use	44,253	Not specified	347,051 litres [liquid containing PCB]
Romania	2013	Transformers - not in service	1	Not specified	854 litres [liquid containing PCB]
Romania	2013	Capacitors - not in service	2,608	Not specified	28,343 litres [liquid containing PCB]

Member State	Year	Type of equipment	Number of pieces of equipment	Content mg/kg	Quantity / Volume
Slovenia	2015	Transformers - not permitted PCB containing equipment	7	Not specified	Not specified
Slovenia	2015	Capacitors - not permitted PCB containing equipment	113	Not specified	1,331 kg [equipment]
Slovenia	2015	Other equipment - not permitted PCB containing equipment	10	Not specified	7,076 kg [equipment]
Slovenia	2015	Total equipment - not permitted PCB containing equipment	117	Not specified	8,407 kg [equipment]

Several Member States reported a downward trend in stockpiles of PCB-containing equipment. Croatia noted that until December 2015 a constant increase of the amount of disposed-of equipment containing PCBs was recorded. In Ireland, since 2012, there continues to be a significant decrease in the national PCB inventory volumes which can be accredited to the enforcement work undertaken by the EPA and Local Authorities. Compared to Ireland's previous triennial report (2013) the Irish inventory of PCB stocks has declined in volume by 43,625 litres of suspect or confirmed PCB liquids, a fall of 76%. The number of transformers and capacitors containing PCB as reported by Slovenia are significantly lower compared to what was reported for the period 2010-2012, i.e., the number of total equipment (not permitted PCB containing equipment) decreased from 232 (2010-2012) to 117 (2015).

Further information on PCB stockpiles was included in Member States' NIPs and has been summarised in Table 5.2 below, with a focus on the reporting period 2013-2015. Beyond information on di-electric sources, several of the NIPs reported information on additional types of stockpiles containing PCBs such as in buildings, sealants, paints etc.

Table 5.2 only contains information from Member States with an updated NIP compared to the version referred to in the third synthesis report. In addition to the Member States indicated in Table 5.2, other Member States (France, Hungary, Ireland, and Romania) also provided information on PCB stockpiles in their NIPs. However, those NIPs date from 2012 or earlier and were discussed in the third synthesis report.

Table 5.2 Overview of stockpiles of PCB included in NIP

Member State	Year (publication of NIP)	Summary
Czechia	2017	*Note: in their previous NIP (2012), CZ provided information on the PCB inventory until 2011. In the most recent NIP (2017), the situation in 2016 is reported, which is most relevant for the reporting period 2013-2015]* In September 2016 there remained 851 transformers (over 5 litres) containing 116,574 tonnes of PCB. For 229 out of these 851 devices, it is assumed they contain a total amount of 97,554 tonnes of PCB. There are 2,254 devices with PCB volume below 5 litres with 14,355 tonnes of liquid containing PCB. Transformers containing more than 0.05 % of weight of PCB or PCT were decontaminated.
Denmark	2018	The NIP indicated that low concentrations of PCB (< 50 ppm) are still found in large transformers and capacitors that are being disposed of in Denmark. The source of the low concentrations of PCB in large transformers and capacitors is believed to be residues of PCBs that were not completely removed when transformers were decontaminated, PCB-contamination on the production site and/or use of regenerated PCB-containing oil. In addition, Denmark reported in the NIP on remaining quantities of PCB in buildings in 2013, i.e., between 17-87 tonnes.
Germany	2016	As no such stockpiles were reported to the competent authorities of the Länder, it is assumed by Germany that PCB stockpiles no longer exist in Germany. However, from 2011 to 2015, in total of 7,042 tonnes of transformers and capacitors containing PCB were exported (waste code number: 160209) according to the transborder statistics (UBA 2017a - Statistics concerning transfrontier shipment of waste).
Croatia	2016	In the observed period (2008–2015) 132 holders who own a total of 639 tonnes of equipment containing PCBs (capacitors and transformers) were recorded. In December 2015, 92 holders disposed of all the equipment (430 tonnes; 67%), while 40 holders were in possession of equipment that remains to be disposed of (190 tonnes; 30%). Out of the 40 holders, 9 partially disposed their equipment (19 tonnes, 3%).
Lithuania	2017	In 2013, 8 transformers containing PCBs < 0,05 % were in operation in Lithuania. The NIP indicated that part of the PCB containing waste is stored in a long-term storage facility in Lithuania. In 2014, 2.1 tonnes of oil containing PCB and 188.5 tonnes of PCB-containing equipment were stored in long-term storage facility. In addition, theoretical calculations indicated that in buildings built in 1950-1970 there may be an accumulated 400 tonnes of PCBs. When demolishing such buildings after 20-50 years construction waste containing PCB will be generated.
Poland	2016	The NIP indicated that in Poland there are no stockpiles of products containing POPs. The previous NIP (2013) still indicated that by the end of 2010 there were 8 waste storage sites with PCBs that

Member State	Year (publication of NIP)	Summary
		were to be removed, representing 801,676 tonnes of waste containing di-electric equipment.
Sweden	2017	Sweden indicated that it is likely that PCB can still be found in small electronic equipment, like starters for fluorescent tubes. However, all electronic waste in Sweden is considered to be hazardous waste and is collected for further treatment at a hazardous waste treatment facility. Sealants and flooring materials will be a source of PCB wastes for a few more years. Estimations show there could be 20–50 tonnes PCB still to be removed from buildings.

Note: The UK, in its most recent NIP (2017) included no new information on stockpiles with PCB containing equipment compared to the version published in 2012.

The information reported by Member States included different levels of detail. For example, Romania reported, in its previous triannual report, information on whether the PCB equipment was in use or not and included information on the actual presence of PCBs based on the minimum/maximum share of PCBs in the contaminated soil. Ireland provided information on stockpiles (liquids) which are confirmed or suspected to contain between 50-500 mg/kg of PCBs. This is a change compared to its previous triannual report, due to changes in the PCB reporting methodology in Ireland.

In order to better understand and complement the data on PCB-containing equipment, a request for information was sent out to the Member State Competent Authorities in April 2017. Acknowledging the levels of uncertainty inherent in the estimates of PCBs in such equipment, the request asked for input on the quantities of PCB actively in use in di-electric equipment, both in 1990 and in 2015, as well as the quantities of PCBs that have been destroyed between 1990 and 2015. In total, 14 Member States responded to the request. The estimates of the fraction of PCBs still in use (%, 2015 compared to 1990) are presented in the table below.

Table 5.3 Percentage of PCB in use in di-electric equipment in 2015 compared to 1990 [responses from Member States to request for PCB data, 2017]

Member State	Remaining PCB quantities in use in 2015 as a percentage of 1990 baseline (%)	Notes
Belgium (Flanders)	0.3	Based on the number of units
Czechia	6.0-9.8	
Denmark	0.5	
Germany	<1.0	
Ireland	19	
Croatia	30	Based on number of units, reference year is 2008
Lithuania	3	

Member State	Remaining PCB quantities in use in 2015 as a percentage of 1990 baseline (%)	Notes
Netherlands	8	Based on waste data (containing PCB)
Portugal	3	
Romania	49	Reference year is 2005
Finland	0.0	
Sweden	0.3	
United Kingdom	7	the data for the United Kingdom are calculations made by the contractor based on the POPs inventory

Note: Poland also responded to the survey, indicating that no data was available.

The majority of the Member States reported that in 2015 <10% of the PCBs were in use, compared to the reference year, i.e., 1990. Five of these Member States estimated a fraction of PCB in use below 1%. Croatia and Romania reported significantly higher PCB fractions in use, 30% and 49%, respectively. It should be noted that their estimates were based on different reference years, i.e., 2008 for Croatia and 2005 for Romania.

5.2 5.2 Stockpiles of PFOS

PFOS, its salts and perfluorooctane sulfonyl fluoride (PFOSF) were added to Annex B of the Stockholm Convention in 2009. In accordance with Part III of Annex B to the Convention, acceptable purposes and specific exemptions are defined for the production and use of PFOS, its salts and PFOSF. After PFOS was added to Annex B of the Stockholm Convention, PFOS was removed from REACH Annex XVII and added to Annex I of the POP regulation[33].

Four Member States reported stockpiles of PFOS in their triannual reports (covering 2013-2015). This mainly related to fire-fighting foams containing PFOS and the use of PFOS in surface finishing processes (chromium plating).

Fire-fighting foams (Class B foams[34]) can be synthetic foams, including aqueous film-forming foam (AFFF) or alcohol-resistant aqueous film-forming foam (AR-AFFF), or protein foams. The vast majority of the fire-fighting foams currently in stock (or service) are AFFF or AR-AFFF. Fluorosurfactants are considered a key ingredient in AFFFs, providing unique performance attributes, enabling them to be effective in preventing and extinguishing fires.

PFOS salts are or have been commonly used as a surfactant, wetting agent and mist suppressing agent for chrome metal plating processes to create a protective barrier from aerosol emissions. PFOS has been used in the chromic acid solution, as other mist

[33] As amended by Commission Regulation (EU) No 757/2010 of 24 August 2010

[34] Class B fire-fighting foams are categorised as those foams for use on class B fires (liquid fuel or liquefied solid fires).

suppressants degrade more rapidly under the strongly acidic and oxidizing conditions. Fluorinated surfactants (including PFOS) are not reported to be used in other metal plating applications (e.g., copper plating, nickel plating, tin plating, zinc, and zinc alloy plating, electroplating of polymers) besides metal plating with chromium (VI)[35]. Table 5.4 summarises the information on PFOS stockpiles provided by the Member States.

Table 5.4 Overview of stockpiles of PFOS reported by Member States

Member State	Year	Types of product / application	Quantity
Germany	2013-2015	Not specified	35,644 kg (45% solution, stored at three sites) 41,223 kg (100% solution, stored at one site)
Spain	2013	Chromium plating	2,065 litres (3.15% PFOS, received from Germany)
Spain	2014	Chromium plating	2,470 litres (3.06% PFOS, received from Germany)
Spain	2015	Chromium plating	85 litres (3.00% PFOS, received from Germany)
Luxembourg	2013-2015	Fire-fighting foams	13,000 litres (no info on PFOS concentrations)
United Kingdom	2012	Chromium plating	3,654 kg (88 kg of PFOS)
United Kingdom	2013	Chromium plating	34,050 kg (109 kg of PFOS)
United Kingdom	2014	Chromium plating	31,796 kg (132 kg of PFOS)

A review of the available NIPs (which had been updated to include PFOS) highlighted additional information for Member States. Table 5.5 summarises the information included on stockpiles of PFOS for the years covered by this report (2013-2015).

Table 5.5 Overview of stockpiles of PFOS included in NIP

Member State	Year (publication of NIP)	Summary
Czechia	2017	Stocks of such substances in Czechia are not expected. No information for the period 2013-2015 was reported. Reassessment of the need for acceptable purposes is carried out so that the Czechia can terminate the use of PFOS in the photographic industry, photolithography and for hydraulic fluids for aviation.

[35] UNEP/POPS/POPRC.14/INF/8

Member State	Year (publication of NIP)	Summary
Denmark	2018	In 2014, four products with the substance tetraethylammonium perfluorooctanesulfonate (CAS no. 56773-42-3) were registered in the Danish Product Register. For 2015 the number of products is indicated as "0", meaning that fewer than three products were used. For information, for 2016 no products were indicated, indicating that the substance is no longer used in Denmark. All uses of the substance have been phased out.
Croatia	2016	There is no data in the NIP for the period 2013-2015 on existing stocks or the quantities of foams used during fire drills. There is a considerable number of small quantities of foams about which little is known. Often, they are left by ships during repair. All foams used today contain only fluorotelomers. The NIP recommends that firefighting organisations carry out detailed assessment/analysis of firefighting foams in use in order to remove doubts regarding the possibility of the presence of stock, and to inform users about the potential risks to health and the environment.
Poland	2016	In Poland, there are no stockpiles of products containing POPs. No information for the period 2013-2015 was reported.
Sweden	2017	There are no known stockpiles of PFOS or any known recycling of carpets or other textiles containing PFOS in Sweden. No information for the period 2013-2015 was reported.
United Kingdom	2017	In 2014 a total 33,837 kg of PFOS-containing material equating to 135 kg of PFOS were notified by six companies. Information from the manufacturer suggests that these quantities will diminish as alternatives are now being used and products reformulated. The NIP indicated that PFOS-foams are no longer in use and several industrial holders of foams notified disposal of the material following a communications campaign. The use and disposal of PFOS-foams are no longer considered to be a current concern. However, the substance may be present in residual forms in land.

From the information provided by the Member States, it can be concluded that only a few stockpiles of PFOS existed in the period 2013-2015 (e.g., Germany, Spain, Luxembourg, United Kingdom), and that most Member States expect that the quantities will decrease over the next years as alternatives are available.

5.3 5.3 Stockpiles of obsolete pesticides

Member States are required to manage stockpiles of obsolete pesticides, i.e. pesticides containing POP substances whose production, placing on the market or use are prohibited. While the Member State reports submitted for the 2013-2015 period do identify stocks of industrial chemicals (primarily PFOS and PCBs), no stockpiles of obsolete pesticides were reported by the Member States for this period.

As a means of comparison towards progress for elimination of pesticide stockpiles, the third synthesis report (covering the period 2010-2012) identified four Member States who

provided information on stockpiles of obsolete pesticides, i.e. Bulgaria, Hungary, Lithuania and the United Kingdom. The reported quantities varied between 88 kg in the United Kingdom to 200 tonnes in Hungary.

A review of the available NIPs highlighted additional information. Table 5.6 summarises the information included on stockpiles of pesticides for the years covered by this synthesis report (2013-2015). Member States indicated that no stockpiles were reported for the period 2013-2015 and/or that all identified stockpiles have been disposed of.

Table 5.6 Overview of stockpiles of obsolete pesticides included in NIP

Member State	Year (publication of NIP)	Summary
Czechia	2017	In relation to the obsolete pesticides, there were/are activities addressed that are associated primarily with ensuring the proper disposal of unused stocks, respectively waste and addressing sites contaminated by these compounds. Disposal of unused stocks was carried out in the early 1990s (carried out by the Ministry of Agriculture).
Denmark	2018	No stockpiles of obsolete POPs pesticides exist in Denmark. No stockpiles for the period 2013-2015 were reported.
Croatia	2016	During preparation of the POPs inventory, no major POPs stockpiles or waste containing POPs were recorded. No stockpiles for the period 2013-2015 were reported.
Cyprus	2014	In their NIP (2014) Cyprus reported that according to the records and inspections carried out by the Department of Agriculture in factories and stores of agricultural products, there are no stockpiles of the chemicals listed in Annexes A and B of the Convention. It is assumed that this is also valid for the reporting period, i.e., 2013-2015.
Lithuania	2017	Until late 2014, 1379 warehouses of old pesticide or contaminated sites containing POPs pesticides were identified within Lithuania. According to the Ministry of the Environment, all identified obsolete pesticides warehouse and stockpiles have been disposed of.
Poland	2016	In Poland, there are no stockpiles of products containing POPs. No stockpiles for the period 2013-2015 were reported.
Sweden	2017	It is estimated that no stockpiles or wastes of these pesticides remain in Sweden. No stockpiles for the period 2013-2015 were reported.

6. 6. Waste Management and Storage

The end-of-life management of stockpiled POPs goods, as well as waste management for POPs within waste streams are covered by Article 7 of the POP regulation. Annex IV and V provide maximum thresholds and accepted means of disposal. The requirements of Article 7 of the POP regulation are provided in the information box below:

Article 7 of the POP Regulation covers the management of waste materials, so that

7.1 Producers and holders of waste shall undertake all reasonable efforts to avoid, where feasible, contamination of this waste with substances listed in Annex IV.

7.2 Notwithstanding Directive 96/58/EC, waste consisting of, containing or contaminated by any substance listed in Annex IV shall be disposed of or recovered, without undue delay and in accordance with Annex V, part 1 in such a way as to ensure that the persistent organic pollutant content is destroyed or irreversibly transformed so that the remaining waste and releases do not exhibit the characteristics of persistent organic pollutants. In carrying out such a disposal or recovery, any substance listed in Annex IV may be isolated from the waste, provided that this substance is subsequently disposed of in accordance with the first subparagraph.

7.3 Disposal or recovery operations that may lead to recovery, recycling, reclamation or re-use of the substances listed in Annex IV shall be prohibited.

7.5 Concentration limits in Annex V, part 2 shall be established for the purposes of paragraph 4(b) before 31 December 2005 in accordance with the procedure referred to in Article 17(2).

7.6 The Commission may, where appropriate, and taking into consideration technical developments and relevant international guidelines and decisions and any authorisations granted by a Member State, or the competent authority designated by that Member State in accordance with paragraph 4 and Annex V, adopt additional measures relating to the implementation of this Article. The Commission shall define a format for the submission of the information by Member States in accordance with paragraph 4(b)(iii). Such measures shall be decided in accordance with the procedure laid down in Article 17(2).

7.7 The Commission shall, before 31 December 2009, review the derogations in paragraph 7(4) in the light of international and technical developments, in particular with regard to their environmental preferability.

Article 7 (4) on derogations states:

waste containing or contaminated by any substance listed in Annex IV may be otherwise disposed of or recovered in accordance with the relevant Community legislation, provided that the content of the listed substances in the waste is below the concentration limits to be specified in Annex IV before 31 December 2005, in accordance with the procedure referred to in Article 17(2). Until such time as concentration limits are specified in accordance with such procedure, the competent authority of a Member State may adopt or apply concentration limits or specific technical requirements in respect of the disposal or recovery of waste under this subparagraph; the substances listed in Annex IV shall be prohibited.

a Member State or the competent authority designated by that Member State may, in exceptional cases, allow wastes listed in Annex V, part 2 containing or contaminated by any substance listed in Annex IV up to concentration limits to be specified in Annex V, part 2, to be otherwise dealt with in accordance with a method listed in Annex V, part 2 provided that:

- (i) the holder concerned has demonstrated to the satisfaction of the competent authority of the Member State concerned that decontamination of the waste in relation to substances listed in Annex IV was not feasible, and that destruction or irreversible transformation of the persistent organic pollutant content, performed in accordance with best environmental practice or best available techniques, does not represent the environmentally preferable option and the competent authority has subsequently authorised the alternative operation;
- (ii) this operation is in accordance with the relevant Community legislation and the conditions laid down in relevant additional measures referred to in paragraph 6; and
- (iii) the Member State concerned has informed the other Member States and the Commission of its authorisation and the justification for it.

6.1 6.1 Management of waste stockpiles

6.1.1 6.1.1 Introduction and background

Annex IV of the POP Regulation sets out the list of named substances subject to waste management provisions; these are the same substances listed within Annexes I, II and III (Banned, Restricted, unintentionally produced) of the regulation. Annex IV also includes the concentration limits above which the provisions of Article 7 apply, including the destruction or irreversible change of the waste to remove the POPs characteristics. Annex V provides the appropriate waste management options for meeting the obligations of Article 7 of the POP Regulation.

In 2007 the POP Regulation was amended by Council Regulation (EC) 172/2007 to include the concentration limits in Annex IV. The POP Regulation was further amended by Commission Regulation (EC) 323/2007 and Commission Regulation (EC) 304/2009, which included additional measures for pre-treatment of waste and aligned the waste management options in Annex V with the requirements of the Basel Convention for metals production. The POP Regulation was further updated by Commission Regulation (EU) 1342/2014 to expand the list of substances in Annex IV (in line with Annexes I, II and III) and also to expand the number of management options in Annex V.

Alongside the POP Regulation, to further align with the Rotterdam Convention on transboundary movements of hazardous waste, the EU created the 'Prior Informed Consent' Regulation (EU) 649/2012 of the European Parliament and of the Council[36]. This regulation contains annexes of named substances which include those substances named within the Annexes of the POP regulation. Where such wastes are moved across political borders for final destruction only, consent is required by the receiving country first. For those substances within Annex III of the Prior Informed Consent regulation it is also a requirement for operators to notify the European Commission via their national competent authority.

6.1.2 6.1.2 Management of old stockpiles

In line with the nature of the substances in Annexes I - III of the POP Regulation, waste stockpiles for final destruction / irreversible transformation in the period 2013-2015 concern three key sources:

- PCBs within the heat transfer fluids of di-electric equipment.
- PFOS containing products; and
- Flame-retardants (PBDEs) used in plastics and foams, particularly those plastics involved with electronics / end of life vehicles.

The Article 12 reports submitted by Member States focused on information on stockpiles themselves (as discussed in chapter 5 on stockpiles). There is less information on how they have been managed (for example, via destruction). However, some information can be gathered from review of the national implementation plans.

PCB containing di-electric

The EU directive on PCBs, i.e. Directive 96/59/EC[37], places requirements on Member States to develop and maintain inventories of PCB containing equipment. The same directive also placed obligations on Member States to remove and decontaminate all di-electrical

[36] ECHA website, details on the Prior Informed Consent regulation and access to original legislation under EURLEX: https://echa.europa.eu/regulations/prior-informed-consent/understanding-pic

[37] Council Directive 96/59/EC of 16 September 1996 on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCB/PCT). OJ L 243, 24.9.1996, p. 31–35

equipment containing PCB of volumes ≥5 dm^3 before 1 January 2010. Review of the previous synthesis reports and national implementation plans suggests that a great deal of work has already been completed for the identification, removal and destruction of PCB containing equipment, but that as of 2013-2015 work was still ongoing to identify and remove PCB volumes from large (≥5 dm^3) equipment.

Stockpiles of equipment contaminated with PCBs (see Section 5) remain in eight Member States (Croatia, Czechia, Ireland, Latvia, Luxembourg, Slovenia, Spain, and Romania). These quantities are likely covered within active programmes of final destruction. The Article 12 reports provide more limited information on how this work is being completed.

In its triannual report, Luxembourg referred to a specific action plan, "SuperDrecksKëscht" for the collection and destruction of PCBs from households. This mainly concerns waste capacitors and electric radiators oils.

Germany stated in their NIP (2016) that all remaining PCB-containing waste was disposed of by the end of 2010. Nonetheless, for the period 2013-2015, PCB from unknown sources was identified. This concerns PCB from electronic equipment with parts containing PCB, PCB-containing wastes from construction and demolition projects, sealants, and PCB-containing parts from scrap cars. Appropriate disposal plans have been drawn up in Germany for equipment containing PCB. Transformers containing PCB were stored in underground storage facilities from 1983 and were partly drained before being placed underground. From 2004 to 2010, around 14,000 tonnes of the stored equipment were dismantled, drained, decontaminated and the metals were recovered. Small capacitors were stored in underground storage facilities until 2004. Since 2005, small capacitors containing PCB have been disposed of in high-temperature incineration plants. The quantity of PCB in still active applications such as sealing compounds or fluorescent lamp capacitors cannot be estimated. Information on proper disposal for the owners of electrical equipment and components containing PCB is partly issued.

Slovenia indicated that there are no technical facilities for disposing of PCB and PCB-containing equipment (with final disposal or destruction of PCB) in an environmentally sound manner, and that therefore the waste PCB and waste PCB equipment is exported to other Member States, i.e., France, Germany and Austria, for disposal in an environmentally sound manner.

Czechia listed in their NIP (2017) the capacity of seven facilities for the disposal of wastes containing POPs and PCBs. However, no information is provided on the amount of PCB destroyed between 2013 and 2015.

PFOS containing products

Four Member States reported stockpiles of PFOS (e.g., Germany, Spain, Luxembourg, and the United Kingdom (see section 5 for further detail), with the expectation that stockpiles will decrease over the next years as alternatives are available.

Fire-fighting foams containing PFOS, which were placed on the market before 27 December 2006, had to be used up by 27 June 2011. According to Article 7 of the POP regulation, after 27 June 2011 they must be treated as waste and disposed of.

Germany indicated in their NIP that the remaining stockpiles were incinerated, whereby PFOS was thermally decomposed and no emissions were produced.

In their NIP (2018), Denmark indicated that virtually all PFOS-containing waste would be disposed of by 2016, i.e., at the end of the period 2013-2015. However, it cannot be ruled out that some PFOS would still enter the waste stream after this date, as the service life of some articles may be longer than expected. Furthermore, it is stated that the Danish EPA is undertaking a desk study on destruction efficiencies for PFOS (as well as for SCCP, PBDEs and HBCDD).

The United Kingdom (NIP, 2017) stated that all use of PFOS-foams had ceased, with appropriate disposal for stockpiles also completed. This was based on a communications and compliance campaign in 2011 by the Environment Agency. However, the substance may be present in residual forms in land resulting from PFOS-foam/water run-off occurring during past industrial incidents.

Flame-retardants (PBDEs) used in plastics and foams

Globally C-PentaBDE and C-OctaBDE were phased out in 2004 but based on their use within plastics and the polyurethane (PUR) foams used in soft furnishings they represent a significant legacy issue for waste processes.

The use of C-OctaBDE within plastics for electrical goods, in particular, is of interest and is covered at EU level by the directive on Waste Electrical and Electronic Equipment (WEEE) (2012/19/EU)[38]. The Article 12 reports submitted by Member States contain little or no information with regard to PBDEs and final destruction.

Germany provided information in their NIP (2016) and stated that on 1 January 2016, i.e., at the end of the reporting period 2013-2015, there were 6.5 million cars in Germany that were first registered before 2000, potentially containing polybromodiphenyl ethers identified under the Stockholm Convention (POP-BDE). These accounted for a 14% share of the total car stocks of 45.1 million cars. Germany provided data, which indicated, in 2012, the proportion of cars that could potentially contain POP-BDE was 26% (compared to 46% or 18.9 million cars in 2008). This shows that the potential for vehicles containing POP-BDE is reducing over time. Germany confirmed that 2004 was considered the latest time that POP-PBDEs would have been used in products[39]. Assuming a lifetime of 10-16 years of cars and the phase out in 2004, the majority of C-PentaBDE in automotive applications would be disposed of around latest 2020.

Article 7(2) of the POP Regulation requires that waste that contains above 1000 mg/kg PBDE (sum of tetra, penta, hexa, and hepta homologues) must be treated so that the PBDEs are destroyed or irreversibly transformed. In Germany, brominated and thus PBDE-containing plastics are usually treated in thermal recovery and removal / disposal methods, in which PBDE is destroyed. Placing waste containing POPs on above-ground landfill sites is not permitted under the Landfill Regulations (Deponieverordnung). However, historically, articles from the electrical sector were also used in landfill construction and accordingly are currently present there.

Obsolete pesticide products, particularly lindane

In the triannual reports (2013-2015), Member States did not report information on the management or destruction of obsolete pesticides. For comparison, in the third synthesis report, covering (2010-2012), seven Member States (Croatia, Cyprus, Czechia, Denmark,

[38] WEEE Directive: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:197:0038:0071:en:PDF

[39] EU Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants – SWD(2018) 495 final

Netherlands, Poland, and Sweden) reported that no remaining stockpiles of obsolete pesticides existed within their country. For another five Member States (Finland, Germany, Greece, Portugal, and Romania) the position was unknown.

6.2 6.2 Identification of contaminated sites

Article 7 of the POP regulation covers management of wastes contaminated with named substances but does not specifically cover contaminated land as an issue to be addressed. However, where POPs substances have previously been manufactured and used within the Union the potential for contamination of soil does exist.

In their triannual report (2013-2015), Spain provided information on sites contaminated by HCH in four regions, i.e., Aragón, Castilla y León, País Vasco, and Galicia. In the region of Aragón, gamma-HCH was manufactured between 1975 and 1989, with the generated solid and liquid waste disposed in the landfills of Sardas and Bailin (see table below).

Table 6.1 Data on HCH contamination in two landfills in the region of Aragon, Spain

	Landfill of Sardas	Landfill of Bailin
HCH – solid	60,000 m^3	65,000 t
HCH – DNAPL*	30 m^3	25 t
Contaminated land	350,000 m^3 (mixed with other hazardous waste)	342,000 t

* Dense Non-Aqueous Phase Liquid

From 1992 to 2015, €54 million have been invested in decontamination in Spain (9% EU, 21% Ministry and 70% of the Government of Aragon). Many decontamination actions have been undertaken and actions are still planned, such as hydrogeological monitoring or further testing activities.

In Castilla y León analyses of water samples near the historically contaminated site indicated that no detection of lindane in any of the samples during 2013-2015. Works to carry out a detailed characterization of the soil of the area are currently planned.

Controls and monitoring are carried out in the historically contaminated areas in País Vasco. From the annual follow-up reports it is noted that during 2013-2015, as well as in previous periods, there has been no incident related to lindane contamination.

A number of the NIPs presented by EU Member States cover the topic of contaminated land and activities to address the issue which usually involves excavation and creation of contaminated waste which must be managed following Article 7 of the regulation.

Denmark stated within their NIP (2018) that a literature review of soil and groundwater contamination by PFAS (Nikolaisen and Tsitonaki, 2016) and a screening investigation of groundwater of a number of potentially contaminated sites in Denmark were undertaken (Tsitonaki et al., 2014). In the screening study from 2014, PFAS compounds were detected in five out of eight investigated fire-fighting training grounds. The soil levels varied from a few to several thousand ng/l. PFOS was detected at three of the sites in concentrations

ranging from 15 to 980 ng/l. There are at least 38 large fire-fighting training grounds in Denmark. A high concentration of PFAS compounds of approximately 1,400 ng/l was found in one sample from the carpet industry in Denmark. PFOS accounted for 870 ng/l. The sample originated from a random shallow groundwater well at the site, not situated directly in an area where there was any knowledge of use, storage, or spill of PFAS.

The German NIP (2016) indicated that in 2016 more than 271,000 sites are recorded as potentially contaminated. Similar numbers may be expected for 2013-2015. Details of the number of recorded sites are given for the respective Länder in the corresponding contaminated land registers or by the German Environment Agency. These usually provide information about all uses of the land to date, their technological orientation and contamination typical for the industries concerned. During production of lindane (γ-HCH), large quantities of α- and β-HCH were created as "by-products", which used to be stored above ground, including in Germany. With the inclusion of the compounds as POPs, these landfill sites are to be viewed as being POP contaminated sites.

The Lithuanian NIP (2017) reports that until late 2014, 1,379 warehouses of old pesticide or contaminated sites containing POPs pesticides were identified within the country. It is stated that the soil and the groundwater in these territories are likely to be contaminated with POPs.

The Swedish NIP (2017) states that due to its broad spectra of previous use, PCP could be found in a wide range of contaminated sites, for example garden centres, pulp mills, wood impregnation sites and marinas. It has been identified that treatment of wood has occurred at approximately 1,200 sites in Sweden, according to what is registered in the national database. Similar numbers may be expected for 2013-2015. At these sites PCP or similar chemicals have been used as impregnation agents. Almost half of the sites are classified with high or very high risk for negative impacts on human health or the environment. This means they are prioritised for further investigations and remediation.

Furthermore, 2,700 sites were identified where market gardens could have used pesticides. 750 of these sites are estimated to have high risk or very high risk according to the national risk classification system. Sweden also reported that several sites are known to be contaminated with PFOS, such as military and civilian airports and their surrounding water areas, industrial sites, discharge from waste treatment facilities and landfills and other areas where fire-fighting foams have been used.

Based on the review of national implementation plans, Table 6.2 provides information on where specific POPs are mentioned with regard to contaminated sites. Table 6.2 only contains information from Member States with an updated NIP compared to the version referred to in the third synthesis report. Information from the other Member States dates back from before 2013 and is reported in the third synthesis report.

Table 6.2 Discussion of contaminated land sites within recent national implementation plans (NIPs)

Member State	Date of NIP	POPs named in relation to contaminated land sites
Czechia	2017	PCB, PAH, pesticides
Denmark	2018	PFOS, PCB
Germany	2016	α- and β-HCH
Croatia	2016	None reported
Lithuania	2017	Pesticides
Poland	2016	PCP, pesticides, PFOS
Sweden	2017	PCP
United Kingdom	2017	PCP

6.3 Derogations

Article 7 of the POP Regulation sets out how waste containing POPs should be managed, in particular by prohibiting the re-use/recycling and requiring destruction or irreversible change of POPs contained in the waste. Article 7(4) however sets a derogation for management and disposal of such waste for the activities included in Annex V part 2, provided the POPs concentration in the waste does not exceed the limits set in Annex IV. The derogation mostly applies to ashes, slags, and combustion materials from a range of different processes. The alternative method of disposal in Annex V part 2 is described as:

"Permanent storage only in: – safe, deep, underground, hard rock formations, – salt mines or – a landfill site for hazardous waste (provided that the waste is solidified or stabilised where technically feasible as required for classification of the waste in subchapter 19 03 of Decision 2000/532/EC)"

In order to apply this derogation, Member States are required to provide notifications and their justification concerning the use of this derogation to the Commission. In the third synthesis report, covering the period 2010-2013, it was stated that no information on new derogations had been identified for that period.

Similarly, no Member States reported a derogation in their Article 12 triannual reports covering the period 2013-2015.

7. 7. Environmental releases

The release of POPs, particularly of those substances included in Annex III as unintentionally produced POPs, represents a key issue for management of environmental concentrations. The development of emission estimates for specific sources provides to Member State Competent Authorities a key evidence base for addressing environmental emissions of POPs. Article 6 of the POP Regulation details what action Member States need to take to reduce, minimise and eliminate POPs emissions (see information box below).

Article 6 - Release reduction, minimisation and elimination:

6.1 Within two years of the date of entry into force of this Regulation, Member States shall draw up and maintain release inventories for the substances listed in Annex III into air, water and land in accordance with their obligations under the Convention and the Protocol.

6.2 A Member State shall communicate its action plan on measures to identify, characterise and minimise with a view to eliminating where feasible as soon as possible the total releases developed in accordance with its obligations under the Convention, to both the Commission and the other Member States as part of its national implementation plan, pursuant to Article 8.

> The action plan shall include measures to promote the development and, where it deems appropriate, shall require the use of substitute or modified materials, products and processes to prevent the formation and release of the substances listed in Annex III.

6.3 Member States shall, when considering proposals to construct new facilities or significantly to modify existing facilities using processes that release chemicals listed in Annex III, without prejudice to Council Directive 1996/61/EC 1, give priority consideration to alternative processes, techniques or practices that have similar usefulness but which avoid the formation and release of substances listed in Annex III.

Article 9 - Monitoring:

The Commission and the Member States shall establish, in close cooperation, appropriate programmes and mechanisms, consistent with the state of the art, for the regular provision of comparable monitoring data on the presence of dioxins, furans and PCBs as identified in Annex III in the environment. When establishing such programmes and mechanisms, due account shall be taken of developments under the Protocol and the Convention.

7.1 7.1 Measures to identify and characterise sources and Steps to identify source inventories

A core requirement of the POP regulation has been the development and maintenance of emission inventories for those substances within Annex III of the regulation. These inventories are intended to provide information on source characterisation and emission trends for releases to air, land and water. The development of such inventories acts as an important evidence base to support the work included within national implementation plans for the identification of sources and minimisation of emissions to the environment.

Reporting of emission inventories is covered by Article 12 paragraph 3(b) of the POP Regulation, as part of the triennial reporting that Member States are required to complete. The development and reporting of emission inventories is also a core part of the Stockholm Convention (releases to five vectors: air, land, water, residue, and product) and the Arhus protocol of the Convention on Long range Transboundary Air Pollution (releases to air only). Development of such inventories requires the use of a range of approaches, such as:

- Monitoring at release,
- Development of estimates using ‘activity’ data combined with emission factors,
- Source flow modelling for aquatic environments.

To help in the development of inventories, international tools have been developed, such as the UNEP standardised toolkit for dioxins and furans[40], and the EMEP guidebook[41]. The latter provides both emission factors by activity and guidance on how inventories can be developed dependent on the level of detailed information available.

In addition to the international tools described above, a number of databases of emission estimate information exist to help assess, compare, and benchmark the work completed under their own inventory development. In particular these include:

CORINAIR Emission Inventory database: EMEP Webdab

The UNECE Convention on Long range transboundary air pollution (CLRTAP) covers multiple air pollutants. POPs are specifically covered by the Aarhus protocol to the Convention. Ratifying countries are required to submit emission estimates annually to the Centre on Emissions and Projections (CEIP), which is a part of the European Environment Agency. This data is collated and managed as a central pool of information, which is publicly available through the EMEP Webdab website. The information provided covers the period from 1990 to present. It is a valuable source for Member States to compare their emission estimates. The website is available at: http://www.ceip.at/.

The European Pollutant Release and Transfer Register (E-PRTR) database

The E-PRTR was created by Regulation (EC) 166/2006. It replaces the former European Pollutant Emission Register (EPER) expanding upon the number of pollutants and economic activities covered. The E-PRTR is part of Europe's response to the Aarhus Convention on making pollutant information publicly available. It places obligations on operators through the environmental permitting to calculate emission estimates for their given facility and report back to their competent authority on an annual basis. The E-PRTR acts as the central repository for this information spanning approximately 27,000 facilities and data on emissions of 91 pollutants to air, land, and water, including the POPs listed in the POP Regulation. The E-PRTR provides emission data from regulated facilities from 2007 to present and again provides a valuable tool to Member States when deriving their own estimates. The E-PRTR website is available at: http://prtr.ec.europa.eu/.

Other repositories of useful information for inventory development include:

- The Water Information Systems for Europe (WISE) website developed by the European Commission, Joint Research Centre, and Eurostat to provide guidance and data on water and water quality issues including monitoring and modelling.
- The US EPA 42 emission factor database which spans a wide range of regulated activities.

Table 7.1 provides a summary on the status of emission inventories reported under the Stockholm Convention, CLRTAP, and the POP Regulation. It is noted that five Member States (Greece, Hungary, Italy, Lithuania and Malta) did not provide Article 12 responses to questions in the current reporting period, and a number of Member States did not update their NIP during this period (see Section 8), so the status of their emission inventories under the Convention and POP Regulation are unclear. Overall, however, it is noted that a greater amount of inventory data has been provided by Member States in 2013-2015 compared to the previous reporting period (2010-2012).

[40] UNEP, 2012, Standardised toolkit for dioxins and furans https://toolkit.pops.int/Publish/Downloads/UNEP-POPS-TOOLKIT-2012-En.pdf
[41] https://www.eea.europa.eu/publications/emep-eea-guidebook-2016

Table 7.1 Status of emission inventories reported for 2013-2015

Member State	Stockholm Convention	Convention on Long Range Transboundary Air Pollution (CLR-TAP)	POP Regulation
Belgium	✓$_2$	✓	
Bulgaria	✓$_1$	✓	✓$_1$
Czechia	✓$_5$	✓	✓$_5$
Denmark	✓$_1$	✓	✓$_1$
Germany	✓$_1$	✓	
Estonia	✓$_1$	✓	✓$_1$
Ireland	✓$_5$	✓	✓$_1$
Greece		✓	
Spain	✓$_2$	✓	✓$_2$
France	✓$_2$	✓	✓$_2$
Croatia	✓$_5$□	✓	✓$_1$, ✓$_5$□
Italy		✓	
Cyprus	✓$_1$	✓	✓$_1$
Latvia	✓$_1$	✓	✓$_1$
Lithuania	✓$_1$	✓	✓$_1$
Luxembourg		✓	✓$_1$
Hungary		✓	
Malta		✓	
Netherlands	✓$_1$	✓◊	✓$_2$
Austria	✓$_4$‡	✓	✓$_4$
Poland	✓$_1$	✓	✓$_1$
Portugal	✓$_1$	✓	✓$_2$
Romania	✓$_1$	✓	✓$_1$
Slovenia	✓$_1$	✓	✓$_1$
Slovakia	✓$_1$	✓	✓$_1$
Finland	✓$_1$	✓	✓$_1$
Sweden	✓$_3$	✓	✓$_5$
United Kingdom	✓$_5$	✓	✓$_5$

◊ - PCB emissions not reported under emission inventories submitted – assumed to be negligible.
□ - Applies to dioxins and furans only.
† - Applies to PAH and HCB only.
‡ - Excluding PCBs.
1 - air emissions only. 2 - air and water emissions. 3 - air, water, and residue/products. 4 - air and residues. 5 - all vectors.

The strategy to identify, characterise and manage potential sources of POPs is part of a larger policy framework, which includes additional actions contributing to the development of emission estimates:

- UNECE Convention on Long-Range Trans-boundary Air Pollution, ratified in 1981 and entering into force from March 1983.
- Aarhus Protocol on Persistent Organic Pollutants as a Protocol to the Convention on Long-Range Transboundary Air Pollution, ratified in 1998.
- Council Directive 96/59/EC of September 1996 on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCB/PCT).
- Regulation (EC) No 166/2006 concerning the establishment of a European Pollutant Release and Transfer Register, which requires that emissions and waste transfers from specified industrial and waste management operations must be reported to the European Commission.
- Directive 2010/75/EU regarding industrial emissions (IED) which supersedes the directive on integrated pollution prevention and control (IPPC); this directive sets down best available techniques for industrial facilities and environmental permitting including reporting.
- Directive 2012/19/EU regarding control of major-accident hazards involving dangerous substances, known as the SEVESO III Directive.
- Regulation (EC) No 1907/2006 regarding the Registration, Evaluation, Authorisation, and restriction of Chemicals (REACH). In particular the elements of REACH concerning substances of very high concern and PBT assessment.
- Regulation (EC) No 1272/2008 regarding the classification, labelling and packaging of substances and mixtures (CLP).
- Regulation (EC) No 649/2012 on the export and import of hazardous chemicals.
- Directive 2000/60/EC establishing a community framework for water policy, known as the Water framework directive.
- Directive 2013/39/EC concerning the establishment of environmental quality standards (EQS) for water which identifies lists of priority and priority hazardous substances. Following on from the water framework directive obligations are placed on Member States to develop inventories of losses and releases to surface water for priority and priority hazardous substances to be communicated to the EU through river basin management plans.
- Directive 2008/56/EC establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).
- Convention for protection of the marine environment of the north east Atlantic (OSPAR) which includes specific provisions regarding the release of persistent pollutants to marine waters.
- UNEP Barcelona Convention ratified in 1975 for the protection of Mediterranean which includes specific provisions regarding the release of persistent pollutants to marine waters.
- UNEP Rotterdam Convention ratified in 2004 covering trade of specific hazardous materials and transboundary movements of such chemicals.
- UNEP Basel Convention ratified in 1989 covering the transboundary movement of hazardous wastes.

7.2 7.2 Emission inventory estimates for Annex III substances

Article 6(1) of the POP Regulation requires Member States to develop, maintain and report the details of emission inventories for those substances named within Annex III of the regulation. These should be reported to air, land, and water. This section of the report provides a summary of the information reported by Member States under Article 12 but has also been supplemented by emission estimates reporting to both the UNEP Stockholm Convention and the UNECE Convention on Long Range Transboundary Air Pollution.

In providing a summary of the emission inventories, it is also necessary to detail some of the terminology, in particular in relation to the development of emission inventories for the Stockholm Convention which requires data on the following five vectors:

'Air' – relates to all emissions of POPs directly to air, deposition (wet or dry) and re-volatisation, to air which can be important pathways for long range transport, are not covered within this definition. Only the initial release should be estimated.

'Water' – relates to all emissions of POPs directly to water.

'Land' – relates to all emissions of POPs directly to land, a good example being bonfires or backyard burning where the contaminated ash is lost directly to land.

'Residue' – relates to contaminated solid wastes, which are subsequently managed, again a good example might be air pollution control residues (ash), which are consigned to a managed landfill site.

'Product' – relates to POPs substances within a product, for inventories an example might be the granulated slags or ashes from combustion, which can be used within aggregate for road surfacing.

7.2.1 7.2.1 Dioxins and Furans (PCDD/F)

Dioxins and furans are a family of 210 congeners. The family of congeners vary in toxicity making analysis and comparison to health effects complex. To help quantify dioxins and furans, a system of toxic equivalent factors (TEFs) was developed, based on toxic equivalent to the most toxic and carcinogenic congener, 2,3,7,8 Tetrachlorodibenzo-p-dioxin (TCDD). Two systems of TEFs are in existence denoted by the suffix I-TEQ for the NATO system and WHO-TEQ for the WHO system. A more detailed explanation of TEFs is provided within Appendix A of this report. The summary provided within this chapter will be based on I-TEQ unless otherwise clearly stated.

Dioxins and furans have no known commercial use and have never been manufactured intentionally for any purpose. Typically, they are produced as a by-product of incomplete combustion processes and can sometimes be formed de-novo within the exhaust systems of manufacturing / combustion plants where the correct temperature range exists to allow such formation. Because dioxins and furans are formed in this fashion the key emission vector has been to air as exhaust stacks of combustion processes, or where open burning occurs (such as bonfires) there is also a potential for direct release to land as contaminated ash.

Figure 7.1 provides a breakdown of the key sources for dioxin and furan emissions to air based on the data provided by Member States to the UNECE for the CLRTAP protocol on POPs between 2013–2015.

