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**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

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1. Introduction

Persistent Organic Pollutants (POPs) are chemicals of global concern due to their persistent, bioaccumulative and toxic (PBT) properties and their potential to undergo long range transport, which leads to their deposition and accumulation far from the point of production and use. Two international treaties address POPs and aim at protecting human health and the environment from their adverse impacts by eliminating or reducing their production, use and releases in the environment. The Aarhus Protocol on Persistent Organic Pollutants was adopted in 1998 as part of the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP) and the Stockholm Convention on Persistent Organic Pollutants, adopted in 2001, entered into force in 2004.

The European Union is a Party to the Aarhus Protocol and to the Stockholm Convention and adopted Regulation (EC) No 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants and amending Directive 79/117/EEC (POPs Regulation) in order to implement the Convention. Regulation (EC) No 850/2004 has been repealed and replaced by Regulation (EU) 2019/1021 on persistent organic pollutants.

The POPs Regulation is regularly updated to transpose amendments to the Convention and Protocol (largely addition of new substances to the respective annexes) and places specific obligations on all EU Member States. These obligations include details regarding the production, placing on the market, and use of listed POPs covered by three Annexes (Annex I – banned, Annex II – restricted, Annex III – unintentionally released). It also covers the management of those substances within stockpiles, environmental releases and monitoring of environmental concentrations, as well as containing provisions for waste management. As part of the POPs Regulation it is also a requirement for Member States to draw up national implementation plans and action plans to identify and manage sources of POPs within their own territories.

The reporting requirements for Member States and the European Commission under Regulation (EC) No 850/2004 were described in Article 12. Member States were required to report annually on statistical data for the production and placing on the market of Annex I and Annex II substances. Member States were also required to report to the Commission every three years on the implementation of the provisions of the POPs Regulation. The Commission had the obligation to draw up a synthesis report every three years summarising the information provided by the Member States as well as supporting information provided through the European Pollutant Release and Transfer Register (E-PRTR) and CORINAIR emission inventories under EMEP (Cooperative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe). The Commission was also required to forward a summary of that synthesis to the European Parliament and to the Council.

To date two synthesis reports were published covering the activities of the Union and its Member States under Regulation (EC) No 850/2004. The first synthesis report covers the period from the entry into force of the POPs Regulation in 2004 until 2006 and was published in 2009. The second synthesis report, published in 2011, covers the period 2007 – 2009. This Commission Report summarises the third synthesis report covering the period 2010-2013.

2. Management and Control Measures

2.1 Overview

The management of POPs substances covers multiple elements of the life cycle of a substance. Specifically this would include 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 regulation itself.

2.2 Production, placing on the market, use, export and enforcement

According to the reports provided by the Member States, enforcement of the POPs Regulation is the task of environmental agencies or inspectorates who manage this through an inspection and reporting regime. Two Member States reported the production of Annex I or II substances for the period 2010-2013 in line with specific exemptions or acceptable purposes under the POP Regulation. Germany reported that around 9 tonnes of PFOS were manufactured per annum. However, in 2013 most of this (5.8 tonnes per annum) was exported outside the EU, with the largest receivers being the USA (2 tonnes) and countries and territories in East and South East Asia (South Korea, Singapore, Taiwan and Hong Kong). Additionally, Croatia reported the production of short-chain chlorinated paraffins in 2010, 2011 and 2012.

In terms of placing on the market, a small number of Member States made use of the Article 4 provisions for use of POPs substances in research and development. A number of Member States also made use of the possibility of placing on the market of PFOS, using the exemptions under Annex II. This was largely for use in the chrome metal plating industry as a mist suppressant.

Four Member States (Germany, France, Austria, United Kingdom) stated that quantities of POPs substances were exported from the EU, which was dominated by the export of 5,800 kg PFOS per annum from Germany to 12 countries. Lindane was exported from the United Kingdom to South Korea. In addition, some chemicals were exported for use as laboratory reference material: aldrin was exported from Austria to North Macedonia, and aldrin, DDT, dieldrin and lindane to Belize, and DDT from France to USA.

Five Member States (Bulgaria, Lithuania, Netherlands, Sweden, United Kingdom) launched infringement proceedings for the illegal sale of POPs substances. This included the presence of HCB in fireworks, and the presence of SCCPs in children's toys.

