Guidance for strengthening regulatory framework and voluntary agreements for regular monitoring of products or articles that may contain new POPs

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Abbreviations

ASR	Auto Shredder Residue
ASYCUDA	Automated SYstem for CUstoms DAta
BAT/BEP	Best Available Techniques/Best Environmental Practices
BFR	Brominated Flame Retardant
CAS number	Chemical Abstract Service number
c-OctaBDE	commercial Octabromodiphenyl ether
c-PentaBDE	commercial Pentabromodiphenyl ether
CRT	Catode Ray Tube
DecaBDE	Decabromodiphenyl ether
DGDs	Decision Guidance Documents
EEE	Electrical and Electronic Equipment
ELV	End-of-Live Vehicle
EPDs	Environmental Product Declarations
FR	Flame Retardant
GADSL	Global Automotive Declarable Substance List
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
HBB	Hexabromobiphenyl
HBCDD	Hexabromocyclododecane
HS code	Harmonized System code
ICSMS	Information and Communication System for Market Surveillance
IMDS	International Material Data System
JAMP	Joint Article Management Promotion Consortium
MSDS	Material Safety Data Sheet
NIR	Near Infrared
PBB	Polybromodiphenyl
PBDE	Polybrominated diphenyl ether
PBDD/PBDF	Polybrominated dibenzo-p-dioxins and polybrominated dibenzofurans
PCB	Polychlorinated biphenyl
PCDD/PCDF	Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans
PET	Polyethylene terephthalate
PFOS	Perfluorooctanesulfonic acid or Perfluorooctane sulfonate
PFAS	Perfluoroalkyl and Polyfluoroalkyl Substances
POPs	Persistent Organic Pollutants
POPRC	Persistent Organic Pollutants Review Committee
PUR	Polyurethane
PWB	Printed Wiring Board

PXDD/PXDF	Polybrominated-chlorinated dibenzo-p-dioxins and dibenzofurans
RAPEX	Rapid alert system for all dangerous consumer products (EU)
REACH	Registration, Evaluation and Authorisation of Chemicals
TCPA	Tetrachlorophthalic Anhydride
UPOPs	Unintentionally produced POPs (PCDD, PCDF, PCB, HCB, and PeCB)
WEEE	Waste Electrical and Electronic Equipment
XRF	X-ray fluorescence
XRT	X-ray transmission

1. Introduction and objective

1.1 Scope of this guidance

Obtaining information on the presence of new POPs as substances, in products, and in articles on the national market and in imported goods is essential for the enforcement of regulations aimed at restricting and eliminating POPs. The collection of such information on a regular basis by the relevant authorities is facilitated by the existence of an adequate regulatory framework for the monitoring of products and articles that contain POPs. For some POPs which are still produced and have exemptions for production and use (e.g. PFOS or endosulfan), the entire life cycle needs to be controlled including production, import, use, recycling, and the end-of-life phase.

Such a framework should also promote among competent authorities the exchange of information collected at different stages of the life cycle of products and articles. In addition, in light of the globalized nature of the supply chains of products and articles that contain POPs, obtaining up-to-date information on such products and articles can be facilitated by regional and international schemes for information exchange.

Only a relatively few countries are producers and exporters of POPs. For most countries POPs entered and still enter the country by import of chemicals, products, and articles. Therefore the monitoring of POPs in imports is crucial for their control.

Some of the key newly listed POPs were or continue to be included in consumer goods (e.g. POP-BDE as flame retardants in electronics or transport; PFOS in carpets, paper, leather, or textiles), and their use and presence in these material flows need to be monitored and managed. In addition to imported articles/ products, this includes the monitoring and management of articles in use, stockpiles, and end-of-life. A range of these articles/products can return to the market either as second hand articles (e.g. electronics, cars, carpets, furniture) or as material in the recycling flow (e.g. polymers from electronics, polyurethane foam from furniture, material recycling of textiles, paper, or synthetic carpets). Therefore, information on monitoring data from these materials is also crucial to get an overall picture of newly listed POPs in the material flows including product/article and recycling flow.

The overview on the stocks and flows of newly listed POPs in a country should be established within the inventory phase. Methodologies for the inventories of new POPs have been developed (see *Guidance for the inventory of PFOS and related chemicals* and *Guidance for the inventory of PBDEs listed under the Stockholm Convention*). For some of the flows updating the inventories for reporting purposes might be sufficient for the regular monitoring (e.g. PBDE in articles in use or waste management), while for other flows more frequent monitoring might be necessary for regular monitoring (e.g. import and use of articles possibly containing PFOS).

The objective of this guidance document is to assist Parties in developing a regulatory framework and monitoring concept that can facilitate monitoring of products and articles that contain POPs. The document includes guidance on key issues to consider for the enforcement of regulations under such a framework. With the development of a framework for monitoring and identification of new POPs, the provisions of the Stockholm Convention on new POPs can be enforced. This in turn protects consumers from the risks arising from the exposure to POPs and increases their confidence in products on the market. If appropriately communicated to the consumers and by possibly including them in a bi-directional information exchange, their awareness on new POPs can be increased and might contribute to overall awareness on POPs.

1.2 Reasons to change the life cycle and regulatory frameworks of POPs

Developing countries and countries with emerging economies have experienced large challenges with the end-of-life management of POPs including, for example, their PCB stockpiles and POPs pesticide stockpiles. The export of POPs contaminated materials is expensive and the management of the 3 million

tonnes of PCB containing equipment alone might be estimated to have management costs of USD 6-15 billion worldwide (calculated with treatment costs of USD 2-5,000 per tonne.[1]

The same is true for the large pesticide stockpiles in Africa (50,000 tonnes with an estimated management cost of USD 250 million)[2] and East Europe/Asia (estimated to 240,000 tonnes with an estimated management cost of USD 1 billion). Therefore, the 10 years of Stockholm Convention activities have revealed that end-of-pipe solutions for POPs, in particular for developing and transition countries, cannot be considered a sustainable solution.

Furthermore, the non-environmentally sound management of POPs at production sites, during use, and in end-of-life treatment have created large POPs contaminated sites and huge deposited waste where management and remediation costs can even hardly be managed by industrial countries.[3]

The situation is also similar for most of the new POPs:

- Comprehensive monitoring of PFOS in ground water in recent years revealed large contaminated sites from production[4] and application of fire-fighting foams[5]
- The end-of-life management of PBDE containing e-waste has resulted in contaminated sites with PBDE, brominated- and brominated-chlorinated dioxins as key pollutants[6]
- The production of lindane and HCH have generated large contaminated sites at production sites with threats to human health and the environment[7]
- The production of certain chlorinated solvents and some other organochlorines have generated large contaminated sites and stockpiles of PeCB/HCB[8]

A considerable share of new POPs in consumer products are disposed to landfills and dumps at the end of their useful life with the risk for current and future releases and associated environmental contamination and human exposure.[9] In particular for developing countries where landfills normally do not have lining systems or treatment of leachates, the landfilling of POPs containing waste represents unsustainable burdens for the next generations.

Furthermore, for some of the new POPs crucial impacts on public health have been demonstrated: for

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[1] Stockholm Convention (2010) PEN Magazine, Issue 01, 12/2010.

[2] World Bank (2002) AFRICA: Africa Stockpiles Program (ASP): Funding the Prevention and Disposal of Obsolete Pesticides from African Countries Work Program Inclusion – Resubmission – (FAO – World Bank Co-Submission) Project Brief 11th September 2002. New York: World Bank.

[3] Weber et al, (2008) Dioxin- and POP-contaminated sites—contemporary and future relevance and challenges. Env Sci Pollut Res 15, 363-393 (2008). http://www.springerlink.com/content/0q10km8582605r1x/fulltext.pdf

[4] Oliaei et al (2006) Investigation of Perfluorochemical (PFC) Contamination in Minnesota Phase One. Report to Senate Environment Committee, February 2006. http://www.nikwax.com/cmsdata/Downloads/pr/7-investigation_PFC_minnesota.pdf

US EPA (2011) PFC Contamination near Decatur/Alabama http://www.epa.gov/region4/water/PFCindex.html

Kröfges et al (2007) PFOS/PFOA contaminated megasites in Germany polluting the drinking water supply of millions of people. Organohalogen Compd. 69, 877-880. http://www.dioxin20xx.org/pdfs/2007/07-634.pdf

[5] Moddy & Field (2000) Perfluorinated Surfactants and the Environmental Implications of Their Use in Fire-Fighting Foams. ES&T 34, 3864-3870.

[6] Yu et al. (2008) E-waste recycling heavily contaminates a Chinese city with chlorinated, brominated and mixed-halogenated dioxins. Organohalogen Compounds 70, 813-817 http://www.dioxin20xx.org/pdfs/2008/08-367.pdf

[7] Vijgen et al (2011) HCH as new Stockholm Convention POPs – a global perspective on the management of Lindane and its waste isomers. Env Sci Pollut Res. 18, 152-162 (2011). http://www.springerlink.com/content/g62g810418512421/fulltext.pdf

Vijgen J (2006a) The legacy of lindane HCH isomer production. Main report. IHPA, Holte, January 2006 http://ew.eea.europa.eu/Agriculture/Agreports/obsolete_pesticides/lindane_production.pdf

[8] Weber et al. (2011) Unintentionally produced hexachlorobenzene and pentachlorobenzene POPs waste from solvent production – the need to establish emission factors and inventories. Organohalogen Compounds 73, 2205-2208. http://www.dioxin20xx.org/pdfs/2011/5002.pdf

[9] Weber et al (2011) Persistent Organic Pollutants and Landfills - A Review of Past Experiences and Future Challenges. Waste Manag. Res. 29 (1) 107-121. http://wmr.sagepub.com/content/29/1/107.full.pdf

example, low sperm quality in young Danish men showed a significant correlation with PFOS (and PFOA) levels.[10] A cohort study monitored the development of more than 150 U.S. children over six years and associates prenatal exposure to higher concentrations of PBDE flame retardants with lower scores on tests of neurodevelopment. The children with higher levels of PBDE exposures consistently had, on average, lower developmental scores.[11] An external cost of health damage from PBDE exposure for California alone was estimated to exceed USD 55 billion.[12]

These two examples highlight that exposure and contamination with some of the newly listed POPs results in a significant impact on human health in societies. Chlorinated, brominated, and fluorinated POPs and other persistent bioaccumulative substances have resulted in considerable contamination of human milk and blood and more than 300 industrial chemicals can be detected.[13] High concern exists here on the effects of this toxicological mixtures[14] and the POPs Review Committee (POPRC) has ongoing work on the effects of POP mixtures.

Therefore, in particular for transition and developing countries, the management of POPs needs a paradigm shift from end-of-life management to the monitoring and control of POPs and other critical chemicals along their life cycle stages and their final substitution in production. As long as they are still produced and several uses are exempted, appropriate monitoring and environmentally sound management need to be established. Such responsibility lies mainly within the governments, competent authorities, and other stakeholders to develop appropriate regulatory frameworks for monitoring and managing new POPs along their life cycle. In such regulatory frameworks, extended producer responsibility schemes need to be included as an incentive for the industrial stakeholders to shift as soon as possible to more sustainable alternatives.

1.3 Key features and overview of this guidance

An overview on the information and approaches described in this guidance is given in Figure 1, below. A short description of the key features of each section of this document is also presented below.

The regulated POPs, the POPs legally on the national market and the POPs legally traded between parties are described in Section 2. That several new POPs and related products/articles can have exemptions for use in a country need to be considered when monitoring and managing them.[15] However, also the information on these legally traded articles/ products is valuable and should be forwarded to the focal points compiling data at the national level (and if the information is relevant for other countries forwarded to the Secretariat of the Stockholm Convention as well).

A wide range of products and articles can contain new POPs and needs to be addressed in a systematic way along the life cycle in order to get a detailed picture on new POPs possibly present in imports, on the national market, and in recycling schemes and waste management. Key products and articles containing new POPs and the main stakeholders monitoring them are described in Section 3.

To get an overview of the national situation, different stakeholders within a country need to identify the newly listed POPs for different purposes. An overview of the stakeholders and their role are given in Section 4. Different tools and different levels of monitoring are also described (see Figure 1; Section 4).

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[10] Joensen et al. (2009) Do Perfluoroalkyl Compounds Impair Human Semen Quality? EHP 117:923–927. http://ehp03.niehs.nih.gov/article/info%3Adoi%2F10.1289%2Fehp.0800517

[11] Herbstman et al. (2010) Prenatal exposure to PBDE and neurodevelopment. Environ Health Perspect 118(5): 712-719. http://ehp03.niehs.nih.gov/article/fetchArticle.action?articleURI=info%3Adoi%2F10.1289%2Fehp.0901340

[12] UNEP (2010) Technical review of the implications of recycling commercial penta and octabromodiphenyl ethers. (UNEP/POPS/POPRC.6/2)

[13] BUND & FoE (2005) Toxic inheritance. http://www.foeeurope.org/publications/2006/toxic_inheritance.pdf

[14] Bergman A (2010) http://sustainability.formas.se/en/Issues/Issue-5-December-2010/Content/Focus-articles/How-polluted-is-our-environment/
Stefan Jarl (2010) Submission http://www.underkastelsen.se/

[15] Articles/products containing new POPs, but having an exemption, need environmentally sound management at the end-of-life and exposure to humans and the environment during their useful life needs to be considered and minimized.

While information on new POPs might come from the assessment of declaration paper or labels during import or placing on the market (e.g. from chemical/product names, GHS labelling, CAS numbers, HS codes), a range of gaps for the monitoring and management of new POPs still exist. Tools and regulatory frameworks for identification of chemicals (and related gaps) to facilitate the control of import/export of new POPs or the monitoring of products and articles possibly containing new POPs are described in Annex 1. Voluntary schemes for identification of chemicals in articles (and related gaps) to facilitate the control of import/export and monitoring of articles possibly containing new POPs are described in Annex 2.

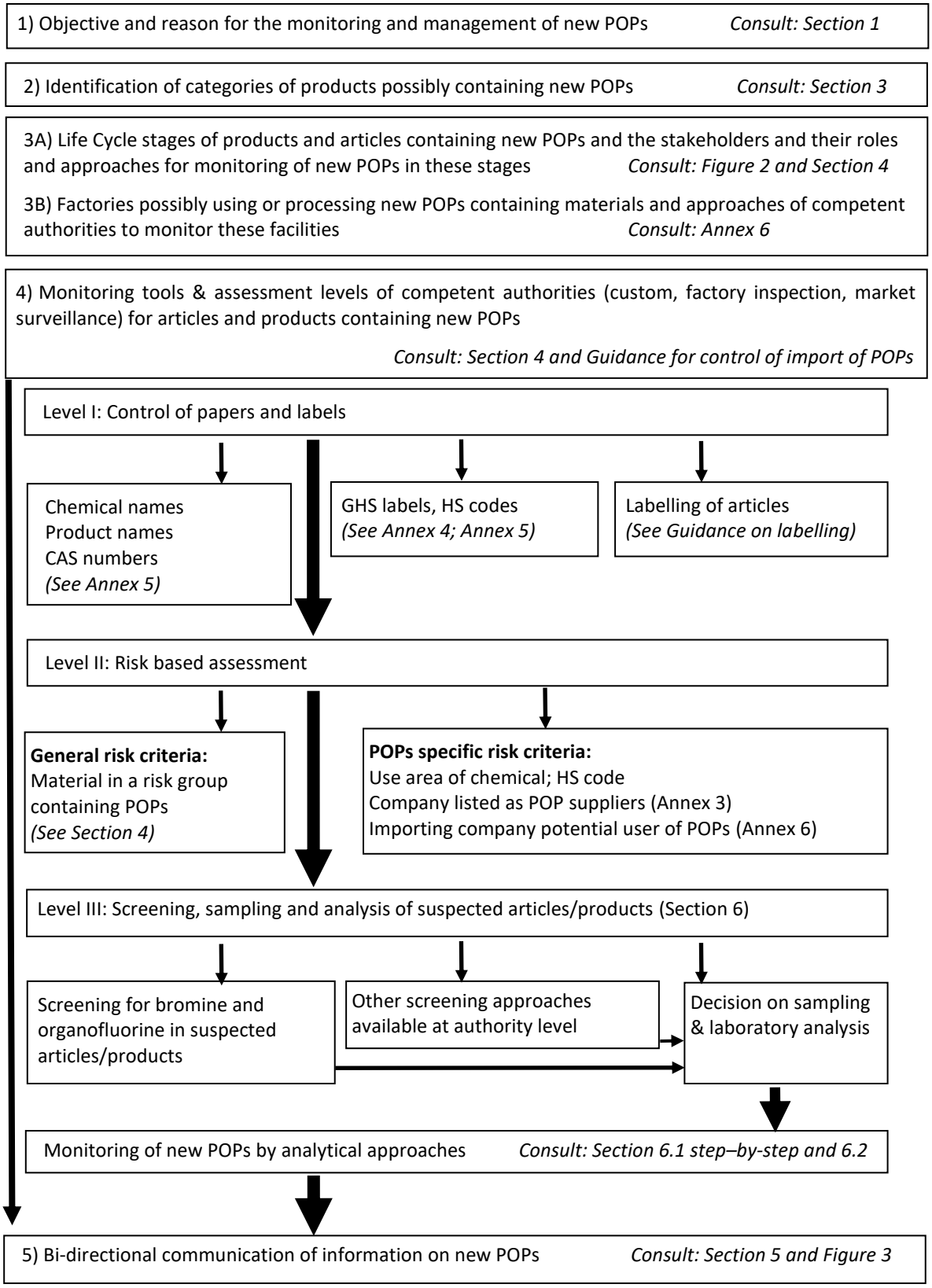
The gaps elaborated for the existing tools (Annex 1 & 2) and the lacking information on new POPs in articles in use, reuse, and recycling requires that further information needs to come from monitoring of products and articles by analytical means including screening and confirmation methods (see Section 6). An overview of the step–by-step approach for analysis of new POPs is given in Section 6.1 and some details on analytical screening for the individual new POPs are provided in the other subsections of Section 6.