Figure 7.1 Sources of emissions of dioxins and furans to air for the EU 28 in 2015 (UNECE reported data)

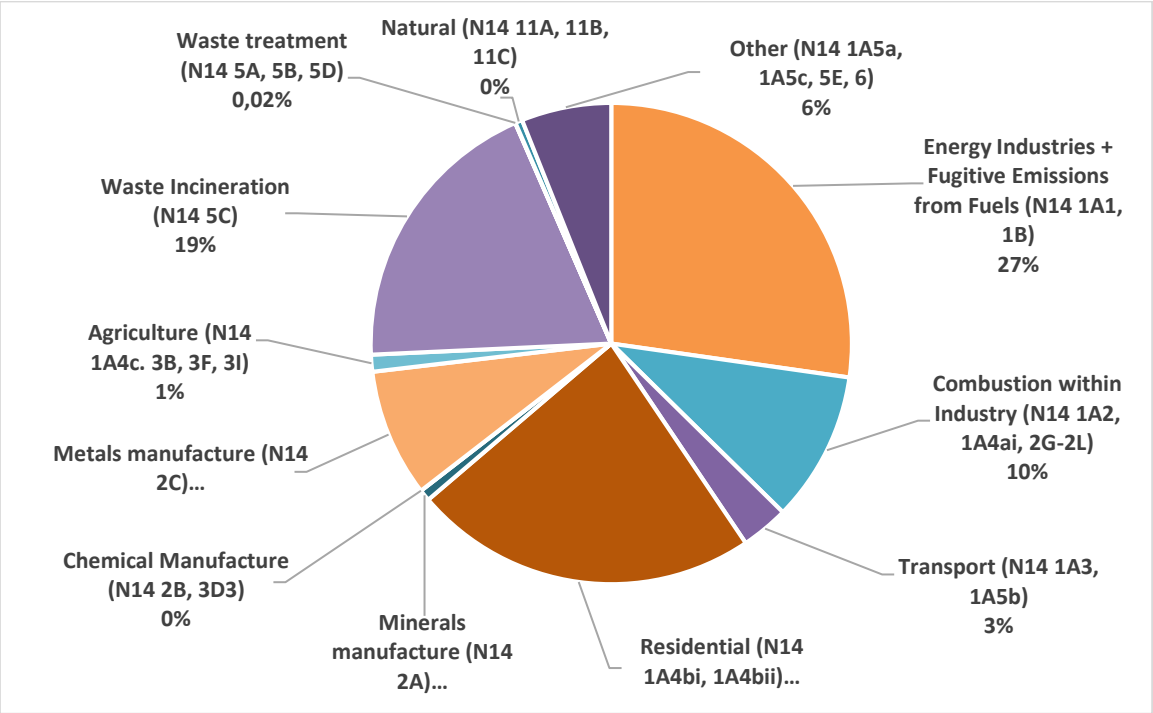


Figure 7.1 highlights the importance of so-called 'diffuse' sources to the overall release estimates for air. The UNECE data for 2015 indicate total EU28 emissions of dioxins and furans to air of 3,105 g I-TEQ. The main contributions are from the energy sector (27%); combustion in domestic residences, likely linked to solid fuels such as coal (23%); and incineration of waste (19%).

The total EU28 emissions are notably much higher than reported in the previous synthesis report (2010-2012), and the distribution of sources is also noted to be different to that reported in the third synthesis report, which was dominated more by residential combustion. This shift can be largely attributed to an increased number of Member States reporting their emissions, particularly Greece, for which emissions of dioxins and furans is shown to be relatively high (contributing over 39% of the EU total).

As detailed later in this section, releases of dioxins and furans into the environment have seen a sharp decline since 1990 when the first UNECE inventories began (with the notable exception of Greece). Much of this decline has been the result of improved processes and abatement within industry. However, the diffuse sources are becoming increasingly important as industrial sources fall. This is also an issue for inventory compilation as the diffuse nature of such burning events makes estimation difficult and typically these sources within inventories have the highest levels of uncertainty.

Figure 7.2 provides an adjusted pie-chart to include only those sources from regulated industrial sites. Based on this revised pie-chart the key sources of dioxin and furan emissions to air are from combustion in the energy (40%) and waste incineration (29%) sectors. This represents a notable change from the previous reporting period (2010-2012), where emissions were reported to be dominated by combustion within industry and metals manufacture.

Figure 7.2 Sources of emissions of dioxins and furans to air (EU 28) – Regulated sites only (UNECE reported data)

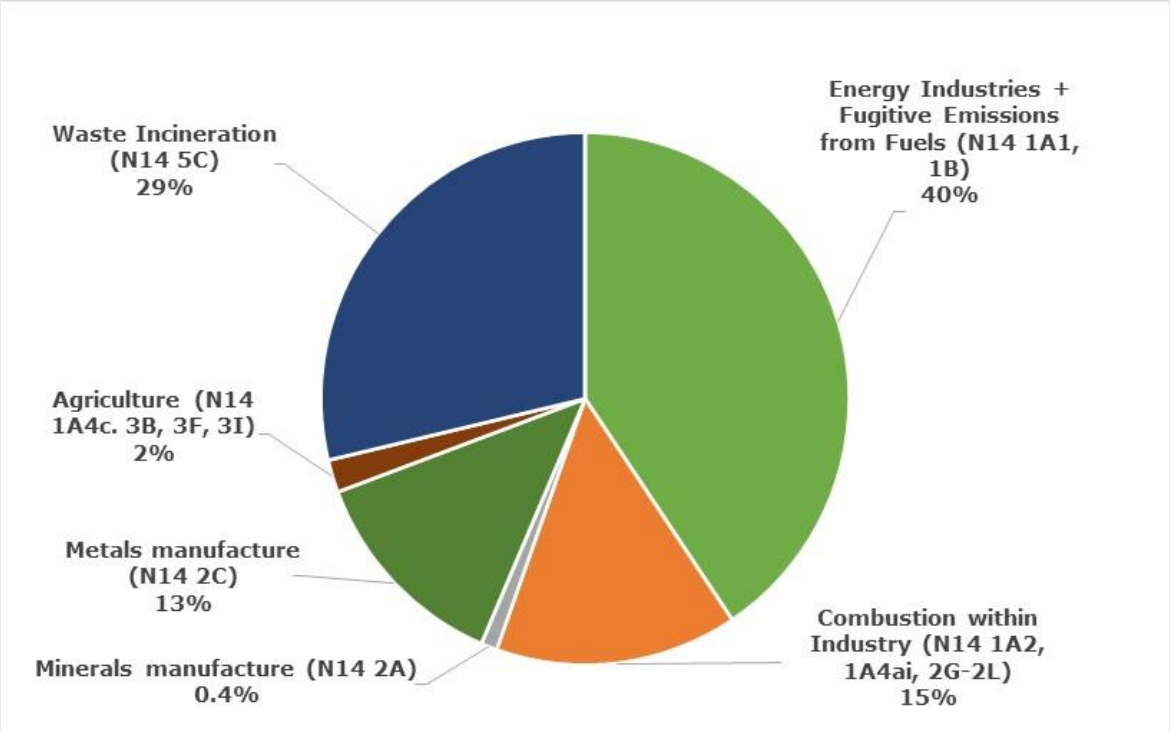


Figure 7.3 provides a breakdown of dioxin and furan emissions to air for 2013–2015 by Member State based on the data submitted to the UNECE protocol on POPs. The graph helps to identify where the highest quantities of dioxins and furans have been reported, with annual emissions ranging from <1 g I-TEQ to >1,300g I-TEQ.

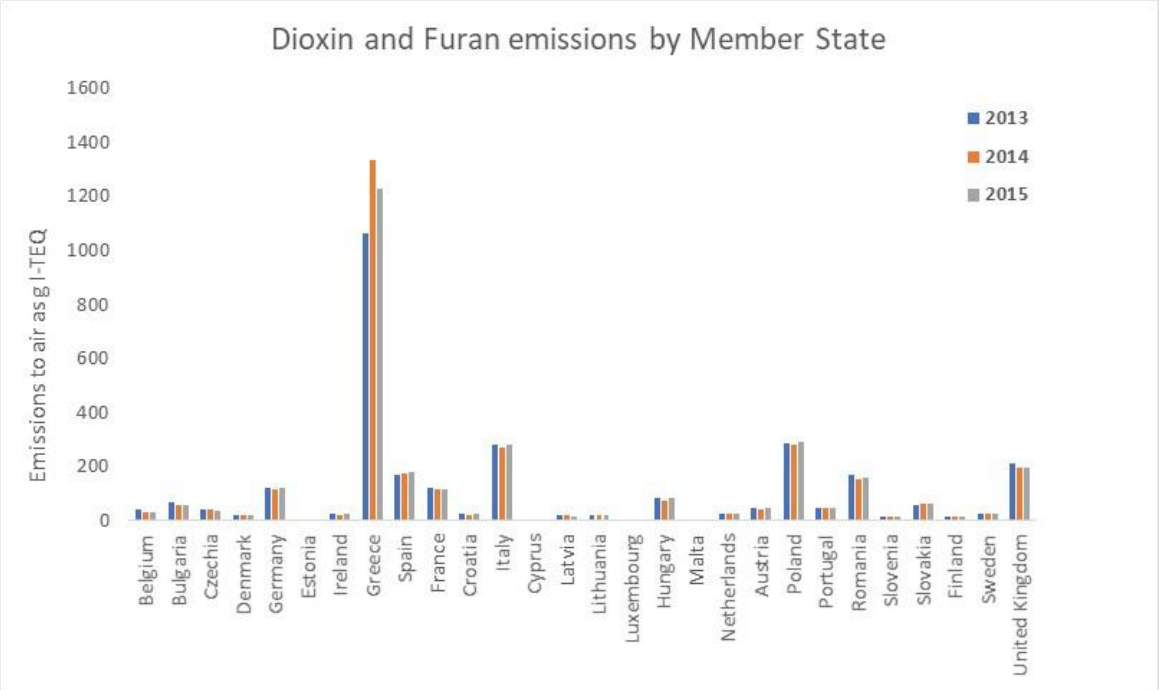
The highest levels of dioxin and furan emissions reported in 2015 are in Greece (1,230 g I-TEQ, 39%), with other key contributions from Poland (290 g I-TEQ; 9%), Italy (280 I-TEQ; 9%), and the United Kingdom (190 I-TEQ; 6%). As noted above, the inclusion of Greece in the emissions reporting in this synthesis report is the cause of a deviation compared to the third synthesis report, where the highest proportion of emissions to air was from Poland, Romania, Italy, and the United Kingdom.

Upon further investigation of the emission of PCDD/F in Greece, there is reasonable agreement in the emissions data reported under the EMEP and E-PRTR databases. The E-PRTR indicates that, in 2015 there were 7 facilities in Greece reporting total PCDD/F emissions of 633 g to air from seven facilities. Four of these facilities, contributing 99% of these emissions, were thermal power stations and other combustion installations.

This value for emissions from the energy sector is reflected in the EMEP Webdab data for Greece in 2015 (658 g I-TEQ, 54% total emissions). The other key source revealed in the EMEP data for Greece in 2015 is incineration of clinical waste (429 g I-TEQ, 35% total emission). This is substantially higher than other Member States, and it is noted that emissions from this sector in Greece have increased substantially since 1990 during the current reporting period.

The figure also presents some basic information on emission trends over the period from 2013–2015. This illustrates that the majority of Member States show a largely static level of emissions on an annual basis with a small number showing a general increase in the levels of emissions between 2013 and 2015.

Figure 7.3 Dioxins and Furans emissions to air by Member State (2013-2015)[42]



The figure also presents some basic information on emission trends over the period from 2013–2015. This illustrates that the majority of Member States show a largely static level of emissions on an annual basis with a small number showing a general increase in the levels of emissions between 2013 and 2015.

Compared to the previous synthesis report (2010-2012), a notable reduction can be seen for Croatia which had higher emissions in the third synthesis report. Conversely, there has been an increase in dioxin and furan emissions to air between the last and this (current) synthesis report in France, Germany, Hungary, Italy and Spain.

Table 7.2 helps provide additional context on these estimates, including data on the 1990 vs 2015 annual emission estimates and emission reduction, as well as per capita emissions by Member State for 2015. The mean average fall in dioxin and furan emissions to air since 1990 shows a 62% reduction. However, for specific Member States, notably Belgium, Luxembourg, the Netherlands and Romania, the fall in emissions has been much greater with a decline of ≥95%. Overall, nearly all Member States have shown a decline in emissions of dioxins and furans between 1990 and 2015 with the lowest reductions being 19% for Slovenia and 12% for Poland.

Table 7.2 illustrates that the per capita emissions of dioxins and furans ranges from 0.5 - 114 µg / person / year with an average of 9 µg / person / year. As expected, Greece has the highest per capita emissions (114 µg / person / year) with the next highest value reported by Slovakia (12 µg / person / year). Most Member States have per capita emission values <5 µg / person / year. Table 6.8 also provides details regarding the reduction of emissions since 1990 with the biggest reductions in the Czechia, Spain and the United Kingdom with emissions reduced by over 95%. The one Member State reporting an increase in emissions during this period is Greece, where emissions are reported to have risen 45% between 1990 and 2015.

[42] Emission estimates provided in this table are taken from reporting under the Convention on Long Range Transboundary Air Pollution (CLRTAP)

Table 7.2 Emissions reduction for dioxins and furans, and per capita emissions based on data reported under the UNECE POP Protocol

Member State	Emission to air 1990 g I-TEQ	Emission to air 2015 g I-TEQ	Reduction in annual emissions 1990:2015 as a percentage	Per Capita emissions 2015 µg I-TEQ/Person
Belgium	586	31	95%	2.75
Bulgaria	118	56	52%	7.86
Czechia	93	36	62%	3.38
Denmark	69	22	68%	3.80
Germany	806	119	85%	1.45
Estonia	8	4	49%	3.14
Ireland	62	24	61%	5.13
Greece	851	1230	-45%	113.00
Spain	403	178	56%	3.83
France	1,782	115	94%	1.72
Croatia	48	23	52%	5.50
Italy	503	281	44%	4.63
Cyprus	2	0	80%	0.48
Latvia	26	16	39%	8.16
Lithuania	28	19	31%	6.72
Luxembourg	43	2	96%	2.88
Hungary	105	82	22%	8.32
Malta	-	-	-	-
Netherlands	744	23	97%	1.38
Austria	124	44	65%	5.03
Poland	328	290	12%	7.64
Portugal	531	48	91%	4.60
Romania	3,073	156	95%	7.88
Slovenia	19	15	19%	7.44
Slovakia	323	63	80%	11.70
Finland	18	14	20%	2.63
Sweden	67	23	66%	2.33
United Kingdom	1,377	194	86%	2.96

Reporting of emissions of dioxins and furans to other vectors beyond air is more limited with only 11 Member States reporting emissions to more than one vector to either the Stockholm Convention or to the European Commission as part of the Article 12 reporting. Table 7.3 provides a summary of these emissions estimates including air as a comparative vector. The key point to note from Table 7.3 is the comparison between emissions to air and land/residue. Austria, Croatia, Czechia, Estonia, Ireland, Sweden, and the United Kingdom report emission estimates for concentrations of dioxins and furans within residues and/or land. Broadly similar levels of emissions are quoted between air and land/residue in Austria, Czechia, and Sweden, with these estimates suggesting that residue is a much more significant emission vector than air.

The United Kingdom and Estonia report emissions of dioxins and furans to both land as a direct release and also to the 'product' vector, with very good agreement between the two for the proportion of total emissions to each vector.

Releases to land are likely to be dominated by the open burning of waste, as well as accidental fires. As with other Member States the regulated sources have seen a sharp decline in the release of dioxins and furans to all vectors, meaning that the unregulated sources, particularly backyard burning have become increasingly important. Developing estimates for these sources is particularly difficult due to the diverse and widespread nature of the activity. Actions to control emissions in several Member States have focussed on these sources (see Section 8).

Table 7.3 Emissions of dioxins and furans to all vectors based on those reported to the EU and Stockholm Convention

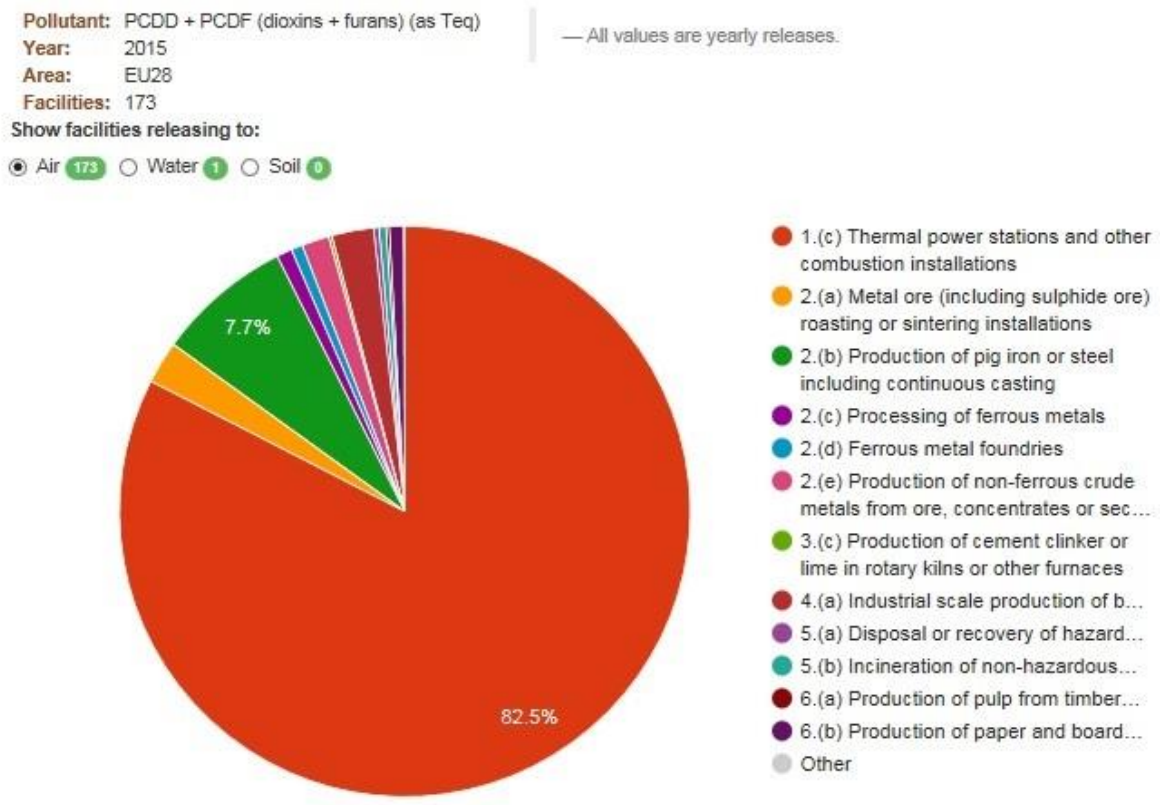
Year	**2015**	**2012**	**2013**	**2015**	**2015**	**2015**	**2012**	**2013**	**2015**	**2013**	**2014**
Member State	AT	BE	HR	CZ	EE	FR	IE	NL	ES	SE	UK
Air	12%	99.8%	69%	12%	56%	89%	68%	84%	14%	14%	43%
Water	NR	0.2%	1%	NR	2%	11%	NR	16%	86%	NR	3%
Land	85%	NR	NR	29%	5%	NR	32%	NR	NR	NR	5%
Residue	NR	NR	27%	59%	15%	NR	NR	NR	NR	86%	32%
Product	2.4%	NR	2%	NR	22%	NR	NR	NR	NR	NR	17%

NR – Not reported

The estimates quoted from the United Kingdom for the product vector, which in 2015 amounted to 145 g I-TEQ, relate to those waste materials from combustion processes re-used within the cements and aggregates industry. While APC residue is highly toxic and treated as hazardous waste, ashes from bottom grates tend to be less contaminated and represent an inexpensive material which can be used within aggregates industries, particularly for road surfacing materials. The POP Regulation provides guidance under Annex IV on threshold concentrations above which waste contaminated by POPs must be destroyed and cannot be reused. Given the quantities involved it is assumed based on communication with waste incinerator operators that those materials reused within aggregate industries are bottom ashes with concentrations below the Annex IV thresholds.

The data submitted to the European Commission under Article 12 have been compared with data available under the UNECE POPs Protocol and Stockholm Convention and in the E-PRTR. Figure 7.4 provides an overview of emissions to air for dioxins and furans based on total number of sites that reported data to the E-PRTR (173 regulated sites). In contrast to the data reported in 2012 (which was dominated by iron and steel foundries), the key industrial sources are dominated by thermal power stations (82.5%) with production of pig iron or steel casting as the next most significant source (8%) of emissions to air in 2015.

Figure 7.4 Data reported to the E-PRTR for emissions of dioxins and furans to air (taken from the E-PRTR website on the 17/01/2019)



The data on emissions to air (from the E-PRTR) suggests that emissions to air are dominated by the energy sector (thermal power stations and other combustion facilities), with the main contribution coming from Greece (65%), which has only 7 of the 173 facilities, while countries with greater number of facilities, e.g. United Kingdom (21) and Spain (22) have much smaller contributions to total emissions (~4%). These observations are consistent with the data from the POPs Protocol, discussed above.

One notable discrepancy to note, however, is that the E-PRTR data reviewed, indicates a substantial (98%) decline of emissions in Czechia from 2013 to 2015, which can be attributed to the reduction or closure of one specific facility. This is not reflected in the trend in overall emissions observed in Figure 7.3.

Figure 7.5 provides an overview of E-PRTR data based on all sites that reported dioxin and furan releases to water (34 regulated sites in total) across the Union. This chart shows that emissions are dominated by emissions from oil and gas refineries (94%). It is noted that this

is attributed to two specific facilities in Spain. Many PCDDs and PCDFs are formed during the regeneration of spent catalyst material in the refining industry which then end up in waste streams; however, such wastes are tightly controlled by environmental legislation requiring appropriate levels of treatment. It is unclear whether the estimates are a genuine reflection of true emissions or an artefact of methodological approaches.

Figure 7.5 Data reported to the E-PRTR for emissions of dioxins and furans to water (taken from the E-PRTR website on the 27/01/2019)

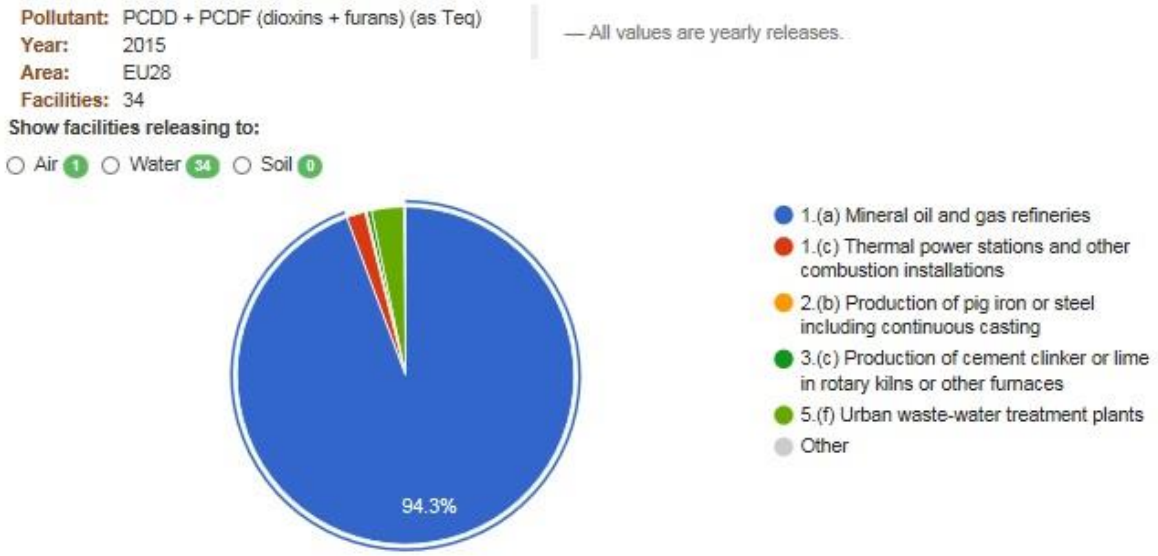


Table 7.4 provides a comparison of the total quantities of dioxins and furans emitted to air between different emission inventories, namely POPs protocol, the POP Regulation and the operator reporting for the E-PRTR. For the E-PRTR, it is important to note that there are reporting thresholds below which data is not required and that reporting is only required for activities listed in Annex I of the E-PRTR regulation. The data reported under the POP Regulation and POP Protocol will also include unregulated sources such as accidental fires.

Table 7.4 Comparison of emission estimates between inventories

Year	Article 12 POP Regulation Total emissions g I-TEQ to air	UNECE EMEP emissions Total for EU28 g I-TEQ to air	E-PRTR emissions total for EEA (31 countries) g I-TEQ to air
2013	2080.5	3036	2030 (181 facilities)
2014	1187.5	3223	1180 (161 facilities)
2015	257	3119	980 (173 facilities)*

*633g of this total is from 4 thermal power station facilities in Greece.

Note that not all Member States reported data under Article 12, leading to important discrepancies in the data.

The three inventories present different estimate levels and trends over this reporting period. While the E-PRTR data suggests a continuing decline in emission from 2013-2015, the POP Protocol data (from EMEP) suggest total emissions have remained largely static over 2013-2015. It should be noted that a time trend cannot be inferred from the data submitted by Member States under Article 12 of the POP Regulation, as the emission totals are dependent on the number of Member States submitting information. This number of member states reporting was much higher in 2013 (18) than in 2015 (7) and there were member states with significant sources of emissions that did not report for 2015.

7.2.2 7.2.2 Polychlorinated Biphenyls (PCBs)

Polychlorinated biphenyls are a family of chemicals consisting of two benzene rings joined by a single carbon to carbon bond and with a variable number of chlorine atoms. In total 209 different congeners exist based on the number and position of chlorines on the basic structure. As with dioxins and furans, the toxicity of individual congeners varies across the whole spectrum. 12 congeners have been identified by the World Health Organisation as having carcinogenic effects and have been more closely aligned with dioxins and furans. These 12 congeners are known as 'dioxin-like PCBs'.

PCBs have been widely used in the past, particularly as heat transfer fluids within di-electric equipment. They also found widespread use as lubricants for turbines and pumps and in the formulation of cutting oils for metal treatment, sealings, adhesives, paints, and carbonless copy paper[43]. The production of PCB as a commercial product within Europe began in the 1930s reaching its peak around the 1970s, with commercial goods using the trade names Aroclor and Clophen[44]. Production is believed to have ceased around the end of the 1980s but the long service life of large scale di-electric equipment in electric distribution networks presents a serious legacy issue.

PCBs can also be created during thermal processes where a source of chlorine and organic matter are present.

Figure 7.6 is based on data reported to the UNECE for CLRTAP over the period 2013–2015 and presents the major sources of PCB emissions to air in the Union. The PCB emissions are dominated (52%) by 'consumption of POPs and heavy metals. This source includes use of electrical equipment (mainly capacitors and transformers), PCBs as dielectric fluids, leaks from transformers and capacitors, fragmentising operations, and disposal of electrical equipment containing PCBs). This represents a much higher contribution than reported in the previous (2010-2012) reporting period (32%).

Closer review of the temporal and sectoral trends in PCB emissions, reported in the EMEP Webdab dataset, suggest that one of the most important PCB emission sources in Europe in 2000 was iron and steel production (2,285 kg: 33% of total). The total and percentage contribution of this source has since declined substantially, contributing 428 kg (12%) in 2015. This would suggest that, over the past 20 years, PCB emissions from industrial sources have declined with the introduction of more efficient combustion and abatement processes, while the emissions from electrical equipment and wastes have declined a lot more slowly, leading to an increasing relative proportion from this source to the EU total.

[43] Eurochlor, 2002, 'Euro Chlor Risk Assessment for the Marine Environment OSPARCOM Region - North Sea'.
[44] UNEP,'Technical guidelines on wastes comprising or containing PCBs, PCTs and PBBs (Y10)'

Other major sources of PCB emissions to air in the current reporting period include residential combustion of fuel (particularly solid fuels like coal and waste wood) (15%), and also metals manufacture (13%).

Figure 7.6 Sources of PCB emissions to air for the EU 28 (UNECE reported data, 2015)

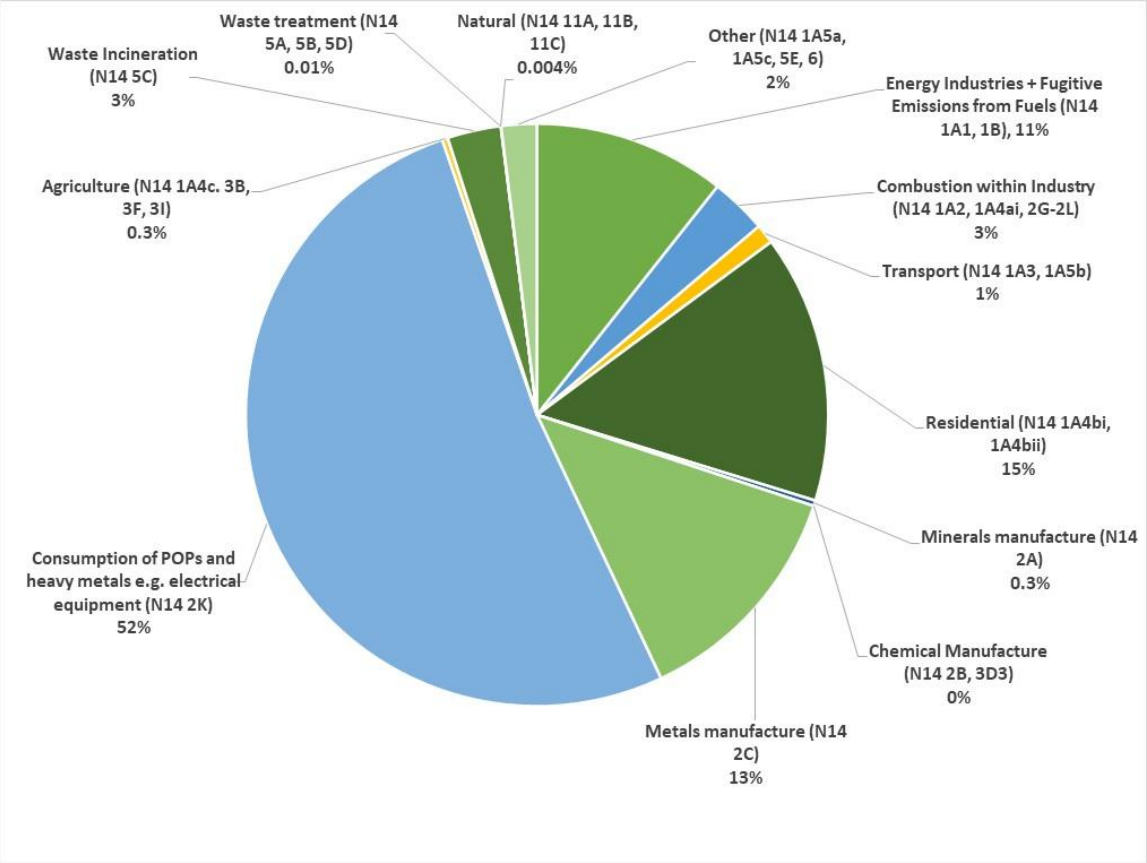


Figure 7.7 provides a breakdown of PCB emissions to air for 2013–2015 by Member State, while Table 7.5 provides details of emission totals reported to the UNECE for 1990 and 2015, emission reduction and emissions per capita. As with the similar graph of dioxins and furans, Figure 7.7 shows a mixture of trends with the emissions in some Member States declining, although a broadly static level of emissions in most Member states is apparent.

Figure 7.7 highlights three Member States - Poland (25%), the United Kingdom (24%) and Croatia (17%) - as the highest emitting nations in 2015, which is broadly consistent with the previous reporting period. Austria and Greece started reporting emissions during the current reporting period and estimates have changed little over the 3-year period.

Comparing data reported in Figure 7.7 with that reported for the 2010-2012 period indicated that in Poland and the United Kingdom PCB emissions have declined across both reporting periods. Emissions in Croatia have remained relatively static.

Production of crude steel in electric furnaces tends to generate PCB because of surface contamination or use of degreasing agents prior to smelting. In the context of unintentional

emissions of PCBs from metal manufacture, the world steel organisation[45] reported on the production rates of crude steel in electric arc furnaces in 2015. The highest rates of steel production for the EU in 2015 came from Italy (17.2 Million of tonnes), Germany (12.6 Million of tonnes), Spain (10.1 Million of tonnes), France (5.2 Million of tonnes).

Figure 7.7 PCBs emissions by Member State (2013-2015)

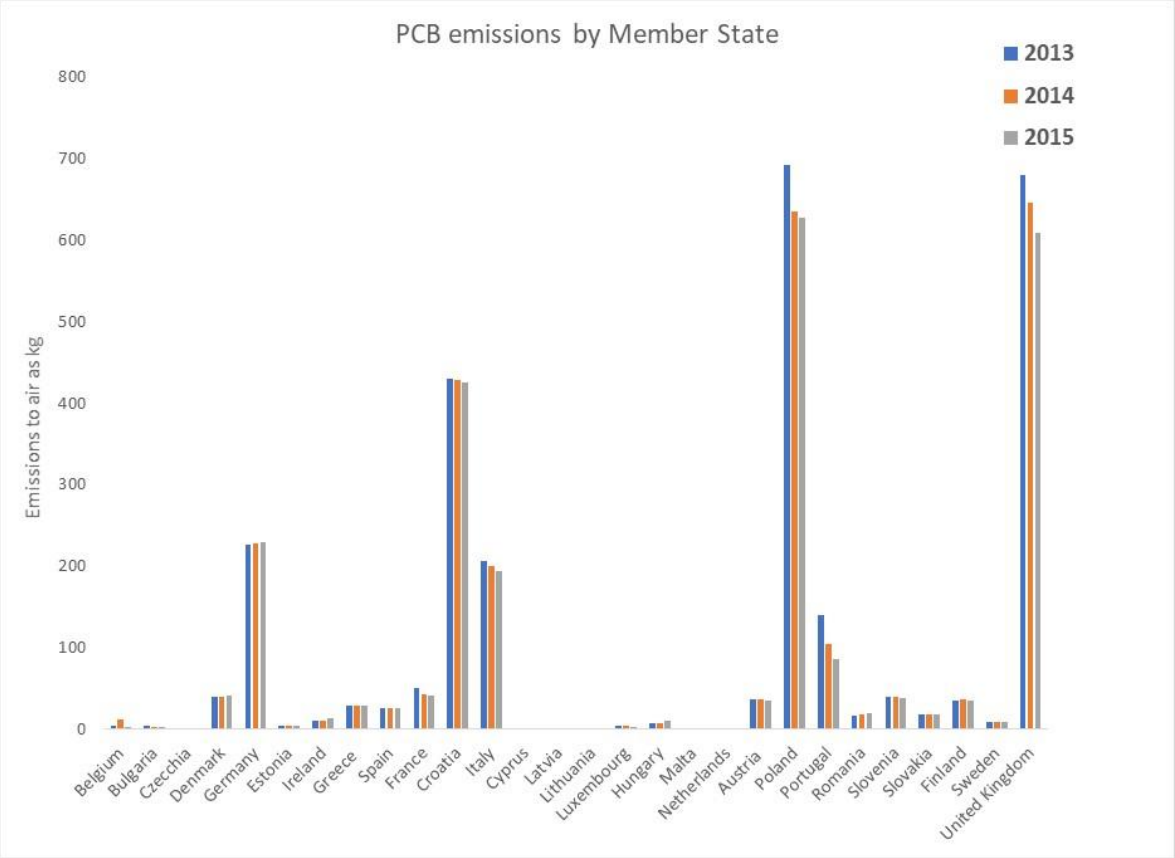


Table 7.5 provides further details on the variation in emission estimates. The per capita emission estimates range from 0.01 mg/person/year to 106 mg/person/year. It is unclear what impact source gaps and differences in inventory approach will have on this large variation in per capita estimates. Overall, the average emission per capita per year for the EU is 11 mg/person/year. The highest per-capita emissions of PCBs are reported for Croatia (>100 mg/person/year), with the next highest being Slovenia (18 mg/person/year).

Table 7.5 also provides details of emissions reductions with the greatest levels of per annum emission reduction between 1990 and 2015 coming from Belgium, Bulgaria, Czechia, Latvia and the United Kingdom, which all saw emissions fall by over 90%. Other Member States with significant reductions in emissions to air include Germany, Luxembourg and Romania.

Other Member States (e.g., Cyprus, Finland, Spain, and Sweden) had either static levels or a small (2 to 9%) increase in emissions between the years 1990 and 2015, suggesting no change in emission of PCBs over a 25-year timeframe.

[45]https://www.worldsteel.org/en/dam/jcr:37ad1117-fefc-4df3-b84f-6295478ae460/Steel%2520Statistical%2520Yearbook%25202016.pdf

*Table 7.5 Emissions reduction for PCBs and per capita emissions based on data reported under the UNECE POP Protocol**

Member State	Emission to air 1990 kg	Emission to air 2015 kg	Reduction in annual emissions 1990:2015 as a percentage	Per Capita emissions 2015 mg/Person/ year
Belgium	107.1	3.1	97%	0.27
Bulgaria	13.8	3.0	78%	0.42
Czechia	3.7	1.8	52%	0.17
Denmark	110.5	41.5	62%	7.27
Germany	1,735.6	229.0	87%	2.79
Estonia	8.4	4.2	49%	3.22
Ireland	40.5	14.5	64%	3.07
Greece	9.2	29.1	-216%	2.70
Spain	25.8	26.9	-4%	0.58
France	176.8	41.6	76%	0.62
Croatia	483.1	425.1	12%	101.45
Italy	288.8	194.8	33%	3.21
Cyprus	0.0	0.0	-9%	0.04
Latvia	4.3	0.2	94%	0.12
Lithuania	6.2	1.3	79%	0.45
Luxembourg	39.9	3.1	92%	5.31
Hungary	25.9	10.8	59%	1.09
Malta		0.0		0.00
Netherlands	0.09 grams	0.09 grams	0%	0.005
Austria	47.2	35.7	24%	4.10
Poland	760.6	627.3	18%	16.52
Portugal	2,305.7	86	96%	8.30
Romania	134.7	20.2	85%	1.02
Slovenia	416.9	38.9	91%	18.83
Slovakia	66.2	18.4	72%	3.40
Finland	33.4	35.7	-7%	6.50
Sweden	9.0	9.1	-2%	0.92
United Kingdom	6,744.5	608.5	91%	9.31

* a negative percentage shows an increase in emissions

The majority of reported data for PCB emission estimates relate to the air vector. However, a small number of Member States do report data to other vectors as part of the Article 12 reporting to the European Commission and also to the Stockholm Convention. Table 7.6 provides a breakdown of the emission data to illustrate the importance of the different emission vectors listed under the Stockholm Convention.

The data from Table 7.6 illustrate large differences between key vectors reported by different member states. Belgium, France, Ireland, Spain, and the United Kingdom highlight air as the key pathway, likely from volatisation of PCB in di-electric equipment, along with combustion from industrial sources. The Netherlands highlights water as the main emission pathway, most likely relating to water usage and contamination within the metal manufacture sector. Czechia and Sweden suggest that residue is the main pathway for PCBs, likely through the management of contaminated wastes from di-electric equipment, metals manufacture and air pollution control residues from combustion of solid fuels and waste incineration.

Table 7.6 Emissions of PCBs to all vectors based on those reported to the EU and Stockholm Convention

Year	**2012**	**2015**	**2015**	**2015**	**2012**	**2012**	**2013**	**2015**
Member State	BE	CZ	IE	ES	FR	NL	SE	UK
Air	95%	2%	96%	86%	74%	0%	32%	87%
Water	5%			14%	23%	100%		
Land			1%		3%			13%
Residue		98%					68%	0%
Product			3%					0%

NR - Not Reported

As a further comparison of estimated PCB emissions to air and other vectors a review of the data reported to the E-PRTR for 2015 was also undertaken. Figure 7.8 provides a summary of the data reported to the E-PRTR for emissions of PCBs to air from 32 facilities. The pie chart demonstrates that around 43% of all emissions in 2015 related to the manufacture of iron and steel. Other key source sectors include disposal of non-hazardous waste (22%), oil refineries (19%) and thermal power stations for energy generation (11%). Taken together, these three sources account for almost all of the PCBs emitted to air.

It is noted that, from reviewing the E-PRTR data, a shift in emission distribution is observed, with a declining contribution from oil and gas refineries, which could be attributed to the reduction or closure of facilities in Spain during this period (2013-2015).

Figure 7.9 provides a breakdown of the main sources within the E-PRTR for release of PCBs to water. In this case the estimates reported by 14 facilities are dominated by urban wastewater treatment works (75%), with the other main contributor being industrial-scale production of basic organic chemicals (18%). The main contributor to the urban wastewater emission is reported to come from Italy (85%), with smaller contributions from Belgium, France, Poland, Spain, and the United Kingdom.

Figure 7.8 Data reported to the E-PRTR for emissions of PCBs to air (taken from the E-PRTR website[46] on the 27/1/2019

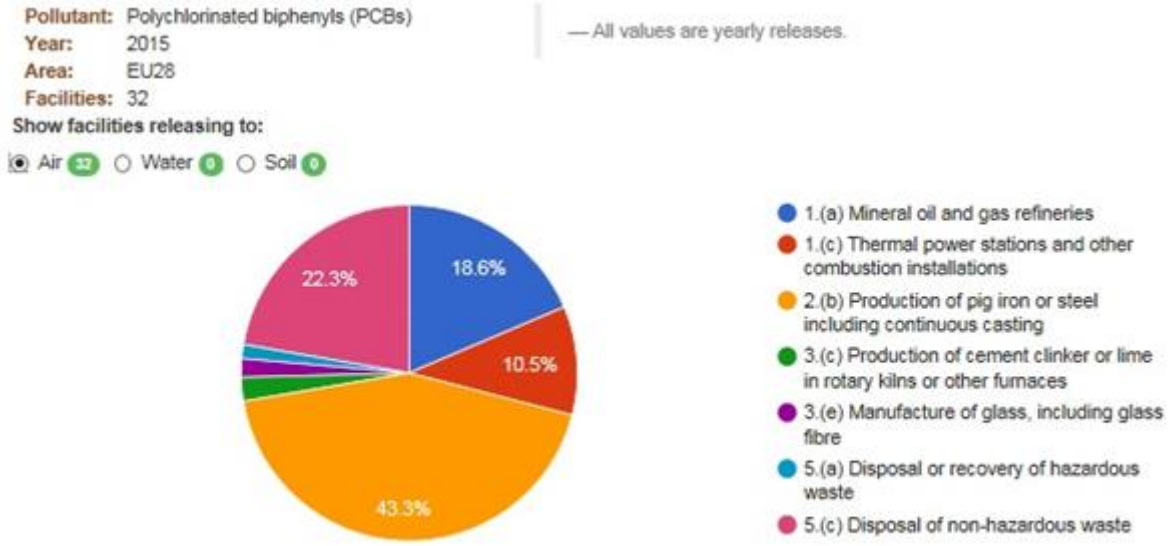
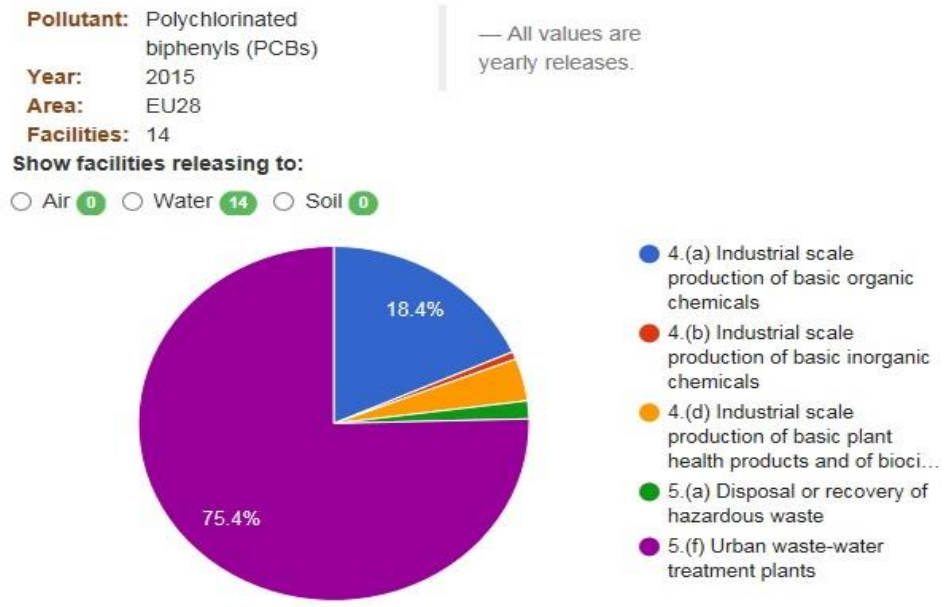


Figure 7.9 Data reported to the E-PRTR for emissions of PCBs to water (taken from the E-PRTR website on the 27/1/2019)



[46] https://prtr.eea.europa.eu/#/home

Table 7.7 provides a comparison of the emission inventory estimates for the UNECE, E-PRTR and Article 12 reporting to the European Commission. The three inventories agree regarding the emission trend, which is declining year on year. However, the total estimates range from 56 kg to 3500 kg in 2015.