2.3 Stockpiles

Stockpiles of POPs substances typically related to three types of goods, namely PCBs or PCB-contaminated di-electric equipment, obsolete pesticides and stockpiles of phase-out goods covered by the addition of substances to the POPs Regulation since 2009. Many Member States had already taken significant steps to identify and remove PCB-containing equipment from service in the past, but this was an ongoing process and six Member States (Germany, Ireland, France, Romania, Slovenia, United Kingdom) reported that use of PCB-containing equipment was still occurring in the period 2010-2013. For obsolete pesticides, a number of Member States reported that they either never produced or used pesticide POPs substances or began early phase-out, meaning that stocks no longer existed within the country by 2010.

Other Member States noted that, while large quantities of obsolete pesticides were still present, programmes of management or destruction were in place to handle them. Final disposal of obsolete pesticides includes incineration either within a Member State or through export to facilities in neighbouring Member States. Bulgaria exported a significant quantity of obsolete pesticides to Germany for final destruction through incineration. A second option is

to rely on long-term storage. In particular Bulgaria used B-B cubes, which are reinforced-concrete containers used to hold highly toxic waste, removing the risk of loss to the environment.

Germany, Ireland and the United Kingdom report stockpiles of PFOS and PBDE-containing goods for final destruction. The German National Implementation Plan also includes comments on the quantities of PBDEs likely to be found within end of life vehicles and the need to remove and dispose of these goods suitably, avoiding recycling.

2.4 Waste Management and Storage

The information reported by the Member States highlight the issue of contaminated land. Whilst a good proportion of Member States have enacted programmes to gather, stockpile and destroy obsolete pesticides, a further issue is posed by contaminated land, particularly land close to sites of former manufacture of those substances. Data from the Netherlands and Finland show the potentially high number of sites that may be contaminated. The typical remediation steps involve excavation, which in turn generates large quantities of contaminated soil that has to be treated as hazardous waste.

3. Environmental Releases and Environmental Concentrations

Article 6(1) of the POPs Regulation places an obligation upon the Member States to develop inventories of emissions to air, land and water for those substances listed in Annex III within 2 years of the regulation entering into force. Emission inventories form a key resource to inform policy makers during the development of national implementation plans. In particular, they help to identify key sources for emissions reduction or areas of uncertainty, where further research is needed to help characterise a source.

Nine Member States (Bulgaria, Czechia, France, Lithuania, Netherlands, Romania, Slovenia, Sweden, United Kingdom) provided emission estimate data as part of the reporting, highlighting major data gaps within the available data set provided. To supplement the data sets reported, data from the EMEP WebDab website¹ was used to get a more complete picture. The EMEP WebDab data include the emissions reported to the UNECE under the Aarhus Protocol for the period 2010-2012. Additionally, data submitted to the Stockholm Convention as part of the second round of reporting (31st October 2010) was also used to supplement the information gathered. Comparison was also made against data from the E-PRTR website and with environmental monitoring data from EMEP MSC-E and Arctic Monitoring and Assessment Programme (AMAP) to corroborate emission trends.

Based on the data available, 26 out of 28 Member States have developed and reported estimates of emissions for dioxins and furans, PAHs, and HCB, and 24 out of 28 Member States have developed and reported emission estimates for PCBs. Greece and Luxembourg were the only Member States that did not report emission estimate data on any of the Annex III substances through the UNECE or under the Article 12 reporting to the POPs regulation for 2010-2013. In all cases, the data developed and reported largely relates to emissions to air, with only a small number of Member States deriving and reporting estimates of emissions to vectors other than air, although the regulation requires estimates for air, land and water.

¹ <http://www.ceip.at/>

Dioxins and Furans

Dioxins and furans are not commercially produced and are typically associated with either incomplete combustion processes such as open burning, or with metallurgy. The major source sector identified for Europe was residential use of solid fuels, accounting for 38% of all emissions. By comparison, the energy generation sector made up 5% and combustion of fuels for heat and power in industry made up 18%. While the power generation sector consumes large quantities of solid fossil fuels, the high operating temperature and advanced levels of abatement brought in by the industrial emissions Directive² means that the emissions per tonne of coal is much lower than that from residential sources. Aside from residential use of fuels, the other major source was iron and steel industry (15%), the E-PRTR data corroborates the conclusion that iron and steel facilities are the single largest point source for emissions of dioxins and furans.

The review of data over the 2010-2012 period demonstrates that the emission of dioxins and furans in the majority of Member States was on a declining trend. Comparison to 1990 emission levels showed an emission reduction across the EU of 45% between 1990 and 2012 (please see also figure 1). The average per capita emissions of dioxins and furans were 5.5 µg I-TEQ / person / year in 2012.