After validation of data from the different monitoring approaches, the information can be included in a database on new POPs in products and articles and a bi-directional information system for wider communication (Section 5). The communication between the individual stakeholders will facilitate the gathering and compilation of information and therefore an optimized use of resources. To facilitate an efficient communication between the stakeholders and an effective distribution of relevant information, a bi-directional information system should be established. This is briefly outlined in Section 5. Relevant information on the new POPs, gathered at the national level, should be forwarded to the Secretariat of the Stockholm Convention in accordance with Article 9 on reporting and possibly communicated on a regional level.

Significant monitoring activities are conducted during the establishment of new POPs inventories. All valuable information generated during the inventory activities should be entered into a database and the relevant information should be stored and made available and accessible to the different stakeholders. While the set-up of a meaningful monitoring scheme for new listed POPs and related substances on country level would be desirable, limitations on monitoring/analytical capacity (see Section 6) for some new POPs categories (which requires sophisticated analytical instruments and might not be available for some time in a country or even in regions) will also limit the available approaches for the respective country or region. These challenges also require the close cooperation of different stakeholders including possible collaboration between governmental institutions, industry, and research institutions. The approaches for different regions and countries might vary. In all cases, a systematic generation of data and monitoring of products/articles should be considered and guaranteed at least on regional levels, generating information for the countries in the respective regions.

Therefore, regional and global activities should possibly be linked with the national approaches on new POPs monitoring, in particular for countries with limited capacity of new POPs analysis. Information generated in other countries or regions can largely compensate for the lack of analytical capacity if the bi-directional communication system gathers and provides such information on a regional and global scale so that the necessary information to monitor and control new POPs in products and articles becomes available for each country (Section 5).

Figure 1: Overview of key information in this guidance document and decision tree elements for monitoring of new POPs in the different life cycle stages for different actors



2 Introduction to the control of legal obligations for import of POPs

The identification of banned or severely restricted (newly) listed POPs as substances, in mixtures, and as appropriate, in articles during production, import, and use/presence in the country, and during export is mandatory for all Parties and essential for the success of the Convention.

2.1 Regulated POPs

The POPs listed in Annexes A and B of the Convention as substances, in mixtures, and articles containing these POPs are regulated by the Convention.[16] In addition, chemicals, products, and articles that contain unintentionally the listed POPs in a concentration higher than a trace contaminant (trace contaminant concentration needs to be determined) are regulated. That means that the following are regulated (i.e. banned or restricted globally) by the Stockholm Convention:

- a listed POP as a chemical substance
- a mixture produced by intentionally adding a listed POP
- an article produced by intentionally adding a listed POP
- a non POP chemical that due to its production contains a listed POP unintentionally as a contaminant in a concentration higher than a trace contaminant
- a mixture produced by intentionally adding a non POP chemical that due to its production contains a listed POP unintentionally as a contaminant in a concentration higher than a trace
- an article produced by intentionally adding a non POP chemical that due to its production contains a listed POP unintentionally as a contaminant in a concentration higher than a trace

Depending on national legislation, the content of unintentionally produced POPs (listed in Annex C of the Convention) in articles and products can also be regulated and products and articles containing these POPs then can also be banned or restricted on the respective market.

2.2 POPs legally on the national market

Based on the analysis of the Annexes A and B listing of POPs, the following newly listed POPs can legally be on the market (can be traded on the territory) of a Party if notifications for exemptions have been made[17]:

- *Lindane*: No production; use allowed for registered specific exemption
- *Endosulfan*: Production for allowed use; use allowed for registered exemption for specific crop/pest complex. This applies to Parties from 27 October 2012 onwards
- *DDT*: Production for allowed use; use allowed for notified acceptable purpose. The production and use of DDT should be in accordance with the World Health Organisation recommendations and guidelines on the use of DDT
- *Commercial PentaBDE (tetrabromodiphenyl ether and pentabromodiphenyl ether) or OctaBDE (hexabromodiphenyl ether and heptabromodiphenyl ether)*: Recycling of articles containing commercial PentaBDE or OctaBDE and the use and final disposal of articles produced from these recycled materials containing commercial PentaBDE or OctaBDE are allowed where the Party has notified the Secretariat of its intention to make use of this exemption and the provisions in Annex A, Part IV and V 1a, 1b, 1c are followed
- *PFOS, its salts, PFOSF and PFOS related chemicals as substances, in mixtures, and in articles containing these chemicals*: Production for allowed uses, use allowed as substances, in mixtures and in articles containing these chemicals for registered specific exemptions and notified acceptable purposes. Parties that produce and/or use these chemicals shall take into account, as appropriate,

[16] See: http://chm.pops.int/Convention/ThePOPs/tabid/673/Default.aspx
[17] http://chm.pops.int/Implementation/Exemptions/SpecificExemptions/tabid/790/Default.aspx

guidance such as that given in the relevant parts of the general guidance on best available techniques and best environmental practices given in Part V of Annex C of the Convention. PFOS related chemicals are chemicals that contain the structural element PFOS in their molecular structure as they are and were produced with perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF) as an intermediate or starting material.

2.3 POPs legally traded between Parties

An analysis of the newly listed POPs and DDT shows that only the following chemicals as substances, in mixtures, or in articles are allowed to be traded between Parties involving export from one Party and import into another Party:

- *Lindane*: Trade of lindane for allowed use and of a mixture containing lindane provided the importing Party and exporting Party have registered the specific exemption for lindane
- *Endosulfan*: Trade of endosulfan as a substance is allowed provided the exporting Party has registered the production for a crop/pest complex in the register for specific exemption and the importing party has registered the use for the same crop/pest complex. Trade of a mixture containing endosulfan is allowed provided the exporting Party and importing Party have registered the use for the same crop/pest complex
- *DDT*: Trade of DDT as a substance is allowed provided the exporting party has notified the intention to produce it to the Secretariat and the importing Party has notified the intention to use DDT for the acceptable purpose to the Secretariat. Trade of a mixture containing DDT is allowed provided the exporting Party and the importing Party have notified the intention to use DDT for the acceptable purpose to the Secretariat
- *Commercial PentaBDE (tetrabromodiphenyl ether and pentabromodiphenyl ether) or OctaBDE (hexabromodiphenyl ether and heptabromodiphenyl ether)*: Trade for articles in use containing commercial PentaBDE or commercial OctaBDE is allowed provided the type of article is notified to the Secretariat by the exporting Party and importing Party and the exporting as well as the importing Party have notified the exemption for recycling to the Secretariat. The exporting Party should take steps to prevent exports of such articles that contain levels/concentrations of commercial PentaBDE or commercial OctaBDE exceeding those permitted for the sale, use, import, or manufacture of those articles within the territory of the Party
- *PFOS, its salts, PFOSF and PFOS related chemicals as substances, in mixtures, and in articles containing these chemicals*: (i) Trade of PFOS, its salts, PFOSF and PFOS related chemicals as a substance is allowed provided the exporting Party has registered the substance for the production for a certain specific exemption or notified its intention to produce the substance for a certain acceptable purpose and the importing Party has registered the use for the same specific exemption or the importing party has notified the intention to use the substance for the same acceptable purpose. (ii) Trade is allowed for PFOS, its salts, PFOSF and PFOS related chemicals contained in a mixture or in an article provided the exporting Party has registered the mixture or the article for a certain specific exemption or notified its intention to use the mixture or the article for a certain acceptable purpose and the importing Party has registered the use of the mixture or the article for the same specific exemption or the importing Party has notified the intention to use the mixture or the article for the same acceptable purpose. (iii) Trade is not allowed for articles containing PFOS, its salts, PFOSF and PFOS related chemicals for a non-registered specific exemption or for a non-notified acceptable purpose or for another use not listed in Annex B under specific exemptions and acceptable purpose. (iv) Parties that produce and/or use these chemicals shall take into account, as appropriate, guidance such as that given in the relevant parts of the general guidance on best available techniques and best environmental practices given in Part V of Annex C of the Convention

Additional information on the regulation of POPs by the Stockholm Convention can be found in *Guidance for the control of the import of POPs and* Annex 1 of that guidance.

3 Chemicals and products consisting of and articles containing new POPs, POPs as trace contaminants, and strategies for their monitoring

3.1 Introduction

POPs are chemicals that are produced and marketed nationally and internationally as substances, or contained in mixtures and articles. Provisional definitions[18] of chemical substance, chemical product, mixture, article are:

- *Chemical substance* – characterized by following an agreed system of nomenclature such as a standardized IUPAC name, and/or a unique Registry Number and a CAS Index Name
- *Chemical product* – a substance and/or a mixture/preparation of chemical substances with certain percentages or percentage ranges of the chemical substances
- *Article* – an object which during production is given a special shape, surface or design, which determines its function to a greater degree than does its chemical composition. Examples of articles possibly containing newly listed POPs are a car (PentaBDE in polyurethane foam in seat), an airplane (PentaBDE in upholstery of seats; PFOS in hydraulic oil), a computer (c-OctaBDE in polymers), and a textile (c-PentaBDE as flame retardant; PFOS related chemical for surface treatment)

In this section, for the individual new POPs the most relevant products and articles which warrant monitoring are briefly described. The assessment is described along the life cycle stages − production, industrial use, commercial products, recycling, and end-of-life − for the new POPs. An overview of the stakeholders responsible for the monitoring of new POPs along the life cycle is given in Figure 2. The individual stakeholders responsible for the monitoring and their role are described in Section 4. Additionally, specific stakeholders responsible for the particular products/articles are briefly mentioned in this section.

For certain uses, a country might have registered for exemptions or acceptable purposes. The exemptions and the counties having applied are listed on the website of the Stockholm Convention.[19] The individual listings need to be considered in the monitoring strategy of the individual uses.

3.2 PFOS and PFOS related chemicals in products and articles

Since PFOS is still produced and a range of uses are exempted, this POP and related substances need to be monitored along the entire life cycle of products and articles. (Note: Countries might have applied for specific exemptions and acceptable purposes for using PFOS in certain applications. Further information on the situation can be retrieved from the National Focal Point of the Stockholm Convention.)

PFOS and approximately 160 related chemicals have historically been produced and used. These substances together with their chemical names and CAS numbers are compiled in Annex 5. The CAS numbers and chemical names should be used for the monitoring of PFOS and related chemicals where appropriate in the areas of PFOS containing articles elaborated below.

The main stakeholders to monitor the import and presence of PFOS and related chemicals are customs, competent authorities monitoring products/articles and assessing industries, and the individual industries using PFOS and related chemicals.

PFOS and related chemicals were applied in a wide range of industries. Today the main users are most probably four main industries (metal plating, semiconductor industry, insecticide production (sulfluramid formulations), and possibly fire-fighting foam) while other industries have already largely changed to alternatives or are only minor users. These preliminary estimations need to be assessed and verified/falsified for the possibly PFOS-using industries and will be done in the establishment of national inventories where the use of PFOS in applications, products, and articles (see below) will be compiled.

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[18] Other definitions are given in Annex 1 of the *Guidance for the control of the import of POPs*.

[19] http://chm.pops.int/Implementation/Exemptions/SpecificExemptions/tabid/790/Default.aspx

3.2.1 PFOS and related chemicals in production and as products

PFOS and related chemicals are produced in several countries (e.g. China, Germany, and Italy). The trade names of products and their use and – if the company agrees – the production volume should be collected by the respective competent authorities or the NIP focal point and forwarded to the Stockholm Convention Secretariat.

Furthermore, customs in cooperation with the local competent authority should monitor the export of PFOS and related chemicals so that they are only sent to countries that have applied for exempted uses. Also, the authorities should evaluate the products for appropriate labelling to enable appropriate monitoring (see *Guidance on labelling of products or articles that contain new POPs or use new POPs during manufacture*).

Depending on the management of production lines, other perfluoroalkyl and polyfluoroalkyl substances (PFAS) might also become contaminated by PFOS and related chemicals. Therefore, other products might be monitored for unintentional trace contaminants of PFOS and related chemicals.

The main stakeholders for monitoring the products from the factories are local competent authorities responsible for factory inspection[20] in cooperation with the industry.

3.2.2 PFOS in fire-fighting foams

Specific fire-fighting foams (aqueous film forming foams (AFFF)) with PFOS or other PFAS are used for extinguishing liquid fuel fires: to suppress fires in flammable liquids like oil, petrol, other not water soluble hydro carbons, and flammable water soluble liquids like alcohols, acetone, etc. They are especially used at installations and plants where large quantities of flammable liquids are stored. The consumption of fire-fighting foams depends on the frequency of fire drills and the rate of fire accidents. The dispersive use of fire-fighting foams represents a risk of high releases to the environment and exposure to humans and is the cause of many contaminated sites.

AFFF foam is listed as an acceptable purpose. Therefore, countries can register for this use which has to be considered then for monitoring. Today, alternatives are available and used. However, PFOS containing AFFF foams are still on the market and one country has listed for an exemption.

The main stakeholders for monitoring of AFFF are customs, local competent authorities controlling installations, and public and industrial fire-fighting services. An appropriate monitoring approach is a national survey of AFFF foams used in cooperation with a national fire-fighting association. In such a survey, AFFF containing PFOS should be inventoried. In particular, the fire-fighting services of the locations listed in Table 1 should be inspected. However, fire-fighting services from the city/region also have AFFF for specific uses and should be assessed. Within the inspection of the AFFF used, the practice areas and areas of major fires where AFFF have been used should also be inspected and reported to the NIP focal point.

[20] The factory inspection should also assess current and former waste management of production residue and related deposits and forward this information to the NIP focal point.

Table 1: Fire-fighting services and locations where AFFF foams are mainly used

- fire-fighting training sites
- airports
- oil refineries
- military areas
- offshore installations, mobile rigs
- onshore gas terminals, onshore installations for gas and oil extraction
- storage facilities at industrial sites
- tank farms
- waste management installations
- hospitals
- car parks
- ships and ferries

3.2.3 Metal plating industries

PFOS related chemicals are mainly used as surfactant/wetting agent/mist suppressants in hard and decorative chrome plating, which can reduce the emission of chromium and improve the working environment in this sector. Besides chrome plating, copper plating, nickel plating, tin plating, plating plastic, and plating with precious metals also possibly use PFOS containing performance chemicals.

PFOS use in metal plating in closed loop systems is listed as an acceptable purpose, and use in hard metal plating and decorative metal plating as a specific exemption. Therefore, countries can register for this use and several countries have already registered.

The main stakeholders to monitor the import and presence of PFOS in PFOS containing performance chemicals of the metal plating industry are customs and in particular the competent authority controlling the plating industries. The association of metal plating industry and individual metal plating industries should be informed and encouraged to participate in a survey of the presence of PFOS and related chemicals in mist suppressant. Besides chrome plating, copper plating, nickel plating, plating of plastics, and plating with precious metals should also be informed and asked for information.

3.2.4 Other relevant industrial uses of PFOS having exemptions

PFOS and related chemicals use in photo imaging, photo resist and anti-reflective coatings for semi-conductors, and as etching agent for compound semi-conductors and ceramic filters have already been asked for as exemptions by several countries.

The main stakeholders to monitor the import and presence of PFOS in PFOS containing performance chemicals for these uses are customs and in particular the competent authority controlling these industries. From the industrial side, the relevant association and individual facilities should be informed and asked for information.

3.2.5 Other industrial uses with specific exemptions, but considered less relevant

Other industrial uses considered less relevant today are: treatment of paper, carpets, textiles, and leather; and PFOS derivatives that may be used as surfactants in the oil and gas industries to enhance oil or gas recovery in wells, as evaporation inhibitors for gasoline, as jet fuel, and hydrocarbon solvents. These uses are listed as specific exemptions and countries can register. However, for these uses, alternatives are available and already mainly used. Since alternatives are often persistent chemicals they also should be assessed.

The related industries include the oil and gas industries, carpet industries, paper industry, textile industry, and leather industry. The main stakeholders to monitor the import and presence of PFOS and related substances in these industries are customs, and in particular the competent authorities responsible for supervision of these industries. Additionally, the industrial stakeholders should be included in the monitoring.

3.2.6 Aviation hydraulic fluids

Hydraulic oils containing PFOS have been used as an anti-erosion additive in civil and military airplanes since the 1970s to prevent evaporation, fires, and corrosion. This use of PFOS is listed as an acceptable purpose. Therefore, countries can register for this use.

The main stakeholders to monitor the import and presence of PFOS in aviation hydraulic fluids are customs, and in particular the competent authorities responsible for repair shops at airports and military air bases. Industrial stakeholders are airlines and workshops at airports using hydraulic oils for airplanes. Other stakeholders may include the military air force of the country and possibly other air forces stationed in the country.

3.2.7 Insect baits and insecticides

A PFOS related substance (sulfluramid[21]) is used as insecticide against ants, cockroaches, termites, etc. The use for control of leaf-cutting ants is listed as an acceptable purpose and the use to control red fire ants and termites is listed as a specific exemption.

The main stakeholders to monitor the import and presence of PFOS related chemicals in insecticides are customs and the Ministry of Agriculture. Competent authorities should check for the presence of sulfluramid containing insecticides at pesticide producers, formulators, and in stores selling pesticides. Industrial stakeholders are companies importing and formulating pesticides.