As with the discussion of dioxins and furans above, it should be noted that a time trend cannot be inferred from the data submitted by Member States under Article 12 of the POP Regulation, as the emission totals are dependent on the number of Member States submitting information. This number was much higher in 2013 (18) than in 2015 (7).

Table 7.7 Comparison of PCB emission estimates between inventories

Year	Article 12 POP Regulation Total emissions for EU28 (kg to air)	UNECE EMEP emissions Total for EU28 (kg to air)	E-PRTR emissions total for EU28 (kg to air)
2013	2,281	3,687	88 (44 facilities)
2014	1,653	3,586	54 (40 facilities)
2015	177	3,517	56 (32 facilities)

Note that not all Member States reported data under Article 12, leading to important discrepancies in the data.

7.2.3 7.2.3 Polycyclic Aromatic Hydrocarbons (PAHs)

Polyaromatic hydrocarbons (PAHs) are a complex family of organic chemicals composed by multiple aromatic rings. PAHs can occur naturally in the environment but are also generated by anthropogenic sources. Typically, PAHs are associated with fossil fuels such as oil, gas and coal, but they can be generated from the incomplete combustion of solid materials such as wood and biomass as well as waste materials and even cigarettes.[47] Similarly to dioxins, furans and PCBs, the toxicity and physico-chemical behaviour of individual PAH congeners can be variable, but as a whole they are recognised as meeting the criteria for being considered persistent organic pollutants. As PAHs are generated as a complex mixture, their analysis focuses on key markers that act as representative for the whole group. Benzo[a]pyrene, one of the most toxic and carcinogenic PAH congeners, is normally considered as a representative of the whole group.

PAHs are included in Annex III of the POP Regulation and in the UNECE CLRTAP but are not part of the Stockholm Convention.

In trying to qualify the emissions of PAHs, different international schemes have targeted different numbers of congeners. The different analytical schemes range from 4 congeners to 16 congeners. Figure 7.10 provides further detail on the breakdown of specific species for analysis. Under the Article 12 reporting and the UNECE reporting the focus has been on the main 4 congeners in the far-right hand column of Figure 7.10, namely:

- Benzo[a]pyrene.
- Benzo[b]fluoranthene.
- Benzo[k]fluoranthene; and
- Indendo[123 cd]pyrene.

[47] USEPA, 2008, 'PAHs factsheet', guidance document

Research data needs to be used with care when developing the emission estimates for PAHs. Data can be presented and described as 'PAHs total', without explicitly stating which congeners have been monitored. In some cases, the wording 'PAHs total' is used when referring to monitoring of benzo[a]pyrene only. Such issues can have a significant effect on the emission factors, on derived estimates, on the comparison between estimates for different sources within the same inventory and on comparison between inventories.

The best practice, based on the EMEP UNECE guidelines (EMEP guidebook), is to provide estimates either on an individual congener basis or to clearly indicate for 'total' value which and how many congeners were included in the analysis. The data in this chapter will be based on PAHs total, assuming that this is the sum of four congeners as defined in the Article 12 reporting and UNECE requirements. Information on individual congeners will not be provided.

Figure 7.10 Congener sets for PAHs under different schemes[48]

	US EPA Priority pollutants (16 PAHs)	**IARC** Probable or possible human carcinogens (6 PAHs)	**Borneff** (6 PAHs)	**UNECE POPs Protocol** Indicators for the purposes of emissions inventories (4 PAHs)
Naphthalene	✓			
Acenaphthylene	✓			
Acenapthene	✓			
Fluorene	✓			
Anthracene	✓			
Phenanthrene	✓			
Fluoranthene	✓		✓	
Pyrene	✓			
Benz[a]anthracene	✓	✓		
Chrysene	✓			
Benzo[b]fluoranthene	✓	✓	✓	✓
Benzo[k]fluoranthene	✓	✓	✓	✓
Benzo[a]pyrene	✓	✓	✓	✓
Dibenz[ah]anthracene	✓			
Indeno[123cd]pyrene	✓	✓	✓	✓
Benzo[ghi]perylene	✓		✓	

Figure 7.11 provides a summary of the data reported by EU Member State to the UNECE for CLRTAP for the air vector between 2013-2015. This demonstrates that emissions to air for PAHs are dominated by the use of solid fuels, particularly coal, within residential premises, with 75% of the total emissions coming from this sector alone.

The second largest source sector identified within Figure 7.11 is the manufacture of iron and steel (including the use of fossil fuels) (7%). Further contributions to PAH emissions come from other forms of stationary combustion (for heat and power) within non-residential buildings (e.g., public buildings, retail, etc), the manufacture of non-ferrous metals, road

[48] European Environment Agency, 2007 'EMEP Emission Inventory Guidebook', guidance document for inventory compilers

transport, open waste burning, and natural fires (including forests, health land, and other vegetation). Emissions from the residential sector are particularly key as the combustion of coal and wood on domestic grates are expected to be less efficient and to operate at lower temperatures than that of equipment in the power generation sector.

As a comparison the combustion of solid fuels for public energy production (0.5%) makes up much smaller proportions of the total emission. While these sectors are expected to use large volumes of fossil fuels for energy and heat, the equipment used, particularly within energy generation sectors, is designed to run at high temperatures and will include improved abatement under the requirements of the industrial emissions directive (IED). The higher operating temperature and improved abatement will lead to much lower emissions of PAHs per tonne of fuel compared to equipment used in the domestic market.

Figure 7.11 Sources of PAH emissions to air for the EU 28 (UNECE reported data) in 2015

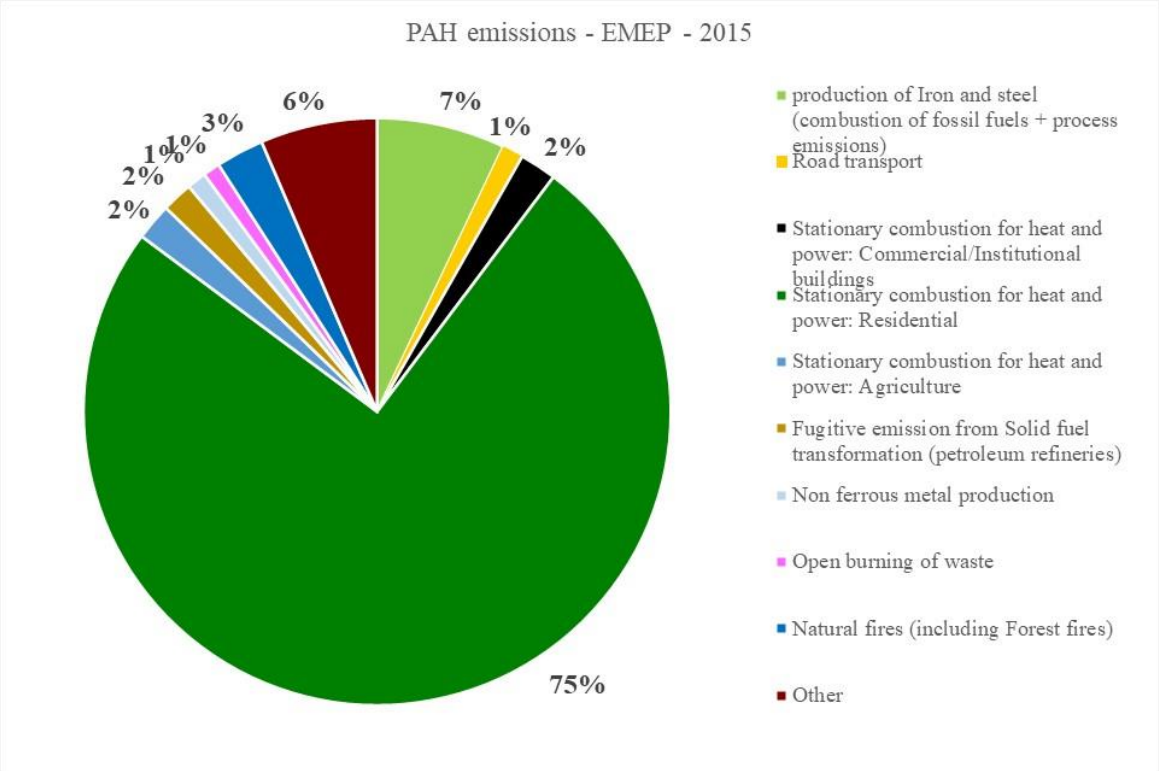


Figure 7.12 provides a summary of emissions reported to the UNECE by Member State. It shows that the highest emitting Member State is Poland (27%), with other key contributors being Germany (9%), Italy (8.5%) and Spain (8.4%). In comparison to emissions stated in the last synthesis report, reductions in PAH emissions in Czechia and Romania are noted.

Closer examination of the emission estimates, indicate that the PAH emissions are typically dominated by combustion-related activities, which is aligned with expectations for this pollutant. Table 7.8 provides further detail by Member State on emissions reduction in the period 1990–2015 and also the per capita emissions for Member States.

Figure 7.12 Quantity of PAH emissions to air for the EU 28 (UNECE reported data)

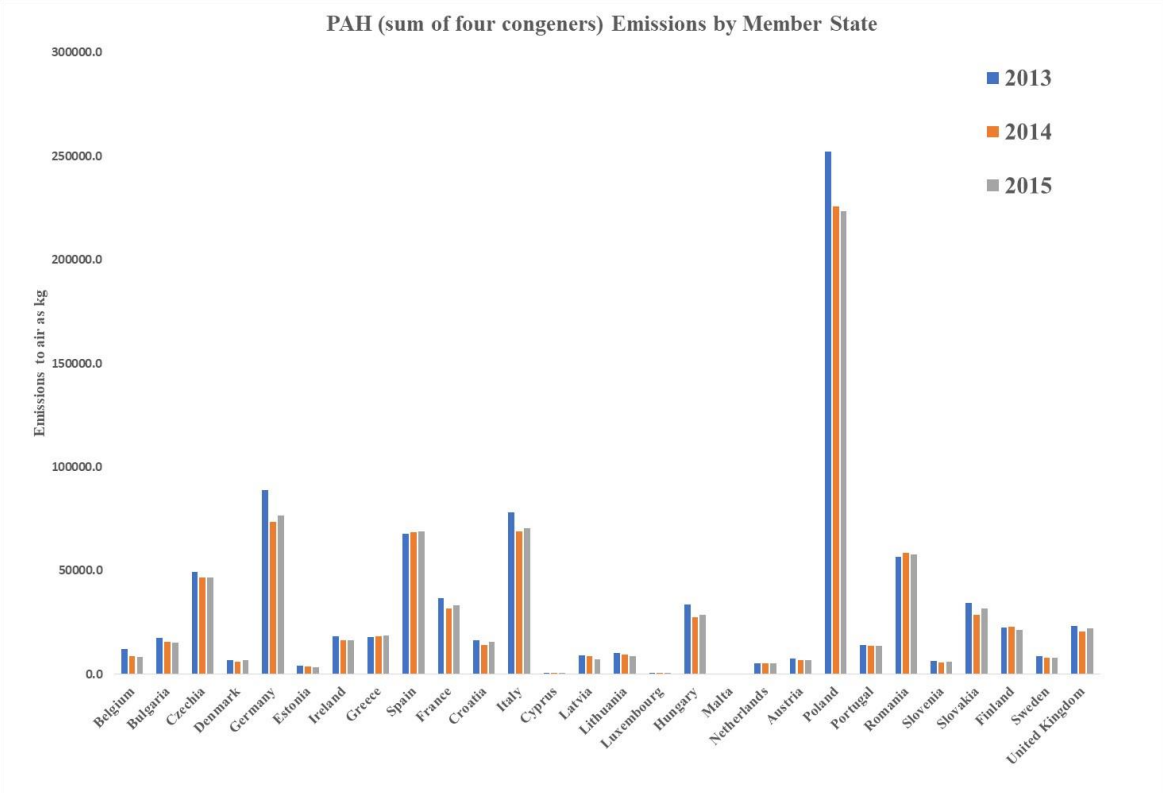


Table 7.8 illustrates that the per capita emissions of PAHs (sum of 4 congeners) ranges from 0.23 - 5.9 g/person/year with an average of 2.2 g/person/year. However only two Member States have per capita emissions greater than 5 g / person / year, with the lowest per capita emissions in Malta (0.23) and the highest in Poland (5.9).

Table 7.8 also shows the reduction of emissions since 1990 with the biggest reductions in Spain, Portugal and the United Kingdom with emissions reduced by over 98%. Overall, between 1990 and 2015, based on the reported emission estimates, the annual release of PAHs to air within the EU has declined by almost 10,000 tonnes down to approximately 825 tonnes. This decline amounts to a reduction of 92% in emissions over the 25-year period.

A caveat with comparing baseline year (1990) data across multiple synthesis reports is that, given the EMEP emission data is updated on an annual basis for the entire time series, emission estimates are not always comparable across years. For example, baseline information for 1990 is still being updated and altered making comparisons difficult between this report and the previous synthesis report.

PAHs are not listed under the UNEP Stockholm Convention and the UNECE Aarhus Protocol requires reporting to the air vector only. However, the POP Regulation requires reporting to all vectors for PAHs, similar to all other listed POPs. Very few Member States provide details of emissions other than to air; however, for those that have reported, a further breakdown is provided in Figure 7.13.

Table 7.8 Emissions reduction for PAHs (sum of 4 congeners) and per capita emissions

Member State	Emission to air 1990 kg	Emission to air 2015 kg	Reduction in annual emissions 1990:2015 as a percentage	Per Capita emissions 2015 g/Person/ year
Belgium	54,906	8,558	84%	0.76
Bulgaria	37,162	15,327	59%	2.14
Czechia	280,200	46,900	83%	4.45
Denmark	5,304	6,756	-27%	1.19
Germany	373,582	76,550	80%	0.94
Estonia	8,196	3,570	56%	2.71
Ireland	48,826	16,389	66%	3.49
Greece	17,030	18,809	-10%	1.74
Spain	7,173,753	69,083	99%	1.49
France	45,613	33,370	27%	0.50
Croatia	23,649	15,583	34%	3.71
Italy	98,642	70,689	28%	1.16
Cyprus	13,754	892	94%	0.77
Latvia	18,992	7,330	61%	3.71
Lithuania	20,350	8,921	56%	3.07
Luxembourg	4,330	594	86%	1.04
Hungary	79,120	28,765	64%	2.92
Malta	-	101	-	0.23
Netherlands	19,830	5,193	74%	0.31
Austria	20,149	6,796	66%	0.29
Poland	146,768	223,603	-52%	5.89
Portugal	589,765	13,863	98%	1.34
Romania	274,260	58,022	79%	2.93
Slovenia	8,380	6,026	28%	2.92
Slovakia	19,932	31,687	-59%	5.84
Finland	7,090	21,380	-202%	3.90
Sweden	17,108	7,909	54%	0.81
United Kingdom	1,353,747	22,300	98%	0.34

Czechia, Spain, the Netherlands and the United Kingdom report to multiple vectors (Table 7.9). Three of the four, highlight air as being the key emission pathway, with the Netherlands, Spain, and the United Kingdom noting fractions to air of 88%, 84% and 96% respectively. This relates to combustion processes that generate PAHs within smoke and gaseous exhausts. One member, state (Czechia) reports significant emissions to land, from 'waste'. It is unclear which source would result in such a high proportion of emissions being associated with 'waste'. Review of the EMEP data, discussed above, indicates emissions of PAH in Czechia are dominated by residential stationary combustion, which would most likely result in emission to air. Three of the four Member States (the Netherlands, Spain, and the United Kingdom) also report emissions to water, with a fraction of 12%, 16%, and 4% respectively.

Table 7.9 Emissions of PAHs (sum of 4 congeners) to all vectors based on those reported to the EU

Year	**2014**	**2015**	**2013**	**2014**
Member State	Czechia	Spain	Netherlands	United Kingdom
Air	6%	84%	88%	96%
Water	0%	16%	12%	4%
Land	94%	NR	NR	NR
Residue	NR	NR	NR	NR
Product	NR	NR	NR	NR

For emissions to water, it is noted that PAHs can reach the water environment via atmospheric deposition, road run-off and discharges from wastewater treatment plants. The EEA[49] notes that the main pressures leading to failure to achieve good chemical status are atmospheric deposition and discharges from urban wastewater treatment plants. Atmospheric deposition leads to contamination with mercury in over 45,000 water bodies failing to achieve good chemical status. It is reported that inputs from urban wastewater treatment plants lead to contamination of over 13,000 water bodies with polyaromatic hydrocarbons (PAHs).

A review of the data reported to the E-PRTR for 2015 allows a comparison for the emissions reported not only to air, but also to water and land. The E-PRTR also provides information on pollutant transfers, mostly from processing or final management of hazardous waste. The E-PRTR Regulation suggests that PAHs should be reported as the sum of 4 congeners, the same identified in the POP Regulation. Figures 7.13 – 7.15 show the data from E-PRTR for emissions to air, water, and pollutant transfers. Releases of PAHs to soil were not reported within the E-PRTR. Figure 7.13 shows the key source of emissions of PAHs to air are cement production (28%), production of pig iron and steel (18%) and production of nitrogen, phosphorous and potassium (13%). Compared to the previous reporting period (2010-2012) the proportion of emissions to air resulting from cement production has increased, while those from production of nitrogen, phosphorous and potassium has declined. The major contributors to PAH emissions to air indicated by the E-PRTR data are Poland (56%) Spain (12%), Romania (11.5%) and France (6%). This is in contrast to the data from the EMEP

[49] EEA (2018) European waters. Assessment of status and pressures 2018

presented above. The use of fossil fuels within residential properties is not listed as an activity in Annex I of the E-PRTR (and is then outside the scope of the reporting requirements), which could account to some extent for this discrepancy.

Figure 7.13 shows that, for emissions to surface water, based on 57 reporting facilities there is no single dominant source. Close to 40% of total emissions are from urban wastewater treatment plants, with the next largest contributions from power stations for energy generation (17%) and production of pig iron and steel (17%). This is in contrast to 2012 where emissions were significantly larger and dominated by petroleum refineries (52%, 2.8 tonnes). A substantial (>50%) reduction in PAH emissions to water is indicated from 2013 and 2015.

Based on the E-PRTR data, for pollutant transfers to land, 24 facilities report emissions of PAHs totalling 95 t. Of this, 98% (93.3 t) is attributed to disposal or recovery of hazardous waste. Nearly all of this results from two plants in Italy (Sicily). These materials are likely the same contaminated wastes referred to within the residue vector of the Article 12 reports.

Figure 7.13 Data reported to the E-PRTR for emissions of PAHs to air (taken from the E-PRTR website on 27/1/2019)

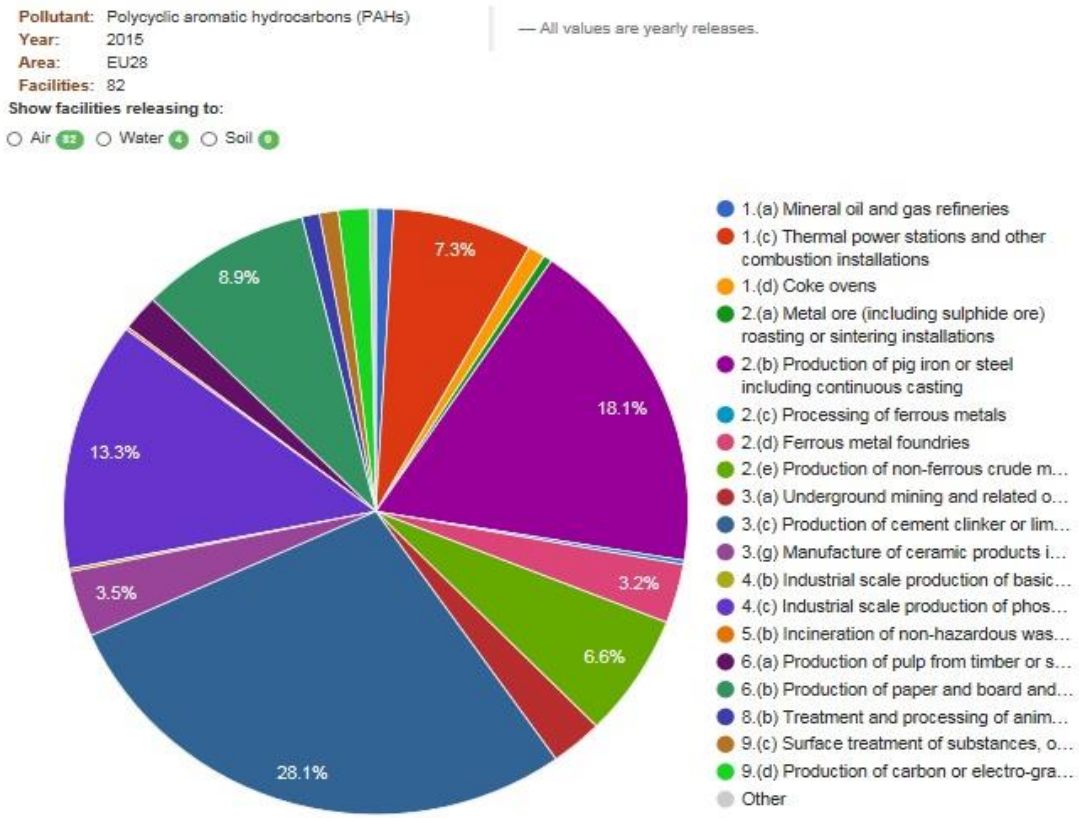


Figure 7.14 Data reported to the E-PRTR for emissions of PAHs to water (taken from the E-PRTR website on the 27/1/2019)

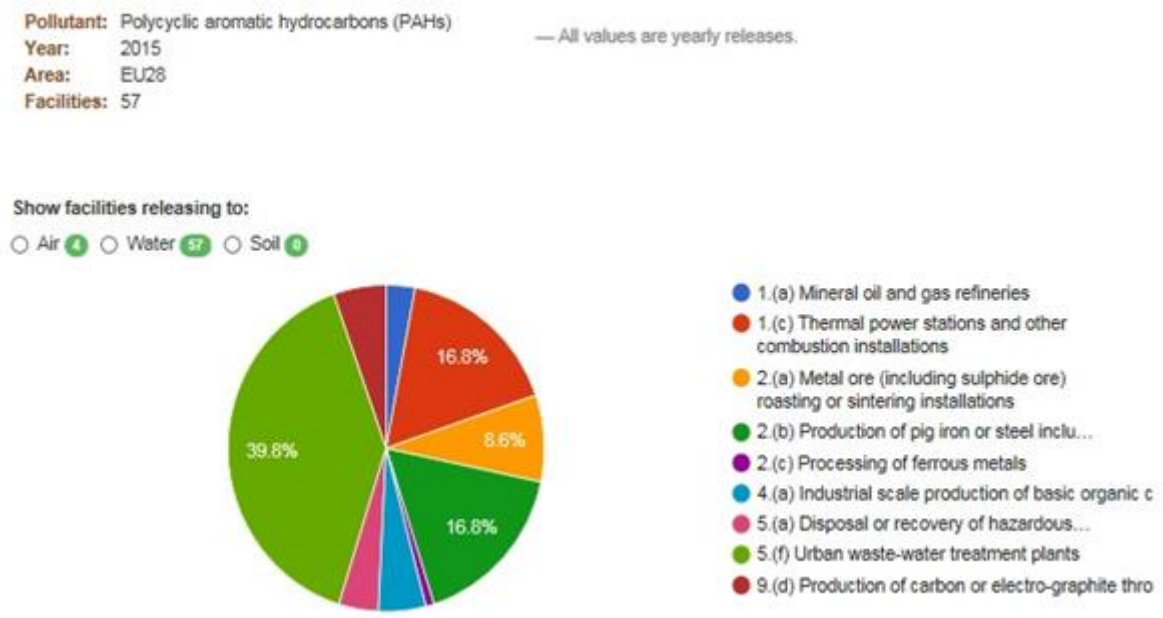


Figure 7.15 Data reported to the E-PRTR for pollutant transfers of PAHs (taken from the E-PRTR website on the 27/1/2019)

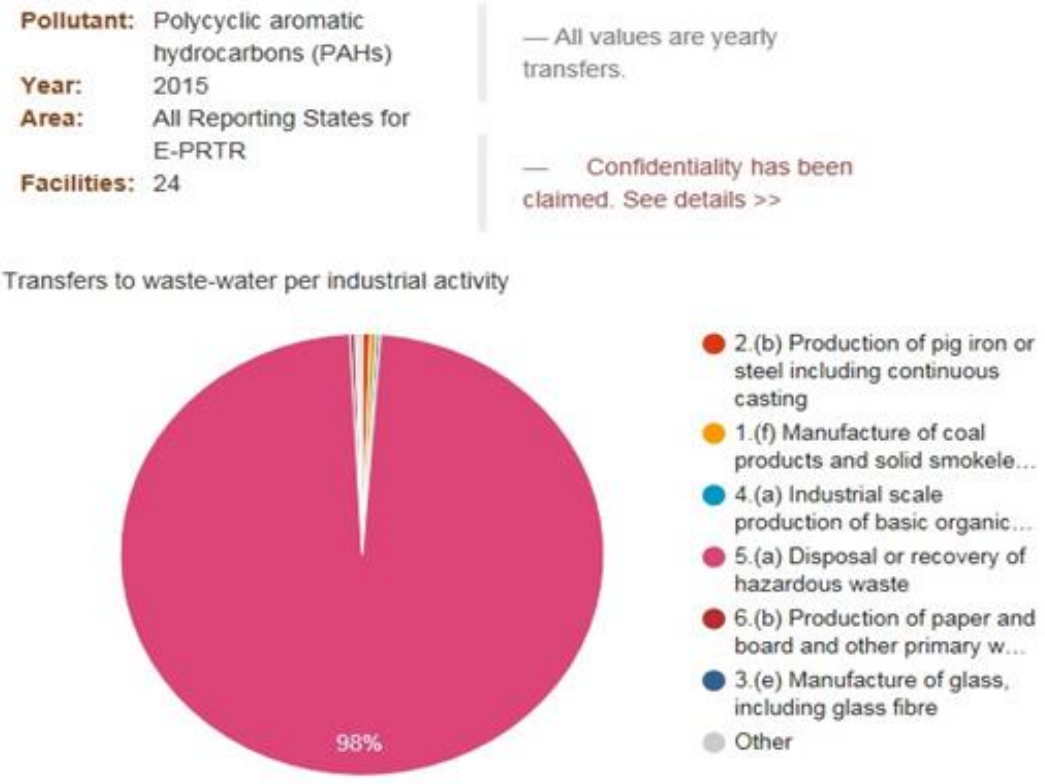


Table 7.10 provides a comparison of the total emissions from Article 12 reports, UNECE inventories and E-PRTR data. The E-PRTR data reports an increasing trend in emissions between 2013 and 2015 while the UNECE data indicate similar emissions of PAHs from 2013 to 2015.

The Article 12 reports show smaller quantities of PAHs released with a decreasing trend over the reporting period. However, as noted for dioxins and furans above, a time trend cannot be inferred from the data submitted by Member States under Article 12 of the POP Regulation, as the emission totals are dependent on the number of Member States submitting information. This number was much higher in 2013 (18) than in 2015 (7).

Table 7.10 Comparison of emission estimates between inventories for PAHs (sum of 4 congeners)

Year	Article 12 POP Regulation total emissions for EU28 tonnes to air	UNECE EMEP emissions total for EU28 tonnes to air	E-PRTR emissions total for EEA (31 countries) tonnes to air
2013	410	1,160	38 (83 facilities)
2014	386	1,097	35 (74 facilities)
2015	64	1,116	52 (82 facilities)

Note that not all Member States reported data under Article 12, leading to important discrepancies in the data.

7.2.4 7.2.4 Chlorobenzenes – Hexachlorobenzene (HCB) and Pentachlorobenzene (PeCB)

Chlorobenzenes are a family of chemicals with a single benzene ring and varying numbers of chlorine atoms (up to a maximum of six) substituting hydrogen atoms. Within this family, two specific substances have been identified as POPs, hexachlorobenzene (HCB) and pentachlorobenzene (PeCBz). HCB was added to Annexes A (banned) and C (unintentional production) of the Stockholm Convention in 2004 and PeCBz was added to both annexes in 2009. Both substances are included in Annexes I (banned) and III (unintentional production) of the POP Regulation.

As with many of the Annex III substances listed under the POP regulation, HCB and PeCBz can be formed from combustion processes where there is a source of chlorine and with suitable combustion mechanics (temperature, catalysts, and particulate size). However, both substances have also had commercial uses in the past as detailed below.

HCB had commercial applications as a fungicide used in seed treatments. Its use started in the 1950s[50], with a peak in the EU around the mid-1970s before it was banned for agricultural use in 1981[51]. HCB remained present as a contaminant in other fungicides, notably chlorothalonil. Directive 2005/53/EC sets a maximum limit for HCB in chlorothalonil of 10 mg/kg (10ppm), and industry has continued to work to reduce the levels of contamination.

[50] Eurochlor, 2005 'Hexachlorobenzene - Sources, environmental fate and risk characterisation', Eurochlor science dossier

[51] EFSA, 2006, 'Opinion of the scientific panel on contaminants in the food chain on a request from the Commission related to hexachlorobenzene as undesirable substance in animal feed', The EFSA Journal (2006) 402, 1 - 49

A sampling programme from the United Kingdom found an average concentration of 8 mg/kg of HCB in chlorothalonil in 201252. Aside from use as a fungicide, an industry dossier27 also identifies a number of key emission sources as a by-product of other production processes, notably the manufacture of industrial chlorinated organics, particularly the solvents perchloroethylene, trichloroethylene and carbon tetrachloride. HCB was also identified as a contaminant of hexachloroethane (HCE), used as a cover gas within metal manufacture. Other sources of HCB come from the combustion of materials, particularly within the metallurgic sector, but also from combustion of solid fuels and waste, particularly so from open burning such as backyard burning of waste.

Pentachlorobenzene had a number of commercial uses in the past, mainly as an intermediate in other goods. Eurochlor53 states that PeCBz was used as an intermediate in the manufacture of the pesticide Quintozene. However, since 2001, product processes have been altered to avoid the use of PeCBz, reducing contamination in quintozene to only trace quantities. PeCBz was also used to reduce the viscosity of PCB within PCB oil-based goods used for heat transfer fluids in di-electric goods. The Stockholm Convention also states that PeCBz was used as carrier within dyes and in some flame-retardant products54. Aside from use within commercial products, PeCBz can be generated in combustion of solid fuels and wastes and can also be generated through thermal processes in metallurgy. In 2009 RIVM55 published a study to review and derive emission factors for use in deriving estimates of PeCBz to air. The study includes a number of combustion sources and industry sectors, as well as read-across methods linked to generation of dioxins and furans from related sources.

Hexachlorobenzene emissions to air

Figure 7.16 provides a breakdown of the main sources for HCB as reported by Member States under the UNECE Aarhus Protocol in 2015.

No data on reported PeCBz emissions is currently available from the CEIP Webdab website56. Figure 7.16 highlights that metals production (33%) and combustion with industry (25%) are the main contributors to HCB estimates for emissions to air, with other key sources including residential combustion (18%) and the energy sector (12%)

In contrast, in the third synthesis report, for the reporting period 2010-2012, 75% of emissions were attributed to metals manufacture.

[52] Defra, 2012, A further update of the United Kingdom source inventories for emissions to air, land and water of dioxins, dioxin-like PCBs, PCBs and HCB, incorporating multimedia
emission inventories for nine new POPs under the Stockholm Convention', Report reference CB0429
[53] Eurochlor, 2007, 'Pentachlorobenzene – Sources, environmental fate and risk characterization', Eurochlor science dossier
[54] UNEP, 2007, 'Draft risk profile for pentachlorobenzene', Stockholm Convention
[55] RIVM, 2009, 'Inventory emission factors for pentachlorobenzene', Letter report 601773002
[56] Correct as of 27 January 2019

Figure 7.16 Sources of HCB emissions to air for the EU 28 (UNECE reported data)

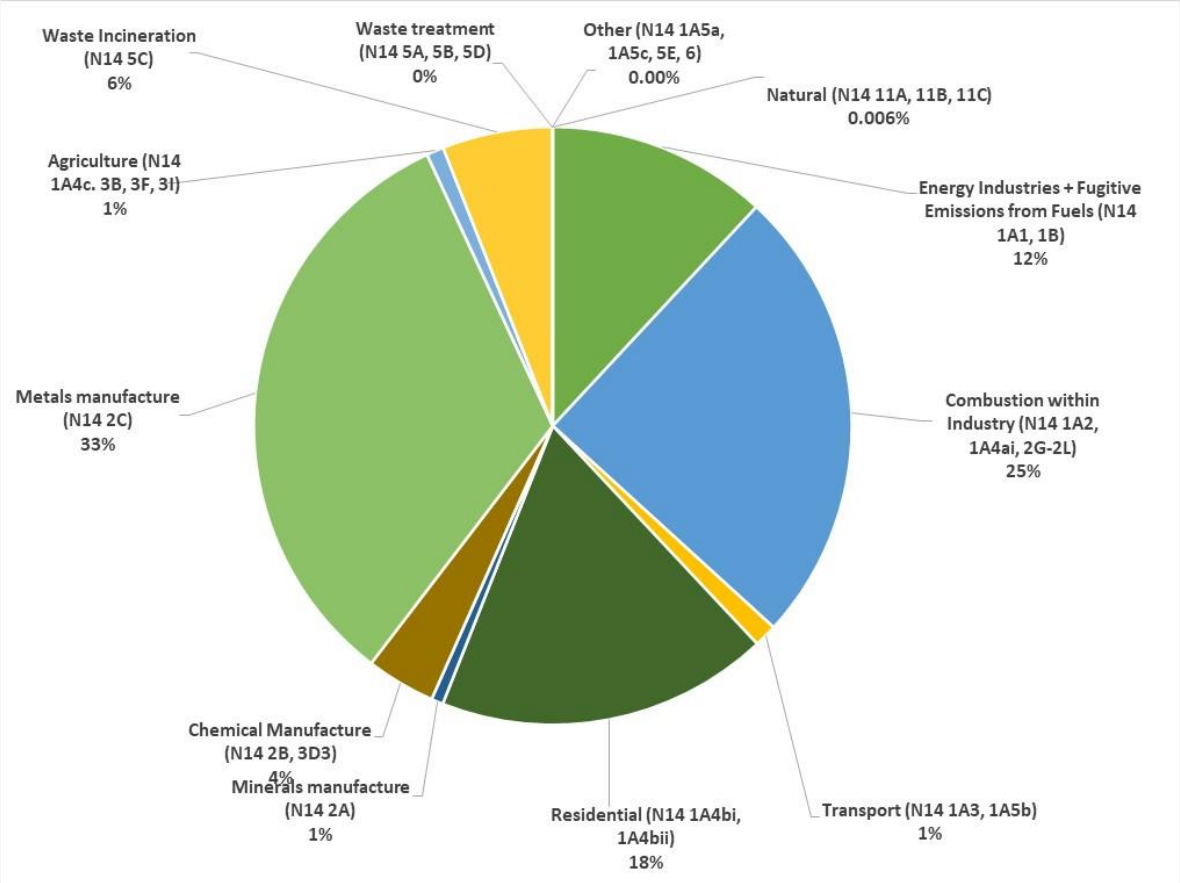


Figure 7.17 provides a summary of reported HCB emissions by Member State from 2013-2015. The main HCB emitter during this reporting period was Austria (> 100 kg in 2013: >40 kg in 2015). In total, six member states (Belgium, Czechia, Finland, Germany, Italy and the United Kingdom) reported between 5 kg and 30 kg of HCB emitted to air per year in 2015 and 20 Member States reported less than 5 kg per annum. The EU total for 2015 is reported as 182 kg as the sum of 28 Member States' emissions. A noticeable reduction in HCB emissions can be seen between 2014 and 2015 in Austria (from 147 kg to 42 kg).

The source profiles of Austria from the UNECE EMEP Webdab data provide a possible explanation for these observations. These indicate that the rise in HCB emissions in Austria is due to greater emissions (300% rise) from stationary combustion in manufacturing industries and construction (non-metallic minerals) between 2012 and 2013. Emissions from this source are indicated to have almost completed ceased in Austria between 2014 and 2015.

Figure 7.17 illustrates no other clear trends in emissions. Other Member States appear to have emissions that were relatively static over the 2013-2015 period, with some (e.g., United Kingdom) having a gradual increase over the period, and others (e.g., Poland, Belgium) showing a gradual decrease.

Figure 7.17 HCB emissions by Member State as reported to the UNECE Aarhus Protocol (2013 – 2015).

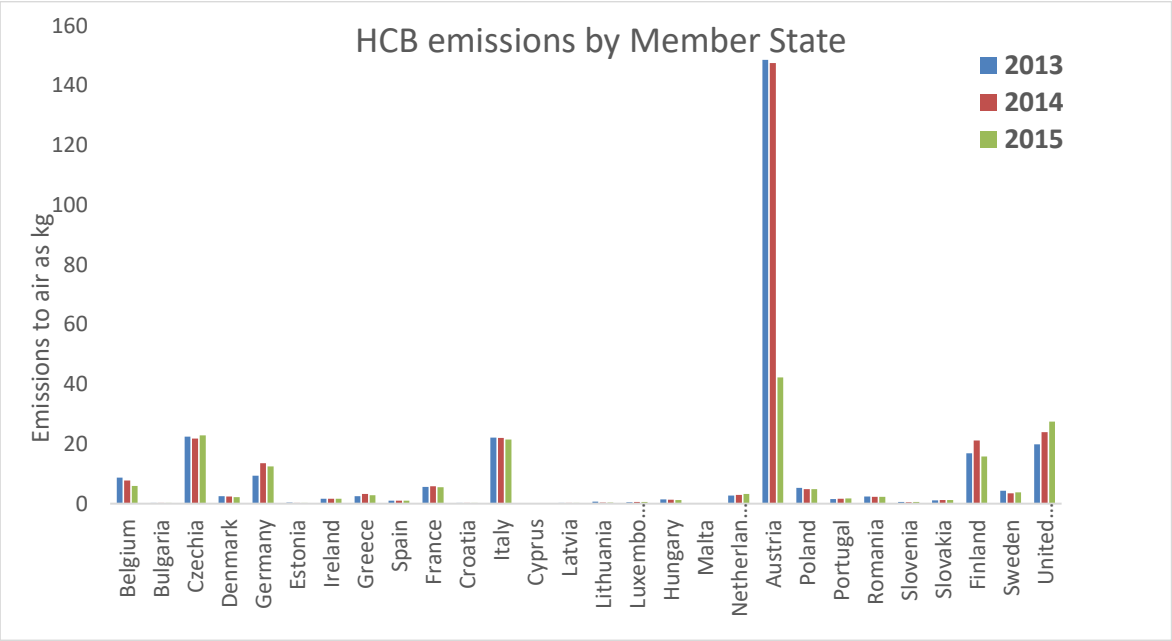


Table 7.11 provides further details, with information on per capita emissions and emissions reductions per Member State between 1990 and 2015. This demonstrates that the per capita emissions in 2015 ranged between 0.01 and 8.5 mg/person/year with an average emission for the EU28 of 0.9 mg/person/year. The majority of reporting Member States had emissions at or below 0.5 mg/person/year. As expected from the above observations, Austria has the highest per capita emissions with values of 8.5 mg/person/year respectively, followed by Finland and Czechia (>2 mg/person/year).

Table 7.11 also provides an indication of emissions reduction over a 25-year period (1990 to 2015). Emissions in most Member States substantially declined, with several Member States reporting a reduction of >90% (Denmark, France, Ireland, Lithuania, Netherlands, Romania, Spain, the United Kingdom) over this period. Others (e.g., Croatia, Estonia, Latvia, Luxembourg, Greece, Portugal, Slovenia) had HCB emissions that remained relatively static or exhibited an increase over this period.

Table 7.11 Emissions reduction for HCB and per capita emissions

Member State	Emission to air 1990 kg	Emission to air 2015 kg	Reduction in annual emissions 1990:2015 as a percentage	Per Capita emissions 2015 mg/Person/ year
Belgium	40.84	5.93	85%	0.52
Bulgaria	0.30	0.21	31%	0.03
Czechia	105.53	22.89	78%	2.17
Denmark	27.36	2.18	92%	0.38
Germany	112.48	12.42	89%	0.15
Estonia	0.19	0.28	-45%	0.21
Ireland	40.81	1.68	96%	0.36
Greece	2.10	2.82	-34%	-
Spain	327.12	1.03	100%	0.02
France	1,195.76	5.53	100%	0.08
Croatia	0.27	0.30	-9%	0.07
Italy	43.30	21.52	50%	0.35
Cyprus	0.05	0.01	82%	0.01
Latvia	0.20	0.27	-37%	0.14
Lithuania	11.05	0.38	97%	0.13
Luxembourg	0.44	0.60	-38%	1.05
Hungary	2.56	1.24	52%	0.13
Malta	-	0.00		-
Netherlands	45.29	3.27	93%	0.19
Austria	76.27	42.25	45%	4.86
Poland	6.34	4.83	24%	0.13
Portugal	58.67	1.7	97%	0.16
Romania	99.32	2.32	98%	0.12
Slovenia	0.48	0.52	-9%	0.25
Slovakia	2.42	1.25	49%	0.23
Finland	36.57	15.82	57%	2.88
Sweden	16.40	3.82	77%	0.39
United Kingdom	3,154.59	27.48	99%	0.42

Pentachlorobenzene emissions to air

No data on reported emissions of PeCBz to air from the UNECE EMEP Webdab website is available for 2013-2015. Without recent data it is difficult to comment on data trends or relationships to emission sources.

Five Member States (Austria, Czechia, Netherlands, Spain, United Kingdom) reported emissions of PeCBz under Article 12. Emission estimates vary from <0.01 kg in Czechia to 50 kg in the United Kingdom.

Hexachlorobenzene and Pentachlorobenzene emissions to other vectors

The majority of reported data for HCB and PeCBz emission estimates relates to the air vector. However, a small number of Member States report data on release to other vectors as part of the Article 12 reporting to the European Commission and also to the Stockholm Convention. Table 7.12 provides a breakdown of the emission data for the five vectors listed in the Stockholm Convention, separately for HCB and PeCBz. The number of Member States reporting emissions to multiple vectors is greater for HCB (7) than for PeCBz (4).

Table 7.12 Emissions of HCB and PeCBz to all vectors based on those reported to the EU and Stockholm Convention

Hexachlorobenzene (HCB)								
Year	**2012**	**2015**	**2012**	**2015**	**2015**	**2013**	**2013**	**2014**
Member State	BE	CZ	IE	ES	FR	NL	SE	UK
Air	96%	<0.1%	71%	83%	2.5%	14%	53%	79%
Water	4%	NR	1%	17%	97.5%	86%	0.1%	5.5%
Land	NR	NR	28%	NR	NR	NR	46.9%	15.5%
Residue	NR	>99.9%	0%	NR	NR	NR	NR	NR
Product	NR	NR	0%	NR	NR	NR	NR	NR

Pentachlorobenzene (PeCBz)				
Year	**2014**	**2015**	**2015**	**2014**
Member State	CZ	ES	AT	UK
Air	0%	2%	87%	65%
Water		98%		18%
Land	100%		13%	6%
Residue				9%
Product				3%

NR - not reported

Four member states (Belgium, Ireland, Spain and the United Kingdom) indicated emissions to air dominate with a lower proportion emitted to water (and in the case of the United Kingdom, to land). However, France reported emissions to water dominate over air

emissions, while Sweden reported comparable emissions between air and land. Czechia is the only Member State reporting emissions to the 'residues' vector, noting that nearly all HCB emitted was to this vector. No Member State has reported HCB emissions to all vectors.

The United Kingdom is the only Member State reporting emissions of PeCBz to all five vectors, indicating that emissions to air dominate, followed by water, land, residues, and product, respectively. Austria also reported that air emissions dominate compared with emissions to land. However, Spain's emissions to water were greater than those to air.

For comparison, the data provided to the E-PRTR has also been reviewed. For HCB only a limited data set is available comprising of one facility in Germany involved in industrial scale production of basic inorganic chemicals, emitting 32 kg of HCB in 2015. This could suggest the reduction in emissions or close of facilities emitting HCB to air since the previous (2010-2012) reporting period (when four facilities reported emissions). However, this is not clear as there is no obligation on facilities to report data.

There are no data available in the E-PRTR database for the emissions of PeCBz to air for any of the years in the current reporting period.

Figure 7.18 illustrates that, for emissions to surface water, based on three reporting facilities (in Italy, France, and Spain), emissions are dominated by urban wastewater treatment plants (72%), with Italy as the key contributor. Emissions from this source are indicated to have remained broadly static over the reporting period.

Historically, the data set reported for emission of PeCBz has been extremely limited so comparisons are difficult. Data on PeCBz emissions to water from the E-PRTR is available for 2015 (see Figure 7.19), which indicates, based on five facilities, ~79 kg of PeCBz is emitted to water with Italy (62%) and France (34%) the two main contributors. Emission sources are dominated by urban wastewater treatment plants (60%) with a lesser contribution from organic chemical production (38%).

Table 7.13 provides a comparison between the inventory data provided for HCB emissions to air for the Article 12 reports to the European Commission, UNECE reporting and E-PRTR. As with the earlier figures and tables the results presented within Table 7.13 illustrate a similar pattern of fluctuating emissions.