Where estimates for vectors other than air have been provided by Member States, there was general agreement that emissions to air were broadly matched by emissions to residue³. Air emissions abatement and process design has improved since the advent of the waste incineration directive, and emissions of dioxins and furans to air from industry have dropped significantly between 1990-2012. 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. Care is required with interpretation of the data, as emissions to air, land and water are direct releases lost to the environment in an uncontrolled fashion. On the other hand, residue refers to the contaminated solid waste generated, which is typically disposed of in a controlled fashion and does not necessarily constitute a total loss to environment.

Polychlorinated biphenyls (PCBs)

PCBs were commercially used within a variety of applications, in particular di-electric equipment. Their high chemical stability and persistence made them ideal heat-transfer fluids for this application. PCBs can also be produced through unintentional pathways, particularly combustion. The main source of emissions was from dielectric equipment, contributing 32% of all emissions to air. However, of the 25 national inventories submitted to the UNECE under CLRTAP, only four (Ireland, Croatia, Hungary, United Kingdom) include estimates for PCB emissions, which shows a major gap. Other major sources included domestic combustion of fuel of fossil fuels (21%) and metallurgy (16%).

The atmospheric emission trend for the 2010-2012 period largely indicated declining emissions. In comparison to the 1990 levels, emissions declined by about 50% across the EU in 2012 (Table 1). The average per capita emissions were 13 mg/person/year in 2012. Figure 1 provides maps of the available ambient monitoring data from EMEP/MSC-E in both 1990 and in 2012, as a means of comparison to the inventory estimates. Both the EMEP data for Europe in Figure 1 and Arctic monitoring by AMAP indicate a clear decline in ambient atmospheric concentrations and emissions since 1990.

² Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control). OJ L 337, 17.12.2010, p. 17.

³ Under the Stockholm Convention 'residue' is assumed to constitute a waste contaminated by POPs which is disposed of in a controlled manner, it differs from 'land' which is a direct uncontrolled release of material to land.

Limited data is available on the emission of PCBs to vectors other than air. Based on the Article 12 reports of five Member States (Czechia, France, Netherlands, Sweden, United Kingdom) plus additional data provided by Spain to the Stockholm Convention that provided estimates for other vectors, no clear pattern was evident. Different Member States highlight the importance of water, land and waste residue to different extents.

Polyaromatic hydrocarbons (PAHs)

PAHs are a family of chemicals that can form naturally in the environment from the combustion of vegetation such as forest fires, but which also have anthropogenic sources, particularly linked to the combustion of fossil fuels. The data show that the dominant source of PAH emissions was the use of domestic fuels, particularly coal, making up 57% of all emissions.

The data for 2010-2012 show a decline in emissions. The average annual emissions were estimated to be 37% lower in 2012 compared to 1990. This reduction is smaller than that seen for dioxins and furans and PCBs, which was corroborated by the environmental monitoring by EMEP. The monitoring data from EMEP indicates a 40% decline in airborne PAH concentrations since 1990, compared to declines of 60% for PCBs and 85% for dioxins and furans.

Limited data is available for other vectors beyond air for PAHs. However, based on the four Member States (Czechia, France, Netherlands, United Kingdom) that provided data, water and residue are also key emission vectors for PAHs.

Table 1: Emissions reduction for PCBs by the Member States

Member State	Emission to air 1990 Kg	Emission to air 2012 Kg	Proportion of 2012 emission compared to 1990 baseline
Belgium	112	10	9%
Bulgaria	6	5	83%
Czechia	773	34	4%
Denmark	111	42	38%
Germany	1672	236	14%
Estonia	10	10	100%
Ireland	68	17	25%
Greece	-	-	-
Spain	24	29	121%
France	182	58	32%
Croatia	486	433	89%
Italy	286	217	76%
Cyprus	0.01	0.01	100%
Latvia	4	1	25%

Lithuania	6	300	5000%
Luxembourg	73	NR	-
Hungary	37	16	43%
Malta	-	-	-
Netherlands	-	-	-
Austria	-	-	-
Poland	2425	735	30%
Portugal	65	868	1335%
Romania	135	53	39%
Slovenia	417	53	13%
Slovakia	67	34	51%
Finland	314	154	49%
Sweden	0.1	0.05	50%
United Kingdom	6645	727	11%

Comparison to the E-PRTR suggested that the key source of PAH emissions to water was petroleum refinery processes, while combustion wastes, metallurgic wastes and auto repair waste were all important sources for residue.