3.2.8 Articles treated with PFOS and related chemicals

A part of PFOS, PFOS related chemicals and other PFAS might enter a country by impregnated products (see *Guidance for the inventory of PFOS and related chemicals*, Sections 2.4 and 5). This includes articles currently produced and articles in use. This might include:

- *Synthetic carpets*
  - See Section 2.1.3 of *Guidelines on BAT and BEP for the production and use of PFOS and related chemicals*
  - A large share of synthetic carpets has been treated with PFOS and other PFAS for stain resistance
- *Textiles*
  - See Section 2.1.2 of *Guidelines on BAT and BEP for the production and use of PFOS and related chemicals*
  - PFOS and other fluorinated surfactants and polymers have been used to treat textiles and leather to provide oil and water repellency and soil and stain release properties
- *Furniture*
  - See Section 2.1.2 of *Guidelines on BAT and BEP for the production and use of PFOS and related chemicals*
  - In particular coaches, chairs

[21] CAS: 4151-50-2; N-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-1-octanesulfonamide

- *Paper*
  - See Section 2.1.4 of *Guidelines on BAT and BEP for the production and use of PFOS and related chemicals*
  - PFOS and other PFAS containing chemicals were/are used in food contact paper to provide oil, grease and water repellency (see Table 2, below)
- *Leather*
  - See Section 2.1.2 of *Guidelines on BAT and BEP for the production and use of PFOS and related chemicals*

Currently these articles are not labelled to indicate that they contain PFOS or other PFAS (for details on labelling approach see *Guidance on labelling of products or articles that contain new POPs or use new POPs during manufacture*). Therefore, it is currently not possible to discover such articles by labels. For the time being, monitoring approaches using screening are necessary to address potential PFOS impregnated materials.

Table 2: Some categories of food contact paper/packaging possibly using PFOS or other PFAS for oil, grease, or water repellency

- Wrapping paper used for fast food
- Burger boxes, pizza boxes
- Popcorn bags
- Muffin paper cups
- Baking paper, microwave paper
- Paper coffee cups
- Disposable crockery
- Cake and biscuit boxes (longtime storage of fatty foods)
- Sandwich wrapping paper (to wrap lunch boxes)
- Chewing gum cardboard boxes
- Other food packaging

While the impregnated articles listed above are currently not labelled to contain PFOS or other PFAS, an indication for furniture, carpets, textile, or other fabrics that possibly contain PFOS or other PFAS is a "stain resistant" label or advertisement for this property. For paper and paperboards, an indication for possible use of PFOS and other PFAS containing coatings are properties of water, oil, and grease resistance.

The main stakeholders to monitor the import and presence of articles impregnated with PFOS and related chemicals are customs and market surveillance authorities. The industrial stakeholders are companies producing, importing/exporting, or marketing these articles and products.

3.2.9 Further uses of PFOS in products and articles considered less relevant

Some other former PFOS uses that are not considered to be of priority include:

- Industrial and household surfactants
- Paint and varnishes
- Toner and printing ink
- Sealants and adhesive products

However, a country might decide to also assess the current status of the presence of PFOS in these applications and to ensure that PFOS is not used and to evaluate what alternatives are currently used including their environmental/health performance. For a more detailed description of these (former) PFOS applications, see *Guidance for the inventory of PFOS and related chemicals*. The use of PFOS and related chemicals in these applications is not exempted and is therefore prohibited by the Convention.

3.2.10 Monitoring of PFOS in articles in stocks

The historic production of PFOSF from 1970 to 2002[22] is estimated to be approximately 96,000 tonnes and 26,500 tonnes of related production wastes[23]. A large share of the produced PFOS and related chemicals was applied for surface treatment of carpets, textiles, paper, leather, and furniture. Therefore, the stock of PFOS and related chemicals in use and in particular deposited in landfills might have major relevance (in particular when considering the minor use volume today). Therefore, monitoring efforts need also to consider the stocks of articles currently in use. This is addressed in the development of the inventory.

3.2.11 Monitoring of PFOS in reuse and recycling

Guidance for the inventory of PFOS and related chemicals considers carpet recycling as one inventory activity.[24] Other articles (formerly) treated with PFOS are textiles, paper, leather, and textiles on furniture. Of these former relevant PFOS uses, the recycling of furniture and leather seems to be of minor relevance. Paper is recycled to a high degree in some countries, but due to the rather short use phase the paper formerly impregnated largely before 2002 (when 3M stopped such PFOS use) has already entered the recycling chain some years ago.

The main stakeholders to monitor the recycling of PFOS containing carpets (and possibly other materials) are the competent authorities in the waste management sectors. Industrial stakeholders are the carpet (recycling) industry. Stakeholders for the monitoring of reuse of furniture impregnated with PFOS and related chemicals are market surveillance authorities in cooperation with second hand furniture retailers.

3.2.12 Biosolids/Sewage Sludge

Sewage sludge and related biosolids are a final sink for a range of old POPs (e.g. PCB, PCDD/PCDF, HCB) where, for some countries, regulation limits exist. Also, new POPs – in particular PFOS and POP-BDEs – are detected in sewage sludge/biosolids. The application of PFOS/PFAS contaminated biosolids (originating from wastewater treatment plants related to PFOS/PFAS production and industrial use) on agricultural areas have resulted in large scale contaminated sites, e.g. in Germany and the USA (Decatur Alabama)[25] including groundwater and drinking water contamination. In the German case, PFOS/PFOA containing sludge has been imported into the country (Germany) and by further application as biosolid has resulted in large contaminated sites and the contamination of drinking water for approximately 5 million inhabitants.[26]

Therefore, the use and import of biosolids can be a relevant source of PFOS/PFAS. Limit values of 100 µg PFOS+PFOA/kg (0.1 ppm) have been reported for Austria and Germany (North Rhine-Westphalia).[27]

The main stakeholders to monitor the import of biosolids/organic fertilizers are customs. The agricultural ministry to control and monitor the overall use of sewage sludge and other biosolids in the country including imported biosolids/organic fertilizer is also an important stakeholder. Companies exporting or importing biosolids/organic fertilizer need to assure the origin of the biosolids and guarantee certain

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[22] In 2002, 3M ended PFOS production.
[23] Paul et al (2009) A First Global Production, Emission, And Environmental Inventory for Perfluorooctane Sulfonate. ES&T, 43, 386-392.
[24] See Section 2.2.8.
[25] http://www.epa.gov/region4/water/PFCindex.html
[26] Kröfges et al.(2007) PFOS/PFOA Contaminated Megasites in Germany Polluting the Drinking water Supply of Millions of People. Organohalogen Compd. 69, 877-880. http://www.dioxin20xx.org/pdfs/2007/07-634.pdf
[27] ESWI (2010) Study on waste related issues of newly listed POPs and candidate POPs. Update 13 April 2011.

pollutant levels including (new) POPs and heavy metals.

3.3 Commercial PentaBDE and OctaBDE in articles and products[28]

Since production of c-PentaBDE and c-OctaBDE is considered to have stopped in 2004, the monitoring can largely concentrate on articles and products in use, recycling, and end-of-life.

For c-OctaBDE, the material flow with the largest amount of c-OctaBDE content are certain polymers used in Electronic and Electric Equipment (EEE) and related Wastes (WEEE).[29] Large amounts of EEE and WEEE were and are exported from industrial countries with former major use of c-OctaBDE (e.g. USA and Europe) to developing countries. Furthermore, polymers from recycling of WEEE are partly sent for recycling to developing countries (e.g. China or India). Recent studies have shown that recycled polymers containing PBDE have been used to produce articles for which no flame retardancy is required including, for example, children's toys, household goods, and video tapes.[30] This shows that the flows of polymers containing PBDEs for recycling are not well controlled and need to be monitored and better managed.

For c-PentaBDE, the main use was PUR foam in transport (cars, buses, trains, etc.) and furniture. Therefore, the reuse and recycling of these two major material flows need to be monitored.

Details on the POP-BDE material flows are given in the *Guidance for the inventory of PBDEs listed under the Stockholm Convention* and *Guidelines on BAT and BEP for the recycling and waste disposal of articles containing PBDEs listed under the Stockholm Convention*.

Considering these major uses of c-PentaBDE and c-OctaBDE, the following reuse of articles and goods and recycling flows need to be assessed in imports and be monitored.

3.3.1 POP-BDEs as product

Although production has officially stopped, some companies still offer c-PentaBDE (CAS 32534-81-9)[31] and c-OctaBDE (32536-52-0) for sale in the public domain although production and marketing is banned under the Convention. Therefore, illegal trade of these chemicals might still take place. Companies offering POPs are listed in Annex 3.

3.3.2 Second hand EEE in import and on the local market

Polymers of second hand electronics (produced before 2005) can contain c-OctaBDE. The most relevant WEEE fractions are CRTs casing from TVs and computers. Imported used electronics are, in many countries, subjected to assessment of their functionality to avoid illegal import of WEEE. Therefore, customs are already monitoring used electronics. Within this monitoring, screening of bromine for indication of c-OctaBDE can be done. However, since other brominated flame retardants are mainly present in today's second hand electronic, confirmation analysis would need to be considered.

Another approach already used by countries which would indirectly solve the c-OctaBDE problem is a country policy of accepting only second hand electronics for reuse which have been produced in recent years. This ensures proper functionality of such equipment and avoids import of electronic waste. Applying this approach will at the same time limit and possibly eliminate the import of c-OctaBDE containing articles via this main route.

3.3.3 Import of Waste Electronic and Electric Equipment (WEEE)

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[28] Production of HBB stopped in 1976 and it is therefore not considered for the regular monitoring of articles.
[29] See Section 4 of *Guidance for the inventory of PBDEs listed under the Stockholm Convention*.
[30] UNEP (2010) Technical review of the implications of recycling commercial penta and octabromodiphenyl ethers. (UNEP/POPS/POPRC.6/2)
[31] Examples include: Shi Jiazhuang Luchi Chemical Co., Ltd.; Yick-Vic Chemicals & Pharmaceuticals (HK) Ltd; Weifang Sinobrom Imp & Exp Corp.,Ltd.; Tianjin Chengyi International Trading Co., Ltd.; Dalian Jinbosheng Chemical Co., Ltd; Jia Xiang Industry Co.,Ltd; XiaoShuLin, HeBei District, TianJin; Shenyang Jiutongyuan Chemicals Co., Ltd; Shijiazhuang Hengsikai Chemical Imp&Exp Co.,Ltd; and Shijiazhuang Kunli Chemical Co. Ltd; Zenith Chemicals Ltd. (HK).

The largest amount of c-OctaBDE is present in electronic waste, in particular TVs and computer monitors (Cathode ray tubes (CRTs)) and office equipment. WEEE might be imported into a country, for example, as a good for recovery of metals. Considering the legislation of a country and the Basel Convention rules, such imports might be legal.

Depending on further treatment of this WEEE and in particular the treatment of the polymer fraction, this PBDE containing material can cause environmental pollution (e.g. from the practice of open burning) or hazards if recycled into sensitive products. Therefore, competent authorities and industries treating the WEEE need to assure the appropriate management and treatment of the associated polymer material of such WEEE imports (see Section 5 of *Guidelines on BAT and BEP for the recycling and waste disposal of articles containing PBDEs listed under the Stockholm Convention*). If the polymer is subjected to further recycling, the competent authority should monitor and assure pollutants like POP-BDE are separated according to the recommendations of the Convention. If the country has asked for exemption of recycling PBDE containing materials, it should take care that, in particular, such polymer is not recycled into sensitive uses (Table 3; see also Section 5.1 of *Guidelines on BAT and BEP for the recycling and waste disposal of articles containing PBDEs listed under the Stockholm Convention*).

The main stakeholders to monitor the import and presence of POP-BDEs in WEEE are customs, local competent authorities, and industries trading and processing WEEE. When customs check the import of WEEE material, decisions on the restriction of the import of WEEE materials should be based on the regulations regarding whether or not WEEE can be imported into the country considering national legislation and the Basel Convention.[32] The presence of c-OctaBDE in such wastes can be regarded as one of a wide range of contaminants in WEEE[33] and can be part of the reasoning for restriction. Competent authorities should monitor the polymers used or traded by companies treating imported and local WEEE (see Section 4 below and Annex 6).

For the appropriateness of the techniques and practices used to treat WEEE and the related polymer fraction, the competent authorities and industries should consider the *Guidelines on BAT and BEP for the recycling and waste disposal of articles containing PBDEs listed under the Stockholm Convention* and the guidelines developed by the Basel Convention.

3.3.4 Polymers from recycling of WEEE

The polymer fraction from recycling of WEEE is the most relevant material flow possibly containing c-OctaBDE. Such polymer fractions are partly exported – often from industrial countries to developing countries for material recycling purposes to produce new plastic products. Such polymers might be plastic flakes from WEEE shredders or pelletised plastic. The monitoring for the recycling of this polymer might also include, in addition to PBDE, other RoHS relevant substances.

The main stakeholders for monitoring of polymers from WEEE are:

- *Customs*: The detailed assessment of imported plastic/polymers should be based on risk evaluation (importing countries and companies; description of the polymer in the declaration papers). An import of mixed polymer materials can first be evaluated by visual control. If suspected mixed polymer material is discovered, then in a second step the polymers might be screened for bromine content by screening tools described in Section 5 and bromine positive samples might be further analysed for POP-BDE.
- *Local competent authorities*: to assess companies using imported or domestic polymers from recycling for the production of new polymeric materials and articles. The same monitoring approach

[32] The challenge is rather to describe between second hand electronics for reuse and electronic waste.

[33] An overview on contaminants in WEEE is given in Swedish Environmental Protection Agency (2011) Recycling and disposal of electronic waste – Heath hazards and environmental impacts. Report 6417 March 2011 http://www.naturvardsverket.se/Documents/publikationer6400/978-91-620-6417-4.pdf

(visual control; bromine screening/confirmation analysis) can be applied.[34]

- *Industries processing polymers from WEEE recycling*: should monitor materials to ensure that these polymers do not contain POP-BDEs. If a country has registered for an exemption to recycle POP-PBDE containing materials, then such WEEE polymers might be recycled considering the *Guidelines on BAT and BEP for the recycling and waste disposal of articles containing PBDEs listed under the Stockholm Convention*. In any case, polymers from WEEE recycling should not enter sensitive use areas listed in Table 3.

**Table 3: Examples of sensitive use areas*
where POP-BDE containing recycled polymers must not be used****

- Sensitive uses
- Toys
- Food packaging; food containers
- Kitchen equipment
- Refrigerator interior***; freezer interior***
- Water tanks (in particular tanks used for drinking water)
- Water pipes (in particular drinking water pipes)
- Silos, storage, and piping for food and animal feed
- Polymer parts with direct contact
- (Furniture, handles of tools, doors, etc.)

* In such applications generally recycled polymer fractions containing heavy metals, or critical softeners, brominated flame retardant, phosphor organic flame retardant, or other critical chemical should not be used.

** The list provides key examples of sensitive uses and is not considered comprehensive.

*** The recycling of polymers from WEEE polymers containing no critical chemicals is encouraged following the cradle to cradle principle, e.g. polymers from refrigerators/fridges to refrigerators/fridges.

3.3.5 Second hand cars, buses, and other vehicles (produced before 2005)

PentaBDE have been used in cars, buses, and trucks for treating polyurethane foam in the upholstery of seats, headrests, and armrests until 2004 in some regions. C-OctaBDE has been used to a minor extent in dashboards and other plastic parts until 2004 in some regions.

Depending on the phase out of POPs-PBDEs in different regions, vehicles produced from a region can be regarded as not impacted:

- In Japan: POP-PBDE have not been used after 1998
- In Europe: POP-PBDEs have not been used after 2000
- In the US: POP-PBDE have not been used after 2004

Vehicles produced before these dates from/in these regions can contain POP-PBDEs.[35] Therefore, POPs-

[34] In addition, the appropriateness of the techniques and practices used to treat polymers from WEEE and the appropriateness of products produced should be considered. The *Guidelines on BAT and BEP for the recycling and waste disposal of articles containing PBDEs listed under the Stockholm Convention* gives guidance. The negative list of products (Table 3, above) should not be produced from WEEE plastic.

[35] Please note that Japanese and European car manufacturers have also produced within the US and therefore these cars produced in the US might contain POPs-BDEs until 2005.

BDEs are imported to developing countries with second hand vehicles containing such treated polymers.

Currently there are no data on which producers have used POP-BDEs in which series. Therefore, currently only screening of the vehicles by non-destructive XRF could clarify the presence/absence of PBDE/BFRs in the respective vehicles. A positive detection of bromine in PUR foam (seat, headrest, etc.) in vehicles produced before 2005 is a strong indication of the presence of c-PentaBDE. A confirmation analysis by GC/ECD or GC/MS might be performed.

If a country has registered for exemptions for recycling of PBDE containing materials, such vehicles containing POPs-BDE might be imported and reused in the country (see section 2.3).

The main stakeholders to monitor the import and presence of PBDE containing vehicles are customs which monitor the import of vehicles. Also relevant are the competent authorities responsible for market surveillance to monitor the second hand market of vehicles. The original producers could publish a list of cars and other vehicles containing POP-BDEs. If a country has not registered for an exemption, then importers and companies selling second hand cars and other vehicles should ensure that the vehicles they import or sell do not contain POP-BDEs. The second hand car importers/sellers and related associations should develop monitoring schemes to assess the presence and guarantee the absence of POP-BDEs in vehicles.

3.3.6 Articles produced from recycled polymers

Currently no regulation exists on the labelling of articles produced from recycled polymers. Therefore, monitoring of these materials can currently only be performed by analytical screening. As part of Stockholm Convention implementation, the authorities should evaluate the products for appropriate labelling to enable appropriate monitoring and require such a monitoring approach (see *Guidance on labelling of products or articles that contain new POPs or use new POPs during manufacture*).

The main stakeholders to monitor the import and presence of PBDE containing articles made from recycled polymers are customs and authorities for market surveillance. Industries using recycled polymers from WEEE or transport should monitor for POP-BDE and report to the NIP coordinator on levels of POP-BDEs.