As with the discussion of dioxins and furans, and PCBs, it should be noted that a time trend cannot be inferred from the data submitted by Member States under the POP Regulation, as the emission totals are dependent on the number of Member States submitting information. This number was much higher in 2013 (18) than in 2015 (7).

Table 7.13 Comparison of emission estimates between inventories for HCB

Year	Article 12 POP Regulation Total emissions for EU28 (kg to air)	UNECE EMEP emissions Total for EU28 (kg to air)	E-PRTR emissions total for EU28 (kg to air)
2013	218	394	42.2 (2 facilities)
2014	225	374	59.2 (3 facilities)
2015	54	269	32.0 (1 facility)

Note that not all Member States reported data under Article 12, leading to important discrepancies in the data.

Figure 7.18 Data reported to the E-PRTR for emissions of HCB to water (taken from the E-PRTR website on the 27/1/2019)

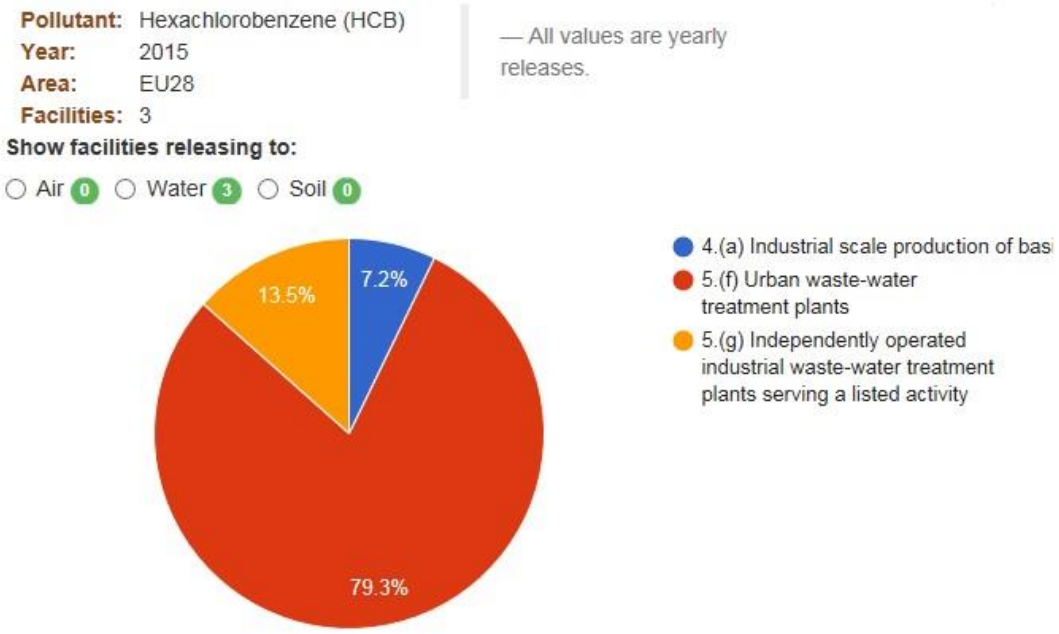
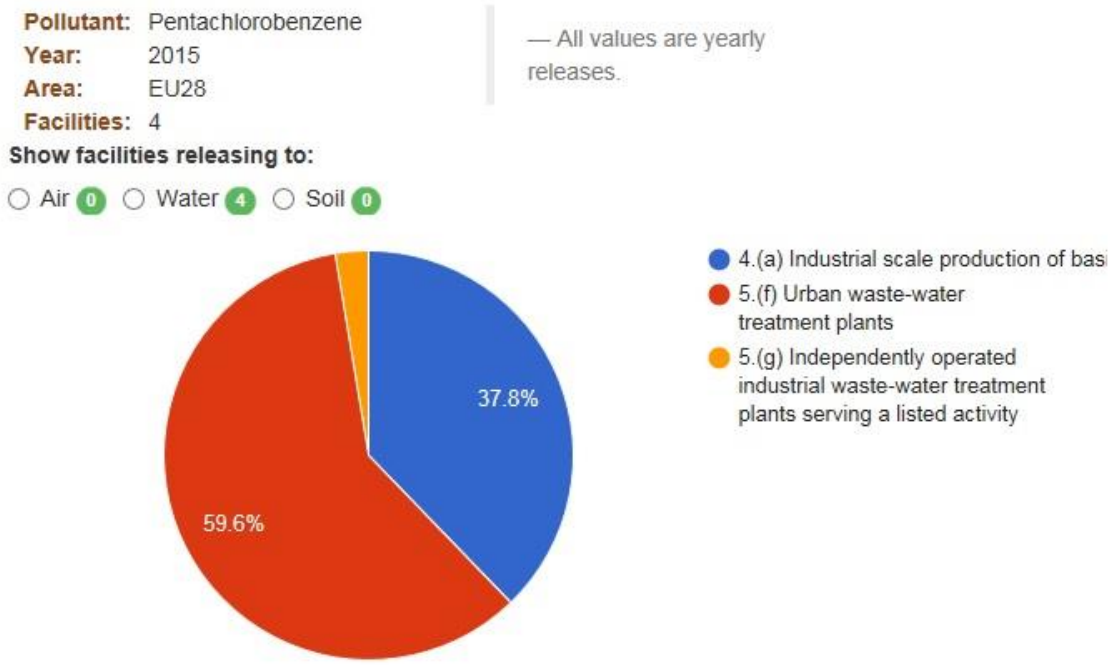


Figure 7.19 Data reported to the E-PRTR for emissions of PeCBz to water (taken from the E-PRTR website on the 27/1/2019)



7.3 Environmental monitoring

The Article 12 reports provided to the European Commission include emission inventory estimates for releases of Annex III substances to the natural environment via five emission pathway vectors: air, land, water, residue, and product. The development of emission inventory estimates is intended to provide the Member State Competent Authorities with a valuable tool to help them assess the key sources and trends for estimated emissions within their Member State. This allows the Member State Competent Authorities to have an informed position when policy planning and developing implementation plans for the control and further reduction of emissions.

The monitoring of POPs in the environment can help tracking the trans-boundary fluxes and the environmental concentration trends, which can be used to validate the trends shown by the emission inventory estimates. The European Monitoring and Evaluation Programme (EMEP) is the basis for pan-European monitoring of POPs in the environment. A summary of the findings from this report is presented below.

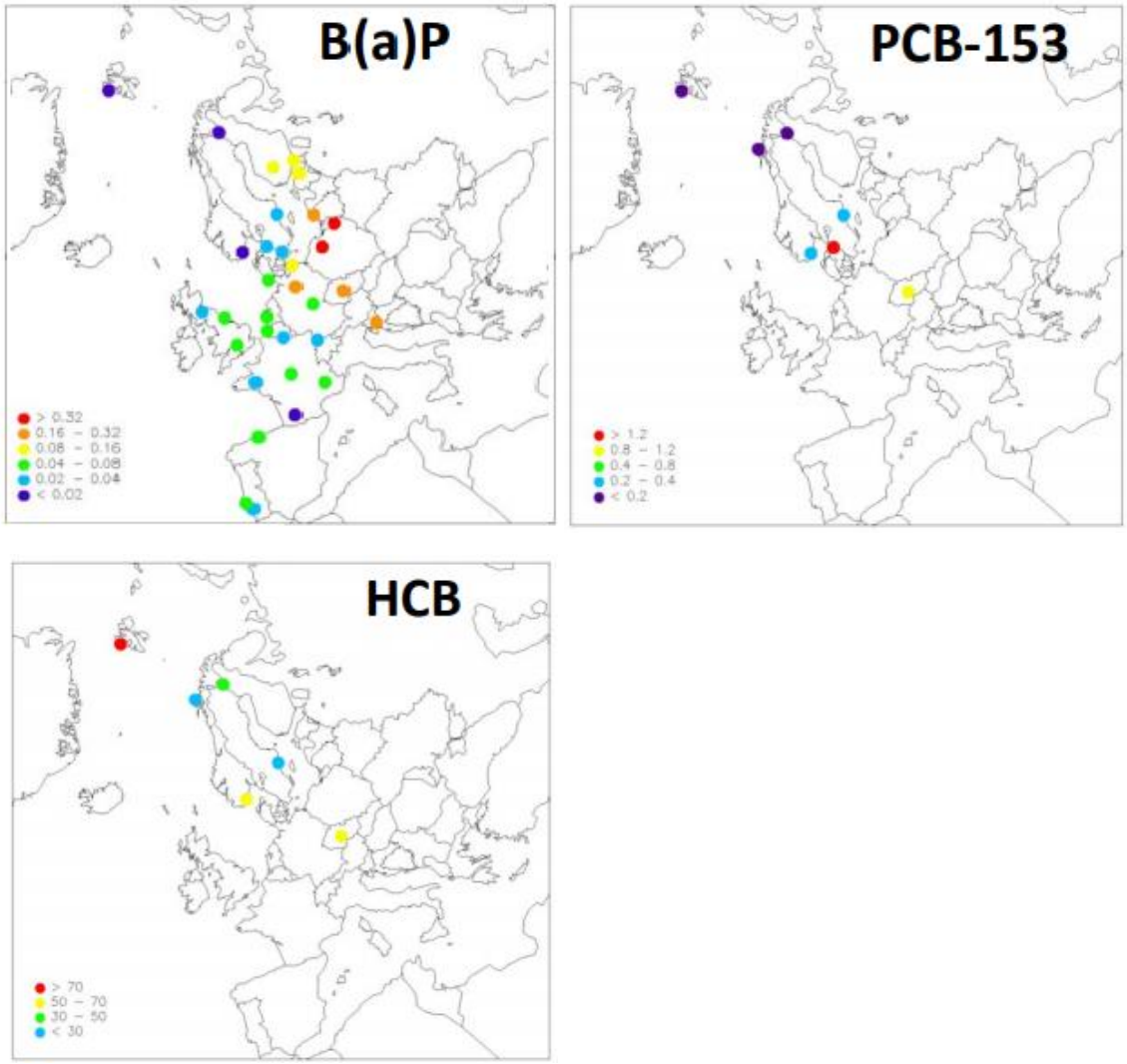
EMEP report (3/2016) Status report on Persistent Organic Pollutants: assessment of transboundary pollution on regional and global scales

The EMEP status report on POPs (2016) covers emissions, fate and transport modelling and measurement data for the EMEP region. In 2016, 41 countries reported estimated POP emissions for the period of at least one year, over the period from 1990-2014. Using these official data, the Centre on Emission Inventories and Projections (CEIP) and the Meteorological Synthesizing Centre-East (MSC-E) prepared gridded emission data with data gaps filled using expert estimates. The most significant decline in estimated emissions to air for the EU28 over the period 1990-2015 was for HCB (96%), followed by PCBs (83%), PAHs (78%) and dioxins and furans (67%).

EMEP monitoring network summary

The EMEP monitoring programme for POPs started in 1999, although some earlier data are available, and are reported in the EMEP database hosted by NILU (http://ebas.nilu.no/). As of 2015 there are 34 monitoring stations within the EMEP region that report PAH data, whilst PCBs and HCB are reported at 7 sites. Figure 7.20 provides the location details for these stations.

Figure 7.20 EMEP monitoring stations operating in 2015.

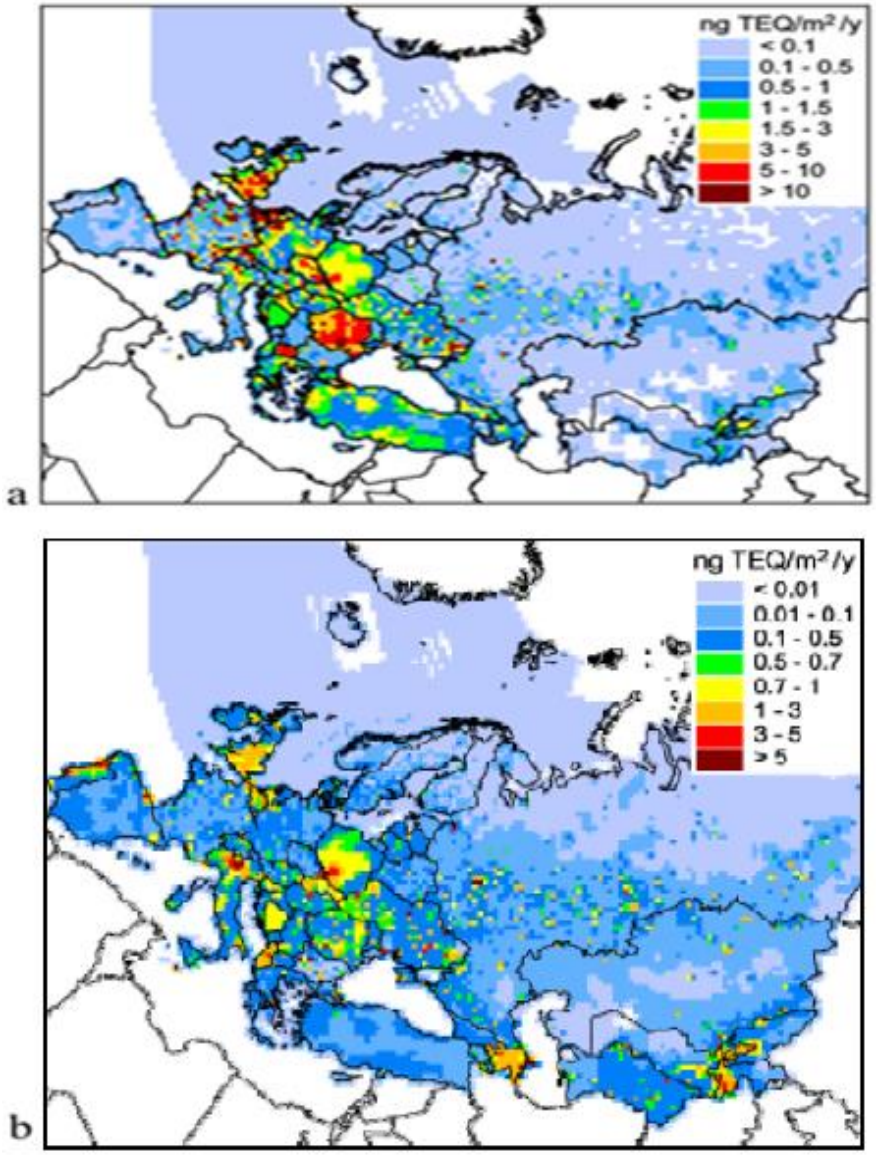


The Global EMEP Multi-media Modelling System (GLEMOS) uses both emission data and measurement data to assess the spatial distribution of POPs concentrations across the EMEP region in the main environmental media. The emission data are prepared by the Centre on Emission Inventories and Projections (CEIP) and by MSC-E (Meteorological Synthesizing Centre-Est) and are based on official emissions data reported by Parties to the Convention, with additional unofficial expert estimates (for example, the global PCB inventory provided by Breivik et al. (2007)). These data are converted into a gridded emission dataset by CEIP.

Dioxins and Furans (PCDD/Fs)

Emission estimates for the sum of the 17 PCDD/Fs (expressed as TEQ) showed a decline across the EMEP countries from 15kg TEQ (in 1990) to 4.2 kg TEQ (in 2014) (see Figure 7.21). The decrease in emissions was variable in the different countries, with the largest reductions occurring in Luxembourg and the Netherlands (97%), Belgium and France (95%). Some countries also reported an increase in emissions since 1990, namely Greece for the EU.

Figure 7.21 Emissions estimates for the sum of 17 PCDD/Fs (TEQ) for EMEP countries in (a) 1990 and (b) 2014 as ng TEQ/M2/year – EMEP Status report 2016

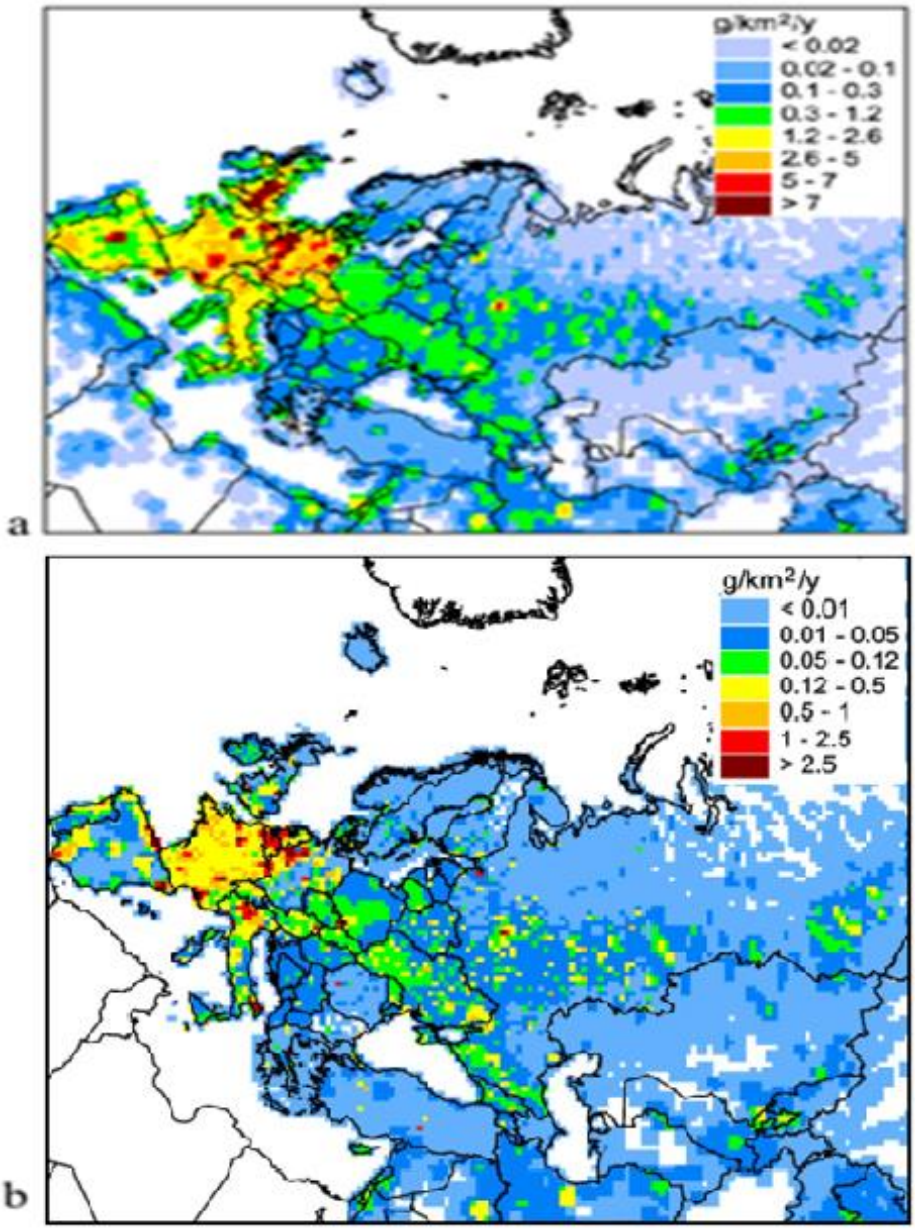


Polychlorinated Biphenyls (PCBs)

The PCB emission inventory has been compiled using data from Breivik et al (2007)[57], the data submitted officially by the countries and expert estimates. These data suggest a 6-fold overall emission reduction across the EMEP countries over the period from 1990 to 2014 (Figure 7.22). The decrease in emissions varied by country, with the largest reductions occurring in Latvia, Portugal, Norway, and the United Kingdom (all >90%).

[57] Breivik,K., Sweetman, A., Pacyna, J. and Jones, K.C. (2007) Towards a global historical emission inventory for selected PCB congeners – a mass balance approach 3. Submitted to Science of the Total Environment, 377, 296-307

Figure 7.22 Emissions estimates for the indicator congener PCB-153 for EMEP countries in (a) 1990 and (b) 2014 – EMEP Status report 2016



Polycyclic Aromatic Hydrocarbons (PAHs)

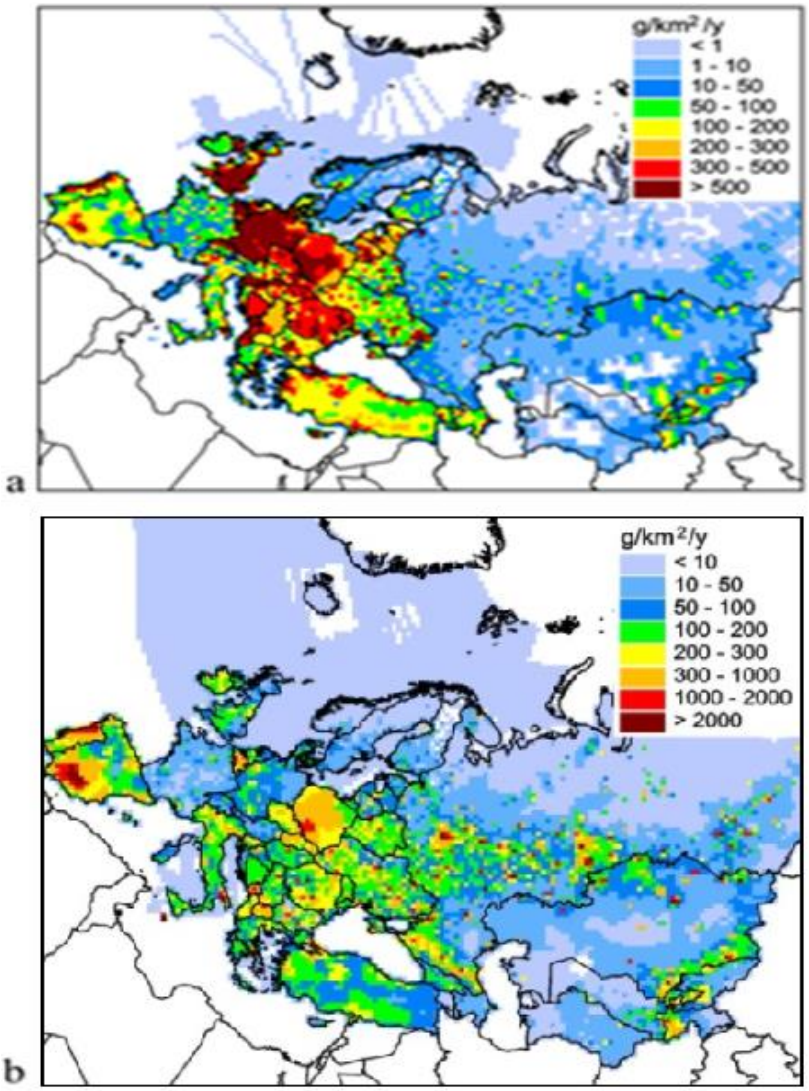
Emission estimates for the sum of 4 reference PAHs showed a decline across the EMEP countries from 6,505 tonnes in 1990[58] to 2,635 tonnes in 2014 (Figure 7.23). Changes in emissions have varied by country and within the EMEP region, emissions have increased in 22 countries and decreased in 28 countries.

The most notable increases of emissions have occurred in the EECCA countries, many of which have significantly improved their inventory reporting methods or reported data for the first time in 2014 leading to large changes in emission estimates. For example, total PAH

[58] The previous synthesis report quoted estimated emissions of PAHs in 1990 of 2417 tonnes. It should be noted that under the UNECE emission estimates are calculated annually with improvements made to the whole time-series as new data becomes available. Which may explain the significant difference in revised estimates.

emissions of Kazakhstan have been reported for the first time which has led to an increase in emission of 164 tonnes in 2014. For EU Member States the data over the years 2013 and 2014 illustrates fluctuations with higher emissions in 2014 (than 2013) for a number of EU countries (e.g., Malta, Portugal, Spain, Sweden, and the United Kingdom). Where PAHs emissions are linked to the combustion of organic matter, including natural sources (e.g., forest fires) year on year comparisons are less useful. Instead, the overall trend is more important with the more recent years 2012-2014 recording emission rates of 1,400 – 2,600 tonnes per annum.

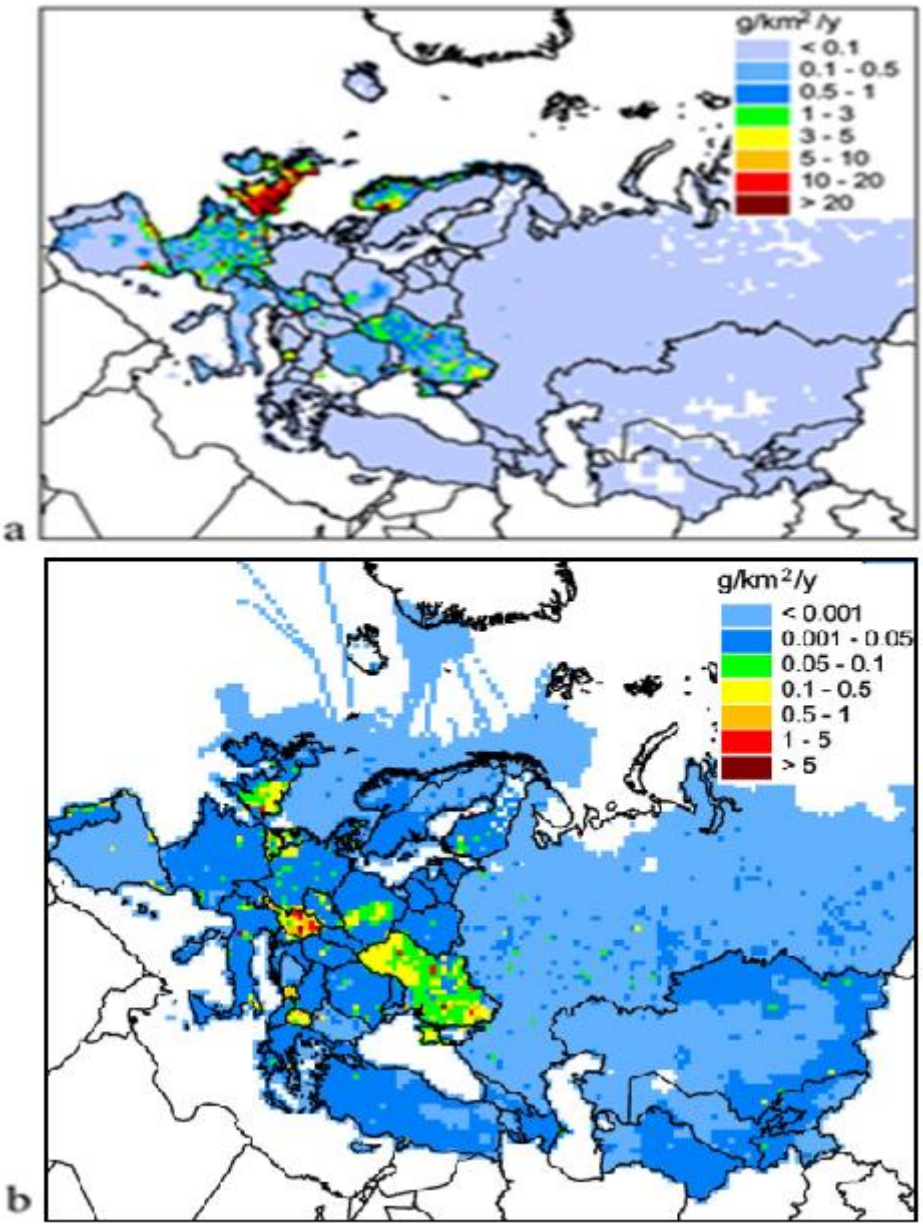
Figure 7.23 Emissions estimates for the sum of (4 congeners) PAHs for EMEP countries in (a) 1990 and (b) 2014 – EMEP Status report 2016



Hexachlorobenzene

Total HCB emissions decreased from 6 tonnes to 0.45 tonnes across 29 EMEP countries over the period from 1990 to 2014 (Figure 7.24). The decrease in emissions varied by country, with the largest reductions occurring in the United Kingdom and Norway (99% reduction) followed by Spain, France, and Slovenia (98% reduction).

Figure 7.24 Emissions estimates of HCB for EMEP countries in (a) 1990 and (b) 2014 – EMEP Status report 2016

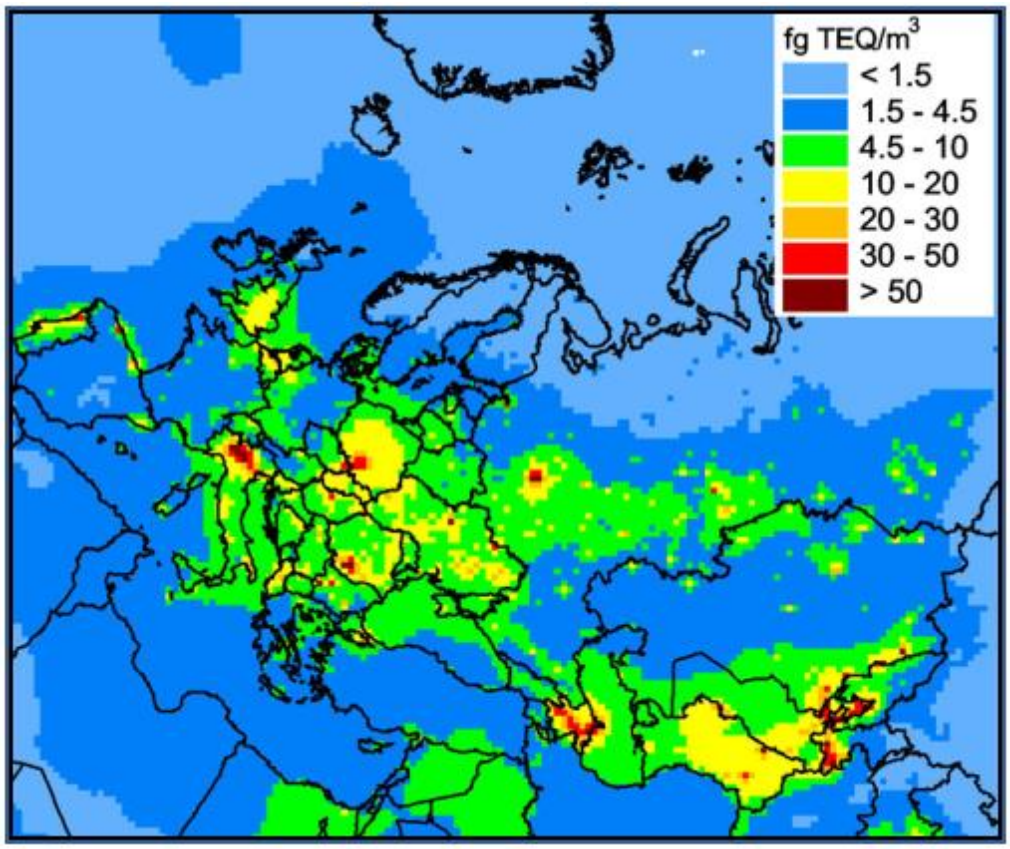


EMEP monitoring network summary

Dioxins and Furans (PCDD/Fs)

A reduction in emissions across the EMEP region since 1990 (mean 30% reduction) for PCDD/Fs is reflected in the predicted air concentrations provided by the GLEMOS model. Elevated levels of annual mean air concentrations (10-50 femtograms TEQ/m3 and higher) are noted for Poland, northern Italy, Portugal, Slovakia, Romania, Albania, and Azerbaijan (see Figure 7.25). Areas of relatively high air concentrations can also be noted for Ukraine, the Russian Federation, Tajikistan, and Turkmenistan.

Figure 7.25 Predicted spatial distribution of ambient air concentrations for the sum of 17 PCDD/Fs (fg TEQ/m3) for EMEP countries in 2014

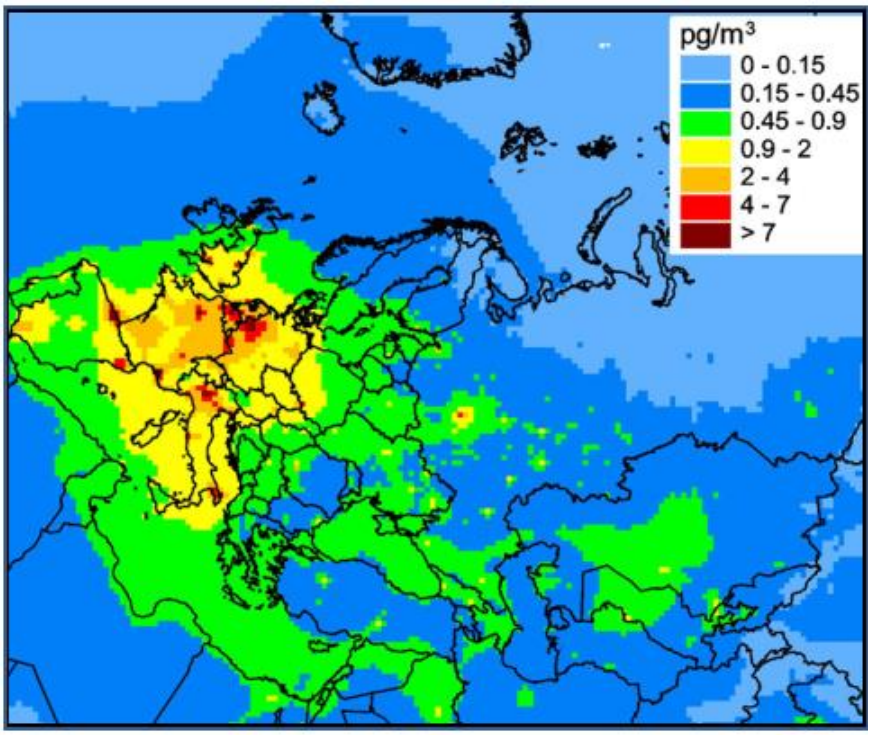


Polychlorinated Biphenyls (PCBs)

The spatial distribution of ambient air concentrations for PCB-153 for EMEP countries in 2014 is shown in Figure 7.26. Relatively high annual mean air concentrations (1-7 pg/m3 and higher) can be noted for countries in Western and Central Europe, while lower levels of concentrations are obtained for Northern Europe and the EECCA countries. Since 1990 the levels of air pollution by PCB in EMEP countries have decreased by approximately 83%, which varies geographically for individual countries. For example, there has been a 60% reduction in Estonia compared to approximately 90% for the United Kingdom.

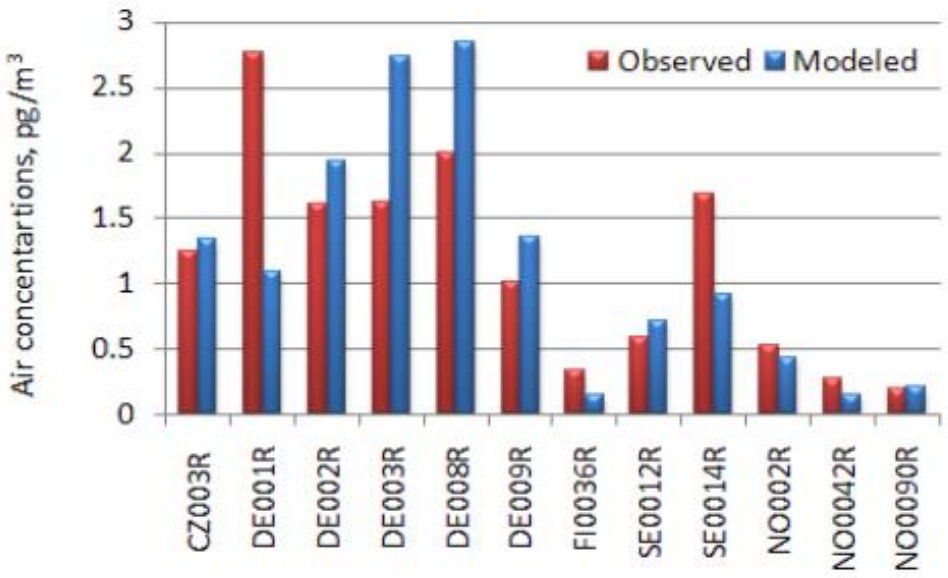
In 2014, secondary emissions were estimated to contribute 50-70% of the total. The remainder comes from ongoing anthropogenic emissions (5-50%) and emissions outside the EMEP region (1-30%).

Figure 7.26 Predicted spatial distribution of ambient air concentrations for PCB-153 for EMEP countries in 2014 – EMEP Status report 2016



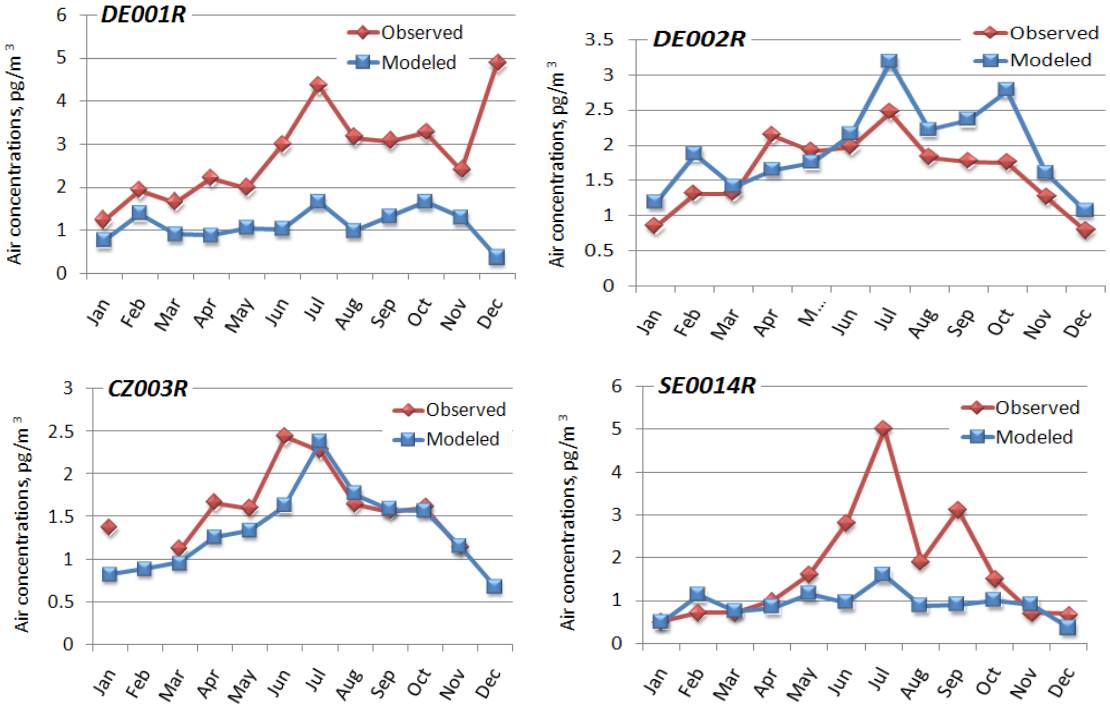
The measurement data collected across the EMEP region are used for model validation. Figure 7.27 shows that, for Europe, predicted and measured concentrations are within a factor of two for 85% of the monitoring sites.

Figure 7.27 Comparison of predicted ambient air concentrations for PCDD/Fs (TEQ) for EMEP countries and measurement data within Europe – EMEP Status report 2016



Modelled and observed monthly mean PCB-153 air concentrations (see Figure 7.28), illustrate that for most of the year modelled concentrations for CZ0003R and DE0002R reproduce variations of observed PCB-153 air concentrations. The biggest anomaly is for the sites DE0001R and SE0014R. The model underpredicts concentrations measured at SE0014R in summer months, and measured concentrations at DE0001R for most of the year. The under prediction can be explained by the uncertainty of applied emission data (including spatial distribution) of emissions and seasonal variability that requires more detailed analysis.

Figure 7.28 Comparison of monthly mean modelled PCB-153 air concentrations with measurements of EMEP monitoring sites for 2014, pg/m3– EMEP Status report 2016

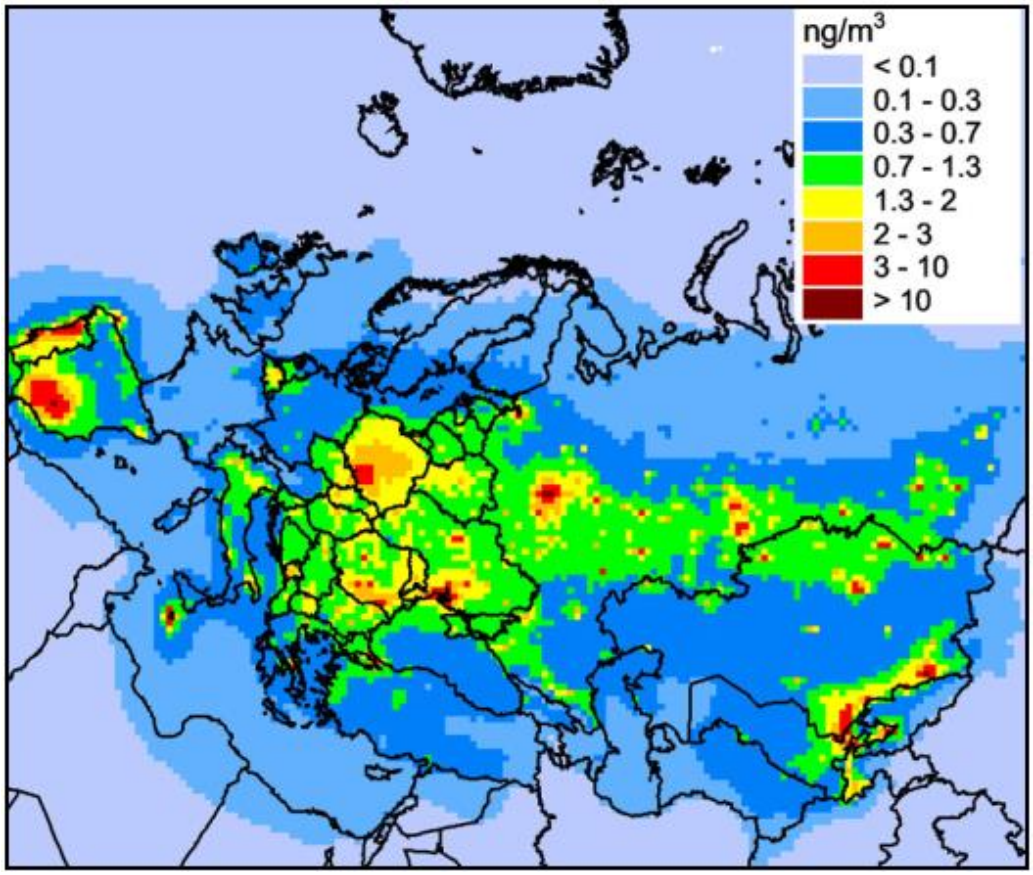


PAHs

Figure 7.29 provides an illustration of the atmospheric concentrations for four reference PAHs in 2014. Analysis of temporal changes of emissions and air concentrations in the EMEP region, performed for the two recent decades, has shown that decline of B[a]P air pollution levels slowed significantly during recent ten years (since 2000) and air concentrations even started to increase in some of the EMEP countries.

Benzo(a)pyrene (B[a]P) is the only PAH with an EU air quality standard (of 1 ng/m3). While overall atmospheric concentrations for Europe have fallen since 1990, the decline has slowed in the last ten years, with variation across regional and sub-regional areas of the EU. Figure 7.29 illustrates elevated atmospheric concentrations of PAHs in the central and eastern European Member States, namely Poland, Czechia, Slovakia, Slovenia, Romania, Bulgaria, and Lithuania. Elevated concentrations are also seen for some Mediterranean countries, particularly Spain.

Figure 7.29 Spatial distribution of modelled annual mean air concentrations, ng/m3 of 4 PAHs in the EMEP domain for 2014 – EMEP Status report 2016

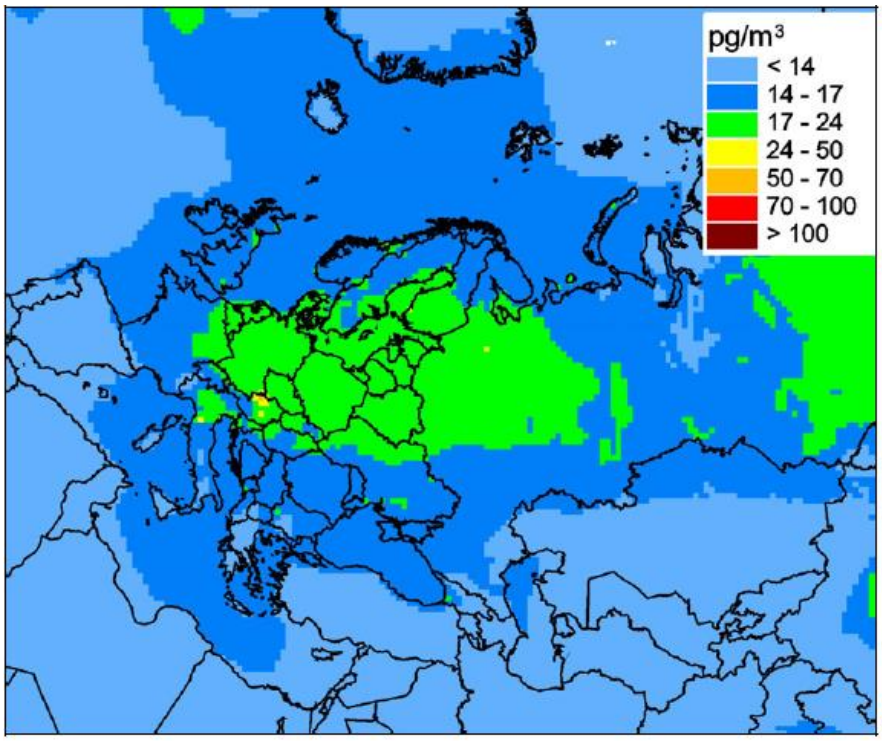


Hexachlorobenzene (HCB)

The reduction in emissions of HCB across the EMEP region are reflected in the predicted air concentrations provided by the GLEMOS model. Figure 7.30 shows the spatial patterns in ambient air concentrations for HCB for 2014. The reduction in emissions of HCB across the EMEP region as a result of banning its use in agriculture and controlling other anthropogenic sources is reflected in the predicted air concentrations by the GLEMOS model. Across the EMEP region, there has been a greater than 90% reduction in ambient HCB concentrations since 1990.