Chlorobenzenes (hexachlorobenzene and pentachlorobenzene)

Hexachlorobenzene (HCB) was listed in Annex III at the time of adoption of the POPs regulation, and pentachlorobenzene (PeCB) was added to Annex I and III of the regulation in 2010 following its addition to the Stockholm Convention. Both HCB and PeCB were commercially used as pesticides, but are also created as a by-product of industrial processes, particularly the manufacture of chloro-organic solvents. PeCB was also used to reduce the viscosity of PCBs in dielectric equipment. Both HCB and PeCB can also be produced as a product of combustion of solid fossil fuels, waste oils and waste material.

Estimates for PeCB were provided by only three Member States (France, Netherlands, United Kingdom). The Netherlands reported emissions of PeCB in 1990 as 0.8 kg with an increasing emission trend reaching annual releases of 2.3 kg in 2012. The United Kingdom provided estimates of emissions to air for PeCB in 2009 -2011 of broadly 35 Kg per annum. France provided a limited data set of PeCB emissions from sewage treatment.

The HCB data submitted for air illustrated that 75% of all emissions came from metallurgy, although the data in this respect was heavily dominated by emissions from one Member State (Spain). Other sources included agriculture (6%), energy generation (5%), waste incineration (5%) and residential combustion of fuels (4%). The review of Member States' emissions for the period 2010-2012 indicated no clear patterns, with emissions, rising, falling and remaining static across the EU. Comparisons with 1990 levels however did illustrate a decline of annual emissions across the EU of 54% by 2012. EMEP monitoring across Europe indicated more

significant decrease in airborne concentrations of HCB, which had dropped by 85% since 1990. This was not confirmed by AMAP monitoring of Arctic air with only a very minor decline in airborne concentrations of HCB over the Arctic area.

Very limited data is available for estimates of emissions to non-air vectors, with only three Member States (Netherlands, Sweden, United Kingdom) providing such information in their reports. Additionally, Belgium provided further data under the Stockholm Convention. Based on the available data, water and residue are the second most significant emission vectors after air.

UNECE review of POPs emission inventories (2012)

A 2012 review⁴ of all POPs emission inventories submitted to the UNECE was carried out on behalf of the Centre for Emission Inventories and projections (CEIP). This review identified major and minor sources for each POP. Comparison was then made to the reported emission inventories to check what major sources were missing; what the major source was in each inventory for each POP; and other consistency checks.

The CEIP review highlighted significant inconsistencies between inventories across the UNECE with a lack of transparency in estimates derived and further need for clarity on the emission factors and estimates in use. The review indicated that the dioxins and furans and PAHs inventories had the greatest completeness and consistency, whilst PCBs and HCB had greater data issues.

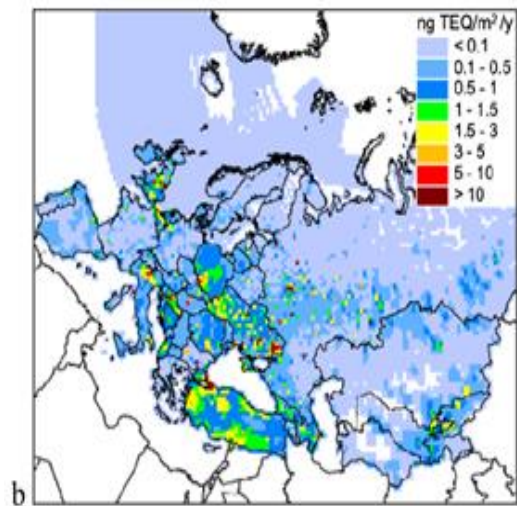
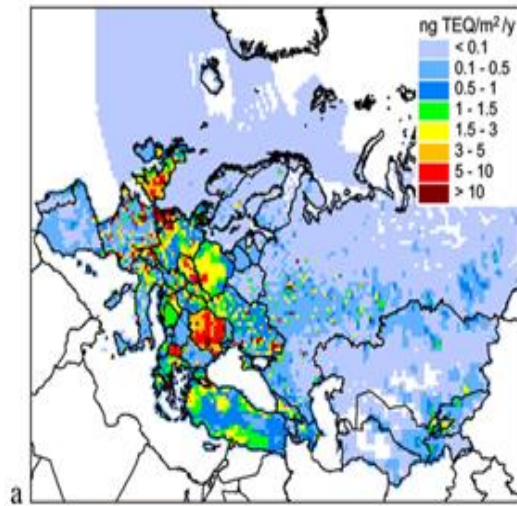
Only four Member States (Croatia, Hungary, Ireland, United Kingdom) made estimates for PCBs relating to the use of di-electric equipment, which is the biggest commercial use of PCBs. For HCB it was noted that 6 Member States (Belgium, Cyprus, Ireland, Netherlands, Portugal, Sweden) out of the 28 that reported to the UNECE had inventories of HCB made up of three or fewer sources. Given the potential for HCB to be generated through combustion, this can indicate poorly developed inventories.