The articles can be assessed in a similar way as the polymers described above. A similar screening approach as for other materials (XRF screening combined with confirmation analysis) can be applied. Possible articles for a screening are, for example, those listed in the negative list (see Table 3, above).

3.3.7 Carpet rebond produced from recycled PUR foam

In North America (mainly the US), PUR foam is recycled to carpet rebond (see *Guidelines on BAT and BEP for the recycling and waste disposal of articles containing PBDEs listed under the Stockholm Convention*). If carpet rebond is imported from this region, it might contain POP-BDEs.

The materials can be monitored in a similar way as the polymers described above.

3.4 Lindane and other HCHs

The production of lindane is banned and the last lindane production is considered to have stopped.[36] Still, stocks from production are available to satisfy the demand for permitted uses.

The local competent authority in cooperation with customs should monitor the export of lindane containing products so that they are only sent to countries that have applied for exempted uses. Also, the authorities should evaluate the products for appropriate labelling enabling appropriate monitoring (see *Guidelines on BAT and BEP for the recycling and waste disposal of articles containing PBDEs listed under the Stockholm Convention*).

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[36] Vijgen J, et al. HCH as new Stockholm Convention POPs – a global perspective on the management of Lindane and its waste isomers. Env Sci Pollut Res. 18, 152-162 (2011).
http://www.springerlink.com/content/g62g810418512421/fulltext.pdf

The main stakeholders for monitoring the products from the factories are local competent authorities responsible for factory inspection in cooperation with the industry.

3.4.1 Lindane in exempted uses

The only exempted use for lindane is second line treatment of head lice and scabies. In principle, the trade of these articles are allowed. However, the respective countries need to register for exemptions and therefore also second line treatment is restricted in countries which have not registered for the exemption.

3.4.2 Illegal import of lindane

Lindane is still traded illegally, e.g. the Nigerian environmental ministry highlighted in a new POPs pilot project that lindane is imported illegally for the treatment of cocoa and for illegal fishing practice.

The main stakeholders to monitor lindane in products are customs to assess the import of lindane. Trade names for lindane are compiled in Annex 5. The health ministry in cooperation with the market surveillance authority should monitor if lindane is present on the market in pharmaceuticals in non-registered uses. The agricultural ministry and related local competent authorities monitor should monitor the presence of lindane or technical HCH on the pesticide market and use by farmers. Importers, formulators, and sellers of pesticides need to ensure that lindane is not used.

3.5 Endosulfan

Parties have to consider endosulfan by 27 October 2012. A range of uses for endosulfan has been exempted[37] for which countries can register for use.

3.5.1 Production of endosulfan and products

Endosulfan is produced in several countries. The trade names of products and – if the company agrees – the production volume should be collected by the respective competent authorities or the NIP focal point and forwarded to the Stockholm Convention Secretariat.

Furthermore, customs in cooperation with the local competent authority should monitor the export of endosulfan containing pesticides so that they are only sent to countries having applied for exempted uses. Also, the authorities should evaluate and ensure that endosulfan containing products are labelled appropriately enabling appropriate monitoring by importing countries (see *Guidance on labelling of products or articles that contain new POPs or use new POPs during manufacture*).

The main stakeholders for monitoring the products from the factories are local competent authorities responsible for factory inspection[38] in cooperation with the industry.

3.5.2 Illegal import and use of endosulfan

If a country has not listed for exemptions, then import of endosulfan is not allowed as of 27 October 2012.

The main stakeholders to monitor endosulfan as a product are customs to assess the import and the agricultural ministry and related local competent authorities to monitor non-registered uses in the country. Trade names to facilitate the monitoring of endosulfan are compiled in Annex 5.

3.6 Chlordecone

The production and use of chlordecone stopped in 1991 and a recent survey for chlordecone on the pesticide market did not find any indication of current trade. Since chlordecone has generated large contaminated sites in areas where it has been applied (e.g. Martinique and Guadeloupe), specific food

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[37] http://chm.pops.int/Portals/0/download.aspx?d=UNEP-POPS-COP.5-36.English.doc

[38] The factory inspection should also assess current and former waste management of endosulfan production residue and the related deposits and forward this information to the NIP focal point.

products from these areas might be contaminated (e.g. fish or shrimp).[39]

The main stakeholders to monitor chlordecone in such food are customs to assess the import and the health ministry (and responsible competent authorities) for the presence in the market. If such food is imported/on the market, then chlordecone residue levels could be analysed by a certified laboratory.

3.7 DDT

DDT is still produced and can be imported from parties which have registered for use of DDT in vector control. The authorities should evaluate the products for appropriate labelling to enable appropriate monitoring (see *Guidance on labelling of products or articles that contain new POPs or use new POPs during manufacture*).

3.7.1 Production of DDT and products

DDT is still produced. The trade names of products and – if the company agrees – the production volume should be collected by the respective competent authorities or the NIP focal point and forwarded to the Stockholm Convention Secretariat.

Furthermore, customs in cooperation with the local competent authority should monitor the export of DDT containing pesticides so that they are only sent to countries having applied for exempted uses. Also, the authorities should evaluate and ensure that DDT containing products are labelled appropriately enabling appropriate monitoring by importing countries (see *Guidance on labelling of products or articles that contain new POPs or use new POPs during manufacture*).

The main stakeholders for monitoring the products from the factories are local competent authorities responsible for factory inspection[40] in cooperation with the industry.

3.7.2 Illegal import of DDT

If a Party has not registered for exemptions, then import of DDT is not allowed. For uses other than vector control, DDT is also not allowed in countries which have registered and need to be stopped.

The main stakeholders to monitor DDT as products are customs to assess the import and the health ministry and agricultural ministry and related local competent authorities to monitor non-registered uses in the country. Trade names to facilitate the monitoring of DDT are compiled in Annex 5.

3.7.3 DDT as unintentionally trace contaminant in dicofol

Due to the production process of dicofol from DDT, DDT can be included in Dicofol at high levels.[41] The main stakeholders to monitor DDT in dicofol are customs and the agricultural ministry and related competent authorities. If dicofol (CAS 115-32-2) is imported or sold on the market, selected samples can be analysed for DDT contamination in an accredited laboratory.

3.8 PeCB and other UPOPs (HCB, PCDD, PCDF and PCB) as unintentional trace contaminants in chemicals, chemical in mixtures, and articles

Pentachlorobenzene (PeCB) has been listed as the only new unintentionally produced POP in Annex C. Similar to HCB, it is also listed as an intentionally produced POP in Annex A. Today, the relevance of PeCB and HCB are rather as trace contaminants in products than intentional production. However, production of PeCB and HCB also seems to take place (see below).

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[39] Garrigues P. Chlordecone in the French West Indies: Overview of research activities dealing with soil and aquatic ecosystems Presentation at RECETOX workshop on "Research needs 10 years Stockholm Convention" 22-24 May 2011 Brno/Czech Republic. http://www.recetox.muni.cz/res/file/pdf/workshop/BrnoPG1-2.pdf

[40] The factory inspection should also assess current and former waste management of endosulfan production residue and the related deposits and forward this information to the NIP focal point.

[41] Qiu et al (2005) Contribution of Dicofol to the Current DDT Pollution in China. Environ. Sci. Technol. 39, 4385-4390.

Since the different unintentionally formed POPs are normally formed in most processes in parallel, it is reasonable not to solely address PeCB in suspected chemicals and articles, but to also address and monitor all listed unintentionally produce POPs in screenings of unintentional POPs products and articles. The necessity to screen PCDD/PCDF in products was recently highlighted by discovery of extreme high levels of PCDD/PCDF (522 µg TEQ/kg) in Chinese chloranil with PCDD/PCDF levels 35 times above the low POPs threshold of the Basel Convention for wastes (Liu et al, 2011).[42] The estimated total PCDD/PCDF content of this currently marketed chemical from China alone was estimated to 1044 g TEQ which is about 10% of China's total PCDD/PCDF inventory, but present directly in treated consumer products. PeCB, HCB, and PCB were also detected in these chemicals in relevant concentration (Liu et al, 2011).

Unintentionally produced POPs present as unintentional trace contaminants in chemicals, mixtures, and articles can be addressed by lists of chemicals, mixtures, and articles which, from past analysis, have been found to contain these chemicals or are suspected to contain unintentionally produced POPs.

3.8.1 PeCB and HCB as product

Some companies still offer HCB and PeCB although production and marketing is banned under the Convention. Therefore, trade of these chemicals might still take place. Companies offering HCB and PeCB are listed in Annex 3. These companies should be inspected by the local competent authority for possible production and the trade.

3.8.2 PeCB, HCB, and PCDD/PCDF in pesticides and related organochlorine chemicals

Some pesticides are known to contain or form during production relevant levels of HCB and therefore can be suspected also to contain PeCB. These include, for example, PCNB (CAS No 82-68-8), PCP (CAS No 87-86-5), Dimethyltetrachloro terephthalate dacthal (CAS No 1861-32-1), Chlorothalonil (CAS No 1897-45-6), and Dicloram (CAS No 1918-02-1) (Tobin, 1986).[43]

While releases from production in industrial countries have been reduced, the main production capacity has shifted to developing/transition countries like China, India, and others. Recent screening of contemporary used pesticides in Australia (Holt et al, 2010) and Chloranil in China (Liu et al, 2011) revealed that PCDD/PCDF were present in all tested products and that some products contained high levels of PCDD/PCDF.

In the UNEP standardized toolkit for Dioxin and Furan releases, some chemicals are listed which are known to contain PCDD/PCDF. The United States Environmental Protection Agency (USEPA)[44] and the German Environmental Agency[45] has formerly established lists of chemicals which either have been found to contain PCDD/PCDF or are suspected to contain PCDD/PCDF. These chemicals have been compiled and included in Annex 5. Since unintentionally produced POPs are normally formed in parallel, these chemicals can be suspected to also contain PeCB, HCB, and PCB. This list might therefore be used for monitoring of PeCB and other unintentionally produced POPs in products and articles.

3.8.3 PeCB, HCB in pigments and tetrachlorophthalic anhydride

Some pigments based on tetrachlorophthalic anhydride contain relatively high levels of HCB. They can also be suspected to contain PeCB and possibly other unintentionally formed POPs. Japan has informed the Conference of Parties (COP) of the Stockholm Convention of the high HCB content and suggested BAT

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[42] Liu et al. (2011) Contamination and emission factors of PCDD/Fs, unintentional PCBs, HxCBz, PeCBz and polychlorophenols in chloranil in China. Chemosphere doi:10.1016/j.chemosphere.2011.09.034

[43] Tobin P (1986) Known and potential sources of hexachlorobenzene. In: Morris, C.R.; Cabral, J.R.P. Hexachlorobenzene: Proceedings of an International Symposium. Lyon, IARC Sci. Publ. 77, 1-12.

[44] U.S. Environmental Protection Agency. 1998. The Inventory of Sources of Dioxin in the United States. EPA/600/P-98/002Aa, Washington, D.C., April 1998.

[45] Umweltbundesamt (1985) Sachstand Dioxine, pp. 21–24

levels for HCB in these pigments and in tetrachlorophthalic anhydride.[46,47] Pigments reported to contain HCB should be monitored for PeCB and other unintentionally produced POPs. These are listed in Table 4 and details can be found in Annex 5.

Table 4: Pigments known to contain HCB and possibly contain PeCB and other UPOPs

Pigment/chemical	*CAS Registry Number*
Pigment Yellow 110	5590-18-1
Pigment Yellow 138	30125-47-4
Pigment Green 7[48]	1328-45-6 and 1328-53-6
Pigment Green 36	14302-13-7
Solvent Red 135	20749-68-2 and 71902-17-5
Tetrachlorophthalic anhydride	117-08-8

3.8.4 PeCB and HCB in chlorinated solvents

During production of certain chlorinated solvents, high amounts of unintentional HCB and PeCB can be formed (UNEP, 2010).[49] These include tetrachloroethene (CAS: 127-18-4), trichloroethene (CAS: 79-01-6), and tetrachloromethane (CAS: 56-23-5). The largest part of the unintentionally produced POPs are normally separated in the production by a distillation step from the marketed solvent and remain as heavy distillates (Jacob et al, 1986). It has been reported that these deposits also contain PeCB (UNEP, 2010). There is a scarcity of data on the content of HCB and PeCB in chlorinated solvents (UNEP, 2010). Therefore, screening of PeCB, HCB, and possibly other unintentionally formed POPs in chlorinated solvents might be considered.

3.8.5 Biosolids/sewage sludge

Sewage sludge and related biosolids are a sink for unintentionally produced POPs (PCDD/PCDF, PCB, HCB, and PeCB) and new POPs (PFOS, POP-BDE). In some countries, regulation limits exist for POPs in respect to the application on agricultural areas and pasture areas to prevent the contamination of food. Biosolids and organic fertilizers are also traded at the international level and control of POPs levels should be addressed with respect to imports, exports, and trade.

3.8.6 Main stakeholders to monitor the import and presence of unintentionally produced POPs in products

The main stakeholders to monitor the import and presence of unintentionally produced POPs in products are:

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[46] Government of Japan (2006) Submission to COP3: Assessment Committee on BAT Levels for Reduction of a Specified Chemical as a Contaminant By-product November 2006

[47] Government of Japan (2007) Submission to COP3: Assessment Committee on BAT Levels for Reduction of a Specified Chemical as a Contaminant By-product. April 2007

[48] Due to its stability, Pigment Green 7 is used in inks, coatings, and many plastics. In application, it is transparent. The pigment is insoluble and has no tendency to migrate in the material. It is a standard pigment used in printing ink and packaging industry. It is also allowed in cosmetics except those used around the eyes, and is used in some tattoos.

[49] UNEP (2010) Additional consideration of new persistent organic pollutants: pentachlorobenzene. Stockholm Convention document for 6th POP Reviewing Committee meeting (UNEP/POPS/POPRC.6/INF/21) Geneva 11-15. October 2010.

- *Customs*: Customs to assess the import of chemicals potentially contaminated with PeCB and other unintentionally produced POPs. Based on a risk evaluation, selected samples can be sent to national laboratory accredited for analysis of the different unintentionally produced POPs.
- *Competent authorities*: The respective competent authorities (agricultural ministry, environmental ministry, health ministry) and related local competent authorities to develop a monitoring strategy for known or suspected chemicals. Such approaches could be coordinated on regional level by the Stockholm Convention Regional Centres to achieve with a minimum monitoring effort the maximum coverage, outreach, and awareness.
- *Importers, formulators, and sellers of pesticides, dyes, solvents, and others*
- *Importers, exporting companies, formulators, and sellers of chemicals known or suspected to contain unintentionally produced POPs*: to ensure that the imported (exported) and marketed chemicals are low in unintentionally produced POPs content.
- *Research institutions with capacity of monitoring unintentionally produced POPs*: Research institutions can support the efforts of the competent authorities by unintentionally produced POPs monitoring studies in products. Such studies should be coordinated with respective national authorities and possibly regional centres.

3.8.7 Limit values for unintentionally produced POPs in products and articles

While the Basel Convention has set, for wastes, a provisional limit for unintentionally produced PCDD/PCDF, no global standard for unintentionally produced POPs in products and articles exists. Japan has developed a standard for pesticides which require contamination level below 0.1 µg TEQ/kg (100 ppt) for each 2,3,7,8-substituted PCDD/PCDF congener and dioxin-like PCB[50] which might be considered by other countries for organochlorine chemicals.

Canada has set a limit of 0.02 ppm for HCB in products and also included PeCB (and TetraCB) in their Prohibition of Certain Toxic Substances Regulations.[51] Specific products with higher HCB levels (e.g. certain pigments/dyes) require requesting a permit. Countries might consider a similar approach for controlling HCB and PeCB in products until a coordinated global approach might possibly be developed.

Japan suggested at COP-3 a BAT/BEP approach for HCB contamination of pigments.

[50] Japanese Government (2002) Agricultural Chemicals Regulation Law No.14, 3 (Nouyakutorisimari hou No.14, 3 (in Japanese)) http://www.env.go.jp/council/10dojo/y104-25/mat06.pdf

[51] Environment Canada (2005) Prohibition of Certain Toxic Substances Regulations, 2005.

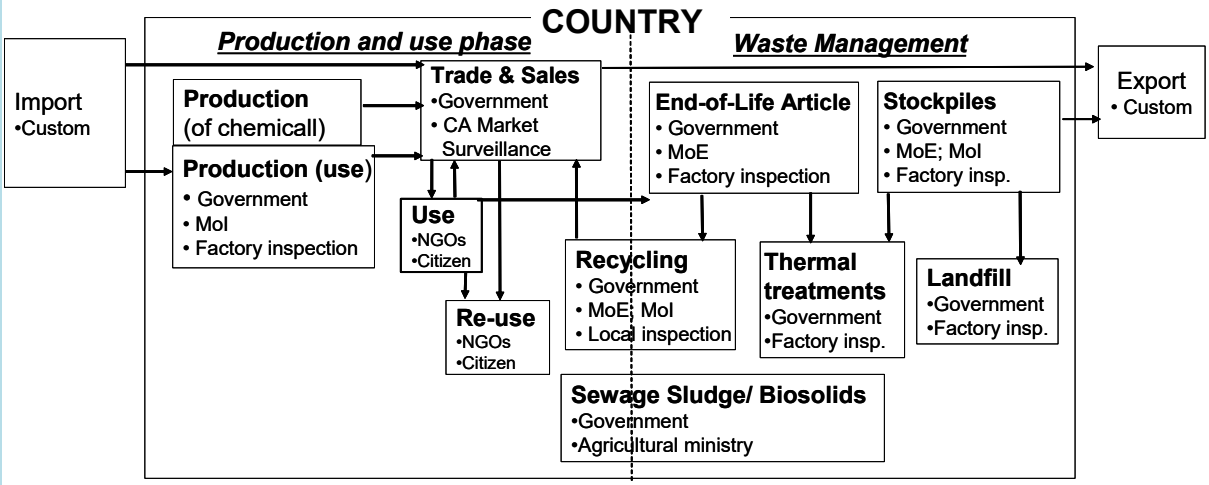
4 Identification/control of new POPs in the life cycle stages and role of stakeholders

4.1 Introduction on monitoring of new POPs in the life cycle and role of stakeholders

The main responsibility of monitoring of hazardous chemicals like POPs and their control on the national level in the different life cycle stages is with respective ministries and the related competent authorities (see Figure 2). Ministries and competent authorities (e.g. customs, factory inspectorates, authority for market surveillance) have the main responsibility and legal backing for monitoring and enforcements. Competent authorities can monitor new POPs in articles along the life cycle by monitoring the material flows at the production, import, in sales, in the recycling flow, and at the end-of-life.