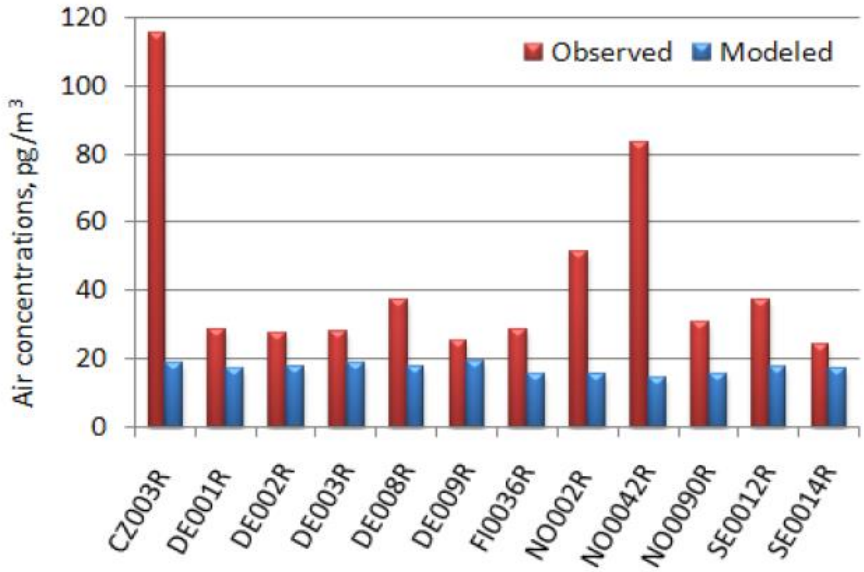
Across the EMEP region there is a relatively homogenous distribution of HCB in air which can be explained by its high stability in the atmosphere. Central and Eastern Europe are predicted to have elevated concentrations (20-40 pg/m3) of HCB.

Figure 7.30 Predicted spatial distribution of ambient air concentrations of HCB for EMEP countries in 2014 – EMEP Status report 2016



Comparing the model predictions with the measurement data (Figure 7.31) shows that in the majority of cases (75%) the agreement between predicted and measured concentrations are within a factor of two.

Figure 7.31 Comparison of predicted ambient air concentrations for HCB for EMEP countries and measurement data within Europe for 2014 – EMEP Status report 2016



Conclusions

Predictions from the MSC-E model GLEMOS suggest that over the period from 1990 to 2014 there has been a reduction in environmental concentrations of PAHs, PCDD/Fs, HCB, and PCBs. GLEMOS uses gridded versions of the official emission data provided by the Parties to the Convention with additional expert input and unofficial emissions estimates. Model results are assessed against monitoring data, largely consisting of ambient air concentrations provided by the EMEP monitoring network. Decreasing environmental concentrations over this period are most evident in the atmosphere, largely driven by reductions in emissions. The reduction in primary emissions for some POPs has resulted in the increasing importance of secondary sources from environmental recycling, particularly for soil.

- PAHs and BaP. As a result of an emission reduction of 40-60% across the EMEP region there has been a corresponding reduction of ambient air concentrations of 30%. There are some regional variations, with the United Kingdom and Germany showing reductions of 90% and 70%, respectively, while other countries show smaller reductions (e.g., Finland, Bulgaria, and Estonia with a reduction of 3 to 6%). PAHs (e.g., BaP) generally show a limited long-range atmospheric transport potential and so ambient air concentrations generally reflect the presence of local sources. Because of deposition from air, soil is an on-going sink for these substances and will show a slower response to emission reduction.

- PCDD/Fs. Across the EMEP region there has been an average emission reduction of 60%. In the EU there has been a reduction of ambient air concentrations of 75% over the period from 1990 to 2014. Emission estimates and modelling approaches have suggested that over this period secondary sources (e.g., volatilization from soil) has become dominant over primary sources.

- HCB. Emission estimates for HCB from 1990 to 2014 across the EMEP region have shown a reduction of >90%, largely as a result of restrictions of its use in agriculture. This has resulted in a 90% reduction in ambient air concentrations, with the main secondary source, volatilisation from soil, accounting for approximately 75% of on-going emissions.

- PCBs. Across the EMEP region there has been an average emission reduction of 80%, resulting in an estimated reduction of 80% in ambient air concentration. This has occurred mostly thanks to control of primary sources. Secondary sources of PCBs now dominate and account for 68% of the total emissions. The soil ‘reservoir’ is likely to re-supply the atmosphere for still a long time.

8. 8. Control measures

The POP Regulation requires Member States to take actions in identifying, controlling, and ultimately reducing the emission of POPs in the environment. The key mechanism for action is the development of national implementation plans, which should document the current situation and issues in each Member State. On the basis of this information, the Member States can develop action plans as part of the national implementation plan to address the identified issues. Various Articles of the POP Regulation contain those control measures (information box below):

Article 3 and **Article 4** of the POP Regulation provide control measures for the production, placing on the market and use of substances listed in Annex I (banned) and Annex II (restricted) to protect human health and the environment from POPs.

Additionally the POP Regulation requires Member States to develop National implementation Plans (Article 8) Action Plans (Article 6) and emission inventories for Annex III (unintentional substances) (Article 6)

These issues are detailed within the POP Regulation as follows:

Article 8 – National Implementation Plans:

- 8.1 When preparing their national implementation plans, Member States shall, in accordance with their national procedures, give the public early and effective opportunities to participate in this process.
- 8.2 As soon as a Member State has adopted its national implementation plan in accordance with its obligations under the Convention, it shall communicate it both to the Commission and to the other Member States.
- 8.3 When preparing their implementation plans, the Commission and the Member States shall exchange information on the content as appropriate.

Article 6 – Action Plans:

- 6.2 A Member State shall communicate its action plan on measures to identify, characterise and minimise with a view to eliminating where feasible as soon as possible the total releases developed in accordance with its obligations under the Convention, to both the Commission and the other Member States as part of its national implementation plan, pursuant to Article 8.

Article 6 – Emission Inventories

- 6.1 Within two years of the date of entry into force of this regulation, Member States shall draw up and maintain release inventories for the substances listed in Annex III into air, water and land in accordance with their obligations under the Convention and the Protocol.

Member States need to ensure that the actions are enforced and reported back to the Commission as part of the annual and triennial Article 12 reporting. Control of Annex III substances is a more complex problem and the development of emission inventories (detailed in the previous chapter) is intended to inform Member State Competent Authorities on the specific issues that need to be addressed within their nation.

The emission inventories together with supporting work from other aspects that relate to POPs such as the food chain/food services and waste sector/management of POPs contaminated waste can be used to develop an action plan for further work to minimise emissions or provide the basis for additional research where a particular source is not well defined within the emission estimates. These action plans form a core part of the overall national implementation plan, which covers all aspects of the POP regulation managed by individual Member States.

The development and continuous update of national implementation plans provide the reference information on policies and activities undertaken by a specific Member State to control POPs, which should be communicated to all other Members of the Union to ensure close cooperation and coordination in the continued efforts to meet the overall aims of the POP Regulation.

The POP regulation requires Member States to create emission inventories within two years of its entry into force. These inventories, together with supporting work and public consultation, are used to develop the development of action plans and national implementation plans. The first round of NIPs are therefore typically dated between 2006 and 2008.

From 2010, new substances were added to the Annexes of the POP Regulation in order to comply with listings adopted under the Stockholm Convention. This included a new Annex III substance, pentachlorobenzene, and other additions of legacy substances with potential for release into the environment, particularly polybrominated diphenyl ethers (PBDEs) and Perfluorooctanesulfonic acid (PFOS). These additions required an updated second round of national implementation plans which typically date from 2011 onward.

Since 2013, further new substances were added to the Annexes of the regulation as a response to additions within the Stockholm Convention. This included hexabromocyclododecane (HBCDD) (Annex A) in 2013 hexachlorobutadiene (HCBD) (Annex A), pentachlorophenol (PCP) and its salts and esters (Annex A), and polychlorinated naphthalenes (PCNs) (Annex A and C) in 2015; decabromodiphenyl ether (decaBDE) (Annex A), and short-chain chlorinated paraffins (SCCPs) (Annex A) in 2017[59]. Parties are expected to transmit revised and updated implementation plans addressing the amendment(s) adopted at the Conference of Party (COP) meetings, which confirmed the listing of these 'new' substances.

Based on the review of national implementation plans submitted to the Stockholm Convention[60], an overview of the status of submissions is provided in Table 8.1. This indicates when the most recent plan was submitted, and which COP amendments each of these plans cover. As noted in the previous synthesis report, no plan has yet been developed by Greece or Malta, and the position for Italy is unknown as Italy has not directly ratified the Stockholm Convention. The remaining 25 EU Member States had all developed national implementation plans and national action plans as per the first round of national implementation reporting.

As shown in Table 8.1, a number of Member States (Estonia, Latvia, Luxembourg, Portugal, Slovakia, and Slovenia) have not transmitted an updated plan since their initial submission. A total of eleven Member States (Belgium, Croatia, Cyprus, Czechia, Denmark, Germany, Hungary, Lithuania, Poland, Sweden, and the United Kingdom) have submitted updated plans in the current reporting period (since 2013).

[59] Outside of the scope for the current review but included here for completeness.
[60] Information correct as of January 2019

Table 8.1. Overview of EU Member States' National Implementation Plans

Member State	Year of most recent NIP	Initial NIP	COP4 update (2009)[61]	COP5 update (2011)[62]	COP6 update (2013)[63]	COP7 update (2015)[64]	COP8 update (2017)[65]
Belgium	2012	✓	✓	✓	✓		
Bulgaria	2012	✓	✓	✓			
Czechia	2017	✓	✓	✓	✓	✓	
Denmark	2018	✓	✓	✓	✓	✓	✓
Germany	2016	✓	✓	✓	✓		
Estonia	2011	✓					
Ireland	2012	✓	✓	✓			
Greece	n/a*						
Spain	2013	✓	✓	✓			
France	2012	✓	✓	✓			
Croatia	2016	✓	✓	✓	✓		
Italy**	n/a*						
Cyprus	2014	✓	✓	✓			
Latvia	2007	✓					
Lithuania	2017	✓	✓	✓	✓		
Luxembourg	2006	✓					
Hungary	2013	✓	✓	✓			
Malta	n/a*						
Netherlands	2011	✓	✓				
Austria	2012	✓	✓	✓			
Poland	2016	✓	✓	✓	✓	✓	
Portugal	2006	✓					
Romania	2012	✓	✓	✓			
Slovenia	2009	✓					
Slovakia	2013	✓					
Finland	2012	✓	✓	✓			
Sweden	2017	✓	✓	✓	✓	✓	
United Kingdom	2017	✓	✓	✓	✓	✓	

* No national implementation plan has been submitted to date.
** Italy has not been a Party to the Convention at the time when this report was finalised.

[61] Listing, alpha-HCH, beta-HCH, chlordecone, hexabromobiphenyl, hexaBDE and heptaBDE, lindane, pentachlorobenzene, PFOS, its salts and PFOSF, tetraBDE and pentaBDE
[62] Listing endosulfan
[63] Listing hexabromocyclododecane
[64] Listing hexachlorobutadiene, pentachlorophenol and its salts and esters, polychlorinated naphthalenes
[65] Listing decaBDE, and SCCPs

A number of Member States have provided detailed information on the steps that have been taken to intervene in the release of POPs to the natural environment. Further detail on the Article 12 responses for control measures is provided in Appendix B of this document. Previous synthesis reports have provided details on specific national policies and additional measures that had been implemented to help mitigate the emission of POPs. The Article 12 responses submitted for the period 2013–2015 build upon this aspect further.

Table 8.2 provides an overview of the Member State responses in the Article 12 questions, indicating where measures to identify, characterise, and minimise emissions are in place. The second and third synthesis reports note that it is difficult to comment on the activities being undertaken by some Member States due to the lack of information provided. This position is unchanged within the current synthesis report.

Under the Article 12 questions for measures to identify and characterise emissions, one Member State (Hungary) indicated that these issues were not applicable. It is assumed to mean that in this case measures have either already been put in place or that the addition of new POPs since 2010 are not relevant for that Member State.

The majority of Member States (Belgium, Cyprus, Czechia, Germany, Estonia, Spain, Finland, France, Croatia, Ireland, Luxembourg, Latvia, Netherlands, Romania, Slovenia, Slovakia, and the United Kingdom) indicate that control measures in place are achieved through national legislation, to implement the POP Regulation and other relevant EU-wide legislation.

Most notably, many Member States (Bulgaria, Czechia, Denmark, Germany, Hungary, Finland, France, Netherlands, Romania Slovenia, Sweden, and the United Kingdom) report that emission reduction is achieved through setting emission limit values for industrial installations following or exceeding the requirements of the industrial emission directive (IED), through environmental permits requiring application of best available techniques.

Other Member States (e.g., Latvia, Romania, United Kingdom) also reference the implementation of the European Pollutant Release and Transfer Register E-PRTR Regulation for identifying and reporting the sources of substances in Annex III, while the implementation into national law of the restriction of the use of certain dangerous substances in electrical and electronic equipment has also been reported (e.g. Cyprus).

Some Member States report the use of national legislative measures beyond that of the IED. For example, Belgium report new general environmental legislation regarding controlling of non-ducted dust emissions, and premarket control of certain raw material in the animal feed sector is required for dioxins and PCB. Ireland also reports national legislation addressing industrial and waste facilities, beyond the scope of the IED. Sweden reports that, under their national law, residents are required to investigate and if necessary, remove the joint-sealing compound or flooring compound if it is found to be a PCB-containing product.

The control measures put in place by some Member States (e.g., Czechia, France, Ireland, the United Kingdom) are reported to be part of wider national strategies for emissions reduction. Other Member States have reported specific targeted research on POPs and further development of action plans. For example, Finland and Latvia report the use of research programmes (COHIBA) to monitor sources and emissions to air, soil, and surface water, for the hazardous substances listed under the HELCOM Baltic Sea Action Plan (BSAP).

Table 8.2 Breakdown of work completed based on Article 12 reports

Member State	Measures to Identify	Measures to Characterise	Measures to Minimise
Belgium	✓	✓	✓
Bulgaria	✓	✓	✓
Czechia	✓	✓	✓
Denmark	✓	✓	✓
Germany	✓	✓	✓
Estonia	✓	✓	✓
Ireland	✓	✓	✓
Greece			
Spain	✓	✓	✓
France	✓	✓	✓
Croatia	✓	✓	✓
Italy			
Cyprus	✓	✓	✓
Latvia			
Lithuania**	✓	✓	✓
Luxembourg	✓	✓	✓
Hungary*	n/a	n/a	✓
Malta			
Netherlands	✓	✓	✓
Austria	✓	✓	✓
Poland	✓	✓	✓
Portugal			
Romania	✓	✓	✓
Slovenia	✓	✓	✓
Slovakia	X	X	✓
Finland	✓	✓	✓
Sweden	✓	✓	✓
United Kingdom	✓	✓	✓

*No submission in the current reporting period. ** Based on previous reporting period.

Sweden has developed and maintained an inventory of contaminated land sites. Sweden also reports that studies to characterise and evaluate the relative importance of long-range atmospheric transport of POPs have been performed. The United Kingdom also reports that

further research has been undertaken to characterise sources and factors which may influence emissions as the required technical and financial resources become available. The United Kingdom maintains an active monitoring network (TOMPs) for airborne concentrations of POPs to help verify the success of policy addressing POP emissions.

The nature and scale of monitoring programmes and inventories varies between Member States. The United Kingdom was the only Member State for which a national-level inventory has been reported covering all five Stockholm Convention vectors (air, water, land, residue, and product).

In other cases, monitoring efforts are reported to focus on specific vectors, source categories or industries. For example, France reports a monitoring programme focussed on discharges from industrial wastewater with an associated plan for envisaged reduction measures. In Belgium, monitoring is often targeted at specific sources (e.g., municipal waste incinerators, waste treatment plants, scrap metal plants, tar refineries) and monitoring levels in food and animal feed. Similarly, in Sweden, monitoring is focussed on a number of key sectors such as the ferrous and non-ferrous metal industry, the pulp and paper industry and waste incineration.

It is noted that many of the Priority Substances and certain other pollutants according to Annex II of the Environmental Quality Standards Directive (2008/105/EC) are POPs[66]. Article 5(1) of the Environmental Quality Standards Directive (2008/105/EC) states that "on the basis of the information collected in accordance with [the Water Framework Directive] and other available data, Member States shall establish an inventory of emissions, discharges and losses of all priority substances".

As discussed in the EEA (2019) report[67], the WFD requires reporting of the emissions inventory for each river basin district, which was required for priority substances for the first time in the second cycle of RBMP reporting, i.e., for 2010. Following the recommendations of EU Technical Guidance, some countries reported emissions only for substances identified as relevant for the river basin. It is also noted that WISE reporting is voluntary and involves reporting of emissions by EEA's member countries. Not all countries report to WISE and those that do may not report all pollutants.

The EEA also report[68] that Member States have used a variety of approaches to determine chemical status, with some Member States using different standards for chemical status, Member States should have reported chemical status for 2015 using the standards laid out in Environmental Standards Directive 2008/105/EC, but some reported it using the stricter standards in the 2013 Priority Substances Directive.

The coverage of substances in monitoring and inventory development also appears to vary between Member States, being largely dependent on the availability of data. While data appear more readily available for PCBs and dioxins/furans, less data is available for PeCBz. One-member state (Denmark) noted that the screening for emission sources for PeCBz showed that the available data are extremely limited and, in many cases, the reported data are based on highly uncertain assumptions.

A number of additional measures are reported by Member States, including the use of awareness campaigns, targeted towards the general public and industry (see Section 9). For example, many Member States note the communication of the risk of dioxins and furans

[66] http://ec.europa.eu/environment/water/water-framework/priority_substances.htm
[67] https://www.eea.europa.eu/themes/water#tab-publications
[68] https://www.eea.europa.eu/themes/water/european-waters/water-quality-and-water-assessment/water-assessments/eea-2018-water-assessment

from combustion of wood in open or uncontrolled fires, woodstoves/boilers) to encourage the appropriate selection of combustion plants and fuel and the effects of uncontrolled combustion in residential building (e.g. Belgium, Croatia, Denmark, Cyprus, Finland, and the United Kingdom).

Other measures reported by member states include:

- Estonia reported the use of labelling of PCB containing equipment.
- Cyprus reported the requirement for fireworks to be checked for HCB before being placed on the market.
- Finland noted work to improve companies' awareness of POPs, their management, and obligations concerning their release, as well as implementation of measures to reduce traffic related emissions and landfills.
- The United Kingdom reported that the implementation of measures on waste management has altered domestic waste disposal behaviour and publicity has helped raised public awareness about good practice in backyard burning which is a source of dioxins and furans, PCBs, and HCB.

9. 9. Activities to promote knowledge exchange

The POP Regulation sees the exchange of knowledge as key to raising awareness, involving stakeholder groups (including the general public) and aiding other states to act proactively in order to minimise the impact of POPs. The POP Regulation addressed these points in Article 10, as explained in the information box below:

Article 10 Information exchange:

10.1. The Commission and the Member States shall facilitate and undertake the exchange within the Community and with third countries of information relevant to the reduction, minimisation or elimination, where feasible, of the production, use and release of persistent organic pollutants and to alternatives to those substances, specifying the risks and the economic and social costs related to such alternatives.

10.2. The Commission and Member States, as appropriate, shall promote and facilitate with regard to persistent organic pollutants:

(a) awareness programmes, including relating to their health and environmental effects and their alternatives and on the reduction or elimination of their production, use and release, especially for

(i) policy and decision makers,

(ii) particularly vulnerable groups;

(b) the provision of public information;

(c) training, including workers, scientists, educators and technical and managerial personnel

10.3. Without prejudice to Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information, information on health and safety of humans and the environment shall not be regarded as confidential. The Commission and the Member States that exchange other information with a third country shall protect any confidential information as mutually agreed.

9.1 Reporting activities

Member States are required to implement this provision and promote knowledge exchange, public awareness, and training. The information included in this section is based on Member States' reports for the 2013-2015 period. In addition, activities conducted by the Commission to raise public awareness and knowledge exchange platforms such as the E-PRTR are included.

According to Article 12, the main reporting requirement for Member States is an annual report including statistical data on actual or estimated total production and placing on the market of substances of Annexes I or II. During the 2013-2015 period, 23 Member States have provided at least one annual report:

Austria, Belgium, Bulgaria, Cyprus, Czechia, Denmark, Estonia, Germany, Ireland, Latvia, Luxembourg, Netherlands, Poland, Romania, Slovenia, Sweden, and the United Kingdom have submitted annual reports for 2013, 2014, and 2015.

Article 12 Reporting :

12.1 Member States shall every three years forward to the Commission information on the application of this Regulation, including information on infringements and penalties.

12.2 Member States shall provide the Commission every year with statistical data on the actual or estimated total production and placing on the market of any substance listed in Annex I or II.

12.3. Within three years of the date of entry into force of this Regulation and every three years thereafter, Member States shall provide the Commission with:

(a) summary information compiled from the notifications, concerning stockpiles, received pursuant to Article 5(2);

(b) summary information compiled from the release inventories drawn up pursuant to Article 6(1);

(c) summary information on the presence of dioxins, furans and PCBs as identified in Annex III in the environment, as compiled pursuant to Article 9.

12.4. As regards the data and information to be provided by Member States pursuant to paragraphs 1, 2 and 3, the Commission shall develop in advance a common format in accordance with the procedure referred to in Article 16(2).

12.5. Regarding the substances listed in the Convention, the Commission shall, at intervals to be determined by the Conference of the Parties of the Convention, compile a report on the basis of the information provided by the Member States in accordance with paragraph 2 and communicate it to the Secretariat of the Convention

Five Member States (Croatia, Lithuania, Spain, Finland, France, and Slovakia) submitted two annual reports during this reporting period.

Article 12 also requires Member States to submit a triennial report every three years on the application of the regulation. The latest triennial report covered the 2013-2015 period and was submitted by 22 Member States.

Four Member States (Greece, Hungary, Italy and Malta) did not submit annual reports or a triennial report during this reporting period. The status of information reported and compared to the last reporting period is summarised in the Table 9.1 below.

The 2013-2015 reporting period has a number of reporting gaps with five Member States failing to report any information. For comparison, in the previous two synthesis reports, covering the periods 2007-2009, and 2010-2012, the number of Member States failing to report any information was three and six, respectively.

The notification procedure was discussed in previous sections. As required by Article 12.3 Member States must submit information to the Commission on notifications concerning stockpiles, information compiled from the release inventories as described in Article 6(1) and information on the presence of dioxins, furans and PCBs as identified in Annex III.

Article 8 requires Member States to notify the Commission following the update of their national implementation plans. As noted in the previous section, eleven Member States (Belgium, Croatia, Czechia, Cyprus, Denmark, Germany, Hungary, Lithuania, Poland, Sweden, and the United Kingdom) have submitted updated plans in the current reporting period.

Table 9.1 Information reported by Member States

MS	2010 annual report	2011 annual report	2012 annual report	2013 annual report	2010-2012 triennial report	2013 annual report	2014 annual report	2015 annual report	2013-2015 triennial report
BE	✓	✓	✓	✓	✓	✓	✓	✓	✓
BG	✓	✓	✓	✓	✓	✓	✓	✓	✓
CZ	✓	x	✓	✓	✓	✓	✓	✓	✓
DK	✓	x	x	x	x	✓	✓	✓	✓
DE	✓	✓	✓	✓	✓	✓	✓	✓	✓
EE	x	x	✓	x	x	✓	✓	✓	✓
IE	✓	✓	✓	✓	✓	✓	✓	✓	✓
EL	x	x	x	x	x	x	x	x	x
ES	x	x	x	✓	✓	x	✓	✓	✓
FR	✓	✓	✓	✓	✓	✓	x	✓	✓
HR	✓	✓	✓	✓	x	x	✓	✓	✓
IT	x	x	x	x	x	x	x	x	x
CY	✓	✓	✓	✓	✓	✓	✓	✓	✓
LV	x	x	✓	✓	x	x	✓	✓	✓
LT	✓	✓	✓	✓	✓	x	✓	✓	x
LU	x	x	x	x	x	✓	✓	✓	✓
HU	x	✓	x	x	✓	x	x	x	x
MT	x	x	x	x	x	x	x	x	x
NL	✓	✓	✓	✓	✓	✓	✓	✓	✓
AT	✓	✓	✓	✓	x	✓	✓	✓	✓
PL	✓	✓	✓	✓	✓	✓	✓	✓	✓
PT	x	x	x	x	x	✓	✓	✓	✓
RO	✓	✓	✓	✓	✓	✓	✓	✓	✓
SI	✓	✓	✓	✓	✓	✓	✓	✓	✓
SK	x	x	x	✓	x	x	✓	✓	✓
FI	✓	✓	✓	✓	✓	✓	x	✓	✓
SE	✓	✓	✓	✓	✓	✓	✓	✓	✓
UK	✓	x	✓	x	✓	✓	✓	✓	✓

9.2 Information exchange

A total of 20 Member States indicated that they have established information exchange mechanisms, with 14 of these providing further details on those mechanisms. This information is summarised in Table 9.2. This is an increase from the previous synthesis report, with the corresponding numbers in the previous reporting period being 17 and 10, respectively.

Nine Member States (Bulgaria, Czechia, France, Germany, Netherlands, Poland, Slovenia, Romania, and the United Kingdom) indicated that the information exchange mechanism is used for the update of the national implementation plans.

The Netherlands indicated that public consultation had been undertaken for the drafting and updating of the national implementation plan.

Five Member States (Belgium, Croatia, Estonia, Ireland, Latvia) report that information exchange is facilitated through a national competent authority. Slovakia reported the use of a national contact point to facilitate exchange of information.

Ireland report that a dedicated network for exchange between different authorities has been established. Similarly, Czechia report the use of a joint Government department and research facility to exchange information. In Belgium, there is also a dedicated committee for data exchange to ensure compliance with the requirements of international organisations.

Denmark, Finland, Luxembourg, Spain, Slovakia, and Sweden indicated that information exchange mechanisms were established but their response did not include details on the type of mechanism.

Table 9.2 Overview of information exchange mechanisms reported by Member States

Member State	Information exchange mechanisms	Comments
Belgium	Federal and regional cooperation	The federal authorities and the three regions have adopted a cooperation agreement on international environmental policy. This has led to the creation of a Coordination Committee for International Environmental Policy (CCIEP). It is responsible for monitoring, collection of data to meet international organisations' demands and drawing up joint reports.
Bulgaria	1. National website 2. Update of the NIP	Information is exchanged through a website of the Ministry of Environment and Water: http://www.chemicals.moew.government.bg and the updates of the NIP.
Czechia	National government department and research centre	The National Centre for Toxic Compounds is a joint establishment of the Ministry of Environment and the Research Centre for Toxic Compounds in the Environment. This is used to provide expert support, coordinate national activities related to POPs, and oversee implementation of the goals and targets stated within the action plans of the National Implementation Plan. The activities of the National Centre cover the following key areas:

Member State	Information exchange mechanisms	Comments
		• Support in implementation of the Stockholm Convention on POPs in Czechia • Research and development related to environmental contamination by chemicals • Monitoring of persistent organic pollutants and of other chemicals • Data management, visualization, interpretation, and reporting • Collaboration with industry and others for capacity building • Education and awareness raising In addition, the National Centre collects and disseminates information through the GENASIS portal. GENASIS (Global ENvironmental ASsessment Information System) provides comprehensive information on contamination of the environment by chemicals, namely persistent organic pollutants (POPs) (https://www.genasis.cz/).
Germany	Part of the NIP	An information exchange mechanism is part of the NIP.
Ireland	Competent Authority Meetings and Network for Environmental Compliance and Enforcement	The EPA and Department of Environment, Community and Local Government attend EU POPs Competent Authority Meetings which are held at least once a year and provide an opportunity for information exchange. Other exchange mechanisms include meetings, teleconferences, and email communications. A Network for Ireland's Environmental Compliance and Enforcement (NIECE) provides a useful mechanism for information exchange between a number of public authorities. The Network harnesses the collective resources and expertise available nationally to co-ordinate a consistent and more effective approach to the enforcement of environmental legislation in Ireland. On-going guidance and support, with regards to PCB holdings and potential PCB holdings, is provided to stakeholders through regular telephone and email contact (national email helpdesk pcbs@epa.ie). The provision of the online tool via the EDEN website has also made it easier for holders to report, track and update their holdings. Information received from surveys and returns from known PCB holdings are used to update the National PCB Inventory.
France	Part of the NIP	An information exchange mechanism is part of the NIP.
Croatia	National authority	The Ministry of Environmental and Nature Protection is responsible for exchange of information at national level and with the Convention Secretariat.

Member State	Information exchange mechanisms	Comments
Cyprus	National authority	The Department of Labour Inspection within the Ministry of Labour, Welfare and Social Insurance, is the contact point between Cyprus and the European Commission for the implementation of Regulation (EC) No. 850/2004
Latvia	National Authorities	Responsible institutions implementing national monitoring programs publish information on their websites and provide an annual information report. The Ministry of Environmental Protection and Regional Development established (in 2011) a group of the ministries and competent authorities involved in the management of chemicals to exchange information.
Netherlands	Public consultation As part of NIP	There was public consultation on the first NIP and the second NIP. Scientific information published by RIVM on request of the Ministry of Infrastructure and the Environment are publicly available, as well as Inspectorate reports and court cases dealing with Persistent Organic Pollutants.
Poland	Part of updated NIP	The mechanism for the exchange of information at national level is specified in the updated National Implementation Plan.
Romania	Part of updated NIP	The mechanism for the exchange of information at national level is specified in the updated National Implementation Plan.
Slovenia	Measures detailed in the NIP	Information exchange mechanism is part of Slovenia's NIP on POPs.
Slovakia	National contact point	Exchange of information and stakeholder engagement is organised by the National Contact Point, a point for cooperation with the Stockholm Convention Secretariat and the institutions of the European Union.
United Kingdom	Measures detailed in the NIP	The United Kingdom National Implementation Plan (2013), comments that information exchange is managed in a number of ways, including publication of reports and data on the authority (Defra) website, data made available through the PRTR and targeted engagement with relevant industry sectors.

9.3 Financial and Technical assistance

Article 11 of the Regulation provides that financial and technical assistance can be provided to other Member States and / or third countries with regards to POPs.

> **Article 11 - Technical assistance:**
>
> In accordance with Articles 12 and 13 of the Convention, the Commission and the Member States shall cooperate in providing appropriate and timely technical and financial assistance to developing countries and countries with economies in transition to assist them, upon request and within available resources and taking into account their particular needs, to develop and strengthen their capacity to fully implement their obligations under the Convention. Such support may also be channelled through non-governmental organisations.

Fifteen Member States reported having provided financial and / or technical assistance during the reporting period (Belgium, Czechia, Denmark, Germany, Finland, France, Ireland, Latvia, Luxembourg, Netherlands, Poland, Spain, Sweden, Slovakia, and Slovenia). This is higher than the number reported in the previous synthesis report (11).

Of the Member States reporting that they do not provide, financial or technical assistance, Estonia and Romania reported than they lack the financial and administrative capacity. Cyprus reports that they have not received such a request for this purpose.

Similarly, the United Kingdom reports having had no requests from developing countries, but does note that it provides technical assistance, principally by providing assistance to developing countries and countries with economies in transition included under the Global Environment Facility (GEF) and United Kingdom International subscriptions to the Conventions (see below).

Slovakia reported that it provides technical assistance on the basis of bilateral projects but did not conduct any projects on the subject of POPs in the reporting period.

Bulgaria reports that due to a limited budget, actions are restricted to the implementation of the most urgent priority activities set out in the updated Bulgarian NIP.

The range of technical and financial assistance reported by Member States is important. Some of the Member States reported having provided financial assistance through funding of the Stockholm Convention, the GEF, and SAICM.

However, most of the details were provided on national initiatives and cooperation programmes. The reported objectives include building capacities and expertise in other countries through guidance, training, and expert visits, improving monitoring of POP substances including sampling techniques and improving management of hazardous POP waste including their destruction. These activities have been coordinated both by the Stockholm Convention Regional Activity Centres, and by projects funded by individual Member States.

Several organisations are funded by Member States to provide technical support. The key multilateral initiatives reported include:

Stockholm Convention Trust Fund

The mandatory contributions provided by each signatory to the Stockholm Convention are published on the Convention web page[69]. An overview of the reported mandatory

[69] http://chm.pops.int/TheConvention/FinanceBudget/TrustFund/2015TrustFund/tabid/4320/Default.aspx

contributions of each Member State and of the Union during the reporting period is provided in Table 9.3. It is noted that the EU Member States that have ratified the Convention collectively provided ~44% of the total input to the fund in 2015. This figure rises to ~46% when the additional Union contribution ($126,283) is considered.

Table 9.3 Annual Financial support provided to the Stockholm Convention Trust Fund in the period 2013-2015 (in US$)

Member State/Union	2013	2014	2015
Belgium	64,469	62,919	67,293
Bulgaria	2,279	2,963	3,169
Czechia	2,759	2,963	3,169
Denmark	44,138	42,555	45,514
Germany	480,846	450,205	481,502
Estonia	2,399	2,522	2,697
Ireland	29,865	26,353	28,185
Greece	41,440	40,223	43,019
Spain	190,527	187,433	200,463
France	367,201	352,612	377,124
Croatia	5,817	7,944	8,496
Italy*			
Cyprus	20,930	24,335	26,027
Latvia	2,279	2,963	3,169
Lithuania	3,898	4,602	4,922
Luxembourg	5,397	5,107	5,462
Hungary	17,451	16,770	17,936
Malta*			
Netherlands	111,246	104,277	111,526
Austria	51,035	50,310	53,807
Poland	49,656	58,065	62,101
Portugal	30,645	29,883	31,961
Romania	10,615	14,248	15,239
Slovenia	6,177	6,305	6,743
Slovakia	8,516	10,781	11,530
Finland	33,943	32,720	34,995
Sweden	63,809	60,523	64,731
United Kingdom	396,047	326,511	349,209
European Union	110,127	118,074	126,283

* Member States that had not yet ratified the Stockholm Convention at the reporting period. Malta ratified in 2017.

Stockholm Convention Special Voluntary Trust Fund

The voluntary contributions to the budget of the Stockholm Convention are provided to the special voluntary trust fund. Those contributions are published on the Convention web page[70]. The Union and some Member States are the most important donors to this voluntary fund and an overview of the contributions during the reporting period is given in Table 9.4. It is noted that the EU together with the Member States are the most important donors to this fund.

Table 9.4 Annual Financial support provided to the Stockholm Convention Special Voluntary Trust Fund in the period 2013-2015 (in US$)

Contributing Party	2013	2014	2015	Sum 2013-2015
Germany	154,929	165,618	213,580	534,127
France	203,804	---	5,302	209,106
Netherlands	53,883	50,354	---	104,237
Austria	6,509	---	---	6,509
Finland	39,267	---	89,235	128,502
Sweden	13,364	13,654	54,509	81,527
European Union	1,318,634	489,824	326,019	2,134,477

Multilateral financing Global Environment Facility (GEF): this is the financial mechanism of the Stockholm Convention. Table 9.5 (below) presents information reported by Member States on financial support provided through the GEF.

Table 9.5 Financial support provided to the GEF

Member State	Year	Budget	Comment
Belgium	2012 -	-	Belgium reported being a donor to the GEF for the implementation of the POPs Convention. This is also confirmed in the 2012 NIP
Denmark	2014-2018	€57 m	Danish support to POP-related activities will primarily be channelled through the GEF.
Ireland	2010-2013	€5.73 m	Ireland has maintained its level of contribution to the GEF over the most recent round of funding (GEF5: 2010-2013 of €5.73m) and was reported to be meeting the funding pledges (€5.73m) during GEF6 which runs from 2014 to 2017.
	2014-2017	€5.73 m	

[70]http://chm.pops.int/TheConvention/FinanceBudget/SpecialVoluntaryTrustFund/2015SpecialVoluntaryTrust/tabid/4321/Default.aspx

Member State	Year	Budget	Comment
Slovenia	2013-2015	-	Slovenia is a donor to the GEF.
Finland	2011-2015	€57.3 m	Most of Finland's financial assistance for the implementation of the Stockholm Agreement is channelled through international financial mechanisms (GEF) and institutions (UNDP). In the fourth round of funding (2006-2010) the support amounted to €31.1 million, and in the next round €57.3 million, making Finland one of the countries having increased its support most compared to the fourth round.
Sweden	2014-2018	€1.25 m	Sweden's total funding for GEF6 for the period 2014-2018 is 1,335 million SEK. In the period, 8-9 % of the GEFs funds are allocated for Persistent Organic Pollutants (POPs) projects.
United Kingdom	2013-2015	£210 million	The United Kingdom's NIP (2017) notes that the United Kingdom is contributing £210 million to the GEF-6 replenishment budget of US$4.433 billion.

Strategic Approach to International Chemicals Management (SAICM)[71]: adopted in 2006, SAICM is a policy framework aiming at fostering the sound management of chemicals. It was developed by a multi-stakeholder and multi-sectoral Preparatory Committee and supports the achievement of the goal agreed at the 2002 Johannesburg World Summit on Sustainable Development to ensure that by 2020 chemicals are produced and used in ways that minimise significant adverse impacts on the environment and human health. The information included in Member States' reports on SAICM is summarised in Table 9.6.

Table 9.6 Financial support provided to the SAICM

Member State	Year	Budget	Comment
Austria	2013-2015	-	The Federal Ministry for Sustainability supports the Quick Start Programme of SAICM and the SAICM process to enable countries to develop chemicals management systems including the implementation of the Stockholm Convention.
Slovenia	2013-2015	-	Slovenia also reports contributing to the SAICM/QSP Programme.
Sweden	2006-2015	75 million SEK	Sweden has contributed to the Quick Start Program Trust fund and the SAICM/QSP-secretariat to support capacity building and enabling activities, including POPs-related activities, under SAICM (Strategic Approach to International Chemicals Management). Sweden has also supported developing country participation in Stockholm Convention meetings during 2013 and 2015

[71] http://www.saicm.org/

Funding provided by UN institutions and projects: A range of UN-linked organisations are involved in chemical management and POPs. The information reported by Member States relating to financial support is summarised in Table 9.7 below.

Table 9.7 Financial support provided to UN institutions and projects

Member State	Year	Budget	Comment
UNDP			
Finland	2013-2015	0.5%	Finland has estimated that 0.5% of the UNDP funding is supporting the implementation of the Stockholm Convention
Sweden	2013-2015		The Swedish Chemicals Agency (KemI) has supported the UNDP Case Studies in Partnership Initiative (testing in Cambodia and Zambia): Mainstreaming SMC Issues into MDG-based National Development Planning.
UNEP			
Sweden	2013-2015		The Swedish Chemicals Agency (KemI) supported UNEP in the development of the LIRA-Guidance on legal and institutional infrastructures for the sound management of chemicals (published 2015), including POPs and testing in two countries (Nigeria, Uruguay) and the development of the report on cost of inaction in the management of chemicals, published in February 2013

Beyond international cooperation, Member States reported **national and bilateral cooperation**, as summarised in Table 9.8.

Table 9.8 Other international cooperation reported by Member States

Member State	Year	Description
Czechia	2012-2016	Experts from RECETOX between 2010-2014 in collaboration with UNDP, UNIDO and NATO built capacities in Armenia, Kazakhstan, and Kyrgyzstan. In 2013-2015 intensively and in the long term they cooperated with Turkey, Bosnia and Herzegovina and Serbia; and in the years 2012-2016 for example, performed short-term training in Armenia, Brazil, China, Ghana, South Korea, Malaysia, Mali, Maldives, Seychelles, Ukraine, and other countries.
Denmark	2004-2008	Denmark contributed €2 million for the comprehensive Africa Stockpiles Programme which is implemented by the World Bank and FAO. The programme concerns disposal of stocks of POP pesticides and other pesticides in a number of African countries. Funding has been provided, among other things, for development of a GEF-financed "full-size" POPs project in Moldova. Denmark provides support through its commitments in NEFCO, Nordic Environment Finance Cooperation, projects in Russia, Ukraine and the Baltic countries involving among other things, PCB, dioxin, and disposal of POP pesticides.

Member State	Year	Description
Germany	2013-2016	*Germany has supported through multiple in-country projects (including training and research) the implementation of measures to reduce POPs emissions. This includes work in Algeria, Columbia, Chile, and Pakistan.*
Spain	2013-2015	Spain – Participation in the global workshop on updating NIPs under the Stockholm convention. This was in China.
Croatia	2014	In 2014, a Centre of Excellence was established in the Croatian Ministry of Foreign and European Affairs. The Centre coordinates all Croatian experts willing to share their knowledge and expertise on the European integration and accession process with transition countries in the region and the wider neighbourhood, including the Southern Mediterranean.
Poland	2013-2015	Technical assistance was provided to Armenia and Moldova in the following projects co-financed by Poland: • Polish Aid 2013: "Chemical management system - approximation of national legislation Moldova and its institutions to EU and international standards " • Polish Aid 2013: "Preparation and implementation of a training cycle for specialists in the field of chemicals management and environmental protection in Armenia " • Polish Aid 2014: "Preparation of the public administration staff of Moldova to tasks related to the process of approaching the chemical management system to EU and international standards "
Finland	2013-2015	Bilateral funding includes annual support to environmental NGOs in developing countries. The Ministry of Foreign Affairs has estimated that 5% of such funding supports implementation of the Stockholm Convention.
Finland and Russian Federation		Finland has directly funded a number of bilateral and multilateral projects in the Russian Federation which are related to POPs and hazardous waste management. These include on-going Arctic Council projects on environmentally sound management of obsolete pesticides in Northern Russia.
Finland, Russian Federation, Sweden, Norway, and FAO	2012-2014	Finland has also contributed to assessment of environmentally sound destruction technologies for hazardous waste in Russia, in co-operation with Sweden, Norway and FAO.
Finland and Nepal	2014	Finland has funded a bilateral 3-year project to enhance the environmental administration in Nepal. The project has a chemicals conventions component to build environmental monitoring capacity and improve implementation of MEAs in Nepal.
Finland and Zambia	2014	In 2014 Finland funded a bilateral project with the environmental management authority of Zambia to develop Zambia's POPs monitoring capacity.
Sweden and China	2014, 2015	During 2014 and 2015, two Swedish agencies organised workshops with concerned organisations under the Ministry of Environment of China on chemicals control, management of solid waste incl. e-waste and contaminated sites. In 2015, the Swedish EPA organised also a Chinese study visit to Sweden for a GEF-project in China targeting e-waste.

Member State	Year	Description
Sweden	2013 onwards	The Swedish EPA manages a governmental bilateral cooperation programme with strategic countries in the areas of environment and climate.
Sweden		Funds have been allocated to the Swedish Chemicals Agency, for cooperation with a number of countries (China, Vietnam, Indonesia, Uruguay, Brazil, and South Africa) on activities related to the development of legal frameworks and institutional set-up for chemicals management. Within the same programme, the Swedish EPA runs bilateral activities with a number of countries (China, India, and Russia etc.) focusing on capacity building of the public environmental management, pollution prevention and control of industries and waste management.
Sweden	Ongoing	Sweden is engaged in a number of Arctic projects within ACAP, including an Expert Group on Hazardous Waste and has leader for the Expert Group on POPs.
Sweden	2013-2017	The International Training Programme (ITP) arranged by KemI in "Strategies for chemicals management" has supported the development of chemicals management capacities and therefore also the aims of Stockholm Convention in 43 countries so far (14 in Africa, 13 in Asia, 14 in Eastern Europe/Central Asia, and 2 in South America).
Sweden	Ongoing	KemI in cooperation with FAO, PAN-AP and the Field Alliance supports a programme in South East Asia: Towards A Non-Toxic Environment. The main objective is to support sound pesticide management by development of farming methods and of legislative frameworks.
Sweden and Serbia	2013-2015	Bilateral cooperation with authorities in Serbia on chemicals risk management has been supported.

9.4 Public awareness, consultation, and training

9.4.1 9.4.1 Raising awareness to POPs

Article 10 of the POP Regulation encourages Member States to raise awareness of POP substances to the wider public in particular for policy and decision makers and particularly vulnerable groups.