⁴ Mareckova et al, 2012, 'Inventory Review 2012 - Review of POP emission inventories', report by the Centre for Emission Inventories and Projections (CEIP)

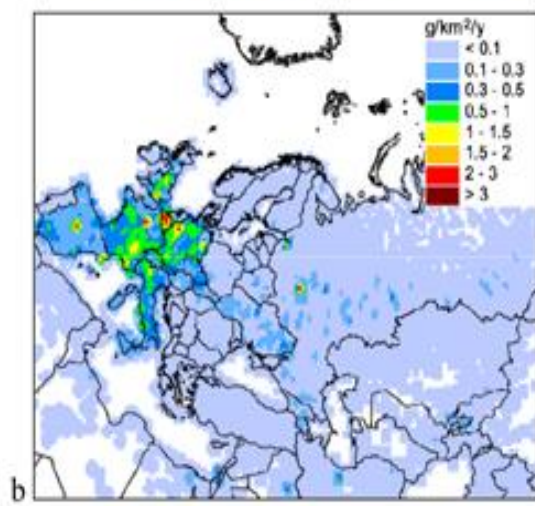
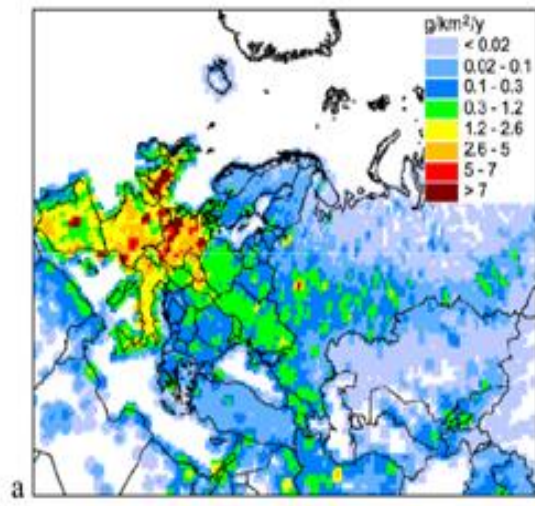
Figure 1: EMEP Monitoring Maps for Europe

(Diagram a presents 1990 and diagram b presents 2012 air concentrations)

Dioxins and Furans



Polychlorinated Biphenyls



4. Activities to promote knowledge exchange

Only 17 Member States (Belgium, Bulgaria, Cyprus, Czechia, Estonia, Germany, Finland, France, Hungary, Ireland, Lithuania, Netherlands, Poland, Romania, Slovenia, Sweden, United Kingdom) provided full triennial reports, compared to 22 Member States that responded in time for the second synthesis report. Four Member States did not provide any annual or triennial report for the current reporting period. This has made it impossible to get a complete picture of the activities of Member States concerning knowledge exchange, public involvement and awareness.

All of those that provided data indicated that systems had been put in place to allow knowledge exchange and dissemination of information. Three Member States (Bulgaria, Slovenia, United Kingdom) commented that they made use of their knowledge exchange networks to fully engage with stakeholders in the development of national implementation plans to ensure that industry, academia, non-government organisations and the general public were involved and had the opportunity to contribute to the work.

The European Union and twelve Member States (Belgium, Czechia, Germany, Finland, France, Ireland, Netherlands, Poland, Slovenia, Spain, Sweden, United Kingdom) provided either financial or technical support for the work on elimination of POPs during the 2010-2013 period. This has largely been through organised schemes such as the Global Environment Facility (GEF) or the voluntary trust fund of the Stockholm Convention.

Alongside support to global schemes, many Member States also informed on national initiatives that had been carried out, which included:

- hosting workshops and conferences for international experts;
- funding of research programmes for work on waste POPs in Africa;
- funding of Arctic monitoring research programmes;
- bi-lateral communication and knowledge-building with non-EU countries; and
- research programmes on the presence of POPs in Eastern European States.