Different stakeholders within a country need to support/develop the regulatory framework and to monitor newly listed POPs at different stages of their life cycle for different purposes. Since several new POPs are included in consumer products, the entire flow of these articles (sales, use, re-use, recycling, and waste management) also needs to be monitored and considered from cradle to grave.

Figure 2: Life cycle stages of products and articles and responsible stakeholders for monitoring and managing of new POPs at these stages



Some selected main tasks for the individual stakeholders are:

- *Government*: to develop an appropriate regulatory framework to manage and monitor new POPs containing material flows. As highlighted above, the introduction of GHS is one important step to control the import, use, and export of POPs as chemical and in mixtures.
- *Government*: to also establish an appropriate regulatory framework for the recycling and end-of-life management including appropriate monitoring of the substance flows and levels of POPs and other critical chemicals in these sectors; and to ensure that new POPs (and toxic substances) do not enter products with sensitive uses and that the wastes are appropriately treated at the end-of-life on the basis of a waste catalogue facilitating the monitoring and tracking.
- *Customs authorities*: to prevent illegal import of banned POPs or severely restricted POPs.
- *Local competent authorities (factory)*: to identify illegally imported POPs, use of POPs, and monitor recycling and waste flows of POPs including related POPs stockpiles.
- *Industry*: to avoid the illegal import and use of banned POPs or severely restricted POPs and ensure appropriate management of POPs and to identify and manage stockpiles of these POPs.

While the main responsibility for the regulatory framework and monitoring is with governmental authorities, other stakeholders might have specific knowledge and information systems for hazardous chemicals also covering new POPs. They might also have a better analytical capacity to identify POPs or already have established studies which have identified them. For example, there are information systems in some industries which already list several new POPs if they are present in the supply chain (e.g. in the car industry or electronic industry; see Annex 2). Furthermore, in developing countries in particular other stakeholders including industries and the research community might have a better analytical capacity compared to the competent authorities and could generate monitoring data or support governmental monitoring approaches. In fact, data on new POPs in transition and developing countries are currently mainly generated by the research community or even NGOs. There are few governmental institutions in developing countries with the analytical capacity to monitor brominated or fluorinated new POPs (PFOS and related chemicals or POP-BDEs) in products, articles, food, or the environment.

Therefore, country approaches to monitor and control new POPs might differ in different regions and efforts should be combined within a region and between regions where appropriate. In any case, a proper bi-directional information exchange among authorities and the different stakeholders should be developed to ensure successful information exchange of monitoring results (see Section 5).

Figure 1, above, gives an overview on the information sources in this document and approaches and level of monitoring for new POPs in products and articles for governmental stakeholders. The monitoring approaches for the competent authorities is described in more detail in this chapter. The methodology is elaborated for customs due to their crucial role in the life cycle of POPs (import and export), but can, in slightly modified form, also be applied by other competent authorities and other stakeholders.

The different stakeholders need to collect information that allows identification of a newly listed POP or another listed POP as a substance, in mixtures, or in articles in the country. The information collected and compared with the information provided in this document can be:

- Chemical name (for POP as substance or in mixtures)
- CAS number (for POP as substance or in mixtures)
- HS code for POP as substance (specific or generic HS code) or in mixtures
- Trade names/common names/generic names (for POP as substance or in mixtures or in articles)
- UN number of transported good
- Classification and labelling according to the GHS with name of POP as substance or in mixture and name of producer/supplier
- Use of the chemical
- Supplier of the chemical

The comparison of the collected information with information available in databases in the Annexe 5 is expected to facilitate the control trade of POPs as substances, in mixtures, and in articles. This procedure is one element of a monitoring system to control the import of POPs. Different national stakeholders have different ways of accessing information that enable identification of a POP.

4.2 National authorities

A range of national authorities have responsibilities for the control of chemicals (including new POPs) in their life cycle stages on the market (see Figure 2, above).

4.2.1 Government

Government authorities are responsible for setting up the legal framework for a system to manage and monitor chemicals (including new POPs). This involves the development of national legislation including restrictions, exemptions, and limits, which are then the basis for a useful monitoring of these chemicals with the possibility of enforcement. Considering the relevance of the GHS for addressing new POPs in products and articles, the implementation of the GHS by government should become a priority activity as a basis for the monitoring of import/exports and use of new POPs as a basis for the implementation of the Stockholm Convention.

4.2.2 Role of ministries for monitoring/addressing new POPs

Ministry of Environment facilitates the review and updating of the NIP with respect to new POPs. Members of a NIP steering group, where applicable, should be able to facilitate a comprehensive assessment and monitoring of new POPs in the life cycle.

Ministry of Industry in coordination with the Ministry of Environment should provide information on industries and factories possibly producing or using new POPs and products and articles containing unintentionally produced POPs. The respective ministry responsible for the competent authorities for factory inspection should direct and instruct the competent authorities regarding inspection of the factories and industries possibly using/producing new POPs.

Ministry of Environment in cooperation with the Ministry of Industry should develop a scheme for monitoring of new POPs in articles in the country.[52] Such monitoring might involve governmental laboratories or research institutions capable of monitoring new POPs. Otherwise, countries should explore monitoring new POPs with regional institutions (e.g. Stockholm Convention Regional Centres) or possibly international cooperation with designated institutions, e.g. working with UNEP on analytical capacity building for POPs.

Ministries also need to decide if national capacity for new POPs analysis should be developed in the country, decide on suitable laboratories, and establish a system that would provide competent authorities (customs, facility inspectorates, authorities responsible for consumer protection, and authorities responsible for market surveillance) with access to the laboratory and for sending suspected samples for analysis.

Ministry of Environment (NIP focal point) might develop an information exchange platform for facilitation of information exchange on monitoring data of new POPs. Such a platform might be best established on a website where information on POPs and the Stockholm Convention might already have been compiled, or on another appropriate platform where, for example, information on chemicals in consumer goods have been collected from a governmental institution.

4.2.3 Focal points of Stockholm, Basel, and Rotterdam Conventions

The national focal points of the Stockholm Convention and Basel Convention and the Designated National Authority (DNA) of the Rotterdam Convention should work jointly together to address newly listed POPs and achieve synergies where the conventions could be addressed together.

The Stockholm Convention NIP focal point should consider and address all aspects of monitoring newly listed POPs when reviewing and updating the NIP.

The DNA plays a crucial role in the implementation of the Rotterdam Convention for the dissemination of information concerning the provisions of the Rotterdam Convention to the relevant government departments as well as to other stakeholders such as export and importing industries and customs officers. The DNA is also the key contact point for matters related to the Rotterdam Convention for other Parties and the Secretariat of the Rotterdam Convention.

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[52] The Ministry of Heath together with the Ministry of Environment should develop a monitoring plan for new POPs in human milk/blood for evaluation of the effectiveness of the Convention.

DNAs and customs officials should develop a standard procedure for implementation of the Rotterdam Convention and, to benefit fully from its provisions, take into account the following elements considering current and future listed new POPs:

- ensure that a current list of chemicals in Annex III (PIC chemicals) of the Rotterdam Convention is available and that the list is updated in respect to new POPs when listed
- integrate the specific HS codes for chemicals in Annex III of the Rotterdam Convention including some of the new POPs (lindane, HCB, HBB) into the domestic customs system; when the HS codes for other new POPs (PBDEs and PFOS) are available, update the domestic customs system as soon as possible

Considering the relevance of the GHS for addressing new POPs in products and articles, the implementation of the GHS should be highly encouraged by the Stockholm Convention national focal point and the Rotterdam DNA and should be communicated to the government and become a priority activity for the implementation of the Stockholm Convention with respect to new POPs.

The Basel Convention national focal point can contribute with monitoring data on E-waste and inventory data of certain E-waste fractions needed for the development of the POP-BDE and HBB inventory. Furthermore, the monitoring and management of wastes containing new POPs and its disposal should be coordinated between the Stockholm and Basel Convention national focal points.

4.3 Customs and control of the import (export) of new POPs

Since only a few countries are producers of new POPs, for most countries the import of new POPs containing products and articles is the main source of an increase of new POPs containing products and articles.

Where certain hazardous chemicals are restricted in the country, including their import, customs has the main responsibility to prevent such imports. Details on the approaches of custom control of POPs are described in the *Guidance for the control of the import of POPs*.

Customs control of imported goods can be done with the tools listed in Table 5, below, for which the control intensity and resource requirements increase from one level to the next.

Table 5: Monitoring levels of goods for customs[53]
(also applicable in modified form for other competent authorities described below)

Level 1: Control of customs papers related to the imported good (Section 4.2.1)

- Chemical name
- Trade name
- GHS code
- CAS number
- HS code

Level 2: Inspection of the imported good based on a risk analysis (Section 4.2.2)

- General risk criteria
  - Commodity code, country of origin, country whence consigned, value, trader compliance, financial consequences, means of transport, financial situation of the trader
- POPs specific risk criteria
  - Use area which might indicate possible POPs properties

[53] For additional details, see *Guidance for the control of the import of POPs*.

- HS code group
- The importing company (possible use area of POPs)
- The trading company (known/suspected to trade POPs)

Level 3: Screening, sampling, and laboratory analysis to identify POPs in article/product (Sections 4.2.3 and 6.2)

- For goods where above risk assessment concluded high risk
- Use of screening technologies
- Cooperation with laboratory for confirmation analysis

4.3.1 Control of Customs papers related to the imported good

The first task of customs is to check the customs declarations. The control of customs papers related to the imported good as chemical, mixture, or article (chemical good) gives information that can be helpful to control the import of POPs. If a trade name/common name is given, it should be checked against the information compiled in Annex 5.

If a POP is identified through the trade name, its presence should be verified by contacting the supplier and possibly the Stockholm Convention focal point of the exporting Party. The UN transport number can be also checked and if it is found there, it identifies the imported POP.

All POPs are hazardous chemicals and their chemical name and CAS number together with supplier information should appear on the label of the imported chemical good if the POPs is imported as such or in a mixture.

As a first step, the HS code assigned by the importer is checked. For some listed POPs, there exist chemical specific HS codes for the chemical, especially when they are listed also in Annex III of the Rotterdam Convention.[54] Then the information of the description of the imported good, if it is a chemical, should be compared with information available in database about chemical names, CAS numbers as well as common names/trade names/generic names of banned or restricted chemicals, especially POPs (see Annex 5).

According to the GHS, for a hazardous chemical or mixture the label should, inter alia, contain a product identifier for the hazardous chemicals and supplier identification. The EU has established GHS labels for all POPs (see Annex 4).

As a product identifier, the identity of a substance is to be provided by its common chemical name. The "common chemical name" may, for example, be the CAS name or IUPAC name, as applicable.

The Chemical Abstract Service (CAS) registry number provides a unique chemical identification and should be provided when available. Supplier identification consists of the name, address, and telephone number of the manufacturer or supplier of the substance or mixture.

For a mixture, the chemical identity, identification number (CAS number) and concentration or concentration ranges of all hazardous ingredients, which are hazardous to health or the environment within the meaning of the GHS, and are present above their cut-off levels, should be provided.[55]

In addition to the normal custom papers, one can request from the importer a declaration that the import of the good is in conformity with the existing national POPs legislation.

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[54] http://www.pic.int/TheConvention/Chemicals/AnnexIIIChemicals/HarmonizedSystemCodes/tabid/1159/language/en-US/Default.aspx

[55] Globally Harmonized System of Classification and Labelling of Chemicals (GHS), *Fourth revised edition,* UNITED NATIONS, New York and Geneva, 2011

4.3.2 Inspection of the imported good based on a risk analysis

Risk analysis in the context of customs controls is a working method which aims to concentrate controls on areas of highest risk of violation while at the same time leaving the majority of trade to flow relatively free through customs.

Customs regulations are designed to ensure payment of customs duties, observance of prohibitions and restrictions, and the application of special rules and quotas, preferences, and other trade measures. For every regulation, there is a corresponding risk that traders may – intentionally or not – break it. Risk analysis techniques attempt to identify and quantify these risks in order to develop control procedures, e. g. selection for documentary check or physical examination, and to concentrate control effort by customs officers on those risk areas where breaches of the regulations are most likely to occur – whether deliberate or not.

Within each risk area, some factors can increase or decrease the level or degree of risk to the revenue or enforcement function. These factors are called “risk indicators“. Depending on the risk area, several risk indicators can be used for risk assessment.

For customs freight, risk indicators include commodity code, country of origin, country whence consigned, value, trader compliance, financial consequences, means of transport, and financial situation of the trader. With the help of these factors, a “risk profile“ is built up. The profile identifies the risk areas in terms of high, medium, and low in freight for the particular customs location and expresses the risk areas. The risk profile should be reviewed by the customs official at regular intervals.[56]

Specific information for a POP risk profile can be derived from the following:

- The use area which might indicate possible POPs properties. For example, the use of a POP whether it is used as a pesticide, as an industrial chemical, or for other specific uses. If in the import documentation the use of one of the newly listed POPs or DDT is mentioned, the information could be part of the risk analysis and trigger an inspection of the good.
- If the HS code relates to a group of chemicals also including a POP, this information can also be used for the customs risk analysis to identify possible illegal trade. Furthermore, the trade names can indicate a POPs (see above).

  The company importing the product or article: Is the importing company possibly using products or articles containing new POPs? The use of imported chemical good is described above in Section 3. Examples are:

  - Metal plating company possibly using PFOS and related chemicals
  - Fire-fighter possibly using a new POPs chemical
  - Company producing articles from recycled plastic
- The exporting company (supplier). Companies which are possibly trading new POPs or initial POPs are listed in *Guidance for the control of the import of POPs* (see Annex 3) and indicate a higher risk that the materials might contain POPs.
- If the risk analysis indicates a high or medium risk of violation, the documentation should be more thoroughly checked or the good should be inspected. For a chemical substance or a mixture, one should check the labelling of the good.

4.3.3 Custom directed laboratory analysis to identify the imported good

The above mentioned customs tools are for the control of POPs as substances, as mixtures with intentionally added POPs, and as articles with intentionally added POPs and known that it is included there. These products/articles are covered or can be covered by the above mentioned approaches. These approaches are, however, of limited value if the POPs are included in:

[56] EU Chemicals/Customs Group, Doc 1/96/Rev.2/05.09.996

- An article produced in the past where a new POPs has been added, but the information that the new POPs is in the article is not available, e.g.:
  - POP-BDEs in cars, furniture, and electronics (formerly intentionally added)
  - PFOS in carpets, textiles, papers, leather goods, etc.
- Currently this information is not available for (most of) these products, but might be developed for some product categories in the framework of the Stockholm Convention implementation.
- A non-POP-chemical or mixture that due to its production contains a listed POP produced or included unintentionally as a contaminant in a concentration higher than a trace contaminant. This can either be an unintentional POP in products (PeCB, HCB, PCDD/PCDF) or a new POP (e.g. PFOS as unintentional by-products in another PFAS).
- An article produced partly from recycled materials which contained new POPs. For example, plastic goods (toys, kitchen ware, electronics) where recycled polymers containing POP-BDE have been used.

For the control of such new POPs containing products or articles, information has to be gathered from companies formerly having potentially used POP-BDE (e.g. car producers or electronic producers) and from monitor these products and articles by analytical screening.

From the results of such monitoring, a database might be developed on an international level so that competent authorities and other stakeholders can gain access to this information (see also bi-directional information system in Section 5).

The customs services that have access to laboratories analyse mainly samples that were taken to verify the customs tariff based on the HS code chosen by the person who declares the good and do not normally use specific laboratory analysis techniques/methodologies needed for confirmation analysis of new POPs. In many countries, customs do not have a laboratory with GC/MS. Furthermore, customs which might have a GC/MS do not normally undertake the rather sophisticated analysis of POPs like PBDEs in articles. Also, the determination of PFOS and related chemicals requires a sophisticated analysis using High Pressure Liquid Chromatography coupled to Mass Spectrometer HPLC/MS. Such sophisticated equipment are not present in most customs and it normally does not makes sense to develop such specific analysis in a custom laboratory for the few samples which would per year or per month be analysed for this compound or compound class. Therefore, cooperation between customs and a governmental laboratory, commercial laboratory, or university laboratory with accredited methods for the target compounds seems to be the most practical approach to analyse suspected products or articles for new POPs. The chosen approach will typically be country-specific.

However, some pre-screening by rapid monitoring systems might be performed at the customs level. This might include the screening of certain new POPs by XRF or sliding spark spectroscopy (see chapter 6.2) for elements related to newly listed POPs in suspected materials. For example, the screening of bromine in suspect plastic flakes or plastic materials which do not need flame retardants (e.g. plastic toys or plastic household goods).

4.3.4 Joint e-learning WCO tool

More guidance on customs procedures to control the import of chemicals can be found in the *Joint e-learning WCO tool on the Basel, Rotterdam and Stockholm Conventions*.[57]

[57] Work in progress WCO, SRC, SSC, SBC.