The majority of the Member States (Austria, Belgium, Bulgaria, Cyprus, Czechia, Denmark, Estonia, Finland, France Germany, Ireland, Latvia, Luxembourg, Netherlands, Poland, Romania, Slovenia, Slovakia, Spain, Sweden, and the United Kingdom) indicated having adopted measures to raise public awareness during the 2013-2015 reporting period. It is noted that, while Cyprus reported having awareness raising measures in place, the detailed response covers specific measures put in place before the current reporting period (pre-2013). A full breakdown of activities reported in Member State's responses is provided in Table 9.9.

Several Member States (Austria, Bulgaria, Czechia, Germany, Ireland, Poland. Romania, Sweden, Slovakia, United Kingdom) report that information is provided to the public through websites operated by national government departments, ministries, or agencies. Furthermore, Sweden and Denmark note the use of dedicated hotlines or information centres, which the public can contact for information.

In addition, several Member States (e.g., Belgium, Croatia, Denmark) report awareness raising campaigns as part of wider strategies/frameworks for community action. These are usually targeted at specific activities (e.g., use of pesticides, gardening, egg production). Similarly, Ireland reports the use of a targeted media campaign to raise awareness of issues relating to backyard burning and waste oil burning activities.

Several Member states (e.g., Belgium, Czechia, Denmark, Croatia) specifically mention the use of leaflets/brochures/newsletters to provide the public with information.

Five Member States (Bulgaria, Denmark, Croatia, Slovenia, and Ireland) report the organisation of workshops or lectures to help raise awareness in, and bring together, relevant stakeholders, e.g., industry, educators, healthcare professionals, researchers, farmers, NGOs and highly exposed/vulnerable groups (pregnant woman, children, elderly).

Six Member States (Greece, Hungary, Italy, Lithuania, Malta, Portugal) did not provide a response to questions in the current reporting period, and most did not update their NIP during this period so the status of their public awareness programmes is not clear.

However, Hungary, in their 2015 NIP update, report information exchange through government and industry association websites, as well as information exchange, events, and training organised by 'green' organisations play a useful role by informing the general public, conducting training courses, designing, and running information websites as well as organising and managing competitions and other public events.

Finally, some Member States commented within their NIP (Czechia, Ireland, Netherlands) that the update of the NIP had given rise to a range of awareness raising events.

Table 9.9 Information reported by Member States on raising public awareness

Member State	Public awareness tools used	Commentary
Belgium	Leaflets/brochures, and other general public awareness campaigns, targeted at specific activities (e.g., use of pesticides, gardening, egg production)	Brussels region – Development of a framework for Community action to achieve the sustainable use of pesticides information campaign to reduce and eliminate the use of pesticides. The Flemish 2011-2015 Environmental Policy Plan contains specific strategies for dioxins, PAHs, pesticides, and others concerning public awareness campaigns. Brochures have been produced concerning indoor and outdoor combustion and gardening. Advice is given on the consumption of eggs from home-grown chickens in order to prevent an increase in PCB-levels in the blood of citizens. The Walloon Region adopted a Pesticide Reduction Program, which includes several actions and targets the different users and providers of pesticides.
Bulgaria	Government websites and organisation of workshops	Actual and updated information on POPs legislation is regularly uploaded on the web page of MoEW: http://www.moew.government.bg/?show=top&cid=650 Workshops are held with professionals from industry (at least 2 per year); and Control Enforcement Authority (at least 1 per year) on the implementation of the updated Bulgarian NIP for POPs and enforcement of the POP Regulation
Czechia	Update of the NIP; information provided through websites and newsletters	Measures to promote awareness are part of the updated NIP (2012-2017). The national body for information exchange regarding POPs is National Centre for Toxic Compounds. Detailed information about awareness programmes and availability of information to the public relating to POPs are available on National Centre website. Up-to-date information can be also found in the RECETOX newsletter, which is a quarterly newsletter published in Czech, English, and Russian.
Denmark	Various tools used, including websites, magazines, school teaching materials, conference, and meetings.	The public is provided with information about POPs primarily as part of more general information on health and hazardous substances. This includes i) a PCB guide as well as a helpdesk and telephone hotline; ii) a public-information magazine published three times per year; iii) The Danish Veterinary and Food Administration website on dioxins and dioxin-like PCBs in food; iv) a number of initiatives carried out under DAKOFA, the Danish Competence Centre on Waste, in the form of conferences and meetings; v) Various teaching materials on the ecotoxicology of PCB, brominated flame retardants, and chlorinated solvents and on WEEE and exports of hazardous waste; vi) a website funded by a number of government agencies and research councils, contains a large number of articles on POP-related topics; vii) The Consumer Council, funded through the Danish Ministry of the Environment, has an independent section focussing on chemicals, providing independent information for consumers.
Germany	Government and agency websites,	There are various example of websites, publications and databases, of the German Environment Agency (Umweltbundesamt) and on the websites of the Federal States providing information on, for example

Member State	Public awareness tools used	Commentary
	publications, and databases	i) General information on the Stockholm Convention and on specific POPs e.g. endosulfan, PCB-containing waste and foodstuffs, hexabromocyclododecane (HBCD), ii) legal issues; iii) emissions; iv) deposition; v) Identification of potentially POP-containing Wastes and Recyclates; vi) expert discussions on dioxins and PCB and on pathways of PCB into beef.
Estonia	Different publications, seminars, and websites.	No further details were provided in the submission
Ireland	Updated NIP, Government and agency websites, Media campaigns, industry interaction	Awareness raising activities include: i) Media campaigns carried out by the EPA on backyard burning and waste oil burning highlighting the health and environmental dangers of burning waste in fireplaces and stoves. Additionally, the EPA hosted an information stand at the Auto Trade Exhibition 2015. ii) The updated National Implementation Plan includes provisions for consultation and awareness iii) The EPA has a dedicated PCB webpage, which provides background and detailed information on PCBs and guidance documents explaining how to upload information on holdings to the EPA PCB online notification tool and a PCB questionnaire to assist holders identifying PCB contaminated equipment.
Spain	Update NIP, including details of information, awareness, and education activities	There are a series of measures in the National Implementation Plan related to information and awareness, including, i) education and awareness plans for the general public; ii) provision of specific information for consumers, users and workers at risk; iii) educational material on POPs for vulnerable groups (children, pregnant women, highly exposed groups) and health workers; iv) awareness-raising programmes to minimise illegal waste burning; v) improved awareness of environmental educators through the design of informative material, seminars, workshops; vi) education of doctors, nurses etc.
France	Government websites, publication of information and education materials, information through Government Agencies, participation in expert groups.	Information is mainly provided through the website of the Ministry of Environment, as well as i) the organisation of events that allow dialogue with stakeholders on developments in the regulations, ii) publication of leaflets or other information media to inform the public of the risks related to chemicals, iii) information provided through French agencies (ADEME, ANSES, INERIS, CITEPA), iv) participation in several international working groups to share information and best practices on POPs management (BAT-BEP group, the Toolkit group and the PEN); v) Membership of key expert groups including the DDT Expert Group, the Global Alliance for the Development and Deployment of Products, Methods and Strategies for the Replacement of DDT in Vector Control and the PCB elimination network.
Croatia	Government website, workshops, publications,	A programme for education, awareness raising and informing the public is aimed at educating the public about POPs. Activities included are: i) A workshop organised by the Ministry of the Environmental and Nature Protection, and production of a brochure,

Member State	Public awareness tools used	Commentary
	and guidance materials, produced as part of the NIP	ii) development of additional publications on POPs management and the elimination of waste in a safe and environmentally sound manner; ii) Development of guidelines for workers and technical and managerial personnel, dissemination of guidelines regarding the adverse effects on health and the environment, safe handling, use, storage, replacement solutions; iv) Workshop and lectures for all target groups which can potentially be exposed.
Latvia	Public awareness campaigns through research projects	Since 2010, three different projects on persistent organic pollutants have been implemented in Latvia: LIFE / FIT for REACH, LIFE BaltActHaz and HELCOM COHIBA, in which broad public awareness campaigns were organised for persistent organic pollutants.
Luxembourg	Activities coordinated by the national government and agencies	In general, with regard to the use of chemicals and biocides, the Chemicals and Hazardous Substances Service of the Environment Administration engages with the public on the possible risks related to the use and disposal of chemicals and exposure to these substances.
Netherlands	Updated NIP, and activities of NGOs and recycling professionals	As per the National Implementation Plan NGOs and the public are already well-informed about national activities on POPs. During recent years there has also been exchange of information with the branch organisations active in recycling of plastics to increase awareness of POPs that may be present in waste.
Austria	Government and agency websites	Information on the Stockholm Convention and the EU POP Regulation are part of the Ministry's website. Additionally, the Environmental Agency runs a website on environmental contaminants and particularly on POPs.
Poland	Government department websites, and research institute materials	Information on applicable provisions are available, among others on the websites of the Ministry of the Environment and the Institute of Environmental Protection. In the reporting period, information materials have been produced on each substance covered by the Stockholm Convention and POP Regulation, and materials posted on the website of the Ministry of Environment.
Romania	Activities coordinated by national government departments	The Ministry of Environment, Waters and Forests together with the Ministry of Health promotes: a) public awareness campaigns on the effects of persistent organic pollutants on health and the environment; b) information campaigns for economic operators generating emissions of POPs, on how to reduce or eliminate production, use and emissions; c) campaigns to inform waste holders of waste contaminated with POPs on how to dispose of or recover such waste so as to ensure the destruction or irreversible transformation of the persistent organic pollutant content.
Slovenia	Activities coordinated by national government	In the period 2013/14 the Slovenian Environment Agency (ARSO) organised events on air quality in cooperation with the Slovenian National Institute of Public Health and Slovenian municipalities. In Slovenia it has been identified that there is a need for certain actions in the energy and transport sector. The purpose was to inform the wider public and decision makers at the local level. The events

Member State	Public awareness tools used	Commentary
	departments and agencies	brought together 27 institutions working in the field of air quality including public institutions, agencies, researchers, NGOs, and schools (eco-schools and healthy schools). More awareness events are needed and many municipalities agreed to be more active in taking actions for cleaner air as this is important for the health of people, especially children.
Slovakia	National authority websites and educational activities	In connection with ensuring awareness of available BAT and BEP for POPs for the professional public, the IPKZ information system, namely the BAT Registry, was incorporated as a part of the BAT and BEP POPs Manual. A guide with a brief guideline is available online to the public.
Finland	Research programmes producing training and education materials	Awareness raising is included in the provision of public information aimed at reducing emissions of Annex III substances. Pathways of some hazardous substances to certain food items have also been studied under the Baltic Sea Region Programme project FOODWEB (Baltic environment, food, and health: from habits to awareness). The project organised training and produced educational materials promoting consumer awareness of human exposure to hazardous substances via food.
Sweden	National government websites, information provided by healthcare professionals	Dietary recommendations on foods (such as fatty fish) that could contain elevated levels of POPs or organic mercury, given by the National Food Administration (NFA) can be found on the NFA website in several languages, and are communicated to Swedish newspapers, broadcasters and other media that could disseminate the information to Swedish consumers. Furthermore, advice on fish in particular, is conveyed to expectant mothers when they attend antenatal clinics. Information on the subject is also given in Swedish schools. Commercial and recreational fishermen and their families have been identified as possible risk groups, with a high consumption of dioxin-contaminated fish. Within these groups, children, and women in their childbearing years in particular should limit their consumption. Consumers can contact the NFA by telephone, e-mail or post, and their questions are answered by a specially created information centre. In addition, local and regional authorities often have the necessary expertise to communicate with consumers on questions of food safety. Exchange of information between food authorities in the different European countries often takes place through EU or EFSA (European Food Safety Authority) channels. Where rapid information is needed, the RASFF system is used.
United Kingdom	Updated NIP; national government website	The United Kingdom Government website provides information on what the Government is doing to protect the environment in a range of areas such as chemicals, air quality, soil and contamination and water quality. It includes news on national, EU and international chemicals policy, Government position statements, advisory committee papers and reports, and developments in research.

9.4.2 9.4.2 Public information and consultation activities

The majority of the Member States (Austria, Belgium, Bulgaria, Cyprus, Czechia, Denmark, Estonia, Finland, France Germany, Ireland, Latvia, Luxembourg, Netherlands, Poland, Romania, Slovenia, Slovakia, Spain, Sweden, and the United Kingdom) have reported undertaking public information and/or consultation activities during the reporting period.

A large number of Member States (Belgium, Bulgaria, Croatia, Cyprus, Denmark, France, Germany, Ireland, Poland, Romania, Slovenia, Spain, Sweden, and the United Kingdom) indicated that information on POPs is provided and regularly updated on the websites of competent authorities. Czechia and Denmark note that national centres are in place, focused on disseminating and communicating information on POPs to the public.

A number of Member States (e.g. Denmark, Ireland, United Kingdom) report that information is also provided to the public in the form of reports and other publications by public authorities, for example, on the results of monitoring or inventories of POPs in the environment or in food products.

Additionally, Belgium, Lithuania and Netherlands have indicated that they conducted public consultations as part of the development of National Implementation Plans.

Some Member States (e.g. Finland) have reported that activities carried out for provision of public information are part of wider-scale national programmes and campaigns in chemicals management, which also target POP, considering the impact on a range of stakeholders, including consumers, public health, employers' health and safety, and the effects on the environment during the entire lifecycle of chemicals. Table 9.10 provides a summary of the responses provided by Member States.

Table 9.10 Information reported by Member States on public information and consultation

Member State	Public awareness tools used
Belgium	Information on POPs is made available nationally through the federal authority website. In the Flemish Region the results of dioxins and PCB-levels in deposition are published via a website. The Flemish government also developed and communicated a general blueprint of 'good practice' for cultivation of crops and eggs in (public) gardens (2015). The Flemish government also initiated new campaigns on awareness raising on outdoor and indoor wood burning. In Walloon Region, the framework of its Pesticide Reduction Program has been used to disseminate information and awareness documents. The Walloon Region has also developed a good practice website and an information campaign on wood burning: "La maîtrise du feu".
Bulgaria	Regularly updated information on POPs is made available on a dedicated web page of MoEW.
Czechia	The National Centre for toxic compounds is used to disseminate information to the public, primarily through the GENASIS portal. Additionally, a public information newsletter is produced by RECETOX.
Denmark	The public is provided information about POPs primarily as part of more general information on health and hazardous substances. This includes i) a PCB guide as well as a helpdesk and telephone hotline; ii) a public-information magazine published three times per year; iii) The Danish Veterinary and Food Administration website on dioxins and dioxin-like PCBs in food; iv) a number

Member State	Public awareness tools used
	of initiatives carried out under DAKOFA, the Danish Competence Centre on Waste, in the form of conferences and meetings; v) Various teaching materials on the ecotoxicology of PCB, brominated flame retardants, and chlorinated solvents and on WEEE and exports of hazardous waste; vi) a website funded by a number of government agencies and research councils, contains a large number of articles on POP-related topics; vii) The Consumer Council, funded through the Danish Ministry of the Environment, has an independent section focussing on chemicals, providing independent information for consumers.
Germany	The Federal Ministry for the Environment, Nature Conservation and Reactor Safety and the Federal Environment Agency publish information on the Internet for interested of the public about new resolutions and developments under the POPs-issue and POP–Protocol of the UNECE and the Stockholm Convention.
Estonia	The Environmental Agency, Ministry of the Environment, and Environmental Board all provide public facing websites which include sections on POPs. In particular this includes a webpage on illegal burning of waste and its risks. There has also been media campaigns on the same issue.
Ireland	The EPA and the Department of Environment, Community and Local Government has established a dedicated POPs webpage which informs the public about, for example, POPs, the POP Regulation, and Ireland's National Implementation Plan consultation: www.pops.ie The EPA publishes annual reports detailing the work that was carried out under the National Waste Prevention Programme which includes work undertaken in relation to POPs. Between 2013 and 2014 the National PCB Inventory team provided PCB training workshops Ireland has a dedicated website for information on Pollutant Release and Transfer Register. The FSAI regularly publishes food related studies including studies related to POPs and the Marine Institute publishes reports relating to the monitoring for contaminants in the marine environment including POPs. The Department of Agriculture, Food and the Marine publishes reports on pesticide residues in food including results of certain POP pesticides detected.
Spain	There is a section on "Chemical products" on the website of the Ministry of Environment, which covers POPs. Within the section on Waste management and prevention, there are also chapters on PCBs. Spain has provided a series of activities/workshops/conferences prepared as part of the measures for awareness-raising and information contained in the NIP. This included four activities held in Madrid (2 high schools, 1 town hall, the Faculty of environmental Sciences of the University of Alcalá de Henares) during 2015.
France	Information is mainly provided through the website of the Ministry of Environment, as well as i) the organisation of events with stakeholders on the developments to the regulation, ii) publication of leaflets to inform the public of the risks related to chemicals, iii) information provided through French agencies (ADEME, ANSES, INERIS, CITEPA),
Croatia	Measures to promote and facilitate awareness of general public have been taken, this includes regular updates to the dedicated webpage on POPs hosted by the MoEW
Cyprus	Information is provided through the web page of the Department of Labour Inspection which includes details about the National Implementation Plan and also information about eliminating POPs emissions from uncontrolled

Member State	Public awareness tools used
	combustion. In addition, a leaflet was published to provide this information to the public.
Latvia	Latvia has published key information on POPs via its national website. This includes information, for certain target groups, such as the safety of the working environment.http://www.vi.gov.lv/lv/vides-veseliba/vides-drosiba/videsriska-faktori/noturigu-organisku-piesarnotaju-ietekme-uz-cilveka-veselibu).
Luxembourg	The Ministry of Sustainable Development and Infrastructures has published a number of key references for the public. This includes: • information on the results of air quality measurement networks; and • information on the situation regarding PCB contaminated equipment; and In addition, the public website includes information on inventories and emissions covered by the Stockholm Convention.
Netherlands	The National Implementation Plan is publicly available online
Poland	The following publications and data are available free of charge to the general public via the Internet: • Annual reports on the state of the environment for EACH individual geographic region, including monitoring data for POPs in air, water, and sediment and information on environmental programs and activities carried out • Report of the Chief Inspector of Environmental Protection Air pollution - polycyclic aromatic hydrocarbons in Poland in 2014 • Publications by the Trace Analysis Laboratory of the Cracow University of Technology concerning dioxins, furans, and PCBs • Basic data on the emission of POPs to air • The Ministry of the Environment website containing materials regarding POPs • National Register of Pollution Release and Transfer: www.prtr-portal.gios.gov.pl,
Romania	All relevant information on persistent organic pollutants is published on the website of the Ministry of Environment, Water and Forests
Slovenia	• Information on POPs is transferred to the public via web pages
Slovakia	• Public seminars on POPs have been organised, including presentation of POPs projects and as well as flyers, brochures and posters explaining the issue of POPs. On the MoE SR site there is also a link to the issue of POPs (POPs management).
Finland	A dedicated POPs website contains updated information on activities related to persistent organic pollutants. The National Action Plan also includes several actions to promote awareness and reduce emissions (for instance, wood burning guidance to reduce PAH/PCDD/PCDF formation). Many of these activities are implemented at the municipal level. In addition, Finland has developed a National Programme on Dangerous Chemicals (KELO Kansallinen kemikaaliohjelma). This has included several programmes and campaigns in chemicals management, also targeting POPs. The programme considers the effects on consumers, public health, employers' health and safety, and the effects on the environment during the entire lifecycle of chemicals.

Member State	Public awareness tools used
Sweden	The websites of the Swedish Chemicals agency (KemI) and the Swedish EPA are continuously updated to provide relevant information on activities in the area of chemicals management with significant amounts of data on chemicals in both Swedish and English. KemI regularly produce information, both on its website and in leaflet form and as newsletters, about the roles and responsibilities of different stakeholders, e.g., manufacturers and importers, downstream users and regional and local supervisory authorities, with regard to sound management of chemicals. POPs management is an integral part of national chemicals management. KemI regularly invites representatives for industrial branches, environmental organisations, and the research sector to inform them about relevant developments on POPs.
United Kingdom	The UK manages dissemination on POPs information through the use of several websites: • The main United Kingdom authority (Defra) hosts a wide variety of published reports and information on POPs which is publicaly available. • The United Kingdom's National Atmospheric Emissions Inventory (NAEI) provides inventory data for POPs. • The United Kingdom's National Air Quality Information Archive provides data on United Kingdom monitoring of POPs. • The Environment Agencies of England, Scotland, Wales, and Northern Ireland all provide information on POPs • The United Kingdom hosts a national PRTR website with reported emission data on POPs. •

9.4.3 9.4.3 Training

Most Member States (Bulgaria, Czechia, Germany, Estonia, Spain, Finland, France, Croatia, Ireland, Latvia, Luxembourg, Poland, Romania, Sweden, Slovenia, Slovakia, and United Kingdom) indicate that training activities are in place. This is notably higher than the number of Member States in the previous reporting period (2010-2012).

Cyprus has indicated that training activities were in place but provided details of activities during previous reporting periods. Similarly, Lithuania did not provide a response to this question in their survey response; their response in the previous synthesis report included a description of the current training programme for the management of PCBs and unintentional POPs.

Denmark report that there has been no demand from any stakeholder groups nationally for this type of activity, so no training activities have been carried out. Austria and Belgium indicate that no training activities have been conducted but do not provide an explanation

Six Member States (Greece, Hungary, Italy, Lithuania, Malta, and Portugal) did not provide a response to questions in the current reporting period, and most did not update their NIP during this period so the status of their training activities is not clear.

The information reported by Member States is summarised in the Table 9.11 below.

Table 9.11 Information reported by Member States on training

Member State	Comments
Bulgaria	Between 2013-2015 the MOEW hosted three workshops for experts on the implementation of the Bulgarian NIP for POPs. This included particular attention to newly added POPs under the Stockholm Convention and POP Regulation.
Czechia	The National Centre regularly organises training workshops with information on these activities disseminated by members of the National Centre Council. Activities include: An International summer school and regular university courses on Technology and Tools for Environmental Protection, carried out at the Masaryk. The international summer school at RECETOX - an intensive six-day training program supporting implementation of the Stockholm Convention in particular. Since 2005 more than 500 experts/participants from 78 countries received such a training. Additional training completed in cooperation with the RECETOX Research Infrastructure. – Since 2010 this has been included in the Czech Roadmap of Large Infrastructures for Research, Development and Innovation endorsed by the Czech Government.
Germany	DE report that law enforcement authorities are catching up and enhancing their knowledge on questions and problems in implementation of POPs legislation by regular conferences. The objective of these conferences is to provide authorities with expertise for law enforcement and to exchange experience of specific knowledge and general information between authorities and enterprises. Specific authorities are responsible for communication of knowledge on POPs to the German Federal States (Länder). These specific authorities are organising meetings to discuss, develop and communicate guidance for enforcement of POP requirements. Target groups of these meetings are: personnel of law enforcement authorities for waste-, emission control- and water licensing procedures, employees from research and scientific institutions, other target groups from enterprises.
Estonia	No information identified on training.
Ireland	The Irish authorities have undertaken awareness and training activities with key stakeholders carried out in support of the National PCB Inventory, including the provision of training, engagement with key stakeholders and general assistance in relation to PCB management
Spain	Within its National Implementation Plan, Spain highlights three activities held in Madrid and Santander during 2015 (courses, NIP implementation monitoring by the Confederation of Industries, awareness-raising activities in a hospital).
France	FR report the following activities are in place: The organisation of events that allow dialogue with stakeholders on the developments in the regulations. Participation in several international working groups to share information and best practices on POPs management (BAT-BEP group, the Toolkit group, and the PEN). France, represented by the ministry in charge of the environment, is also a member of the PCB elimination network. Created in 2009, this collaborative

Member State	Comments
	structure is dedicated to promoting and exchanging information for the environmentally sound management of PCBs, a goal to be achieved by 2028.
Croatia	Croatia identified the importance of training with its National Implementation Plan. This included plans for workshops and expert panels with particular focus on vulnerable groups.
Latvia	Latvia has conducted regular training sessions for regulatory bodies and regional authorities (such as inspectors) on the safe management of chemicals, including POPs. Additionally, as part of Latvia's commitments to sustainable development major research projects have been funded on POPs. Such projects also include the need for training and dissemination of information to others. For the 2013-2015 period this has included training for competent authorities' personnel, laboratories and companies from different sectors (e.g., waste management).
Luxembourg	LU report the following activities are in place: The Environmental Administration and "SuperDrecksKëscht" organise training courses for environmental delegates or / and managers of waste management in companies. Participants are trained on current legislation and have training in prevention and treatment techniques, proper waste management, such as transportation, recycling, or proper disposal. The National School of the Fire and Rescue Service and the Administration of the rescue services provide in their training programs regarding the regulatory framework, risks of use, management, and proper disposal of fire-fighting foams The Grand-Ducal Regulation of 7 October 2014 on Combustion Plants provides for limit values for certain atmospheric pollutants, in particular for reducing emissions of PAHs, for periodic inspection of combustion plants, continued training
Netherlands	NL report that training is arranged through the legislation of specific substances (e.g., PCBs) and through licences. The industry involved in the destruction of POPs is well aware of the necessity to train their personnel in handling these substances.
Poland	Poland reports that a range of different training activities on POPs have been undertaken in the 2013-2015 period: Maritime Fisheries Institute: Conducted research on the Baltic environment with dissemination sessions on the key findings for sustainability. Polish toxicology society: workshops for over 60 delegates were held to discuss the topic of POPs in 2015. Office for Chemical substances: Hosted training at Lodz university on emission of POPs to the environment.
Romania	No further information provided
Slovenia	There is provision that every adviser for chemicals should pass the exam on chemical legislation. POPs content is a part of this educational programme. During the reporting period more than 300 advisers for chemicals were educated about POPs.
Slovakia	The Slovak Republic has organised a series of seminars on POPs to support successful management of chemicals. This had focus on obsolete pesticides.

Member State	Comments
Finland	The FOODWEB project (covering the Baltic environment) organised training and produced educational materials promoting the consumers awareness on human exposure to hazardous substances, including POPs, via food.
Sweden	SE report that, the curriculum in all levels of the educational system includes the provision of basic information about chemicals including when relevant the specific problems with POPs. The web-based tool PRIO has been developed and maintained by the Swedish Chemicals Agency, to facilitate in the risk assessment so that people who work as environmental managers, purchasers and product developers can identify the need for risk reduction. To achieve this PRIO provides a guide for decision-making that can be used in setting risk reduction priorities. The target groups for PRIO are primarily Swedish actors but also include chemical suppliers to Sweden in other countries. PRIO also provides a source of knowledge for environmental and health inspectors, environmental auditors, risk analysts and those who in some other way can influence the use and handling of chemicals.
United Kingdom	United Kingdom refer to measures taken outlined in section 7.1 and 7.2 of its 2012 NIP

10. 10. Dissuasive measures: Law infringements and penalties

The POP Regulation sets in place a number of specific requirements and obligations for Member States to control the production, placing on the market and use of POP chemicals and articles that may contain POP chemicals. Through the national implementation plans and action plans it also requires Member States to be proactive in the management of national priorities on POPs. Enforcement is key to ensuring that the obligations of the regulation are met. Article 13 of the POP Regulation covers enforcement. Details of Article 13 are provided within the information box below:

> **Article 13** of the POP Regulation states that:
>
> Member States shall lay down the rules on penalties applicable to infringements of the provisions of this Regulation and shall take all measures necessary to ensure that they are implemented. The penalties provided for must be effective, proportionate and dissuasive. Member States shall notify those provisions to the Commission one year after entry into force of this Regulation at the latest and shall notify it without delay of any subsequent amendment affecting them.

All the Member States that provided Article 12 reports have adopted rules on penalties related to Articles 3, 5 and 7 of the Regulation. All Member States reported having adopted specific legislation, with the exception of Poland. Poland has not adopted the POP Regulation directly, but it has in place national legislation which covers all the provisions of the POP Regulation, including mechanisms for enforcement and penalties for breach of the national legislation.

Within the Member States the task of enforcing the POP Regulation has largely been tasked to the environmental agencies and regional inspectorates with a duty to report back to their respective Ministries of the Environment, Agriculture or Health. The environmental agencies and inspectorates in charge of ensuring the enforcement of the penalties in cases of infringements of the provisions of the POP Regulation, typically ensure compliance through an inspection regime.

Four Member States have reported having initiated some form of infringement procedures in the 2013-2015 period, including:

- Belgium reported initiating a number of infringement procedures and investigations. For instance, in 2013, actions were focused on HCB in fireworks and 15 samples were analysed. HCB was found in 2 samples and as a result 1 report and 1 warning were issued. In 2014, actions were focused on PFOS in firefighting foams and 12 samples were analysed. However, PFOS was not found in any samples. Finally, in 2015, actions were focused on the presence of SCCP in Christmas lights. Ten samples in total were analysed and SCCPs were found in 4 samples. No penalty has been initiated as a result.
- Bulgaria acknowledged the fact that infringements had occurred but did not provide further details.
- The Netherlands mention that a report published in 2012 “Jaarrapportage Handhaving REACH en EU-GHS 2012” mentions that procedures have been started against two companies that still had PFOS in their fire extinguishing installation. In the case of HCB in fireworks, research carried out under CLEEN (Chemical

Legislation European Enforcement Network), led to enforcement activities. In addition, they also mention two enforcement cases specifically:

  - a. Dioxin emissions from an incinerator (Reststoffen Energie Centrale, REC) in Harlingen, exceeded the permit limits. A penalty was imposed requesting the company to solve the problems of the dioxin emissions within two months (April 2016). The information provided indicates that measures to reduce the emissions have been taken. However, the case is not yet closed. The dioxin emissions led to questions in the Dutch Parliament referring to the Stockholm Convention.
  - b. In 2015, Bin2Barrel Amsterdam BV, a plastic to oil company, requested a permit for a plant transferring plastics into oil by means of pyrolysis. The Dutch Inspectorate ILT advised (in September 2015) on a number of items to be incorporated into the permit to safeguard man and the environment. The permit was granted, but without the recommendations of the Inspectorate. The Noord Holland court was approached by the Inspectorate in December 2015 in order to cancel the permit. The points raised by the Inspectorate included that only non-hazardous wastes were allowed to be treated and that some of the plastics considered may contain brominated flame retardants included in the EU POP Regulation. The inspectorate indicated that the minimum standard for treatment of such wastes are incinerators provided with emission filters. The case has not yet been closed.

- Sweden indicated that nine companies were reported in 2013 to the prosecutor due to SCCP content in plastic toys that they had placed on the market. No penalty had been set. In addition, during market surveillance in 2014 and 2015, SCCPs or HCB were detected in concentration above the limit values in 5 toys, 1 childcare article, 1 pair of exercise gloves, 17 plastic bags, 12 electric products, 4 bathroom articles, 2 items of sport equipment, 1 item of garden equipment, and 1 office article. Furthermore, one set of fireworks tested contained HCB. All companies placing these products on the market were reported to the environmental prosecutor. The products have been voluntarily withdrawn from the market by the companies and no penalties have been reported by Sweden. In combination with the control, all the companies received information on the POP Regulation.

Spain also reported that in 1989, a company called Inquinosa was involved in disciplinary proceedings with the Regional Government of Aragón, which prohibited them from generating waste. Company operators are insolvent, the company has lost all appeals and the government is starting to register in the Land Registry the amounts (costs) resulting from cleaning up the installations, which are now abandoned. Soils from those installations were declared contaminated with lindane. However, company operators did not clean up the site and the government had to publish the information that it was contaminated in the Official Gazette. The clean-up plan is under design and, once finished, it will be submitted to the interested parties for its execution. It is estimated that €550m and 25 years will be necessary to destroy the waste and clean-up the soil from the 3 installations located on the site.

Table 10.1 Information reported by Member States on penalties and infringements

Member State	Information on the types of penalties	Details on the infringement's procedure	Infringements during the reporting period
Belgium	No information provided	Procedure is detailed in the regions' legislation	Yes
Bulgaria	Penalties that can be imposed vary from 10,000 BGN to 100,000 BGN (€5,000 to €50,000). Legislation stating the type, amount, and procedure for imposing sanctions in case of environmental damages or pollution exceeding the limit values and/or in case of failure to comply with the fixed emission limit values and limitations is in force since 2011.	Infringement procedure is enforced through inspection regime. This included 206 inspections during 2013-2015 and inconsistencies were followed up with action by the necessary companies.	Yes
Czechia	The highest possible penalty for illegal POPs waste management that may be imposed is 50,000,000 CZK (approx. €1,850,140). Offenses by the manufacturer, importer or downstream user can initiate a fine of up to 3,000,000 CZK (approx. €110 000).	Procedure is detailed in the legislation	No
Denmark	No information provided	If infringements of the POP Regulation are reported and no action taken to improve the legislation dictates that the infringement is passed over to the police.	No
Germany	The highest possible penalty for illegal placing on the market of POPs is two years in prison or a fine. The enforcement of the measures follows the details set down in the EU POP Regulation.	Procedure is detailed in the legislation including regular control activities and appropriate infringement procedures initiated where necessary	No
Ireland	Fines of up to €5,000 and/or up to 12 months imprisonment.	The appropriate authorities typically enforce the regulations through an inspection regime.	No

Member State	Information on the types of penalties	Details on the infringement's procedure	Infringements during the reporting period
	Fines for intentional criminal activity of up to €500,000 and/or up to 3 years imprisonment	Additional enforcement powers are assigned to the EPA and a number of public authorities in Persistent Organic Pollutants Regulations 2010.	
Spain	The enforcement of the measures follows the details set down in the EU POP Regulation and other additional laws.	No information provided	No (see paragraph before this table)
France	Penalties vary from fines (maximum amount is €15,000, or daily payments of up to €1,500 until infraction is corrected) to two years imprisonment if criminal intent can be demonstrated.	Coordinated enforcement strategy involving several ministries and agencies. In 2012, actions were focused on PAHs, PCB, and dioxins.	No
Croatia	Penalties can be imposed on companies (up to a maximum of €13,500) for infringements such as placing of substances on the market or inappropriate disposal of waste or failing to notify the state on the use of substances listed in Annex I or Appendix II. Responsible persons or business owners can be fined up to €7000 for committing the same/ similar infringements.	Enforcement is managed through annual inspection and control plan regimes for companies that hold environmental permits	No
Cyprus	The highest penalties are for infringement of article 5.1, with fines up to €500,000 and imprisonment up to three years. Additional penalties are in place for production and placing on the market (max €20,000- or two-years imprisonment); exceeding industrial emission limits (max €34,172 or two years imprisonment).	Infringement procedure is enforced through a regular inspection regime to check compliance with the necessary laws.	No

Member State	Information on the types of penalties	Details on the infringement's procedure	Infringements during the reporting period
Latvia	In the event of a regulatory violation, penalties are applied according to the amount of environmental damage caused. This is enforced by Latvian Law and the fine for an administrative violation can be up to a value of €2,900 or criminal punishment can results of a maximum 4 years imprisonment.	State environmental service and health inspectorate provide monitoring and any violations are enforced by Latvian Administrative violation code or criminal law.	No
Luxembourg	The enforcement of the measures follows the details set down in the EU POP Regulation.	Procedure follows that set down in the EU POP Regulation.	No
Netherlands	Procedure is detailed in the legislation and in the 2006 NIP	Procedure is detailed in the legislation	No
Austria			No
Poland	enforcement is through fines, or imprisonment. Penalties/cash fines are imposed per kg of substance exceeding permit limits. A maximum fine of approximately €24,000 is enforceable in cases where illegal products are placed on the market for consumers.	Legislation is in place detailing infringements and penalties. Enforcement is managed through inspection regimes for monitoring as part of the State program.	No
Romania	The penalties follow the details set down in the EU POP Regulation.	Enforcement is managed through annual inspection by the National Environmental Guards Commissioners. This includes checking compliance with the provisions of Regulation. Procedure is further detailed in the legislation	No
Slovenia	The penalties follow the details set down in the EU POP Regulation. There are also penal provisions regarding PCB	Enforcement and infringements are managed through the Inspectorate	No

Member State	Information on the types of penalties	Details on the infringement's procedure	Infringements during the reporting period
	equipment and PCB waste.		
Slovakia	The enforcement of the measures follows the details set down in the EU POP Regulation.	The relevant inspection body is the Slovak Inspection of the environment (SIŽP). Sanctions shall be imposed for a breach of the provisions of the Regulation. The highest sanction is granted by law on the basis of the seriousness of the offense.	No
Finland	No information provided. Legislation is in place detailing infringements and penalties.	Enforcement is managed through inspection regimes for operators related to the environmental permitting procedure.	No
Sweden	Supervisory authorities can issue an injunction with or without a fine. The applicable sanctions for private individuals include fines (set on the basis of the personal income) or imprisonment up to two years. Companies can be required to pay a company charge of €500 up to €1,000,000. An environmental penalty charge must be paid by business operators who in the conduct of commercial operations neglect specific requirements included in the environmental legislation. The charge is founded on strict liability.	The Swedish Chemicals Agency and the Swedish Environmental Protection Agency are responsible for enforcement. The Swedish Chemicals Agency conducts market surveillance activities. Fireworks, carpets, sports apparel, toys, plastic bags, bathroom articles, electric appliances and textiles have been identified as relevant for POPs-related surveillance.	Yes
United Kingdom	The enforcement of the measures follows the details set down in the EU POP Regulation.	Competent authorities for each of the administrations enforce the regulation (Environment Agency, Natural Resources Wales, the Department of the Environment in Northern Ireland, and the Scottish Environment Protection Agency (SEPA) in Scotland).	No

11. 11. Concluding remarks and recommendations

This section aims to present an overview of the preceding sections, covering the management of POPs substances by Member States; the emission inventories and environmental concentrations of POPs across the EU; the work on information exchange and public involvement and planning by Member States. It also provides an analysis of existing weaknesses and potential improvements to help provide greater clarity in, and better use of, the data submitted by the Member States in future rounds of reporting under Article 12. A short summary report accompanies this report to present the overall findings of this document in an abridged format for quick reading. This summary section is not intended to replace the short summary document but to provide a natural conclusion to the details already presented in the earlier chapters.

11.1 Management of POPs substances

The management of POP substances covers multiple elements of their life cycle. It includes the production, placing on the market, and use of chemicals, as well as the stockpiles of obsolete goods, waste management issues and enforcement of the POP Regulation.

Based on the reports of the Member States, enforcement of the POP Regulation is the responsibility of environmental agencies or inspectorates who manage the inspection regime and reporting back to their respective Ministries of the Environment, Agriculture or Health.

Information provided by the Member States illustrated no known legal production of any Annex I substance between 2013 and 2015 in the EU. For Annex II substances, continued production and placing on the market of PFOS (at around nine tonnes per annum) still takes place, primarily for use as a mist suppressant in chrome plating. Compared to the previous synthesis report, rates of manufacture have remained relatively constant over the 2010-2015 period. The Article 12 reporting shows that, despite declining rates of export to non-EU countries for 2013-2015, the quantities of PFOS being manufactured in the EU have remained relatively stable, with increasing internal use offsetting declines in exports.

A small number of Member States made use of the Article 4 provisions for use of named substances within research and development. Small quantities of POP substances were also imported to and exported from the EU, mainly for research and calibration purposes and use within a laboratory setting. Those imported POP substances tend to be within pre-existing laboratory preparations.

Four Member states have brought infringement proceedings for the illegal sale of POP substances within the EU. This included the presence of HCB in imported fireworks (an issue that was also raised in the previous synthesis report), and the presence of SCCPs within children's toys.

For the 2013-2015 reporting period, Member States reported mainly on stockpiles of PCBs in di-electric equipment and on PFOS in fire-fighting foams and for surface finishing. Several Member States reported a downward trend over time in stockpiles of PCB-containing equipment with a number of countries estimating that less than 10% of 1990 quantities were still in use as of 2015. This reflects the efforts being made to remove and destroy remaining stocks of PCBs within di-electric equipment. Other Member States highlighted that the phase-out of PCBs from di-electric equipment was at an earlier stage, while still others highlighted a lack of capacity within the waste incineration sector given the high temperatures required to destroy PCBs.

However, while good progress has been made on the closed sources of PCB (di-electric) less information was provided on the open sources (paints, and sealants) with the quantity in existence largely unknown. Further efforts are needed to get more information on those open sources, including the dimension of those sources, which would be the basis for any actions to eliminate these sources of emissions.

Four Member States reported stockpiles of PFOS in their triannual reports (covering 2013-2015). This mainly related to fire-fighting foams containing PFOS and the use of PFOS in surface finishing processes (chromium plating). Most Member States expect that the quantities will decrease over the coming years given that alternatives are available. However, successive meetings of the UNEP POP review committee for both PFOS and the related fluorinated compound PFOA have highlighted the significance of fire-fighting foams in terms of direct release to the environment (during use). The article 12 reports suggest that for many Member States, detailed inventory information on quantities and locations of PFOS-based fire-fighting foams do not exist. It is also unknown what total EU quantities of PFOS based fire-fighting foam may exist in stockpiles.

While the Member State reports submitted for the 2013-2015 period do identify stocks of industrial chemicals (primarily PFOS and PCBs), no stockpiles of obsolete pesticides were reported by the Member States for this period. For comparison, for the period 2010-2012, four Member States reported having stockpiles of obsolete pesticides, i.e., Bulgaria, Hungary, Lithuania and the United Kingdom. The information from the national implementation plans confirms that these stockpiles have now been destroyed.

Based on the information provided by Member States, management of waste stockpiles for final destruction / irreversible transformation in the period 2013-2015 was dominated by PCBs within the heat transfer fluids of di-electric equipment. Also relevant were PFOS-containing products, flame-retardants (PBDEs) used in plastics and foams and obsolete pesticide products, particularly lindane.

Where POP substances have previously been manufactured and used in the EU the potential for contamination of soil exists. A number of the national implementation plans cover the topic of contaminated land and activities to address the issue which usually involves excavation and therefore creation of contaminated waste which then must be managed following Article 7 of the regulation. As an example, Germany indicated that, in 2016, more than 271,000 sites are recorded as potentially contaminated. During production of lindane (γ-HCH), large quantities of α- and β-HCH were created as “by-products”, which used to be stored above ground. With the inclusion of the compounds as POPs, these landfill sites are now viewed as being POP contaminated sites.

Sweden stated that, due to its widespread previous use, PCP could be found in a wide range of contaminated sites, for example garden centres, pulp mills, wood impregnation sites and marinas. It has been identified that treatment of wood has occurred at approximately 1200 sites in Sweden.

11.2 Environmental releases and environmental concentrations of POPs substances

Article 6(1) requires Member States to develop emission inventories to air, land, and water for substances in Annex III of the Regulation within 2 years of its entry into force. The intention is that, by developing emission inventories, Member States’ Competent Authorities are informed of the key sources for POPs management at national level.

The development of emission inventories, along with supporting work on other aspects of the regulation, should help Member States to develop national implementation plans (NIPs). These present, in detail, the measures a Member State will enact to either minimise emissions to the environment or carry out further research to further characterise emission sources that are not well defined.

Information on the level of emissions of Annex III substances is made available by Member States through the emission inventories reported under the Stockholm Convention, the Convention on Long Range Transboundary Air Pollution (CLRTAP), and the POP Regulation (based on Article 12 reports submitted).

The number of Member States and the number of compounds/environmental vectors (air, water, land, residue, product) covered in the different inventories varies considerably. All Member States have reported data under the CLRTAP. A total of 23 Member States have reported information through the Stockholm Convention, while 21 provide information under the POP Regulation.

Dioxins and Furans

Dioxins and furans are a family of chemicals that are not commercially produced and are typically associated either incomplete combustion processes such as open burning or metallurgy. Based on the data provided by EMEP, the major sources for Europe were the energy sector (27%); combustion in domestic residences, likely linked to solid fuels such as coal (23%); and incineration of waste (19%).

In comparison with the reporting period 2010-2012, the overall EU28 emissions are notably much higher in the period 2013-2015, with a higher contribution from the energy sector relative to residential combustion indicated. This can largely be attributed to relatively high emissions of dioxins and furans reported in Greece during this period, predominantly from thermal power stations and other combustion installations. Greece did not provide comparable input for the previous reporting period, so this is an issue related to data availability, rather than a significant increase in actual emissions.

Data covering the 2013–2015 period demonstrated that emissions of dioxins and furans in the majority of Member States was declining. Compared to 1990 emission levels, the emission reduction across the EU was 62% by 2015.

Where estimates for vectors other than air have been provided by Member States, broadly similar levels of emissions are quoted for air and for land/residue. Over time, the residue vector landfill has gained in importance, which may be due to the partitioning of pollution. Since air emissions abatement has improved (e.g. through EU industrial emissions legislation), air emissions have fallen. Emissions of dioxins and furans to air have dropped significantly from industry. However, this leads to the generation of air pollution control residues, sometimes called fly ash, which can be heavily contaminated with pollutants such as dioxins and furans. However, while emissions to air, land and water are direct releases lost to the environment, residue refers to the contaminated solid waste generated, which is disposed of in a controlled manner and does not necessarily constitute a total loss to the environment.

Polychlorinated biphenyls (PCBs)

PCBs are a family of chemicals, which previously had commercial use in a variety of applications, in particular in di-electric equipment. Their high chemical stability and persistence made them ideal heat-transfer fluids for this application. PCBs can also be unintentionally produced, particularly in combustion.