Member States also commented on work to build awareness and engage with the general public. Activities to promote awareness of the issues surrounding POPs had been put in place using a number of initiatives such as:

- production of information to be disseminated to the general public;
- workshops and seminars for stakeholders organisations;
- public awareness campaigns and questionnaires to seek feedback from the general public.

5. Conclusions

The third synthesis report covers all required aspects of the initial POPs Regulation (EC) No 850/2004 and its implementation in the Union and at Member State level. This 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

The POP Regulation prohibits the production, placing on the market and use of POPs in the Union. Only very few exemptions are granted by the Regulation, mainly for production and use of PFOS. The only Member State that still produced PFOS during the reporting period was Germany. About 35% of the produced quantity of around 9 tonnes per annum were used in the country and 65% were shipped to other countries, mainly countries outside the EU.

Emissions

In general, the regulatory measures established by and implemented through the POPs Regulation show the expected effects since emissions of chemicals listed in the POPs Regulation are declining in the Union.

For dioxins and furans, the data demonstrate that the atmospheric emissions were reduced by 45% between 1990 and 2012 across the EU. For PCBs, emissions were overall about 50% lower in 2012 as compared to 1990. The average annual emissions of PAHs were estimated to be 37% lower in 2012 compared to 1990. Emission estimates for HCB from 1990 to 2012 illustrated a decline of annual emissions of 54% by 2012. These data are corroborated by EMEP emission estimates, which show in general a more important decline during the same period.

However, this general trend was not observed in all Member States, where in some cases emissions increased. This shows that further efforts are needed to achieve the objective of zero emissions (see Table 1).

The emission estimates data submitted by Member States showed a high degree of heterogeneity, which made it very difficult to aggregate and compare the data amongst Member States and at regional or global level. A better harmonisation of data formats would be very useful and improve the value of submitted data. Under the new POPs Regulation (EU) 2019/1021, the heterogeneity of data will be addressed by using a common template for reporting.

Monitoring

The POPs monitoring data from EMEP and AMAP and corresponding data generated by models confirm the trends observed for emission estimates. All data sources indicated a declining trend in ambient air concentrations over the period 1990 to 2012 across Europe. In general, equivalent results were obtained at global level, which indicates that the Stockholm Convention achieves its objectives. However, it should be noted that the vast majority of data reflects the situation for air, whereas very little information is available for water and soil. In order to get a more complete picture, it is necessary to invest more in the generation of data for these two media.

Stockpiles and waste

Stockpiles of POPs or products that contain POPs already manufactured but no longer permitted for use have to be managed as waste. Provisions on waste management include that any contamination of waste by POPs shall be avoided and that POPs contained in waste shall be destroyed.

The waste management was a challenge of diverging importance for Member States and depending on the nature of the waste. In particular the presence of POPs in products that are suitable and interesting for recycling is becoming an increasing issue for waste management since recycling of POPs is forbidden by the Stockholm Convention.

Contaminated sites

The POPs Regulation covers management of wastes contaminated with POPs, which is closely linked with a potential contamination of land, if the waste is not properly managed. There is in particular a potential problem of soil contamination where POPs were previously manufactured and used. A number of Member States already addressed this issue in their national implementation plans, but further efforts are needed to identify, inventory and remediate contaminated sites, including a better coordination and cooperation at Union level. To improve the exchange of information on measures that target contaminated sites, the new POPs Regulation (EU) 2019/1021 requests Member States and the Commission to exchange information to that effect.

Data quality and coherence

The emission inventory estimates illustrate that there are potential issues between different estimates from different Member States that make a comparison very difficult or even impossible. One important problem is that Member States do not follow harmonised approaches in data gathering and reporting. In addition, there is indication of a high variability in completeness of data which probably leads to underreporting by many but not all Member States. Greater support and communication amongst Member States would help addressing some of these issues. The sections on knowledge exchange and technical support highlighted that many initiatives are underway but Member States are mostly working in isolation, making the impact of their activities less significant.

Bi-lateral initiatives (communication and knowledge building between Member States and with non-EU countries) may be helpful, in particular for additional support, review and benchmarking of emission inventory estimates. The systematic use of the Information Platform for Chemical Monitoring (IPCHEM) for the storage, processing and management of POPs monitoring data stipulated in the new POPs Regulation (EU) 2019/1021 is expected to improve the quality and coherence of such data.