4.4 Local competent authorities

4.4.1 Tiered screening by competent authorities

The monitoring of chemicals by local competent authorities might include following monitoring steps considering the main application of new POPs (section 3)

- Selection of the companies (see Annex 6), traders, or shops based on risk criteria
- Assessment of the chemicals used or the product or article sold based on available information (chemical names, CAS numbers, GHS labelling, safety data sheet, product/article description)
- Competent authorities might use screening tools such as XRF (screening of bromine or heavy metals), sliding spark spectroscopy (bromine or fluorine), or the drop test (indication organofluorine) for such inspections (see Section 6.2)
- Analytical screening: If above assessments have raised concerns and possibly presence of a new POPs, but the information is not sufficient to conclude on the presence or content level then an instrumental analysis can proof the presence and the quantity (section 6).

4.4.2 Authorities responsible for enforcement of legislation on chemical uses (e.g. factory inspectorate)

The authorities responsible for enforcement of legislation on chemical uses like the factory inspectorates can investigate the use and presence of new POPs in the industries possibly using these chemicals (see Annex 6). Such local authorities have direct access to companies and the legal backing to do inspections. The NIP focal point or the environmental ministry would inform the local competent authorities on industries possibly using (newly listed) POPs for a targeted screening. Industries possibly using new POPs or new POPs containing materials are listed in Annex 6.

The inspection should assess the use of new POPs or new POPs containing materials.

Use of new POPs chemicals

The competent authority responsible for the supervision could request the companies to have a list of all hazardous chemicals (including all POPs) that are used as substances, in mixtures, or in articles used in the company or produced and marketed. During regular inspection, this list could be verified with the information compiled as described under customs control to identify POPs (see above) and compared with the list of chemical names (Annex 5), GHS classification (Annex 4), and HS codes. The suspected products and articles are described above in Section 3 along with the possible role of the respective competent authority.

For monitoring, the competent authorities can use a similar approach and the same tools as described for the assessment of the import of chemicals, products, and articles described for custom authorities in Sections 4.3 and shortly in 4.4.1.

Monitoring the use of appropriate technologies (BAT/BEP) and waste management

When monitoring the use of new POPs in factories or the processing of new POPs containing materials, the authorities should also evaluate the facilities on the implementation stage of BAT/BEP and related releases to the environment (see *and Guidelines on BAT and BEP for the production and use of PFOS and related chemicals* and *Guidelines on BAT and BEP for the recycling and waste disposal of articles containing PBDEs listed under the Stockholm Convention*).

Materials for recycling, wastes, and stockpiles containing new POPs

National authorities (environment and industry ministries) should direct the local control authorities and cooperate with them in monitoring and identifying recycling flows, waste flows, and stockpiles containing new POPs (see Annex 6). National authorities should develop legislation for management of wastes, stockpiles, and contaminated sites. Local competent authorities should have a clear guidance for

inspecting industries producing or using new POPs or processing materials containing new POPs and the management and risks of wastes and stockpiles to appropriately assess recycling flows or prevent the use of industrial sludges as biosolids.

If stockpiles or contaminated sites are discovered, the information should be reported to the NIP focal point and responsible ministries.

4.4.3 Competent authorities responsible for consumer protection and market surveillance

In (most) industrial countries, authorities for consumer protection and market surveillance have been established. In some developing countries, such authorities might also be present. In the case that such an entity does not exist, responsibility might be with the Ministry of Health or shared between ministries and associated competent authorities. If no dedicated authority for consumer protection and market surveillance exists, then such an authority should be developed as an activity in the NIP review/update.

For the monitoring of new POPs in products and articles, the responsible competent authorities can use a similar approach and the same tools as described for the assessment of import of chemicals, products, and articles described custom authorities in Sections 4.3 and shortly in 4.4.1.

If new POPs containing products or articles are discovered, this information should be communicated to the NIP focal point and other responsible ministries.

4.5 Industry/private sector

The importance of the private sector, including manufacturing, the transport/shipping sector, and service industries, is recognized in achieving the reduction and/or elimination of release of POPs by various ways, e.g. offering new and efficient technologies, making investments for the development of alternatives. In some cases, also involving them in the monitoring process could be beneficial for the monitoring activities and understanding of the trade.

Companies that import chemicals, mixtures, and/or articles should try to identify POPs in the imported chemical good and to avoid illegal trade. The information that is available to companies is normally the chemical name or for mixtures the chemical names of hazardous components, trade name, use, and supplier of the chemical good. Also, the HS code is known for customs purposes. This information can be used as described under customs control to identify POPs.

Companies that buy chemicals, mixtures, and/or articles within a country should request from the producer or importer a declaration that no POP is contained in the good. Based on the available information, the buyer should also assess that no POP is contained in the good (analogous to the approach in Section 4.3).

Some industries have established comprehensive information systems on chemicals in the supply chain and other voluntary schemes (see Annex 2):

- The Joint Article Management Promotion Consortium (JAMP) (Annex 2 - 1.1)
- The Global Automotive Declarable Substance List (GADSL) (Annex 2 – 1.2)
- International Material Data System (IMDS) (Annex 2 – 1.3)
- Joint Industry Guide for Material Composition for Electronics Products (Annex 2 – 1.4)
- BOMcheck (Annex 2 – 1.5)
- Umbrella Specifications (extension possible) (Annex 2 – 1.6)
- Environmental Product Declarations (EPDs) (Annex 2 – 1.7)

Some of these information systems include some new POPs and therefore can be partly be used for tracking and avoiding new POPs (see Annex 2).

Furthermore, companies should aim to identify new POPs stockpiles and contaminated sites from deposition and spillage of new POPs.

Relevant information should be forwarded to the NIP focal point and communicated to the responsible

competent authority.

4.6 Research institutions

Most new POPs measurements and most new POPs investigations are conducted by research institutions. Furthermore, measurement capacity for new POPs (in particular c-PentaBDE, c-OctaBDE, and PFOS and related chemicals) in developing/transition countries is rather established in research institutions than at market surveillance bodies or customs. New POPs research projects usually focus on environmental monitoring, the monitoring of contamination in biota, and the exposure of humans. However, some research groups have started to monitor POPs in products often screening for PBDEs and other brominated flame retardants in consumer products[58,59] or PFOS and other PFAS in consumer products[60,61]. A few groups have started to include PeCB screening unintentionally POPs in products like organochlorine chemicals.[62]

Within the establishment of an effective bi-directional information system, these research institutions would need to be included in the network. Also, when planning further research information exchange between the environmental ministry or the steering committee of the Stockholm Convention NIP and research institutions would need to be ensured.

The Global Monitoring Plan (GMP) has begun to address new POPs. It could be assessed if in addition to the monitoring of air and human milk an activity could be initiated on monitoring or supporting the monitoring of new POPs in products.

4.7 Consultants

Especially during the set-up of the monitoring system for new POPs in articles, it might be advisable to include consultants experienced in monitoring of critical chemicals in articles. For example, national or international consultants supporting the NIP review and updating process could also support the development of a monitoring concept for new POPs in articles/products. They might also support the development of a bi-directional communication between the stakeholders including, for example, a detailed concept or support for a communication platform.

4.8 Non Governmental Organisations (NGOs)

NGOs can also contribute to the monitoring of new POPs and to related awareness raising and some have already become active in this area, e.g. the International POPs Elimination Network (www.ipen.org) has started monitoring new POPs in articles and presented the results in an international POPs conference (DiGangi et al 2011).[63] Using appropriate sampling and accredited laboratories for monitoring, such screening results contribute to the information available on new POPs in articles and can significantly contribute to the process of awareness raising on POPs in articles since the communication to the public by such NGOs is normally quite effective. In the case of IPEN, information gained from a project can be communicated globally to 700 NGOs in the global network. Such communication channels might be utilized for updating information on new POPs.

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[58] Sindiku et al (2011) Screening E-waste plastic in Nigeria for brominated flame retardants using XRF – towards a methodology for assessing POPs PBDE in Ewaste exports. Organohalogen Compounds 73. 785-788 http://www.dioxin20xx.org/pdfs/2011/1909.pdf

[59] Liu, W et al. (2011) Contamination and emission factors of PCDD/Fs, unintentional PCBs, HxCBz, PeCBz and polychlorophenols in chloranil in China. Chemosphere (2011), doi:10.1016/j.chemosphere.2011.09.034

[60] Danish EPA & University Aarhus (2008), Survey of Chemical Substances in Consumer Products, No. 99 Fluorinated Substances http://www.mst.dk/English/Chemicals/Consumer_Products/Surveys-on-chemicals-in-consumer-products.htm

[61] Swerea, IVF (2009) Survey, screening and analyses of PFCs in consumer products. http://www.klif.no/publikasjoner/2578/ta2578.pdf

[62] Liu et al (2011) Chemosphere doi:10.1016/j.chemosphere.2011.09.034.

[63] DiGangi et al. (2011) A Survey of PBDEs in Recycled Carpet Padding. 73, 2067-2070 http://www.dioxin20xx.org/pdfs/2011/4511.pdf

4.9 Stockholm Convention (and Basel Convention) Regional Centres

The Stockholm Convention Regional Centres support the implementation of the Convention in the respective regions, e.g. by supporting the implementation of regional projects or capacity building in the region. With respect to new POPs monitoring, they can support capacity building on the different approaches. Furthermore, they can communicate best practice cases from the region or from other regions reported from other Stockholm Convention Regional Centres. The centres might coordinate monitoring and implementation approaches within a region, where appropriate, and in this way also facilitate national activities. They can also facilitate communication and information exchange within a region and via the global network of Stockholm Convention Regional Centres have the possibility to communicate relevant information to this global network.

5 Bi-directional information/communication for monitoring new POPs

Communication and information exchange on national level between stakeholders is important for the successful monitoring of new POPs (and toxic chemicals in general) (see Figure 3, below). The trade of articles is international and new POPs containing articles are normally not restricted to national markets, but rather are traded on the international market. A control of such flows is therefore also best addressed by an international approach, which at the same time shares monitoring effort between Parties. Relevant findings of new POPs in products and articles should therefore be communicated to and gathered on a global platform. Here, the mechanism of Article 9 of reporting from the national focal points to the Secretariat of the Stockholm Convention provides the framework for reporting relevant information that becomes available for other Parties.

In the EU, it was discovered that the biggest shortcoming in everyday product/article screening practice was that there was simply no way for national market surveillance bodies to exchange information among themselves within a short space of time. It was still possible for an unsafe product taken off the market in one country to be on sale for a long period of time in another country. This was a main reason for establishing related cooperation between the participating governments in, for example, the RAPEX system (European Community Rapid Information System) or the Information and Communication System for Market Surveillance (ICSMS)[64] (see Annex 8).

A further reason to aim for an international network for controlling POPs in articles is that most developing countries do not have and probably will not develop for some time the measurement capacity for new POPs. Therefore, the reporting to the Secretariat of the Stockholm Convention as an international platform for sharing information on monitoring results from countries having the analytical capacity to monitor and track new POPs containing articles with those which do not is important for effective monitoring.

From these experiences and against this background, it is important to develop an effective bi-directional information system on the international level. However, this system needs to be based on effective information exchange at the national level and therefore an effective bi-directional information system also needs to be established there (see Figure 3, below). Such information exchange can also be done within a region (see Annex 8) possibly with the support of regional centres.

An information exchange system on (new) POPs might consider (part of) the approaches used in established systems assessing articles and products, like RAPEX or the ICSMS (Annex 8).

After establishment of an information exchange platform, the existence should be widely communicated and made easy accessible to individuals or institutions that want to know about or report on specific articles or products.

5.1 Stakeholders participating in a bi-directional information system

All stakeholders listed in Section 4 for monitoring new POPs might also be considered as stakeholders in an effective bi-directional information system (Figure 3).

The RAPEX system and the ICSMS system work mainly with governmental institutions (see Table 6, below). In its second phase, the scope of performance and the functionality of ICSMS will be extended. It will then not only be possible for market surveillance bodies to provide information, but industrial safety authorities, certain agencies, occupational injury insurers, and consumer associations will also be able to do so.

[64] https://www.icsms.org

Table 6: Stakeholders of the RAPEX and ICSMS system

Governmental stakeholders	*Nongovernmental stakeholders*
Market surveillance bodies	Industry (with voluntary notification)
Customs authorities	Consumers (currently only receivers of information; in the future, an options will be given that consumers can also inform the surveillance bodies directly)
National focal points	
Coordinating unit	

Similar stakeholders and an adopted approach might be considered for an effective bi-directional information system on (new) POPs. Such stakeholders could include:

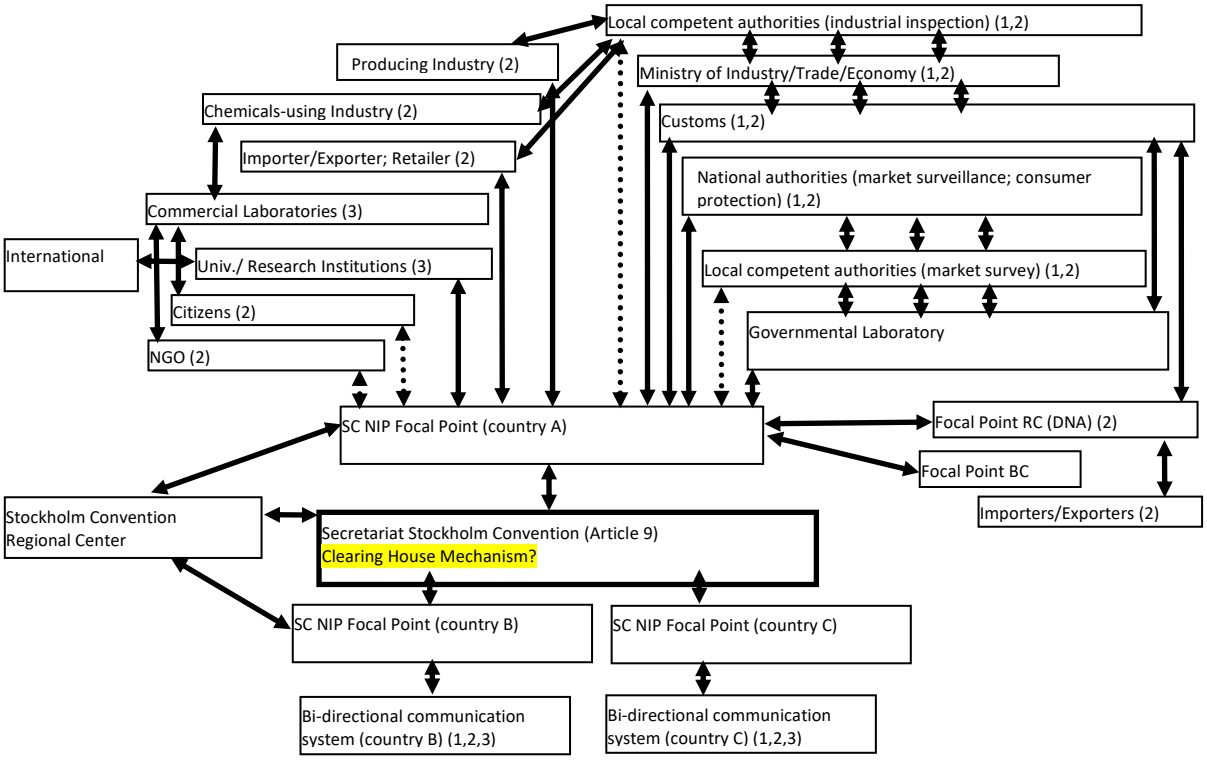
- National focal points
- Customs authorities
- National market surveillance bodies and other related national authorities
- Factory inspection authorities
- Industry (producers, users, importers, exporters)
- Research institutions
- NGOs, civil society organisations
- Consumers
- Consultants (in particular in the development stage)
- Stockholm Convention Regional Centres
- Secretariat of the Stockholm Convention

The national authorities would have competency to take samples of consumer products placed on the market, to test them in laboratories, and – in cases where these products pose risks to consumers – order producers and distributors to stop their sale, withdraw them from the market, and/or recall them from consumers. The authorities would report to the NIP focal point or other dedicated focal point responsible to gather and further communicate information. Also, stakeholders like research institutions, industry, NGOs, or consumers might report data on new POPs in articles and products to the relevant national focal points.

The focal point would examine the information provided with regard to its compliance with developed guidelines (in particular the requirements on the data quality from measurement, but also regarding how the information was retrieved), check the completeness of the information (see Section 5.1.2), and decide if the information will be included in the information system (see Section 5.1.3). The result of this process should be validated and qualified information. If the examination conducted by the focal point leads to validation, then the information is managed as follows:

- The information is included in the national information system, which forwards the information to competent authorities and shows the information on the public domain
- Depending on the relevance, the information is forwarded to the Secretariat of the Stockholm Convention (and possibly regional information platform) where the information is again validated and then made accessible on an information platform and forwarded to the NIP focal points (or other designated contact points) in the region or globally.
- The national focal points forward relevant information to the competent national authorities, which then check whether the notified product is present on the market and if it is necessary to take appropriate action. Results of these market surveillance activities in other countries are then reported back to the Secretariat of the Stockholm Convention and possibly a regional platform including additional information relevant for other national authorities.