The data submitted by nations to the CLRTAP indicated that the main source of PCB emissions (52%) was 'consumption of POPs and heavy metals' (i.e. use of electrical equipment, mainly capacitors and transformers), PCBs as dielectric fluids, disposal of electrical equipment containing PCBs, etc.). Other major sources of PCB emissions include residential combustion of coal and waste wood (15%), and metals manufacture (13%). Over the past 20 years, emissions from industrial sources have declined, with the introduction of more efficient combustion and abatement processes, leading to an increasing relative proportion from dielectric equipment.

Compared to 1990 levels, there was an overall decline in PCB emissions of on average 80% across the EU in 2015. Monitoring data by both EMEP for Europe and arctic monitoring by AMAP corroborate this clear decline in emissions since 1990.

Limited data is available regarding the emission of PCBs to vectors other than air. Based on the eight Member States that provided estimates for other vectors no clear pattern was apparent. Different Member States highlight the relative importance of air, water, land and residue to different extents. This partly reflects the fact that emission inventories for vectors other than air are in general less well developed across the EU.

Polyaromatic hydrocarbons (PAHs)

PAHs are a family of chemicals defined by their multiple aromatic rings. They can form naturally in the environment from the combustion of vegetation such as forest fires, but also have anthropogenic sources particularly the combustion of fossil fuels.

The data submitted to the UNECE as part of CLRTAP identified the main source of PAH emissions as use of solid fuels, particularly coal, within residential premises, making up 75% of all emissions. By comparison, emissions of PAHs linked to iron and steel production (including use of fossil fuels) made up 7%, and other forms of fossil fuel combustion, including road transport, made up 2% of total air emissions. As stated earlier, while the power generation sector consumes large volumes of fossil fuels such as coal, the high operating temperatures and advanced abatement mean that the emission of PAHs per tonne of fuel is much smaller than that of domestic use of coal for heating.

The data for the 2013–2015 period show a decline in PAH emissions, between 1990 and 2015, based on the reported emission estimates, the annual release of PAHs to air in the EU has declined by up to 90%.

Limited data is available for other vectors beyond air for PAHs. However, based on the four Member States that provided data, the main vector appears to be emissions to air, with water and residue also key emission vectors for PAHs. Comparison to the E-PRTR suggested that the key source of emissions of PAHs to water came from petroleum refinery processes, while combustion wastes, metallurgic wastes and auto repair waste were all important sources for residue.

Chlorobenzenes (hexachlorobenzene and pentachlorobenzene)

Chlorobenzenes are a family of chemicals with a single benzene ring and substitution of up to six hydrogen atoms with chlorine. Hexachlorobenzene (HCB) was identified as an Annex III substance at the time of the POP Regulation's adoption. Pentachlorobenzene (PeCBz) was added to Annex I and III of the POP Regulation in 2010, following its addition to the Stockholm Convention. Both HCB and PeCBz had previous commercial use as pesticides and were also generated as by-products of other industrial processes, particularly the manufacture of chloro-organic solvents. PeCBz was also used to reduce the viscosity of

PCBs used in dielectric equipment. Both HCB and PeCBz can also be by-products of combustion of solid fossil fuels, waste oils and waste material.

Data for PeCBz are very limited with only four Member States providing estimates. Emission estimates vary from <0.01 kg in Czechia to 50 kg in the United Kingdom.

For HCB, the data submitted indicate that metals production (33%) and combustion within industry (25%) are the main sources of emissions to air, with other key sources including residential combustion (18%) and the energy sector (12%).

Member States' emission estimates for the period 2013–2015 suggested no clear patterns with emissions, rising, falling, and remaining static in roughly equal measure across the EU. However, compared to 1990 levels, there has been a decline of annual emissions of 90% between 1990 and 2015.

Very limited data is available for emissions to vectors other than air, with only four Member States providing information for PeCBz and eight for HCB. Based on those that provided data, water and residue are highlighted as secondary key emission vectors behind air emissions in some Member States, but relative levels are highly variable between vectors in the reporting Member States.

11.3 11.3 Mechanisms for knowledge exchange and public involvement on the work surrounding POPs substances

Twenty-two Member States have provided full triennial reports as part of the Article 12 reporting. A number of reporting gaps are noted, with five Member States not submitting annual reports or a triennial report during this reporting period. Twenty Member States indicated that systems have been put in place to allow knowledge exchange and dissemination of information. Nine Member States indicated that the information exchange mechanism is used for the update of the national implementation plans.

The majority of the Member States reported undertaking public information and/or consultation activities during the reporting period. In some cases, these activities are part of wider-scale national programmes and campaigns in chemicals management. Most Member States indicate they facilitate training activities, including for industry, scientists, educators, healthcare workers and technical and managerial personnel.

Member States also worked to build awareness and engagement on POPs with the general public. Some of the initiatives were:

- Production of literature and information to be disseminated to the general public.
- Workshops, summer schools and seminars for stakeholders.
- Public awareness campaigns and questionnaires to seek feedback from the general public

11.4 Financial and Technical assistance

Fifteen Member States provided either financial or technical support during the 2013-2015 period, an increase from 10 in the previous reporting period. This has largely been through organised schemes such as the Global Environment Fund (GEF) or the Strategic Approach to International Chemicals Management (SAICM). Member States and the Union also provided their mandatory contributions to the Stockholm Convention Trust Fund, collectively accounting for ~46% of the total contributions to the fund in 2015. In addition,

the Union and some Member States contributed substantive funds to the Special Voluntary Trust Fund for the Stockholm Convention.

Alongside support to global schemes, many Member States also reported on national initiatives including:

- Hosting workshops and conferences for international experts.
- Funding of Arctic monitoring research programmes.
- Bi-lateral communication and knowledge building with non-EU countries.
- Research programmes for the presence of POPs in former Russian states.

11.5 Conclusions

The fourth synthesis report covers all required aspects of the POPs Regulation and its implementation in the Union and at Member State level. This short section draws some conclusions about the work done and the progress made to eliminate POPs in the Union.

Production, placing on the market and use of chemicals

Production of POPs was limited to only PFOS, and the production volume for PFOS in the 2013-2015 period was declining steeply (down from 9 tonnes per annum to 2.4 tonnes). Additionally, a small number of Member States were still importing HBCDD and SCCPs. Some Member States made use of the derogation for import/export of POPs for research or analysis purposes.

Infringement activities identified potential issues with HCB in fireworks in three Member States, associated with import of fireworks. This primarily related to fireworks manufactured in Asia, in particular in China. Other infringement cases identified possible issues with SCCPs in toys and other articles (particularly Christmas lights). PFOS was also identified in remaining ‘in-use’ stocks of fire-fighting foams.

Waste Management and contaminated sites

The majority of Member States have made good progress at the final removal and elimination of PCBs from di-electric equipment. Eleven out of 13 Member States estimated remaining stocks to be lower than 10% against a 1990 baseline. Two other Member States commented that more significant stockpiles may exist (30% and 49% against 1990 levels, respectively).

The majority of Member States had mechanisms to identify, collect, and destroy obsolete pesticides that may contain POPs. No stockpiles of obsolete pesticides were reported. However, four Member States identified stockpiles of PFOS (largely relating to fire-fighting foams), which were destroyed.

Some Member States have also highlighted the challenges with contaminated land and POPs that require active management for many years after the initial contamination has taken place.

Environmental Releases and Environmental Concentrations

The data on the emission of substances subject to release reduction provisions show a strong decline since 1990, with the monitoring data for ambient air concentrations demonstrating a clear improvement.

Key sources of POPs emissions vary by substance, but as a common theme combustion of solid fuels and wastes (in both industrial and domestic settings) is important, as is manufacture of metals. A more select set of sources is important for specific POPs e.g. leak from di-electric equipment is key for PCBs.

Emission data is readily available for emissions to air, while data for other vectors is far more limited. In particular, emission estimate data for water and land was reported by only seven and four Member States, respectively, with no clear trends allowing a comparative analysis. Additionally, the underlying data used in such reports should be produced in a harmonised format so that it can easily be incorporated into IPCHeM.

Knowledge exchange and financial and technical assistance

Only 18 of 28 Member States provided full reporting needed to fully assess this specific topic. However, for those that did report, all have put in place communication networks for POPs to facilitate discussion between policy makers, industry, academics and the wider public. The majority have put in place systems to seek public engagement as part of the continued development of national implementation plans.

The Union and the Member States substantially supported the work under the Convention through the payment of their mandatory contribution as a Party and through contributions to the Special Voluntary Trust Fund. Fifteen Member States stated that they have supported the international work on POPs either financially or technically, with funding to the GEF as a primary pathway to provide their support.

Appendix A – Explanation of how Toxic Equivalent Factors (TEFs) are developed for dioxins and Furans, and dioxin-like PCBs

Dioxins and Furans

Dioxins and furans are a family of chemicals with 210 different congeners based on differing levels of chlorination (1 – 8 chlorines) and placement of chlorine atoms within the ring structures of dioxins and furans. Toxicity and potential carcinogenicity of individual congeners ranges significantly across the family making analysis of the family difficult to quantify. In order to overcome this issue a system of toxic equivalent factors (TEFs) were developed based on the 17 most toxic congeners, in particular 2,3,7,8 Tetrachlorodibenzo-p-dioxin (TCDD), this allows a quantified amount of dioxins and furans to be quoted based on the equivalent quantity of the most toxic form TCDD. For example, using the TEF scheme a 100 kg of a low toxicity congener might be released, based on its toxicity and equivalent to TCDD, this would equate to an equivalent of 10 µg of TCDD.

The development of such TEF schemes began with the work of NATO who in 1989 developed an international scheme based on key congeners to quantify dioxins and furans. Estimates quantified under this scheme can be recognised with the use of units quoted as 'I-TEQ', for example grams I-TEQ. Subsequently to work of NATO in 1998 the world health organisation looked to review and develop their own scheme of TEFs, this work also accounted for those PCB congeners which have similar dioxin-like action. The scheme was subsequently updated again in 2005, with Figure A.1 providing the latest set of TEFs based on key congeners. Estimates derived using this scheme are quoted as 'WHO-TEQ', for example grams WHO-TEQ.

For emission inventory compilation, debates over which is the most suitable scheme of TEFs to use has carried on now for some years within inventory teams. While the WHO-TEQ system is more modern and allows for the calculation of dioxin-like PCB emissions, the NATO scheme has been in place longer with a greater body of research work available for use of inventory compilers. The estimates developed for the UNECE and UNEP inventories typically use I-TEQ with the Standardised dioxins and furans tool kit and EMEP guidebook also working in I-TEQ. Estimates reported to the European Commission for the POP Regulation should ideally be in WHO-TEQ. However, given the levels of uncertainty which can be seen in deriving estimates, the differences between the two schemes are not insurmountable and it is more important to be clear which scheme has been used and whether the derived estimates also include dioxin-like PCBs in the totals. Ideally dioxin-like PCBs should be reported as a separate fraction and not included within the totals for dioxins and furans.

Figure A.1 WHO Toxic Equivalent Factors 2005

Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessment of Polychlorinated dibenzo-*p*-dioxins, Dibenzofurans, and Dioxin-Like Polychlorinated Biphenyls[1]

Compound	1998 TEF[2]	2005 TEF[3]
Polychlorinated dibenzo-*p*-dioxins (*PCDDs*)		
2,3,7,8-Tetrachloro-dibenzo-*p*-dioxin (TCDD)	1	1
1,2,3,7,8-Pentachloro dibenzo-*p*-dioxin (PeCDD)	1	1
1,2,3,4,7,8-Hexachloro- dibenzo-*p*-dioxin (HxCDD)	0.1	0.1
1,2,3,6,7,8-Hexachloro- dibenzo-*p*-dioxin (HxCDD)	0.1	0.1
1,2,3,7,8,9-Hexachloro- dibenzo-*p*-dioxin (HxCDD)	0.1	0.1
1,2,3,7,8,9-Heptachloro- dibenzo-*p*-dioxin (HpCDD)	0.01	0.01
Octachloro-dibenzo-*p*-dioxin (OCDD)	**0.0001**	**0.0003**
Polychlorinated dibenzofurans (*PCDFs*)		
2,3,7,8-Tetrachlor-dibenzofuran (TCDF)	0.1	0.1
1,2,3,7,8-Pentachloro-dibenzofuran (PeCDF)	**0.05**	**0.03**
2,3,4,7,8-Pentachloro-dibenzofuran (PeCDF)	**0.5**	**0.3**
1,2,3,4,7,8-Hexachloro-dibenzofuran (HxCDF)	0.1	0.1
1,2,3,6,7,8-Hexachloro-dibenzofuran (HxCDF)	0.1	0.1
1,2,3,7,8,9-Hexachloro-dibenzofuran (HxCDF)	0.1	0.1
2,3,4,6,7,8-Hexachloro-dibenzofuran (HxCDF)	0.1	0.1
1,2,3,4,6,7,8-Heptachloro-dibenzofuran (HpCDF)	0.01	0.01
1,2,3,4,7,8,9-Heptachloro-dibenzofuran (HpCDF)	0.01	0.01
Octachloro-dibenzofuran (OCDF)	**0.0001**	**0.0003**
Polychlorinated biphenyls (*PCB* congener number)		
3,3',4,4'-Tetrachloro-biphenyl (77)	0.0001	0.0001
3,4,4',5-Tetrachloro-biphenyl (81)	**0.0001**	**0.0003**
3,3',4,4',5-Pentachloro-biphenyl (126)	0.1	0.1
3,3',4,4',5,5'-Hexachloro-biphenyl (169)	**0.01**	**0.03**
2,3,3',4,4'-Pentachloro-biphenyl (105)	**0.0001**	**0.00003**
2,3,4,4',5-Pentachloro-biphenyl (114)	**0.0005**	**0.00003**
2,3',4,4',5-Pentachloro-biphenyl (118)	**0.0001**	**0.00003**
2',3,4,4',5-Pentachloro-biphenyl (123)	**0.0001**	**0.00003**
2,3,3',4,4', 5-Hexachloro-biphenyl (156)	**0.0005**	**0.00003**
2,3,3',4,4',5'-Hexachloro-biphenyl (157)	**0.0005**	**0.00003**
2,3',4,4',5,5'-Hexachloro-biphenyl (167)	**0.00001**	**0.00003**
2,3,3',4,4',5,5'-Heptachloro-biphenyl (189)	**0.0001**	**0.00003**

Polychlorinated Biphenyls (dioxin-like PCBs)

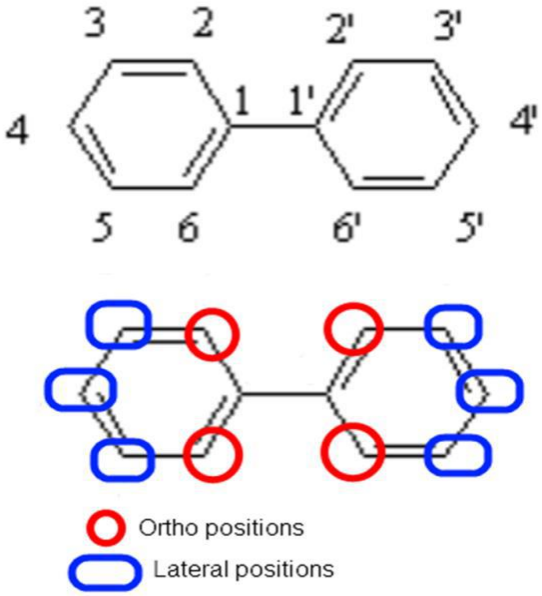
Polychlorinated biphenyls are a family of chemicals based on two benzene rings joined by a single carbon to carbon bond and varying numbers of chlorines. In total 209 different congeners exist based on the number and position of chlorines on the basic structure shown in the top part of Figure A.2. As with dioxins and furans the toxicity of individual congeners varies across the whole spectrum. Additionally, 12 congeners have been identified by the World Health Organisation as having carcinogenic effects and, in that respect, have been more closely aligned with dioxins and furans. These 12 congeners make up what are termed 'dioxin-like PCBs'.

Structurally the majority of PCBs are in a co-planar (flat) formation. However, when more than one chlorine atom is found within the ortho positions (see Figure A.2) the repulsion of

electrons from the atoms in corresponding chlorine atoms causes one of the benzene rings to twist forming a non-planar shape. The dioxin-like PCBs are those congeners with at least four chlorines in the lateral positions shown in Figure A.2 and a maximum of one chlorine in an ortho position to maintain the co-planar shape.

The WHO review of the scheme for toxic equivalent factors (TEFs) under dioxins and furans created a new system in 1998, further updated in 2005, to provide a scheme whereby the dioxin-like PCBs could be quantified from total PCB using a similar method to that outlined for dioxins and furans. The specific PCB congeners with dioxin-like properties is shown in Figure A.1.

Figure A.2 Structural role of PCBs in dioxin-like behaviour



Under international reporting requirements 'total' PCB is reported to the Stockholm Convention, UNECE Convention on Long Range Transboundary Air Pollution and POP Regulation. However, where the POP Regulation prefers Member States to make use of the WHO TEQ system the potential for reporting dioxin-like PCBs is also available. As previously stated, the main issue reporting data will be to ensure that quantities are clearly detailed and aggregation of dioxins and dioxin-like PCBs should be avoided to ensure no ambiguity in the values reported.

Appendix B Technical Annex

Table B1 Control Measure (to identify) details based on Article 12 reports for the period 2013 – 2015

Member State	Measures to identify (Y/N)	Details
Belgium	Y	Flemish Region: Assessments were undertaken to identify dioxins, furans and PCB's near waste treatment plants, for instance. Special attention was paid towards scrap metal plants. The Flemish region performs measurements on the site of the plant as well in the immediate surroundings in order to assess whether the emitted PCBs might pollute the food chain. An assessment was undertaken concerning PAH's in order to estimate whether the elevated levels measured in humans could be correlated with high levels in the environment. Concerning the characterisation of sources, the Flemish Environment Agency develops yearly emission inventories for furans and dioxins (and many other pollutants). She also measures the deposition of dioxins, furans, PCB's and PAHs. PAHs in air are monitored as well. Flanders pays special attention to the measurement of PAHs near tar refineries. Walloon Region: A network for the monitoring of dioxins coming from municipal waste incinerators has been set up. http://environnement.wallonie.be/data/air/dioxines/index.htm For the 2013-2015 period, 429 samples were analysed and only 3 of them did exceed the norm of 0.1 TEQ ng/Nm³. Federal authority: Assessments are undertaken to identify dioxins, furans, PCB's and PAH in food and animal feed.
Bulgaria	Y	Bulgaria identifies sources of substances listed in Annex III on the basis of the inventory on these substances. The inventory has been updated in 2014 and it serves as a basis for reporting according to the POP Protocol of the UNECE and of the Stockholm Convention. These measures are introduced in the first update of the National Implementation Plan (NIP) for the management of POPs in Bulgaria, 2012 –2020 and in the Action plan for unintentional POPs Emissions of PCDD/PCDF, PCB, HCB, PeCBz and PAH. A second update of the National Implementation Plan (NIP) for the management of POPs in Bulgaria is planned and is expected to be finalized in 2017.
Czechia		The measures are parts of the National Implementation Plan for Implementation of the Stockholm Convention in the Czechia and of other national strategic documents. Direct measures and obligation are included in national legislative documents implementing the European law. Emission reduction of PAHs is solved within the National Program for Emission Reduction (NPSE), which was adopted by Resolution of the Government of the Czechia No 978 on 2 December 2015. Emission of PAHs is also partly solved within different Programs on improvement of air quality, which are currently issued. Legislative measures in the area of domestic heating (main source of PAHs in CZ) are provided by the Act on Air protection (201/2012 Coll.). This Act sets up emission requirements for sources with a rated thermal input not exceeding 300 kW, during marketing and their operation. As a result of this measure, significant amount of obsolete equipment particularly in households will be replaced by 2022. - Act No. 69/2013 Coll., amending Act No. 76/2002 Coll. on integrated pollution prevention and control, on the integrated pollution register and on amendment to some laws (Act on integrated prevention) - Act No. 185/2001 Coll., on waste and amending certain other acts, as amended

		- Act No. 25/2008 Coll., on the Integrated Environmental Pollution Register and the Integrated System of Compliance with Reporting Duty in Environmental Areas, and on amendments to other acts - Regulation (EC) No 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC - Government Regulation No. 145/2008 Coll., on the list of substances and thresholds for the integrated register of pollution, as amended - Act. No. 350/2011 Coll., on chemical substances and mixtures, as amended - Act. No. 201/2012 Coll., on the air protection, as amended o Decree No. 415/2012 Coll., on tolerable level of pollution and its detection and other obligations of the Act on air protection, as amended
Denmark	Y	Air emission inventories have been developed for PCB and DK has tried to establish a national emission inventory for HCB and PeCBz, but the conclusion was: "The screening for emission sources for pentachlorobenzene (PeCBz) showed that the available data are extremely limited and in many cases the reported data are based on highly uncertain assumptions. Based on the available data, it appears that waste incineration will be the largest source of PeCBz emissions to air. However, the data foundation is at the moment not strong enough to facilitate the establishment of an emission inventory." Source: DANISH EMISSION INVENTORY FOR HEXACHLOROBENZENE AND POLYCHLORINATED BIPHENYLS, 2014 (available at: http://dce2.au.dk/pub/SR103.pdf)
Germany		Germany identifies sources of substances listed in Annex III based on the inventory on these substances. The inventory has been updated in October 2010 and is basis for reporting for the POP – Protocol of the UNECE and of the Stockholm Convention.
Estonia	Y	Inventory, labelling (PCB containing equipment), elimination, measures to monitor and limit release through environmental permitting. The studies done during the reported period: “Monitoring and assessment of dangerous substances in surface water 2012-2013“, Estonian Informative Inventory Report 1990-2016 Submitted under the Convention on Long-Range Transboundary Air Pollution.
Ireland	Y	a) PCB Inventory As outlined in response to Section II: Stockpiles, the EPA, in order to ensure a comprehensive inventory, has engaged in widespread inspections to identify as many PCB holdings as possible. This work is on-going and such information allows the EPA to identify potential sources of PCBs. For example since 2013 a further 166 inspections have been undertaken of potential PCB holders (including desk based and site visits) and the EPA has provided Local Authority staff across the State with training on PCB-related activities. Measures used to identify sources of Annex III substances as part of the inventories for POPs releases to air, land and water include: · UNECE EMEP/CORINAIR Emission Inventory Guidebook 2007; · UNEP Toolkit 2013 Standardised Toolkit for Identification and Quantification of Releases of Dioxin and Furans and other Unintentional POPs; · Consultation with a wide range of industry sectors, service providers and government bodies; · Emission inventories for residential use of peat are calculated using the United Kingdom National Atmospheric Emissions Inventory (NAEI) EF quoted for coal. This is currently being reviewed (Refer to Section VI-POPs research). · EMEP/EEA air pollutant emission inventory guidebook - 2013 · Targeted research of specific data sources for relevant source sectors; and · Literature sources including research literature on POPs emissions from specialist research symposia and conferences, and POPs inventories of other Member States.

		Other measures used by Ireland to identify sources of substances listed in Annex III include: b) E-PRTR The Electronic Pollutant Release and Transfer Register (E-PRTR) Regulation (EC) No. 166/2006, concerning the establishment of a European Pollutant Release and Transfer Register, came into force in 2006. Related Irish regulations include Statutory Instrument (S.I.) No. 123 of 2007 and S.I. No. 649 of 2011. The E-PRTR database is an effective means for identifying potentially hazardous chemical substances and/or pollutants released to air, water and soil; and wastes transferred off-site for recovery or disposal. The aim of the inventory is to make information more available to the public on pollutant emissions and waste transfers from a range of operations. Reporting under PRTR is an annual process. The E-PRTR Regulation (EC) No. 166/2006 requires that emissions and waste transfers from specified industrial and waste management operations which are above the reporting thresholds must be reported to the European Commission for publication on a dedicated website which is available at the following link: http://prtr.ec.europa.eu/ Ireland has a dedicated website for information on the national Pollutant Release and Transfer Register, including information on quantities of pollutant releases (including POPs) in accordance with the relevant E-PRTR reporting thresholds (i.e. which exceed the E-PRTR reporting thresholds): http://prtr.epa.ie/map/default.aspx The EPA's AER/PRTR Electronic Website and Workbook data reporting system provides certain facilities with a standardised reporting mechanism to report their annual environmental information returns. The EPA extracts the relevant E-PRTR information for reporting to the European Commission. Such data is reported by quarries, IED, IPC, waste and wastewater discharge licensed facilities which help identify potential sources of emissions. Annex III substances (in accordance with the reporting threshold requirements i.e. where reported above relevant reporting thresholds) are included in the list of parameters that are available.
Greece	No response	No information provided
Spain	Y	Spain states that Law 5/2013 and Royal Decree 815/2013 transpose the IED. This legislation includes the industrial activities and installations that need to comply with the requirements related to public information.
France	Y	Reduction of emissions to air and land: A third National plan Environmental health was adopted covering 2015-2019 with an overall aim to reduce emissions. The plan includes an action to reduce 6 toxic substances, including dioxins and furans, PDB and HAP. The objective was to reduce emissions to air and water by 30% between 2007 and 2013. The third plan focusses on contamination of soil/land, actions started in 2015. The actions to prevent and reduce exposure to contamination consider the diffuse character of the sources and the vulnerable groups (e.g. children). First action focuses on PCB, a second one relates to protecting the population against risks from using pesticides in oversea areas (use of chlordecone in the Antilles). Reduction of emissions to water: In 2013 hazardouses substances from all installations discharging industrial wastewater needed to be monitored and for some of these substances, technical and economic studies envisaging the reduction these emissions will have to be undertaken by the operator, including establishing a plan of the envisaged reduction measures.

		In 2010, a micropollutant plan 2010-2013 was launched to define the global for reducing the presence of micropollutants in aquatic environments and to describe the corresponding actions. 14 POPs are included in this plan: hexachlorobenzene, hexachlorocyclohexane, pentachlorobenzene, aldrin, dieldrin, endrin, DDT, heptachlor, chlordane, chlordecone, mirex, toxaphene, PFOS and PCBs. At the end of 2014, 3722 establishments representing 41 sectors of activity had been controlled. Approximately 500,000 analyzes were performed and 112 substances analyzed. A second micro polluting plan (2016-2021) has just been implemented. Reductions in exposures to Chlordecone The government has put in place important means through a first (2008-2010) and second national action plan (2011-2013) to respond to the pollution by the chlordecone, to secure populations and take into account the impacts of this protection in agriculture and fisheries.
Croatia	Y	Unintentional production / emission (PCDD/PCDF, HCBs, PCBs and PeCBz) Emission control of POPs listed in Annex C of the Stockholm Convention PCDD/PCDF, HCBs, PCBs and PeCBz is in competence of more government bodies with regard to elements of the environment in which emission occurs, as follows: the ministry in charge of environmental protection, the ministry responsible for the protection of agricultural land, forestry and the ministry responsible for water management. CEAN also collects data on emission in all aspects of the environment pursuant to international and national obligation and prepares annual reports. In 1991, the Republic of Croatia became a Party to the LRTAP Convention as well the Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP Protocol). The Republic of Croatia is required to identify and calculate its annual pollutant emissions within its territory and to report to the LRTAP Convention Secretariat and Clean Energy Incentive Program (CEIP). Subsequently, CEAN prepares annual reports of calculated air pollutants emissions / inventory on the Croatian territory. Reports are available to the concerned public on its website http://www.azo.hr/EmisijaOneciscujucihTvari and in EEA: http://cdr.eionet.europa.eu/hr/un/UNECE_CLRTAP_HR Calculation of emissions pursuant to the obligations of the LRTAP Convention is produced according to EMEP methodology which covers five major sectors and the following pollutants: the main pollutants (sulphur dioxide (SO2), nitrogen oxides (NOx), carbon monoxide (CO), volatile organic compounds (NMVOC), ammonia (NH3), particulate matter (total suspended matter, PM10, PM2,5), heavy metals (cadmium (Cd), lead (Pb), mercury (Hg), arsenic (As), chromium (Cr), copper (Cu), nickel (Ni), selenium (Se) and zinc (Zn)) and POPs (PAH, HCH, PCDD / PCDF, PCBs and HCBs). The report acts as the document by which the Republic of Croatia proves the fulfilment or nonfulfillment of its obligations according to international treaties, as well as the main indicator of implemented measures which the Republic of Croatia is required to carry out in order to reduce emissions of pollutants. Hrvatske vode (Croatian Waters) is a competent body for monitoring the state of surface water, including coastal water and groundwater. Monitoring is conducted in accordance to an annual Monitoring Plan. The analyses are performed by the Central Water Management Laboratory of Hrvatske vode and in other laboratories authorised by the Ministry of Agriculture. Hrvatske vode is the competent body for the interpretation of monitoring results, preparation of the Annual Report and its submission to the Ministry competent for water management and to the CAEN. Also, in accordance with the Regulation on the prevention of major accidents involving dangerous substances (Official Gazette, No. 114/08 and 139/14), data collection on specific POPs in the base of the Register of installations in which dangerous substances are present is stipulated and managed by CEAN. CEAN also maintains the Croatian PRTR which represents a single register on the release and transfer of pollutants in air, water

		and / or sea and soil, and the production, collection and treatment of waste. Department of Work and Occupational Safety within the Ministry of Labour and Pension Fund is competent for unintentionally produced / released pollutants into the work environment.
Italy	No response	No information provided
Cyprus	Y	The EMEP/EEA Air Pollutant Emission Inventory Guidebook (Published in 2013) was used to check which of the listed sources are found in Cyprus. Cyprus has transposed Directive 2011/65/EC, for the restriction of the use of certain dangerous substances in electrical and electronic equipment, to the National Law with the Regulation 203/2014. The Regulation 203/2014 determines the restrictions of the use of dangerous substances in electric and electronic equipment (EEE) with the aim to contribute for the protection of human health and the environment, including the recovery and the disposal of these wastes in an environmentally sound manner. Among the substances under the restriction, are the PBBs, PBDEs having maximum allowable concentration by weight 0.1%. The Regulations include provisions which are focused to the obligations regarding the manufacturer, the licensed representative, the importer and the distributor. The most significant provisions are (i) the creation of a technical folder by the manufacturer within the framework of the Law on CE marking and (ii) the supervision of the market based on Regulation (EC) No. 765/2008 regarding the determination of the accreditation requirements and the supervision of the market regarding the trade of the products. Articles that contain or may contain brominated diphenyl ethers are not allowed to enter Cyprus. In the case that articles found to contain or may contain brominated diphenyl ethers, are exported back to the country of origin. The disposal and management of the waste is regulated by the Water Pollution Control Law 106(I)/2002 and the Waste Laws of 2011 to 2014. Based on Regulation 9(1) of the Regulations P.I. 636/2002 for the Solid and Dangerous Waste (Polychlorinated Biphenyls and Polychlorinated Triphenyls) (PCB/PCT) a National Implementation Plan and a General Guidance are formed for the management and the destruction of PCBs/PCTs in Cyprus. The Plan has been published with notification of the Minister of Agriculture, Natural Resources and Environment in the Official Gazette of the Republic on 8.12.2006 (Regulation 456/2006). In this Plan, there are actions taken by the Cyprus Government for the establishment of a list for the owners of transformers having PCBs and their relevant decontamination. In addition, it includes the procedure for the gradual collection and environmental sound management of PCBs, the list for the owners of transformers having PCBs and their responsibilities relevant to the legislation. Cyprus is on the process of updating the National Implementation Plan. The Regulations for the waste (Restriction of the use of certain dangerous substances in electric and electronic equipment) of 2014 (P.I. 203/2014) determine rules for the restriction of the use of dangerous substances in electric and electronic equipment (EEE) with the aim to contribute for the protection of human health and the environment, including the recovery and the disposal of such waste with environmentally correct way.
Latvia	Y	Cabinet Regulation No 29 of 29 November 2001 483 “Procedures for Identification and Registration of Contaminated and Potentially Contaminated Sites” shall be applicable to the identification of sources of substances listed in Annex III; Additional measures to identify the sources of substances in Annex III stem from the European Pollutant Release and Transfer Register (E - PRTR) established pursuant to Regulation (EC) No 1829/2003 of the European Parliament and of the Council. 166/2006 on Europe Implementation of Pollutant Release and Transfer Register. Reporting E - PRTR is provided annually and summarizes information from annual national statistical reports “No.2 - Air. Air Defence Review, No.2-Water. Overview of Water Use ”and“ No.3-Waste. Waste Overview ”. The HELCOM project “Control of Hazardous Substances in the Baltic Sea Region” (COHIBA 2010-2012) determined the concentration of POPs in water, sediments and wastewater. The obtained data coincide with the information on POP emissions in Latvia in Table 1.

Lithuania	No response	No information provided
Luxembourg	Y	In particular, the identification and characterisation of substances and their sources takes place during the authorisation procedure for establishments classified under the amended law of 10 June 1999 on listed establishments. These operating authorisations consider the best available techniques.
Hungary	No response	No information provided
Malta	No response	No information provided
Netherlands	Y	The Netherlands interprets the question as follows: From the literature it is known which sources contribute to the emissions. In the request for licenses for these sources' information has to be submitted about the sources. In a number of cases an environmental assessment report is requested before the license is granted. Emissions have to be reported by companies above a certain limit. For a number of sources, such as traffic, emissions are estimated if relevant.
Austria	Y	"Air: Inventories have been established to be able to meet the reporting requirement under the Convention on Long-range Transboundary Air Pollution of the United Nations Economic Commission for Europe (UNECE/LRTAP). Austria compiles an Air Emission Inventory („Österreichische Luftschadstoff-Inventur – OLI") which is updated annually. For the purpose of the action plan this inventory has been further developed to be able to classify the emissions according to the source categories of Annex III of the Stockholm Convention. Water: Excerpt from NAP Review (2017): For the time being, data on sources for POPs releases into water are gathered in two registers in Austria: In the European Pollutant Release and Transfer Register (PRTR) point sources and emissions to water for all POPs are included in principle. In fact, for most industrial sectors, a reporting obligation to PRTR exists only for facilities exceeding a certain production capacity threshold and for emissions which exceed a pollutant release threshold. For Austria approximately 70 facilities with emissions to water or wastewater are listed in the PRTR. None of these facilities reported emissions to water for the pollutants HCB, PeCBz and PCB. Two PRTR-facilities reported PCDD/PCDF emissions to water; one PRTR-facility re-ported PAH emissions to water. So far, no data on diffuse sources of POPs have been available in the PRTR. Additional information on POPs releases was gathered within a supporting project for the setup of the national emissions inventory in 2007/2008. Some 70 substances were analysed for intake and outlet of 15 urban wastewater treatment plants of different capacities, purification technologies and wastewater-composition. The analytical programme comprised the priority substances and certain other substances according to the daughter Directive 2008/105/EC of the Water Framework Directive and pollutants of national relevance regulated in the Austrian Ordinance on Quality Standards for Surface Waters. DDT, chlordane, aldrin, dieldrin, endrin, heptachlor, hexachlorobenzene and pentachloro-benzene could not be detected in crude wastewater. With exception of one facility PAHs were only detectable in crude wastewater. Only polybrominated di-phenylethers were detectable in effluents in the sub-ng/l range and hexachlorocyclohexane (lindane) in the ng/l range. The use of lindane was allowed in some selected minor applications until January 1st 2008. In 2009 a national inventory on pollutant emissions to surface waters was established. The national register comprises emissions of the following point sources: PRTR-facilities, urban wastewater treatment plants with a capacity from 2,000 population equivalents upwards and waste incineration facilities with a capacity of more than 2 tonnes of waste per hour. There is no release thresh-old for reporting. In practice, the lower limit is determined

		by the limit of quantification of the specified analytical method and the wastewater discharge. The first reporting cycle for the data of 2009 covered only basic wastewater parameters. Since 2010 discharges are reported for a number of substances including POPs. The emissions are reported as yearly load data. By 2014 the remediation of a historical landfill needed to be stopped as an off-site thermal treatment of HCB-contaminated lime sludge at a cement kiln caused unintended releases to air. As a new tender for ex-situ treatment of sludges failed, a containment-system to minimise pollutant releases by the abandoned landfill is under installation. It can be concluded that underground pollution by PAHs causes in general local impacts on soil and groundwater. Nevertheless, it must be recognised that, depending on the site-specific situation and where sensitive land uses are concerned, risks to human health or to ecosystems need to be analysed. Whereas underground pollution by PAH is a well-known problem the available information on sites contaminated by PCDD/F, HCB and PCB is scarce. Soil: The Stockholm Convention asks for releases via residues and waste. An inventory of releases via residues and waste can be established in the case of PCDD/F and PeCBz. In the case of the other POPs qualified data are not available.
Poland	Y	In the reporting period, there were no changes in relation to the data provided in the three-Year report for the period from 1 January 2007 until 31 December 2010
Portugal	No response	No information provided
Romania	Y	The National Environmental Protection Agency, together with the Romanian Water Administration, owns the inventory of the sources listed in Annex III, which is updated annually.
Slovenia	Y	"When preparing the inventory in Slovenia the National Emission Inventory (NEI) for calculation and reporting emissions was established. This inventory (NEI) enables the calculation of the emission data (release data) for the four main pollutants, heavy metals, particulate matter and POPs according to the EMEP/EEA methodology. NEI has been prepared on the basis with the INSTRUCTION for organizing the emission inventory of sources of air pollution (OJ of SRS No. 12-20, IV 1979). NEI is a subject of continuous development. The major sources of activity data are the Statistical Office of the Republic of Slovenia, however, the Environmental Agency obtains much of its data through other activities, which are performed under the Environment Protection Act (OJ RS, No. 41/04, 20/06, 39/06, 70/08, 108/09, 48/12, 57/12, 92/13) • Emission factors (default versions), which are used for the calculation are published in EMEP/EEA Atmospheric Emission Inventory Guidebook, 2016. The Republic of Slovenia, as a party to the CLRTAP Convention, is obligated to perform annual emission inventories and to report them."
Slovakia	N	n/a

Finland	Y	See response to question 1.2. Atmospheric emission sources of PCDD/F, HCB and PCBs have been estimated for the UNECE/CLRTAP. In addition, emissions and emission sources of PCDD/F and PCB into air, soil and surface water were estimated more detailed in the COHIBA –project, using system flow analysis. The research project COHIBA (http://www.cohiba-project.net/) assessed the sources and inputs of 11 hazardous substances or substance groups of the HELCOM Baltic Sea Action Plan (BSAP).
Sweden	Y	"Inventories have been carried out within the sectors of the ferrous and non-ferrous metal industry, pulp and paper industry and waste incineration. Studies have also been performed in order to characterise and evaluate the relative importance of long range (atmospheric) transport of these contaminants. Pattern analysis has been developed in order to achieve a preliminary identification of individual sources. An inventory is in place of sites where potentially contaminating activities are taking place or have taken place. The identification has been carried out sector wise focusing on different industrial sectors which potentially could contaminate soil, waters and sediments The identification procedure has been based on a surveys carried out by the Swedish Environmental Protection Agency, on which industrial sectors (activities) that should be included in the assessment (Naturvårdsverket report 4393, 1995 (in Swedish)). This work covers all potential pollutants and hence also POPs in the Stockholm Convention. A Swedish ordinance (Order 2007:19 on PCBs etc March 2007, updated 2010:963 July 2010) requires that anyone who owns a building or other installation in which joint-sealing compounds or anti-skid flooring compounds may have been used during erection or renovation in the period from 1956 to 1973 shall investigate whether the joint-sealing compound or flooring compound is a PCB product. The owner shall ensure that sealants and flooring containing more than 500 ppm (500 mg/kg) PCB product is removed according to the timelines given in the ordinance i.e. 2016 at the latest. The use of PCB in new products was banned in 1978 and since 1995 it is totally prohibited to use PCB. Annex II. Inventories have been carried out regarding potential sources of PFAS (including PFOS) in the environment (NV report 6709, March 2016). Over 2000 potential local sources have been identified. Use of fire extinguishing foam is the largest direct point source, while wastewater treatment and disposal and treatment of waste are likely to be significant secondary point sources. Other potential sources include various types of industrial activities. Atmospheric deposition probably contributes significantly to the load of PFAS in the Swedish environment. (PFOS approx. 25-30 kg). (Hansson K. et al. 2016). "
United Kingdom		The measures developed include source reduction measures and exposure reduction measures. The details are outlined in the United Kingdom Dioxin Action Plan which formed part of the United Kingdom 2007 National Implementation Plan. In addition, permitted processes are required to report releases above a threshold which is designed to capture the majority of releases. A programme of monitoring also takes place which checks compliance with permit conditions on a selection of regulated processes. Releases from processes which do not report releases through the PRTR mechanism, either because they are below the substance release threshold or do not require a permit for the relevant release media, are estimated by standard emission inventory techniques such as finding the product of a release factor and an appropriate activity statistic. Action undertaken as part of the United Kingdom's 2007 Dioxin Action Plan led to the development of multi-vector inventories for emissions to air, water and land. The programme has also been used to identify release routes of greatest uncertainty to close data gaps and develop inventories for emissions to residue and product vectors. Outputs of the activity undertaken are detailed in the review of the Dioxin Plan annexed to The United Kingdom 2012 National Implementation Plan. The Dioxin Plan will be reviewed again in the 2016 update for United Kingdom National Implementation Plan.

Table B2 Control Measure (to characterise) details based on Article 12 reports for the period 2013 – 2015

Member State	Measures to identify (Y/N)	Details
Belgium	Y	See answers provided in the Control Measure (to identify) table
Bulgaria	Y	The action plan for characterisation of the sources of substances listed in Annex III is updated in 2012 as a result of the first update of the National Implementation Plan (NIP) for the management of POPs in Bulgaria, 2012 –2020. A second update of the National Implementation Plan (NIP) for the management of POPs in Bulgaria is planned and is expected to be finalized in 2017.
Czechia	Y	"- Act No. 25/2008 Coll., on the Integrated Environmental Pollution Register and the Integrated System of Compliance with Reporting Duty in Environmental Areas, and on amendments to other acts - Regulation (EC) No 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC - Government Regulation No. 145/2008 Coll., on the list of substances and thresholds for the integrated register of pollution, as amended - Act No. 69/2013 Coll., amending Act No. 76/2002 Coll. on integrated pollution prevention and control, on the integrated pollution register and on amendment to some laws (Act on integrated prevention) - Decree No. 415/2012 Coll., on tolerable level of pollution and its detection and other obligations of the Act on air protection, as amended - Act. No. 350/2011 Coll., on chemical substances and mixtures, as amended - Act. No. 185/2001 Coll., on waste and amending certain other acts, as amended - Act. No. 201/2012 Coll., on the air protection, as amended o Decree No. 415/2012 Coll., on tolerable level of pollution and its detection and other obligations of the Act on air protection, as amended"
Denmark	Y	"Dioxin: Wood combustion in residential plants accounts for 57 % of the national dioxin emission in 2013. The contribution to the total dioxin emission from the waste sector (26 % in 2013) owes to accidental fires, especially building fires. The emissions of dioxins from energy industries mainly owe to the combustion of biomass as wood, wood waste and to a less extend agricultural waste. HCB: Stationary combustion accounts for 51 % of the estimated national hexachlorobenzene (HCB) emission in 2013. This owes mainly to public electricity and heat production. Wood combustion in households is also an important source. The HCB emission from stationary plants has decreased 69 % since 1990 mainly due to improved flue gas cleaning in waste incineration plants. PAH: The most important source of PAHs emissions is combustion of wood in the residential sector making up 68 % of the total emission in 2013. The increasing emission trend is due to increasing combustion of wood in the residential sector. The PAH emission from combustion in residential plants has increased by 47 % from 1990 to 2013.
Germany	Y	"Germany characterises sources of substances listed in Annex III based on the inventory on these substances. The inventory has been updated in October 2010 and is basis for reporting for the POP – Protocol of the UNECE and of the Stockholm Convention."

Estonia	Y	Measures to characterise sources of substances have been done through studies pointed out in point 2.1 and periodical overviews to view and analyse trends in release data.
Ireland	Y	"Ireland prepared and transmitted its National Implementation Plan on POPs in 2012 in accordance with its obligations under Article 7 of the Stockholm Convention. Section 4 of the Plan details the measures used to characterise sources of unintentional POPs. The 1998 Protocol on Persistent Organic Pollutants to the Convention on Long Range Transboundary Air Pollution (CLRTAP) requires the compilation of an inventory of anthropogenic emissions to air. This inventory is reported annually. In order to illustrate the current releases of unintentional POPs for the National Implementation Plan on POPs and national reporting requirements under the Stockholm Convention, the releases of unintentional POPs were reported under the main source categories established in the UNEP Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases. This helped to identify and characterise the key sources of unintentional POPs emissions. Further information is available in Section 4 of Ireland's National Implementation Plan on POPs (available at www.pops.ie)."
Greece	No response	No information provided
Spain	Y	No additional measures to those already presented in 2010.
France	Y	Reduction of emissions to air and land: A third National plan Environmental health was adopted covering 2015-2019 with an overall aim to reduce emissions. The plan includes an action to reduce 6 toxic substances, including dioxines and furans, PDB and HAP. The objective was to reduce emissions to air and water by 30% between 2007 and 2013. The third paln focusses on contamination of soil/land, actions started in 2015. The actions to prevent and reduce exposure to contamination consider the diffuse character of the sources and the vulnarables groups (e.g. children). First action focuses on PCB, a second one relates to protecting the population against risks from using pestices in oversea areas (use of chlodecone in the Antilles). Reduction of emissions to water: In 2013 hazardouses substances from all installations discharging industrial wastewater needed to be monitored and for some of these substances, technical and economic studies envisaging the reduction these emissions will have to be undertaken by the operator, including establishing a plan of the envisaged reduction measures. In 2010, a micropollutant plan 2010-2013 was launched to define the global for reducing the presence of micropollutants in aquatic environments and to describe the corresponding actions. 14 POPs are included in this plan: hexachlorobenzene, hexachlorocyclohexane, pentachlorobenzene, aldrin, dieldrin, endrin, DDT, heptachlor, chlordane, chlordecone, mirex, toxaphene, PFOS and PCBs. At the end of 2014, 3722 establishments representing 41 sectors of activity had been controlled. Approximately 500,000 analyzes were performed and 112 substances analyzed. A second micropolluting plan (2016-2021) has just been implemented.