Figure 3: Stakeholders and communication path of a bi-directional communication system for monitoring of new POPs on national, regional, and global level



(1) Monitor if articles and products contain (new) POPs

(2) Notify (report) on the presence of (new) POP in articles, products, and chemicals

(3) Analysis of products/articles on the market for the presence of POPs

5.2 Information to be reported into the effective bi-directional information system

If a chemical, mixture, or article is found to contain new POPs, the following information should be reported into the bi-directional information system:

- General information on notifying government, focal point, institution, or body
- Product/article details such as
  - Product name
  - Manufacturing company
  - Customs tariff number,
  - CAS number; type number, serial number
  - Place of manufacture,
  - Country of origin
- Test results on detected new POPs (and possibly other contaminants of concern)
- Method used for the measurements (QA/QC); accreditation of the measuring institution
- Additional documentation, such as test reports, detailed analytical data, and photographs
- Measures taken in the respective country

The quality of the generated new POPs data and related documentation is of crucial importance to prove the credibility of the detected contamination. In particular when considering that new POPs analysis will be developed in laboratories which for some time will not have the necessary experience of routine analysis. Due to the possible consequences of the data, only measurements from accredited laboratories with sufficient documentation of QA/QC should be included in an information system.

5.3 Information system/communication platform

An information system where data is gathered and shared/communicated needs to be established. The preferred system is a website or section of a website with specific features making the website suitable as a communication platform. At the national level, such a platform is best established at the website of the environment ministry or other institution where information on the Stockholm Convention and POPs has been compiled. An alternative option is the website of the ministry responsible for consumer protection in particular if a similar system for communication of chemicals and threats from consumer products exists. In the information system, having a section in the public domain and another section which is only accessible for specific stakeholders (e.g. competent authorities) protected by a password should be considered.

For the gathering and communication of information on a regional and possibly global level, such domains would likely need to be established on websites of the Stockholm Convention Regional Centres. The features would be similar as the above described national websites.

6 Rules and standards for measuring POPs in products and articles

Monitoring of chemicals and products by authorities are largely conducted by control of, for example, import papers and other information documents, chemical names, product names, CAS number, or GHS labels (see Figure 1 and Table 5, above; details on the approach are described in Section 4). However, due to the limitations of these tools and of voluntary schemes (see Annexes 1 and 2) in particular for new POPs in articles, monitoring of new POPs by analytical means needs to be included as a complementary approach.

6.1 Step-by-step approach for monitoring new POPs in products and articles by instrumental analysis

In this section, the basis for monitoring (regulation and regulatory limits) and the practical analytical monitoring of new POPs in articles and products are described.

6.1.1 Step 1: Regulatory limits for new POPs and related requirements

Of key importance for monitoring of new POPs are the levels at which a product or article is defined as POPs contaminated. If no national standards are set for new POPs in articles, such standards might be developed in the framework of NIP implementation. Some examples of limit values set for new POPs and some other POPs in products or articles by national legislation are listed in Annex 7. Such national standards should be carefully chosen considering the practical relevance of such limit values. For example, if a new POP has not produced for decades and virtually not present in articles (e.g. a "dead chemical" such as Chlordecone or HBB), inclusion in a national standard might mainly generate analytical costs without real benefit for protection of human health and the environment. For chemicals still produced (e.g. PFOS) or chemicals in the recycling flow (e.g. POP-BDEs, PFOS and related chemicals) or chemicals present as unintentionally produced POPs in certain products/articles (e.g. PeCB, HCB, PCDD/PCDF and other unintentionally produced POPs), the set of standards for these might be useful or important. Also, here care has to be taken for establishing regulatory limits. Such limits should be chosen considering the protection of human health and the environment and they should be practical from an analytical perspective and for a monitoring scheme. Such standards might also take into account recycling markets partly impacted by new POPs. Here, the EU POPs regulation has made an exemption for materials from recycled polymers from their stringent limit of 10 ppm for individual POP-BDE homologues (see Annex 7).

If setting stringent limits for a certain POP (e.g. the limit for HCB of 0.02 ppm in products and articles in Canada[65]), then certain products which cannot meet such a limit (e.g. certain pigments for HCB and possibly PeCB) might need exemptions and might be registered if allowed by national legislation. For such products, BAT/BEP limits might then be defined and companies would have to optimize production in this respect. Japan for example proposed for certain pigments (see table 4) BAT/BEP limits for HCB.[66] Also for PCDD/PCDF only a few limit values considering substances, products, and articles have been set. For example Japan has set limits for PCDD/PCDF in certain products (Annex 7). For brominated PBDD/PBDF, only Germany has developed a limit value for products and articles (Annex 7).

Without regulatory limits for new POPs in a product/article, no regulatory consequences would arise if a new POP is detected in an article or product. The result of such a monitoring would rather have only statistical relevance (e.g. for the generation of data for an inventory) or could be used for risk/hazard assessment. The same is true for limit values defining a biosolid or a soil or ground water as POPs contaminated. Therefore, appropriate regulation limits should be chosen for POPs with possible relevance in products or articles.

Such limits at the same time define the level required to be safely detected for a target new POPs by respective analytical procedure.

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[65] Environment Canada (2005) Prohibition of Certain Toxic Substances Regulations, 2005.

[66] Government of Japan (2007) Submission to COP3: Assessment Committee on BAT Levels for Reduction of a Specified Chemical as a Contaminant By-product. April 2007.

Therefore, when a sample (article or product) is to be analysed for new POPs, the required detection limit in respect to the respective target concentration needs be mentioned when requiring an analysis from a laboratory. When selecting a laboratory, it should be ensured that the target detection limit can be met by this laboratory with an accredited method.

6.1.2 Step 2: Stakeholder identification and monitoring concepts

Studies on new POPs can be performed on local, national, or regional (or even global) levels. Considering that resources are often limited and that countries in a region often have similar or the same products that are possibly impacted by new POPs, it can be appropriate to aim for a regional concept for monitoring of new POPs in products or articles. Such studies might be coordinated by a Stockholm Convention Regional Centre. Since most developing countries do not have established new POPs analysis, regional approaches have the advantage that an appropriate laboratory might be found and that regional studies can address the relevant products of different countries in a harmonized manner.

For larger countries, national studies might seem more appropriate or even selected local studies in a country (e.g. a federal state[67] might have a specific flammability standard and related PBDE impacted articles or a region has a PFOS production facility with impact on food from this region).

Since the analytical equipment for PFOS and related chemicals is relatively expensive and the set-up of PFOS and PBDE requires analytical skills and resources, strategies for an effective monitoring need to be developed. This includes:

- an effective survey/selection of samples
- a well planned sampling campaign. The monitoring can include cheap and quick screening technologies for pre-selection of samples to maximize screened products and to minimize the analysis of products not containing target chemicals
- consideration of a regional monitoring approach with associated synergies resulting in the optimisation and saving of resources and time
- possibly the development of a reasonable analytical capacity in the country or region for selected new POPs

6.1.3 Step 3: Survey of products and articles possibly containing new POPs

A list of relevant products and articles possibly containing new POPs are given in Section 3. Some product/article categories listed in Section 3 might have to be assessed only in the initial monitoring for a country or even region (within the inventory) since the stopping of production of most of the new POPs and possible lack of recycling activities might result in their non-existence or non-relevance in a region. Examples are some of the POP-PBDE containing categories like furniture, mattresses, or construction foam. Other categories might need regular monitoring over years, in particular articles/products possibly containing PFOS and related chemicals still produced and used or PeCB/UPOPs which as unintentional POPs can always be present in possibly impacted products and articles.

In any case, for the first screening, all categories should be evaluated for possible relevance for the country and from this assessment process (survey of available information; determination of industries possibly using new POPs or materials containing new POPs; communication with industry and other stakeholders; assessment of second hand market) categories would then be selected which possibly are:

- imported into the country (e.g. fire-fighting foams, second hand cars)
- present in the local market and second hand market (e.g. second hand cars and electronics)
- articles/products which are present in stocks (e.g. stockpiled electronics, synthetic carpets in use)
- used in industries (PFOS in plating industry; recycled polymers containing POP-BDEs)

[67] For example, a federal state might have a specific flammability standard and therefore might have a higher impact of certain new POPs, as is the case for California with respect to PBDE furniture.

From such a survey, categories of products and articles should then be selected for an analytical monitoring.

6.1.4 Step 4: Collection of products and articles: Sampling and screening

The selection of appropriate samples is the basis of any monitoring study. Samples might arise from:

- spot sampling (e.g. from the above mentioned custom control based on the described monitoring approaches or samples arising from inspection by a competent authority)
- a well planned survey of new POPs in articles, products, the recycling flow, or end-of-life management

A planned survey has the advantage that it can be harmonized within a region and can be established and discussed with experts having conducted similar surveys. Also, it can be discussed with stakeholders and the concept possibly improved and refined.

Sample categories for survey for different new POPs are described in Section 3.

Approaches for monitoring of, for example, PFOS and related chemicals in articles and products[68] are:

- the article contains PFOS and its related chemicals identifiable by the chemical names
- the article contains fluorinated chemicals identifiable by their trade names
- the article was identified as having certain properties that are common for articles treated with PFOS and its related chemicals (e.g. stain resistant, water repellent, and anti-grease)
- the article is used in an area known to formerly have used PFOS

The monitoring of PBDE or PFOS in products and articles might be assisted by a screening approach where samples are analysed with specific techniques on their bromine or fluorine content (see Section 6.2). Positive tested samples are then analysed for their new POPs content by confirmation analysis. The confirmation analysis is best conducted by or in cooperation with an experienced laboratory capable to analyse a wide range of other brominated or fluorinated compounds for a detailed assessment of chemicals present in the screened products and articles.

For the monitoring, an appropriate and detailed sampling protocol should be developed for reporting. A sampling protocol, for example, for polymers from WEEE has been developed from EMPA.[69]

6.1.5 Step 5: Sample analysis and quantification

The analysis of new POPs requires standardized analytical procedures which for some of the new POPs require sophisticated instrumentation and clean-up procedures (see analytical guidance*). If analytical capacity is present in the country, then it should preferably be used. The laboratory should, however, be accredited or at least should have shown in inter-calibration tests or comparable assessments that the laboratory meets certain quality standards and is capable of producing reliable results.

If for certain new POPs qualified analytical capacity is not available in the country, then an accredited laboratory from the region or an internationally operating laboratory should be selected for the analysis. For identification of a qualified laboratory, the “UNEP Databank of Laboratories Analyzing Persistent Organic Pollutants” might be consulted.[70]

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[68] Herzke D, Posner S, Olsson E (2009) Survey, screening and analyses of PFCs in consumer products. TA-2578/2009; Swerea IVF Project report 09/47.

Danish Ministry of Environment (2008) Survey and environmental/health assessment of fluorinated substances in impregnated consumer products and impregnating agents. Survey of Chemical Substances in Consumer Products, No. 99, 2008.

[69] Wäger et al (2010) RoHS substances in mixed plastics from Waste Electrical and Electronic Equipment. Annex 2 pp. 96. http://ewasteguide.info/files/Waeger_2010_Empa-WEEEForum.pdf

[70] http://212.203.125.2/databank/Home/Welcome.aspx

For the analysis of new POPs in articles and products, standard procedures have been compiled (see analytical guidance).

6.1.6 Step 6: Communication of the results

The effort and outcome of new POPs monitoring should be communicated to respective stakeholders. Some of the information might only need to be communicated to competent authorities and other governmental institutions or to the respective industries, while other information might be of public interest and therefore communicated more widely via a suitable communication platform. To facilitate such information, a bi-directional information system should be developed (see Section 5; and Figure 3).

Depending on the outcome, the results of the survey might also be interesting for the region or might be of global interest. Considering the relevance level, the results might be shared on regional level (e.g. via regional centres) or reported to the Secretariat of the Stockholm Convention.

6.2 Screening technologies for bromine and fluorine in products/articles as indication of possible presence of fluorine or bromine containing new POPs

While finally for a clear determination of a new POP and the quantitative POPs content, a confirmation analysis is necessary (see below; analytical guidance). Screening approaches can be very useful for a quick scanning of products and articles for bromine or fluorine as a cheap pre-selection tool for further time-demanding and more expensive confirmation analysis. Such screening can be used, for example:

- to assess if and to what extent categories of furniture or mattresses are impacted by brominated flame retardants and with a following confirmation analysis to determine if these categories are to be considered in a POP-BDE inventory for a country or not
- the screening of plastic in toys or kitchen equipment etc. for bromine as an indicator for contamination by recycling brominated flame retarded materials (possibly including POP-BDEs or HBCDD)
- the screening of fluorine in food contact paper (e.g. baking paper or muffin cups) or synthetic carpets as an indicator for PFAS (including PFOS).

Such screening approaches are relatively simple to use and to interpret and the technologies are already applied by authorities (customs or competent authorities responsible for market surveillance). Since one main application area for screening with XRF is the monitoring of the presence of heavy metals in articles, such equipment might already be present within a country possibly used by an authority for screening. The application area can then just be extended to screen PBDE/brominated flame retardants and possibly fluorinated compounds.

6.2.1 Screening methodology of bromine as an indicator for POP-BDEs in articles and fluorine in articles

There are rapid screening technologies capable of detecting bromine in products/articles like the XRF technology or sliding spark spectroscopy which can be used for screening purposes. These rapid screening methods cannot, however, describe between PBDE and other brominated flame retardants. The screening methods can be especially useful for all articles where the presence of bromine indicate a high probability of POP-BDE (e.g. cars/vehicles produced before 2004; articles with PUR foam before 2004) or for polymer articles where no BFR should be present (plastic toys, household goods, boxes for food, water pipes etc.).

XRF technology

X-Ray Fluorescence (XRF) is a non-destructive screening method which can also detect bromine (as parameter for BFRs including PBDE) and is the method of choice for rapid screening of the presence of bromine in articles. The detection limit of this method for bromine is in the range of 10 to 100 ppm and therefore sufficient to also detect low levels of PBDE in articles produced from recycled plastic. Several

types of hand-held equipment are available on the market.[71]

Sliding spark spectroscopy

Another approach for rapid bromine screening is the sliding spark spectroscopy (www.iosys-seidel.de/en/sss3.html). This method allows an identification and semi-quantitative analysis of bromine in homogenous materials (analysis of surface) like plastic materials, polymer foams, or textiles at a detection limit of approximately 1,000 ppm. Therefore, the detection limit of sliding spark spectroscopy is sufficient for all flame retarded materials (e.g. a flame retarded PUR foam), but might not be sufficient for screening of articles only contaminated with BFR by recycling (e.g. when screening children toys).

Screening of fluorine as indication for PFOS/PFAS

For a first assessment step, fluorine can be screened in such products with specific monitoring equipments (see analytical guidance?). However, today other PFAS are mainly used in articles, e.g. for carpets/textiles (fluorinated telomere alcohols) or paper (mainly polyfluoroalkyl-mono- and diester phosphates), to achieve water, oil, and grease resistance property. Therefore, a confirmation analysis with sophisticated analytical methods (see below) would be required to finally decide on the PFOS content.

Overall, considering that PFOS has largely been substituted by other fluorinated compounds in articles currently produced, the screening of only fluorine is a relatively weak indication on PFOS contamination, but indicates that a PFAS is included in the product. Therefore, other stationary screenings methods with structural information might be applied or combined with mobile fluorine screening methods.

Screening of fluorine: WD-XRF-Analysis

WD-XRF-systems are able to detect fluorine in vacuum mode. Respective systems (e.g. S8-TIGER, Bruker AXS, Karlsruhe) are used to analyze products and articles regarding their fluorine content. It is important to understand that for fluorine the depth of signal saturation is limited to a couple of micrometers, caused by the very low energy of the obtained fluorescence radiation. The system is rather sophisticated and stationary in laboratory.

Screening of fluorine with sliding spark spectroscopy (SSS)

Sliding spark spectroscopy system (SSS2, IoSys, Ratingen) is normally used for plastic characterization and sorting. The basic principle of this method is the thermal vaporization of a small amount of the sample surface using a train of defined high-current sliding sparks. The material components in the spark plasma are vaporized, atomized, and activated to emit radiation. Software analysis of the delivered spectra gives information on the content of elementary fluorine on top of the surface. For fluorine, a typical double-peak at a wavelength of about 350 nm is obtained. In defining special hardware setup, it is possible to get the absolute intensities of the fluorine emission line. The measurement is repeatedly done.

The system is mobile and can detect organofluorine like PFOS and related chemicals at a concentration of approximately 0.1%.

Screening of PFOS and organofluorine with HS-GC-EI-MS or HS-GC-CI-MS

A sophisticated screening tool is a headspace sampler connected to a GC-MS system. About 1 dm² of the material is placed into a 10 ml headspace vial. At a temperature of 150°C volatile PFOS precursor compounds are released into the headspace. An aliquot of the headspace volume is transferred onto a GC column and detected by EI-MS after chromatographic separation. Typical CnFm fragments (i.e. m/z 119, 131, 169, 195, 231, 331) are then monitored in order to identify the presence of organofluorinated compounds. If run with chemical ionisation, even molecule ions can be detected enabling an identification

[71] XRF are available, for example, from: Thermo Scientific Niton http://www.niton.com/RoHS-Compliance-Hi-Rel.aspx?sflang=de; Olympus http://www.olympus-ims.com/en/xrf-xrd/delta-handheld; or Bruker http://www.bruker-axs.com/handheldx-rayspectrometry.html

of the detected fluoroorganic compounds.

The equipment is stationary in laboratory and not mobile. It allows a high throughput of samples for screening of volatile PFOS precursors.

6.3 Confirmation analysis for identification and quantification of new listed POPs in articles and products

6.3.1 Introduction

For the confirmation analysis and the quantification of new POPs in articles, detailed standard analytical procedures have been established or can with some modification be applied.

For the respective standards, dedicated analytical instruments and techniques are described in the respective validated procedures below. The selection of analytical technique depends strongly on the chemical-physical properties of the respective new-POPs including, for example, degradation behaviour at elevated temperature present in, for example, GC/MS system. While for the initial POPs GC/MS was the method of choice for all compounds, for two new POPs (Chlordecone; PFOS) liquid chromatographic techniques coupled to MS systems is the method of choice and GC/MS is difficult or not possible to use.