Croatia	Y	"According to Regulation on emission ceilings for certain pollutants in the Republic of Croatia (Official Gazette No 108/13) for the purposes of developing the emission inventory and the annual emission report the CEAN shall perform the develop of the annual data collection programme by sectors referred to in Appendix I, pursuant to the quality assurance and control plan. The programme referred includes activity data which relate to the current calendar year and the programme is submitted to state administration bodies and legal persons with public authorities referred to in Appendix I of this Regulation by 15 December of the current year. State administration bodies and other legal persons with public authorities referred to in Appendix I of this Regulation shall submit activity data and emission data by sectors required for preparing the pollutant emission inventory on the territory of the Republic of Croatia, according to the annual programme to the CEAN by 30 September of the following year, in electronic form. The Republic of Croatia signed the Convention in May 2001, and the Convention entered into force in the Republic of Croatia on 30 April 2007. Pursuant to Article 7 of the Convention, the Republic of Croatia has prepared "National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants", which the Croatian Government adopted in 2008 (Official Gazette No. 145/08). Due to multidisciplinary approach to POPs control, a Working Group for monitoring the fulfilment of NIP's obligations has been established. So far two reports on the implementation of the National Plan for the Stockholm Convention on Persistent Organic Pollutants in the Republic of Croatia were made: The First report, for the period January 2009 - December 2010 and The Second report, for the period January 2011 - December 2012, and are available for public on the website of the Ministry of Environment and Nature, a proposal of the third report is being made, which covers the period from January 2013 - December 2014.
Italy	No response	No information provided
Cyprus	Y	Data, including activity rate is obtained through enforcement of the Atmospheric Pollution Control Laws of 2002 to 2013 (Law 187(I)/2002, Law 85(I)/2007, Law 10(I)/2008, Law 79(I)/2009, Law 51(I)/2013 and Law 180(I)/2013) and Water and Land Pollution Control Law (Law 106(I)/2002).
Latvia	Y	"Law ""On Pollution"" and Cabinet of Ministers November 30, 2010 Regulations Nr. 1082 "Procedures for Applying for Category A, B and C Polluting Activities and Issuing Permits for Category A and B Pollution Activities" (Integrated Pollution Prevention and Control) lays down monitoring requirements and reporting obligations for emissions into air, water, sewage and data on waste management in national statistical databases. Cabinet Regulation No. 139 of 14 February 2006 "Regulations on Requirements for the Use and Labelling of Equipment and Products containing Hazardous Chemical Substances and on the List of Goods Hazardous to the Environment" lays down requirements for the use of equipment containing polychlorinated biphenyls and polychlorinated terphenyls; the European Pollutant Release and Transfer Register (E - PRTR) established pursuant to Regulation (EC) No 1073/1999 of the European Parliament and of the Council; 166/2006 on Europe Implementation of Pollutant Release and Transfer Register. Baltic Sea Monitoring Programs implemented by the HELCOM Convention (COMBINE) as part of the Baltic Sea Monitoring and Evaluation Strategy developed guidelines for POPs in sea water (refurbished in 2017)."
Lithuania	No response	No information provided

Luxembourg	Y	In particular, the identification and characterisation of substances and their sources takes place during the authorisation procedure for establishments classified under the amended law of 10 June 1999 on listed establishments. These operating authorisations take into account the best available techniques.
Hungary	N	
Malta	N	
Netherlands	Y	There is a general notion of sources of annex III substances. Occasionally research is dedicated to specific sources, for instance as a result of enforcement actions.
Austria	Y	In the National action plan (NAP) the sources of substances listed in Annex III are further characterised, based on the SC's Dioxin Toolkit and the sources enumerated in the SC itself.
Poland	Y	In the reporting period, there were no changes in relation to the data provided in the three-Year report for the period from 1 January 2007 until 31 December 2010
Portugal	N	
Romania	Y	The emissions reported under E-PRTR come from activities covered by the IED Directive as well as a number of non-IPPC activities that are covered by the E-PRTR Regulation. The E-PRTR for the period 2013 - 2014 includes: - emissions of dioxins and furans (PCDD / PCDFs) into the air from the energy sector and the production and processing of metals (2013, 2014) - Tables 7 and 8; - Polychlorinated biphenyls (PCBs) emissions from air produced from metal production and processing (2014) - Table 9; - Polycyclic aromatic hydrocarbons (PAH) in air and water resulting from waste and waste water management and metal production and processing (2013, 2014) - Tables 10 and 11. [Report contains tables with emissions reported under E-PRTR for PCDD-F, PCB and PAH]
Slovenia	Y	"Emissions of POPs (Polycyclic Aromatic Hydrocarbons, Polychlorinated Biphenyls, Dioxins/Furans and Hexachlorobenzene) for Slovenia were calculated and reported since year 1990. The calculations of POPs are based on methodology described EMEP/EEA Atmospheric Emission Inventory Guidebook, 2016. Since then POPs emission are included in annual report format and also reported according to POPs Protocol."
Slovakia	No response	No information provided
Finland	Y	Atmospheric emissions of PCDD/F, HCB and PCBs, and soil and surface water releases of PCDD/F and PCBs (in COHIBA project) have been characterised.
Sweden	Y	"Industrial sources have been characterised in Sweden since years back. In Sweden, the permitting process of industrial installations includes an environmental impact assessment. When necessary, this environmental impact assessment also includes measurements of pollutants released. The permitting process also includes an assessment of what is BAT and an undertaking of BAT-measures to reduce formation and releases of pollutants whilst considering what is economically feasible.

		An inventory with identification of 80 000 potentially contaminated sites is in place. Inventories of actual risks at the potential sites, including risk classification /simplified risk assessment are nearly completed. The inventory work is carried out according to a method provided by the Swedish EPA (Naturvårdsverket Report 5053 Methods for inventories of contaminated sites, 2002 (in English)) and appr.1000 sites are found in the highest risk class.
United Kingdom	Y	A programme of routine measurements has been in place for some years for certain key sources such as incinerator ash and sinter plant emissions to air. Further research is undertaken to characterise sources and factors which may influence their emissions as the required technical and financial resources become available.

Table B3 Control Measure (to minimise) details based on Article 12 reports for the period 2013 – 2015

Member State	Measures to identify (Y/N)	Details
Belgium	Y	"Brussels-Capital Region These are incorporated as technical prescriptions, according to the BATNEEC principle, in the environment permits, in situations where they are required (air filtration, DeNOx with action on PCDD/PCDF, etc.). Flemish Region If necessary to manage the risks from Annex III substances, specific prevention and reduction measures are incorporated in the environmental permits of industrial installations. Information and sensibilisation campaigns are held towards the general public on the risk of dioxins and furans from open fires and woodstoves. A new general environmental legislation regarding controlling of non-ducted dust emissions was approved (VLAREM II , Section 4.4.7.), including very detailed and extensive prescriptions on handling and transport of dust-producing substances, thus providing new leverage to enforce extra dust-reducing measures, where necessary. By this, the diffuse emissions of dust loaded with PCBs released by scrap metal plants might be reduced. The Flemish government released an Action plan to reduce the pollution of dioxins and PCB's (see paragraph III. 1) Walloon Region The implementation of the principles of the IPPC directive through the environmental permit obliges the authority to deliver integrated environmental permits, taking into account BAT's and, where appropriate, specific conditions and ELV's are set, including for POP's. Federal authority

The prevention and reduction of human exposure occurs also by eliminating the contaminated products. The Federal Agency for the Safety of the Food Chain (FASFC) pays particular attention to the risk of contamination of the food chain and animal feed by dioxins, PCBs and PAH.

In Belgium, a premarket control of certain raw material in the animal feed sector is required for dioxins and PCB.

Controls can be performed by the FASFC at the operating location (farms, aquaculture farms, fish markets, etc.), during transport, in the processing sector (abattoir, etc.) and in the distribution chain for:

- Milk and milk products

- Eggs and ovoproducts

- Meat and derived products (cattle, veal, pigs, sheep, horses, poultry, rabbits, pigeons and farmed game, wild deer)

- Aquaculture products

- Fish products

- Cereals, oil seeds

- Drinking water and various foods: baby food, vegetable oils and fats, food supplements

- Animal feed

PAHs are also monitored for these products as well as for cocoa butter and chocolate, spices, aromatic herbs, fish oil, vegetables.

In the event of non-compliance, the intervention levels established in the recommendation of 11 September 2014 for dioxins and dioxin-like PCBs requires the competent authority to conduct an investigation regarding the contamination source in order to identify it, remove it if possible or reduce it as much as possible.

Each year, AFSCA publishes an Activity Report, which recaps controls done during the preceding year http://www.favv.be/rapportsannuels

Sample size in 2014 Conformity in 2014 Sample size in 2015 Conformity in 2015

Dioxines et PCB 2390 99,8% 2.495 99,9%

PAH 595 99,5% 674 100%

Details available http://www.favv.be/rapportactivites/2015/echantillonnagesanalyses/physicochimiques/

With regards mandatory notifications, any operator performing activities which fall under the responsibility of the FASFC must immediately inform the FASFC when it considers, or has reason to believe that a product that it has imported, produced, grown, bred, processed, manufactured or distributed may adversely affect human, animal or plant health (RD of 14/11/2003).

In Belgium, laboratories are also required to report results that reveal a risk.

Bulgaria	Y	"The action plan for reduction and minimisation of sources of substances listed in Annex III is updated in 2012 as a result of the National Implementation Plan (NIP) for the management of POPs in Bulgaria, 2012 –2020. A second update of the National Implementation Plan (NIP) for the management of POPs in Bulgaria is planned and is expected to be finalized in 2017. In total, 32 reference documents (BREFs) developed on EU level are applied in the field of the industrial emissions and are the base for the establishment of BAT for prevention and control of the pollution. For some earlier adopted reference documents a review to take into account new developments has already been completed, including for the cement and lime, pulp and paper and iron and steel sectors. As installations – generators of harmful POPs emissions compounds are defined, being mainly chemical installations for the production of basic organic chemical substances such as halogen hydrocarbons; plastic materials (polymers, synthetic fibres and cellulose-based fibres); synthetic rubbers; dyes and pigments, as well as installations for disposal or recovery of hazardous waste, including oil recovery, re-refining or disposal of waste oil with capacity exceeding 10 tons per day and carrying out one or more activities for hazardous waste disposal; installations for incineration of household waste with capacity exceeding 3 tons per day; installations for disposal or recycling of animal carcasses or animal waste with capacity exceeding 10 tons per day; landfills, receiving more than 10 tons of waste per day or with a total capacity exceeding 25000 tons, excluding landfills of inert waste. These installations are subject to issuing and renewal of integrated permits MEASURES AND ACTIONS: 1. Implementation and enforcement of existing EU and national legislation for Integrated Pollution Prevention and Control (IPPC Directive), relating POPs releases from unintentional production. 2. Implementation of annual update of the inventory of POPs emissions sources in ambient air by the following 11 groups of source categories: heat and power stations, domestic combustion, combustion processes in industry, non-combustion production processes, extraction and processing of fuel resources, solvents usage, road transport, other transport, waste treatment and disposal, agriculture and nature resources.. 3. Inclusion of conditions in the Integrated Permits of combustion installations, metallurgical installations, chemical installations and installations for production of cement clinker for prevention/reduce of POPs emissions, including emission reduction, based on the Best Available Techniques (BAT). 4. Application of BAT, the use of environmentally sound fuels for household heating, the enhancement of the energy efficiency and the improvement of the quality of fuels for the transport and the renewal of the motor vehicle fleet have a significant potential for reducing the POPs emissions. 5. Integrated prevention and control of the pollution from certain categories of industrial activities (cement plants, metallurgical plants, installations for disposal of hazardous hospital waste and incineration of household waste etc.) through the application of BAT, including POPs. Source: Updated NIP for POPs, 2012-2020 http://www.moew.government.bg/

Czechia	Y	"- Act No. 25/2008 Coll., on the Integrated Environmental Pollution Register and the Integrated System of Compliance with Reporting Duty in Environmental Areas, and on amendments to other acts - Regulation (EC) No 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC - Government Regulation No. 145/2008 Coll., on the list of substances and thresholds for the integrated register of pollution, as amended - Act No. 69/2013 Coll., amending Act No. 76/2002 Coll. on integrated pollution prevention and control, on the integrated pollution register and on amendment to some laws (Act on integrated prevention) - Act. No. 201/2012 Coll., on the air protection, as amended - Act. No. 350/2011 Coll., on chemical substances and mixtures, as amended - Act. No. 185/2001 Coll., on waste and amending certain other acts, as amended"
Denmark	Y	In 2014 the Danish EPA ran an awareness campaign about correct use of domestic wood stoves and boilers targeted the general public and several types of advice are available in Danish at the Danish EPA homepage. Continued focus on BAT/BEP for industrial waste incineration facilities.
Germany	Y	a) Implemented measures on the Basis for national legislation: Measures in relation to Annex III of Regulation (EC) No 850/2004 are implemented on a legal basis and is explained below: European Union legislation Basis for implemented national legislation is Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control (IPPC Directive), which regulates the licensing of industrial installations that are particularly relevant to the environment on the basis of a cross-media concept. Under this approach, emissions[72] to air, water and land, along with waste management aspects, issues of waste management, resource and energy efficiency and the prevention of accidents are addressed. A key element of the Directive is the requirement that the "Best Available Techniques" (BAT) be used in all new installations and, from 2007 at the latest, also in all existing installations. For those installations covered by the IPPC Directive, this means that the requirement to use the best available emission reduction techniques for chemicals listed in Annex III of Regulation (EC) No 850/2004 has been fulfilled. Industrial facilities have to report on the basis E-PRTR VO 166/2006 EU[73] https://www.thru.de/thrude/ It includes obligations to report annual emissions of PCDDs/PCDFs, HCB and PCBs in water, soil and air above certain specified thresholds. National legislation: The centrepiece of national legislation is the Federal Immission Control Act (BImSchG)[74] which regulates environmental quality. Its provisions

[72] DIRECTIVE 2008/1/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 Jan. 2008 concerning integrated pollution prevention and control (Official Journal of the European Union L 24/8)

[73] Regulation (EC) No 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register (Official Journal of the European Union L 33/1)

[74] Gesetz zum Schutz vor schädlichen Umwelteinwirkungen durch Luftverunreinigungen, Geräusche, Erschütterungen und ähnliche Vorgänge (Bundes-Immissionsschutzgesetz- BImSchG) in the version promulgated on 26 September 2002 (Federal Law Gazette I, p. 3830), last amended by the Act of 11. August 2010 (BGBl. I S.Federal Law Gazette I p.1163)

	apply to the construction and operation of installations and to the manufacture, placing on the market and import of installations, fuels and other relevant substances. The section of the Act concerning authorisation of installations complies with Community law. A number of Administrative Regulations were issued based on Article 48 of the Federal Immission Control Act. They contain threshold values, amongst other things, for PCDDs/PCDFs that are not to be exceeded and emission values that can be feasibly adhered to using best available technology. Emissions to air: The requirement that the best available techniques be used has been implemented in the individual Immission Control Ordinances and in the Technical Instructions on Air Quality Control (TA Luft)[75] which stipulate limit values for maximum concentrations in atmospheric emissions from certain installations: · First Regulation implementing the Federal Immission Control Act[76] In Germany, combustion installations that do not require a license under Article 4 of the Federal Immission Control Act are subject to the provisions of the Ordinance on Small- and Medium Scale Combustion Plants. This ordinance has been updated recently in 2010 implementing new requirements concerning the quality of fuels, new pollutant limit values along with regular monitoring of emissions. The amended ordinance will lead to optimised combustion conditions in small installations and will achieve a general reduction in the emission of pollutants. It can be assumed that emissions of Annex III of Regulation (EC) No 850/2004 chemicals will be further reduced as a result of optimised combustion. · Fourth Regulation implementing the Federal Immission Control Act[77] Certain installations are subject to official licensing. The licenses are based on emission-restricting requirements to maintain air quality on the basis of the best available technology as defined in more detail in the Ordinances or the Technical Instructions on Air Quality Control. · Thirteenth Regulation implementing the Federal Immission Control Act[78] This Ordinance regulating large combustion plant and gas turbines (13th BImSchV) sets the limit value for PCDDs/PCDFs at 0.1 ng TEQ/m³. · Seventeenth Regulation implementing the Federal Immission Control Act[79] This Ordinance specifies requirements relating to the construction, type, and operation of waste incinerators or co-incinerators. It stipulates that PCDD/PCDF concentrations in the exhaust stream of incinerators may not exceed an emissions limit value of 0.1 ng TEQ/m³. Emission limit values for incinerators burning solid municipal waste are also 0.1 ng TEQ/m³. · Nineteenth Regulation implementing the Federal Immission Control Act[80] This regulation prohibits the use of chlorinated and brominated compounds as fuel additives.

[75] Erste Allgemeine Verwaltungsvorschrift zum Bundes-Immissionsschutzgesetz (Technische Anleitung zur Reinhaltung der Luft - TA Luft) of 24 July 2002 (Gemeinsames Ministerialblatt GMBl pp. 511-605) http://www.bmu.de/files/pdfs/allgemein/application/pdf/taluft.pdf

[76] Erste Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Artikel 1 der Verordnung zur Neufassung der Ersten und Änderung der Vierten Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes) of 15 July 1988 (Verordnung über kleine und mittlere Feuerungsanlagen –1. BImSchV) in the version promulgated on 14 March 1997 (Federal Law Gazette I p. 490), last amended by 26 January 2010 (Federal Law Gazette I, No. 01. February 2010 4 p. 38)

[77] Vierte Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Article 1 d. V zur Neufassung und Änderung von Verordnungen zur Durchführung des Bundes-Immissionsschutzgesetzes) (Verordnung über genehmigungsbedürftige Anlagen – 4. BImSchV) in the version promulgated on 14 March 1997 (Federal Law Gazette I p. 504) last amended by the Ordinance of 11. August 2009 (Federal Law Gazette I p. 2723)

[78] Siebzehnte Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über die Verbrennung und die Mitverbrennung von Abfällen – 17. BImSchV) in the version promulgated on 27 January 2009 Federal Law Gazette I p. 129)

[79] Dreizehnte Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über Großfeuerungs- und Gasturbinenanlagen – 13 BImSchV) of 27 January 2009 (Federal Law Gazette I p. 129)

[80] Neunzehnte Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über Chlor und Bromverbindungen als Kraftstoffzusatz - 19. BImSchV) of 17 January 1992 (Federal Law Gazette I p.75) last amended by the Act of 21 December 2000 (Federal Law Gazette I p. 1956)

	· Twenty-seventh Regulation implementing the Federal Immission Control Act[81] Article 4, in conjunction with Annex 2, specifies an emission limit value for PCDDs/PCDFs of 0.1 ng TEQ/m3 for crematoria. In general, the requirements of the "Technical Instructions on Air Quality Control" must be observed when licensing installations under the Federal Immission Control Act. This specifies as a minimum requirement that the mass concentration of PCDDs/PCDFs in atmospheric emissions also be 0.1 ng/m³ and the mass flow 0.25 µg/h. For other substances that are particularly harmful to the environment, such as polybrominated dibenzo-p-dioxins and dibenzofurans or polyhalogenated biphenyls, emissions must be restricted under the general requirement to reduce emissions. Any existing installations that did not comply with the requirements applicable to new installations with regard to best available technology, set out in the "Technical Instructions on Air Quality Control" as amended in 2002, had to be retrofitted as a rule by 30 October 2007. Emissions to water: Requirements relating to the discharge of effluent into water bodies are set out in permits and licenses granted under water law, as defined in Article 2 ff. of the Federal Water Act (WHG). All these requirements are based on the use of the best available technology as a minimum to avoid and reduce emissions or on the corresponding BAT as defined in the IPPC Directive. The IPPC Directive is implemented in secondary legislation at state level. b) Further measures as element of the National Action Plan: Further action was identified referring to stationary sources and a minor source, the smoke munitions for training purposes by the military. i) Stationary source sector According to stationary sources, significant emission reductions could be reached by the further implementation of control measures in residential combustion facilities, accidental fires and open burning. The main emission sources for PCDD/PCDF of the industrial sectors are obliged to reduce emissions by the Federal Immission Control Act (BImSchG)[82] [see also references to the corresponding part of this chapter outlining national legislation] and its corresponding regulations as well as the Technical Instructions on Air Quality (TA-Luft)[83] by means of limit values. These limiting values correspond to the achievable concentrations reached by the application of the best available technique (BAT). The emissions of small scale combustion installations are regulated in the First Regulation on the Federal Emission Control Act (1. BImSchV)[84]. This regulation has been updated in 2010 implementing new requirements concerning the quality of fuels, pollutant emission limit values along with regular monitoring of emissions. The amended regulation will lead to optimised combustion conditions in small installations and will achieve a general reduction in the emission of pollutants, among them POPs. For awareness raising of relevant sources with regard to the reduction of emissions from residential combustion facilities every operator is informed personally by a chimney sweeper on the proper operation of his or her small scale combustion installation. Besides, subsidies are available for the purchase of low-emission facilities and ecolabels given to low-emission facilities should promote their distribution. Main source categories of open burning are the accidental fires of industrial plants and the illegal waste combustion. Emission reduction measures

[81] Siebenundzwanzigste Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Artikel 1 der Verordnung über Anlagen zur Feuerbestattung und zur Änderung der Verordnung über genehmigungsbedürftige Anlagen)(Verordnung über Anlagen zur Feuerbestattung – 27. BImSchV) of 19 March 1997 (Federal Law Gazette I p. 545), last amended by Article 11 of the Act of 3 May 2000 (Federal Law Gazette I p. 632)

[82] Gesetz zum Schutz vor schädlichen Umwelteinwirkungen durch Luftverunreinigungen, Geräusche, Erschütterungen und ähnliche Vorgänge (Bundes-Immissionsschutzgesetz- BImSchG) in the version promulgated on 26 September 2002 (Federal Law Gazette I, p. 3830), last amended by the Act of 25 June 2005 (Federal Law Gazette I p. 1865)

[83] Erste Allgemeine Verwaltungsvorschrift zum Bundes-Immissionsschutzgesetz (Technische Anleitung zur Reinhaltung der Luft - TA Luft) of 24 July 2002 (Gemeinsames Ministerialblatt GMBl pp. 511-605) http://www.bmu.de/files/pdfs/allgemein/application/pdf/taluft.pdf

[84] Erste Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Artikel 1 der Verordnung zur Neufassung der Ersten und Änderung der Vierten Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes) of 15 July 1988 (Verordnung über kleine und mittlere Feuerungsanlagen – 1. BImSchV) in the version promulgated on 14 March 1997 (Federal Law Gazette I p. 490), last amended by 26 January 2010 (Federal Law Gazette I, No. 01. February 2010 4 p. 38)

		for this source category can only be achieved by fire prevention measures as well as further ecological awareness raising of the population. ii) Smoke munitions for training purposes by the military A minor source of PCDD/F emissions is the use of smoke munitions for training purposes by the military, which is - at least in Germany - a relevant source of POPs created unintentionally. While the formation of PCDDs/PCDFs was ascertained to be < 50 mg/a in 2003, the quantity of HCH released annually was almost 1,500 kg. The departments responsible within the Federal Ministry of Defence (BMVg) have developed an action plan for phasing out the use of smoke munitions which when fired cause PCDDs/ PCDFs and HCB to be formed. For munitions shot from tank howitzers, substitute materials are already available that from 2011 will completely replace the old smoke munitions. In the case of mortar munitions, phase-out is only possible in the medium term, since the introduction of substitute munitions was not scheduled to start until 2008. Nevertheless, the goal of continuous reduction in consumption figures has been set, with a reduction of 1/3 in 2006, followed by continuing reduction until complete replacement is achieved once substitute materials have been received. Implementation of the strategy was achieved in 2014. Current status of implementation with released HCB: 2013 9.9 kg; 2014 < 2 kg; 2015 < 2 kg.
Estonia	Y	Legal framework is in place which supports environmental permitting and sets requirements for monitoring and limiting of substances: Waste Act, Ambient Air Protection Act, Water Act, Chemicals Act, Industrial Emissions Act and Plant Protection Act. This enables efficient control of all polluting substances, including POPs.
Ireland	Y	"National POP Regulations In 2010 Ireland introduced national legislation concerning POPs (Persistent Organic Pollutant Regulations 20106). The regulations designate the EPA as the competent authority for the purposes of the EU POP Regulation (Regulation (EC) 850/2004). The EPA's responsibilities include the preparation and maintenance of release inventories and, in consultation with certain public authorities concerned and the public, the preparation of a national action plan and implementation plan setting out how Ireland is meeting its obligations under the Stockholm Convention. The regulations also set out the roles of certain public authorities concerned in relation to POPs. Controls on emissions from major industrial and waste management activities The Industrial Emissions Directive (IED)7 is the main EU instrument for the control of emissions including dioxins from major industrial installations and certain waste installations. Such installations are required to have permits/licences for their operations and must comply with certain conditions including compliance with emission limit values. The IED supersedes seven previous directives, including the IPPC Directive, the Waste Incineration Directive and others8. National legislation in Ireland also addresses industrial and waste facilities that are outside the scope of IED, under IPC and Waste Licensing regimes, respectively. In Ireland, more than 700 industrial facilities and waste facilities currently hold licences from EPA through IED, IPC and waste licensing. The EPA's Office of Environmental Enforcement undertakes regular inspections of these operations. Emissions monitoring is also undertaken to ensure compliance with their licence conditions. Local Authorities also have a role in regulating and enforcing specified waste activities. EPA licensed operations are required to operate to Best Available Techniques (BAT) Guidance and have monitoring requirements imposed as part of their licences. The concept of BAT is further strengthened in the IED, where BAT Conclusions are legally binding once published as

		Commission Implementing Decisions and are the reference for setting the licence conditions at installations covered by the IED. In addition, for activities regulated by Irish legislation (e.g. under IPC and Waste Licensing regimes) the principles of BAT are applied. Where relevant, controls on POPs emissions are included in order to ensure BAT compliance and minimise emissions from specific sectors. Three metal shredders operate in Ireland and measures have been built into their licences to address control and monitoring of POPs from the activity. National Waste Prevention Programme Under the National Waste Prevention Programme the EPA publishes annual reports detailing the work that was carried out under the programme which includes work that has been undertaken in relation to POPs and PCBs. The annual reports for 2012, 2013 and 2014 are available at: http://www.epa.ie/pubs/reports/waste/prevention/. The annual report for 2015 is due to be published in the coming months. National Hazardous Waste Management Plan The National Hazardous Waste Management Plan 2014 - 2020 is the third National Hazardous Waste Management Plan to be issued, the first plan having been published in 2001. The NHWMP Code of Practice for unregulated waste disposal sites Controls on waste disposal by burning Farm Hazardous Waste Collection Scheme Restrictions on the sale and residential use of bituminous fuels Polycyclic Aromatic Hydrocarbons (PAHs) in food Other enforcement activities
Greece	No response	No information provided
Spain	Y	
France	Y	Reduction of emissions to air and land: A third National plan Environmental health was adopted covering 2015-2019 with an overall aim to reduce emissions. The plan includes an action to reduce 6 toxic substances, including dioxines and furans, PDB and HAP. The objective was to reduce emissions to air and water by 30% between 2007 and 2013. The third paln focusses on contamination of soil/land, actions started in 2015. The actions to prevent and reduce exposure to contamination consider the diffuse character of the sources and the vulnarables groups (e.g. children). First action focuses on PCB, a second one relates to protecting the population against risks from using pestices in oversea areas (use of chlodecone in the Antilles). Reduction of emissions to water:

		In 2013 hazardouses substances from all installations discharging industrial wastewater needed to be monitored and for some of these substances, technical and economic studies envisaging the reduction these emissions will have to be undertaken by the operator, including establishing a plan of the envisaged reduction measures. In 2010, a micropollutant plan 2010-2013 was launched to define the global for reducing the presence of micropollutants in aquatic environments and to describe the corresponding actions. 14 POPs are included in this plan: hexachlorobenzene, hexachlorocyclohexane, pentachlorobenzene, aldrin, dieldrin, endrin, DDT, heptachlor, chlordane, chlordecone, mirex, toxaphene, PFOS and PCBs. At the end of 2014, 3722 establishments representing 41 sectors of activity had been controlled. Approximately 500,000 analyzes were performed and 112 substances analyzed. A second micropolluting plan (2016-2021) has just been implemented. Reductions in exposures to Chlordecone The government has put in place important means through a first (2008-2010) and second national action plan (2011-2013) to respond to the pollution by the chlordecone, to secure populations and take into account the impacts of this protection in agriculture and fisheries."
Croatia	Y	Action plan: Measures to reduce releases from unintentional production (Article 5) Highest emissions of PCDD and PCDF occur due to residential wood burning. Other activities that contribute to these emissions are the processes of steel production in arc furnaces, fuel combustion in transport sectors, waste incineration and cremation. The HCB emission occurs mainly due to biomass and solid fuel combustion and to a lesser extent from waste incineration, if it exists in the county. In the Republic of Croatia, dominant source of HCB emission is fuel combustion in the stationary energy sectors. The dominant source of PCBs is emission from the refrigeration and air conditioning equipment using halogenated hydrocarbons and the electrical equipment. Other sources like steel production, clinical waste incineration and fuel combustion have minor contribution in total PCBs emission in the Republic of Croatia. The main objective of this action plan is to ensure an adequate framework for the PCDD/PCDF management in the Republic of Croatia, including the reduction and prevention of their future releases into the environment. As Parties to the Stockholm Convention have an obligation to revise action plan related to Article 5 every five years, during the revision of NIP this activity was made. Those action plans / activities and measures are included in this document. The proposed measures are divided into four categories of activities / specific objectives: 1. Further development and maintenance of POPs releases inventory 2. Strengthening the capacity of the competent authorities, enhancing cooperation and information dissemination for the efficient management of POPs 3. Development and dissemination of information program 4. Reduction and elimination of the releases of POPs listed in Annex C 1. Further development and maintenance of POPs releases inventory

Proposed measures:
• Harmonization of reporting requirements for making and reporting under LRTAP Convention and Stockholm Convention
• Development of instructions/guidelines for data collection and inventory
• Periodic Review of the Emission Inventory
Measures within the framework of these activities aim to improve the methods of data collection and future revisions of the Emission Inventory. First of all, it is necessary to compare and harmonize the reporting requirements under LRTAP Convention and Stockholm Convention in order to allow better insight into activity data in each category of sources, as well as information on the status of equipment for emission reduction / restriction and data on specific technological processes, and to avoid duplication in data collection process.

2. Strengthening the capacity of the competent authorities, enhancing cooperation and information dissemination for the efficient management of POPs

Proposed measure:
• Further improvements in the implementation of the supervision over the fulfilment of the requirements of the Stockholm Convention.

Implementation of the Convention and efficient management of POPs require inclusion of bodies and organization from different fields of responsibility. To ensure adequate cooperation and information dissemination as well as regular monitoring of implementation it is necessary to further improve the implementation of the supervision over the fulfilment of the requirements of the Stockholm Convention.

3. Reduction and elimination of the releases of POPs listed in Annex C

Proposed measures:
• The implementation of measures from the Plan for air protection, ozone layer and climate change mitigation in the Republic of Croatia for the period from 2013 to 2017 (Official Gazette, No. 139/13); further work on the promotion and enhancement of energy efficiency in the industrial and public sectors, as well as households, renewable energy, and education and dissemination of information about the proper use of fuel and management of fuel combustion plants and the effects of uncontrolled combustion in residential buildings.
• Dissemination of information about the hazards and potential hazards to health and the environment.

Important target group for reduction of releases of POPs listed in Annex C is households, which participate with around 65 % in total air emissions of dioxins and furans. Reduction of these releases includes measures for awareness raising and informing the public on the appropriate selection of combustion plants and fuel and the effects of uncontrolled combustion in residential buildings.

In addition, the existence of sites contaminated with POPs listed in Annex C has not been confirmed during the inventory of POPs in first NIP and contaminated sites were only preliminary recognized. A prerequisite for the determination of contaminated sites is a consideration / adjustment of existing and / or new regulations that will determine the limit values of pollutants in soil for various purposes. The present legal framework exists for the soil used in agricultural purpose, the Ordinance on Agricultural Land Protection against Pollution (Official Gazette, No. 9/14).

Italy	No response	No information provided
Cyprus	Y	Various measures to reduce uncontrolled burning have been taken. These are explained in detail in the updated National Implementation Plan of Stockholm Convention for Persistent Organic Pollutants (NIP) which has been communicated to the Secretariat of the POPs Convention on the 24/10/2014. Fireworks are checked for Hexachlorobenzene before their import to the Cyprus market.
Latvia	Y	"Law ""On Pollution"" and Cabinet of Ministers November 30, 2010 Regulations Nr. 1082 ""Procedures for applying for Category A, B and C polluting activities and for issuing permits for Category A and B polluting activities"" (Integrated Pollution Prevention and Control) shall be provided for by Directive No. 2010/75 / EU on the Implementation of the Requirements for Industrial Emissions in Latvia. Contamination permits include conditions on the characterization of emission sources in the air and compliance with certain emission limits, on the management of hazardous chemical substances and mixtures (in the manufacture of raw materials, consumables or in the form of intermediates or finished products). The European Pollutant Release and Transfer Register (E - PRTR) established pursuant to Regulation (EC) No 1782/2003 of the European Parliament and of the Council. 166/2006 on Europe The introduction of the Pollutant Release and Transfer Register is compiled by information from annual national statistical reports “No.2-Air. Air Defence Review, No.2-Water. Overview of Water Use ”and“ No.3-Waste. Waste Overview"
Lithuania	No response	No information provided
Luxembourg	Y	see response to III.2.1
Hungary	No response	No information provided
Malta	No response	No information provided
Netherlands	Y	a. The IPPC and IED directives are applicable to a number of sources b. A license following national law is granted c. The license may contain conditions on emissions
Austria	Y	The NAP 2008, the NAP 2012 as well as the NAP 2017 listed a variety of measures which on the one hand contribute to lower POPs emissions from relevant sources and which on the other hand would improve the availability of data on POPs in the environment. The NAP 2017 evaluates the measures, lists implemented measures and proposes additional activities.
Poland	Y	In the reporting period, there were no changes in relation to the data provided in the three-Year report for the period from 1 January 2007 until 31 December 2010

Portugal	N/R	No response received
Romania	Y	See the information included in the triennial report submitted in 2013 for the period 2010-2012.
Slovenia	Y	"Fundamental Slovenian strategic document in the field of environmental protection is the Resolution on National Environmental Action Plan 2005-2012 (OJ RS, No. 2/2006). Its basic goals are improvement of environment, quality of life and protection of natural resources. It addresses climate change, nature and biodiversity, waters, air, chemicals, noise, electromagnetic radiation, urban environment, waste, industrial pollution and related international commitments. For each of the above mentioned areas, targets, preferential tasks and measures to achieve the targets are set. Based on NEAP, policies for specific issues are developed. For POPs, the following three policy documents are relevant: • National Implementation Plan (NIP) as pursuant to article 7 of the Stockholm Convention on Persistent Organic Pollutants (adopted by the Government in 2009); • Action plan of reduction and minimization of releases of PAH, PCDD/DF and HCB (in use by the Ministry of Agriculture and the Environment • Operational programme for the disposal of polychlorinated biphenyls and polychlorinated terphenyls for the period of 2009 – 2012 (adopted by the Government on 19.3.2009) • Operational programme for the disposal of waste and a programme of prevention of waste in the RS, June 2016 The Environment Protection Act (OJ RS, No 41/04, 20/06, 39/06, 70/08, 108/09, 48/12, 57/12, 92/13, 56/15, 102/15, 30/16, 61/17-GZ and 21/18-ZNorg) requires that all major stationary sources have to apply for an integrated environmental permit (for larger so called IPPC installations and for smaller installations). This applies to both existing and new installations, which is regulated in Decree on activities and installations causing large-scale environmental pollution (OJ RS, No. 57/15); Decree on the emission of substances into the atmosphere from stationary sources of pollution (OJ. RS, No. 31/07, 70/08, 61/09 and 50/13) and Rules on initial measurements and operational monitoring of the emission of substances into the atmosphere from stationary pollution sources and on the conditions for their implementation (OJ. RS, No. 70/1996, OJ. RS, No. 71/2000, 99/2001, 17/2003, 105/2008). For existing industrial installations permits in most cases are issued and some are still in preparation; the emission reduction requirements in permits are based on BAT, as defined in the BREF documents of the European IPPC Bureau in Sevilla. PCB in existing products, when taken out of use, is considered in Slovenian legislation as hazardous waste and has to be treated accordingly, in line with the EU legislation and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. Production of electrical equipment containing PCB (transformers and capacitors) in Slovenia was terminated in January 1985. A study "A Concept of Handling the PCB/PCT in Slovenia" was made in 1999. The Ministry for Environment and Spatial Planning also defined the measures on how to eliminate electrical equipment (capacitors or transformers) contaminated with PCB from 2003 to 2006. PCB containing equipment has to be registered to the competent authority - ARSO. The following data have to be reported: location and amount of the PCB equipment in kg (it comprises the amount of PCB substance and the overall contaminated parts of the equipment – an estimation), the planned

		(estimated) date of the disposal of the PCB equipment, type of the PCB equipment (whether it is a transformer, capacitor or waste oil containing PCB) and the name of the owner (legal person) responsible for the PCB equipment and its disposal. ARSO keeps the inventory on these data. It is also obligatory for the proprietors / owners of the PCB/PCT equipment to report to the competent authority, whether they disposed of the PCB equipment and when and how the PCB equipment was disposed of and in addition where it was sent according to the principles of shipment of hazardous waste. Slovenia has taken all necessary measures to ensure that all PCB/PCT containing material in the environment will be disposed until 2010. Based on the Directive 96/59/EC on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCB/PCT), the following legislative documents were adopted and implemented in Slovenia: - Rules on the Disposal of Polychlorinated Biphenyls and Polychlorinated Terphenyls (OJ RS, No. 15/00, 54/02, 18/03) – no longer valid - replaced by another legislative act - Operational programme for the disposal of polychlorinated biphenyls and polychlorinated terphenyls for 2003-2006 (adopted by the Government in 2003) – no longer valid – replaced by another programme - Decree on the disposal of polychlorinated biphenyls and polychlorinated terphenyls, (OJ RS, No. 34/08 and 9/09), - Operational programme for the disposal of polychlorinated biphenyls and polychlorinated terphenyls for the period of 2009 – 2012 (adopted by the Government on 19.03.2009), - Decree on waste (OJ RS, No. 37/15 and 69/15), - Decree on waste oils (OJ RS, No. 24/12), It should be stated, that all the PCB/PCT waste (capacitors and transformers) were not disposed until the end of 2010, but the quantity is diminishing over the years.
Slovakia	Y	Within the SR, the emission limit values for waste incineration plants and equipment are applied co-incineration of waste, which are listed in Annex VI of the European Parliament Directive and Council Directive 2010/75 / EU of 24 November 2010 on industrial emissions.
Finland	Yes, as a part of the National Implementation Plan (NIP) for the Stockholm Convention. Latest update is from 2012 (www.ymparisto.fi/POP).	The following measures, inter alia, have been included in the National Action Plan and the NIP: • Regulating emission requirements for stoves, furnaces, and boilers to be placed on the market. Other measures will include ensuring proper combustion by means of instructions and training • Providing citizens with education on the combustion of wood and other biofuels. • Paying special attention to the good management of PCDD/F and PCB releases in the environmental permit process when dealing with industrial processes, energy production, and waste incineration. • Improving companies' awareness of POPs, their management, and obligations concerning their release. Permit applications will examine the possible formation of dioxin and furan releases in industrial and energy production processes. • The authorities produce new data on POPs created during industrial processes and combustion to support the environmental permit process and companies' voluntary environmental management systems. • Measures to reduce traffic related emissions and landfills

		• Rehabilitation plan for river Kymi's contaminated sediments • Mapping the possibilities to reduce or to prevent POP emissions from landfills • Evaluating more detailed the atmospheric emission for PeCB. Estimating the emissions of PeCB, HCB and PCB on surface water and soil • Screening the POP concentrations in slude and evaluating the possible risks of using sewage sludge on agriculture or on landscaping purposes It is also worth mentioning that in 2012 a decision to not remediate the sediments of River Kymi for the time being was made based on Environmental Impact Assessment. River Kymi is the most significant source of POPs in Finland today, and also accounts for the largest single input of dioxins into the Baltic Sea. The total amount of contaminated sediments between Kuusankoski and the Gulf of Finland is approximately 5 million cubic meters. These sediments contain about 6,000 kg of PCDD/F (corresponding to 17 kg ITEQ). Concentrations of PCDD/F up to 350 µg/kg ITEQ have been recorded in riverbed sediments. The river also transports polychlorinated phenols (PCP, max. conc. 720 ìg/kg) and polychlorinated diphenyl ether (PCDE, 500 ìg/kg) into the Gulf of Finland. This EIA can be downloaded at http://ely-centralen.fi/fi/ELYkeskukset/KaakkoisSuomenELY/Tehtavatjatoiminta/ProjektitJaHankkeet/Documents/Environmental%20impact%20assesment%20procedure.pdf (14 MB)
Sweden	Y	"Primary sources: In Sweden has an environmental legislation that requires the use of BAT as long as not unreasonable. This legislation also applies to sources of substances listed in Annex III and is for example used in permitting situations. This approach has resulted in concrete measures to prevent and reduce releases from the industrial sectors. There are however some sectors where further measures to reduce releases may be necessary. One example is the metallurgical sector, where there is still reasonable scope to reduce releases to air, in particular of dioxins. Another area in which further measures may be necessary is the small and medium scale burning of bio-fuels and other alternative fuels. National regulation on chlorinated dioxins and furans exist in relation to the incineration of waste, under chapter four in the Industrial emission directive ((IED) (2010/75 EU). In Sweden this directive is implemented as general binding rules setting minimum standards for the whole waste incineration (and co-incineration) sector. Since the regulation not only includes emission limit values but also construction and management obligations, it is also expected to promote the reduction of other POPs than dioxins and furans. Secondary sources: Studies of the contributions of secondary and diffuse sources to overall environmental loadings of POPs, especially those that are directly connected to exposure of humans and wildlife are undertaken. Sweden is also participating at the global level to support the work to achieve the objectives of the Stockholm Convention. Households: Information and guidance are key instruments, alongside general regulations and their enforcement. Above all, it is necessary to create an awareness of the importance of the selection of optimal fuel and good practices, and that these individual choices, make major difference to emissions. There are information campaigns done by central agencies and municipalities. Contaminated sites (soil, waters and sediments). Extensive work to investigate (including assessing the risks) and (when needed in order to reduce risks, remediate contaminated sites in Sweden is undertaken.

		Long-range transboundary air pollution: The programme (Baltic POPs report: http://www.naturvardsverket.se/Documents/publikationer6400/978-91-620-6566-9.pdf) dealt with dioxins and PCB in the Baltic and was terminated in 2012. Peak levels of dioxins appeared during 1966-84 in coastal hot-spot areas, and later (1982-96) in off-shore areas. Sources related to air emission are and have been important for the Baltic region throughout the studied time period, and particularly so for the southern sub-basins. Previous mass-balance modelling has shown that reduction of air levels will also reduce future water and sediment levels in the Baltic Sea.
United Kingdom	Y	The Industrial emissions Directive (formally the Integrated Pollution Prevention and Control (IPPC)) and related measures has led to a significant reduction of releases from industrial source sectors. The introduction of the Clean Air Act in 1956 required the use of 'smokeless fuels' for domestic space heating in towns and cities to reduce particle emissions which consequently reduced the emissions of pollutants associated with such combustion processes. Since then increasing spread of the natural gas network and domestic heat saving initiatives has significantly further decreased emissions from domestic solid fuel use. The implementation of measures on waste management has altered domestic waste disposal behaviour and publicity has helped raised public awareness about good practice in backyard burning. The United Kingdom has a well-established source inventory for emissions to air, this may be found at: http://naei.defra.gov.uk A comprehensive multimedia inventory has also been established. This currently provides emissions data for air, water, land, residue and product vectors. This will positively increase the knowledge base which will inform measures to minimise emissions.