In this section, key information on the analysis of individual new POPs are given including options of screening approaches for pre-selection of products/articles. The section can, however, only be seen as a brief introduction to information on analytical techniques used for new POPs.

For the introduction for monitoring of individual new POPs, the following structure is used:

- International or other standards available for the determination of the respective new POPs
- Measurement techniques used to determine newly listed POPs including considerations for developing countries
- Considerations on development of respective new POPs monitoring capacity in a country and the utilization of other options

6.3.2 General quality assurance considerations

International and national standard procedures for the analysis of chemicals contain dedicated sections on quality assurance and quality control (QA/QS). Other measurement protocols often do not contain dedicated sections on QA/QS and, therefore, if no specific international or national standard procedures is available or used by a laboratory, at least the following common procedures for the quality assurance of quantitative analysis of new POPs should be considered:

- clean laboratory equipment, material, and chemicals to be used to avoid contamination from background levels
- a system which ensure that effectiveness of the measures and procedures is continuously supervised through the analysis of procedural blank samples
- regular injection of solvent blanks and standard solutions
- tests to be carried out to evaluate the efficiency of the extraction methods, the recovery of the analytes, and the precision of the method
- clearly defined criteria for identification and quantification need to be applied, and calibration curves to be used
- storage of analysed samples and data (including instrumental raw data) for a defined time

Specific measures for brominated compounds:

- measures to minimize exposure of samples to UV-light to avoid losses through degradation
- all glass vials either covered with alumina foil paper or use of brown glassware
- lamps in the laboratory to cover with UV-protective film

For continuous education of laboratory personnel on QA/QS also in developing countries, information resources like dedicated books with training materials on QA/QS might be utilized.[72]

6.3.3 Confirmation analysis of POP-PBDEs and HBB in articles

National and international standards available for determination of PBDE in articles

a) International Standard IEC 62321 ed.1[73]

An International Standard IEC 62321 ed.1 has been developed for "Electrotechnical products – Determination of levels of six regulated substances (lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, polybrominated diphenyl ethers)". The method describes details on sample preparation and analysis. The determination of PBDE (MonoBDE to DecaBDE) and PBB (MonBB to DecaBB) in polymers by GC-MS is described in Annex A of IEC 62321 ed.1, including extraction, analysis, and quality assurance. The method has especially been optimized for the concentration range of 100 mg/kg and 1000 mg/kg due to the compliance requirements of EU RoHS Directive.

b) German national standard for determination of PentaBDE and OctaBDE in plastic materials with respect to the RoHS directive[74]

A standard method for determination of PBDEs in plastic materials in respect to the RoHS directive (Directive 2003/11/EC, Directive 76/769/EEC) has been developed on behalf of the German Environmental Agency. The method includes extraction, clean-up, and measurement procedures. The study has also validated the method for different polymers and assessed for reproducibility and repeatability. The compounds analysed in this method are defined to certain PentaBDE (BDE85 (2,2',3,4,4'-pentaBDE), BDE99 (2,2',4,4',5-pentaBDE), BDE100 (2,2',4,4',6-pentaBDE)) and OctaBDE BDE203 (2,2',3,4,4',5,5',6-octaBDE), BDE196 (2,2',3,3',4,4',5,6'-octaBDE), and BDE197 (2,2',3,3',4,4',6,6'-OctaBDE) since the current RoHS limit is defined for Σ PentaBDE and ΣOctaBDE with a limit of 0.1% each.

Considerations for POP-PBDE and HBB analysis for Stockholm Convention purposes

With respect to quantification, a tailor made measurement method for PBDE for Stockholm Convention purposes needs to consider TetraBDE, PentaBDE, HexaBDE, and HeptaPBDE. Such a method also needs to define detection limits with respect to national standard limits for the PBDE or the target concentration required for the particular monitoring purpose. The not listed OctaBDE to DecaBDE might be included in the analysis for completeness of data and to discover if debromination of the higher homologues might have impacted the measurements. For Stockholm Convention purposes, a lower calibration range would need to be considered if a low POPs limit would be different from the 0.1% limit used for RoHS compliance.

Analytical techniques required for confirmation analysis

The state-of-art analytical technique for PBDE analysis of the PBDE congeners addressed by the Stockholm

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[72] E.g. Wenclawiak, B.W., Koch, M., und Hadjicostas, E. (eds.): Quality Assurance in Analytical Chemistry - Training and Teaching. 2nd Edition, p. 247- 272, Springer-Verlag, Berlin Heidelberg 2010.

[73] A working group (IEC TC111 WG 3) is currently drafting the 2nd edition of the international standard (IS 62321; 2nd editions) and this version is expected by December 2012.

[74] German EPA (UBA) (2005) Kemmlein, S.,Bergmann, M. Jann. Standard measurement method for the determination of polybrominated flame retardants (pentabromo diphenylether, octabromo diphenylether) in products Nr. 31/2005 UBAFBNr 000839/e.Förderkennzeichen 202 67 300, Umweltbundesamt.

Convention (TetraBDE to HeptaBDE) are chromatographic techniques coupled with a mass spectrometer or ECD detector. High resolution gas chromatography is normally used as separation technique.

GC separation

GC separation is performed on a non-polar GC column (often 30m), if it is not intended to monitor DecaBDE. If DecaBDE is also to monitored, a shorter column (e.g. 15 meter) should be used.

Injection temperature should be between 290 and 300°C, since higher temperature may lead to a degradation of DecaBDE and lead to lower brominated PBDE artefacts. For the same reason, it is important that the detector temperatures are not too low (<300°C) in order to avoid sinks for DecaBDE, but also not too high (>340°C) in order to avoid degradation. In conclusion, 330-340°C is recommended for ECD detector temperatures, and 320-330 for the detector side of the column. MS ion source temperatures, however, are usually set between 270-300°C in order to increase life times of the filaments.

Detectors (Mass spectrometer and ECD)

Different detection technologies can be used for PBDEs/BFRs analysis. The advantages and drawbacks of the main utilized detection techniques for are described in Table 7.

Table 7: Advantages and drawbacks of different detection techniques for PBDEs/BFRs[75]

Detection	Advantages	Drawbacks
ECD	purchase cost maintenance cost ease of use	fair sensitivity for BFRs instability of linear range very low selectivity
EI-LRMS	facilitates the use of labelled standards good selectivity	low sensitivity
ECNI-LRMS	good sensitivity good selectivity for brominated compounds	frequent source maintenance required
EI-HRMS	good sensitivity very good selectivity	purchase cost maintenance cost difficult to use higher "down-time"

PBDE detection with mass spectrometry: Sensitive EI-MS analysis is performed in SIM mode analysing monitoring the 2 to 3 most abundant isotopes of the molecular ions (for TriBDE to PentaBDE) and the 2 to 3 most abundant M-2Br isotopes for (HexaBDE-DecaBDE). Normally at least 2-3 SIM windows are defined, other built up SIM windows for each kind of homologues.

Modern GC-EI-MS instruments are sensitive enough in the scan mode and can be run with a scan from 400-1000 m/z. GC-EI-MS may be performed on low resolution and high resolution instruments. The latter is by far more sensitive, but requires highly trained and experienced lab personnel, whereas for analysis in the ppb range LRMS is normally sensitive enough.

PBDE analysis with ECD detector: Electron Capture Detector (ECD) is an appropriate detector for brominated aromatic compounds. The advantage of the detector is the robustness, relative low price, and ease of use. Therefore, the detector is used frequently in developing countries. The robustness of the

[75] Covaci et al. (2003). Determination of brominated flame retardants, with emphasis on polybrominated diphenyl ethers (PBDE) in environmental and human samples—a review. Environ Int 29(6): 735-756

detector and the slightly higher operation temperature is a particular advantage of the ECD detector when analysing samples from "dirty" samples like polymers having often oligomers as co-pollutants.

However, since the signal in the ECD does not include structural information, only the retention time is used to determine the respective compound. Though, since PBDEs are present as mixtures in the polymers they have a specific fingerprint which can be used for confirmation.[76] A recent inter-laboratory comparison study reveals a good agreement of GC-ECD and various GC-MS techniques.[77]

Considerations on development of PBDE monitoring capacity in a country/region and the utilization of other options

While PBDE analysis in articles is developed widely in commercial laboratories, such analysis is less frequently established in laboratories of governmental institutions. In developing countries, the analysis of PBDE is generally not widely established. Considering that PBDE can be analysed by GC/ECD and that a wide range of laboratories in developing countries have these equipments available, such an approach could also be established in a developing country without high investment cost. Furthermore, a range of laboratories in developing countries have low resolution mass spectrometer which are sufficient to detect PBDE in products present either in % for original or in recycled products in ppm range which can also be used. However, care has to be taken with extracts from plastics and polymers (main sample category for PBDE in products) since the matrix lead to relative quick decrease of separation quality of GC columns and can contaminate the detectors resulting in higher maintenance demand.

6.3.4 Analysis of PFOS and related chemicals in articles

National and international standards available for determination of PFOS in articles

For chemicals in products, only the NPR-CEN/TS 15968 "Determination of extractable perfluorooctane-sulphonate (PFOS) in coated and impregnated solid articles, liquids and fire-fighting foams - Method for sampling, extraction and analysis by LC-qMS or LC-tandem/MS" has been developed on international level in English. The method is applicable for a concentration range for PFOS in the extract solution of 0,5 µg/l to 50 µg/l. Other analytical standard procedures have been developed for water (ISO 25101:2009) or drinking water (US EPA Method 537).

Considerations and challenges for analysis of PFOS and related chemicals for Stockholm Convention purposes

Since the Stockholm Convention aims to address all PFOS related chemicals, the use of the NPR-CEN/TS 15968 focusing on extractable PFOS might lead to a significant underestimation of the presence of PFOS related chemicals in a product or article. Challenges are to address PFOS related chemicals and in particular chemically bound PFOS.

Challenge of comprehensive analysis of PFOS related chemicals

The OECD has developed a list of 160 PFOS related chemicals (see Annex 5). Only for a few of the PFOS related chemicals is a standard analysis available. Currently no analysis has been developed to analyse most of the related chemicals.

Challenge of analysis of chemically bound PFOS

The current available standard to analyse PFOS in articles only covers the extractable PFOS. In some applications, however, the PFOS related chemicals are chemically bound (e.g. in carpets or in textiles). Here the analytical standard procedures only/mainly extract the extractable PFOS and PFOS related

[76] The recognition and interpretation of PBDE chromatograms from ECD detector need some experience in particular if BFR mixtures are present in recycled plastics.

[77] Zeleny et al. (2010). Evaluation of the state-of-the-art measurement capabilities for selected PBDE and decaBB in plastic by the international intercomparison CCQM-P114. Analytical and Bioanalytical Chemistry 396(4): 1501-1511

chemicals. The largest part of PFOS precursor can remain on/in the article leading to a considerable underestimation of PFOS related chemicals in these products.

Note: When using the different available analytical methods for PFOS and its related chemicals, caution should be given to follow the measures needed to assure that they provide reliable results. The challenges connected with quantification methods for PFOS and its related chemicals are described in the literature (Martin et al. 2004).[78]

Analysis of PFOSF

Note: The analysis of PFOSF listed in the Stockholm Convention is not relevant or useful since the compound is not stable and only used for the production of intermediates. Therefore, PFOSF analysis should not be established or be requested in tenders or to a laboratory.

Analytical techniques required for confirmation/quantitative analysis of PFOS and related compounds

The analytical detection method of choice for PFOS and most related substances and PFAS is currently Liquid Chromatography (LC) coupled to MS or LC-MS/MS for the anionic compounds, whereas both LC-MS(MS) and Quadrupole tandem mass spectrometry applying negative electrospray ionisation interfaces (HPLC/ESI-MS/MS) seems to be the preferred instrumental method for the determination of PFOS and other ionic PFOS related chemicals.

GC-MS can be used for the determination of the neutral per- and poly-fluorinated alkylated substances including several precursors of PFOS.

Considerations on development of PFOS monitoring capacity in a country/region and the utilization of other options

The analysis of PFOS and related chemicals require sophisticated LC/MS technology not present in most developing countries. Also, the establishment of the analysis of PFOS and related chemicals is different from other POPs and require considerable resources, knowledge, and effort to establish the analysis of an accredited PFOS/PFAS analysis. Furthermore the above mentioned challenges in analysing many of PFOS related chemicals not described by standard method or even not established yet need to be taken into account for monitoring of articles and products.

Therefore, if no capacity for PFOS/PFAS is established in a country, the current most appropriate approach for monitoring of PFOS and related substances is the use of an accredited (commercial) laboratory. Furthermore, for the establishment of PFOS monitoring capacity a regional approach might be considered, possibly linked[79] to Stockholm/Basel Convention Regional Centres. A practical approach might be the establishment of PFOS monitoring capacity in cooperation with experienced laboratories.

A list of laboratories accredited for analysing POPs and using GLP (Good Laboratory Practices) can be found in the UNEP database of POPs laboratories: http://www.chem.unep.ch/gmn/gmnlabs/default.htm.

Analysis of Chlordecone in articles[80]

The analysis of Chlordecone is not trivial and GC/MS cannot be used but an LC/MS is needed. For the analysis of Chlordecone, an LC/MS methodology has been developed from the WHO reference laboratory for human milk after discovering that analysis with GC does not lead to satisfactory results (Malisch 2011). The method is not validated yet and will be published after the validation process is finished.

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[78] Martin et al. (2004) Analytical challenges hamper perfluoralkyl research. Environ. Sci. Technol. 38, 248.

[79] "Linked" does not necessarily mean that the laboratory is established at a center or institution, but that the aim should be for the Regional Centres to develop links to such laboratories to possibly facilitate monitoring on a regional level.

[80] The contamination of articles is probably only relevant for food or bio-solids imported from countries/areas where Chlordecone has been extensively applied (e.g. Martinique and Guadeloupe).

6.3.5 PeCB and alpha-, beta- and gamma-HCHs

The analysis of these organochlorine substances can be performed with GC/MS, GC/EDC or GC-FID and the same instrumental set up and analytical methodology as for the basic organochlorine pesticides can be used.

Some matrices like pigments or pesticides have challenges in the extraction or the clean up which will be elaborated in guidance on analysis of newly listed POPs.

Annex 1: Tools and regulatory frameworks for identification of chemical and their gaps to facilitate the control of import/export of new POPs or the monitoring of products and articles possibly containing new POPs

1.1 Trade names of chemicals and mixtures and gaps

As systematic names are often very long and complicated and difficult to read for marketing and trade of chemical substances, mixtures and articles, generic names, proprietary or trade names and trivial (common) names are used. A trade name is given to a chemical, a mixture or an article by the company that markets/supplies it. The trade name normally specifically identifies the chemical, mixture or article and sometimes gives information on the company.

One model for how to use trade names in the control of banned chemicals is the "UNEP Inventory of trade names of chemical products containing ozone depletion substances and their alternatives".[81] Here the establishment of import and export licensing systems is mandatory for all Parties to the Montreal Protocol. Because those systems determine the accuracy and completeness of national ODS consumption data, by extension they are key tools to help measure and ensure compliance with the Protocol.

If trade names of all currently used chemicals and products of all new POPs would be available and compiled, a similar system could be established. However, the available information differs for the different new POPs. For example:

- For PFOS, its salts, PFOSF, and PFOS-related chemicals, there is very limited information available on trade names, and what is available is generally obsolete, e.g. information from the company "3M", which stopped the supply of these chemicals by 2002. For commercial PentaBDE and commercial OctaBDE, only some common names of congeners are available from the work of the POPRC.
- Only for lindane, endosulfan, and DDT is there an abundance of information on trade names available from CAS, INCHEM, and the Decision Guidance Documents (DGDs) of the Rotterdam Convention. From CAS there are only trade names, common names, generic names, and synonyms available for all three chemicals and no company information. INCHEM PIM provides common names/synonyms, trade names, and company information not related to the trade names for endosulfan; common names/synonyms and trade names but no company information for DDT; and, for lindane, synonyms/common names and trade names and company information not related to the trade names. For mixtures containing lindane, trade names with related company names for mixtures including information of the concentration of the active ingredient are provided.
- The DGD from the Rotterdam Convention provides for endosulfan, trade names, company (basic manufacturers) names not related to the trade names, and a general description of mixtures containing endosulfan as an active ingredient. For DDT and lindane, there are available trade names, company (basic manufacturer) names not related to the trade names, and a general description of mixtures containing DDT or lindane as an active ingredient.

Available information is compiled in the database (see Annex 5), which provides common name, chemical name, CAS number, HS code chemical, HS code mixture, trade names with source (POPRC, CRC, CAS, INCHEM; for PFOS: Environmental working group), trade name mixtures from INCHEM, information about mixtures from CRC, company names from CRC/POPRC and from INCHEM/Environmental working group.

As the different sources provide sometimes the same trade names for lindane, DDT, and endosulfan, the trade names were put into a database and the duplications and other mistakes like UN numbers were removed. The resulting database, which include more than 200 names for lindane, more than 100 for DDT, and almost 100 names for endosulfan, allow users to search the trade name for the three chemicals. The great number of trade names is also due to the fact that common names, synonyms, and trade names

[81] http://www.unep.fr/ozonaction/information/mmcfiles/3328-e.pdf

are collected together, that different forms of writing the same name were accepted, and that the same names are given in different languages. Except for endosulfan, the information sources are from 2000 for lindane and from the 1990s for DDT.

Regarding lindane, many manufacturers are from countries that have long banned the chemicals and the company related trade names are expected to not be very useful for customs control or other control purposes. Therefore, it would be useful to collect additional information on trade names and companies for these three chemicals and for the other newly listed chemicals.

The only specific actual information for PFOS, its salts, PFOSF and PFOS-related chemicals is through a private communication concerning some information collected in China in connection with the preparation of a NIP for the Stockholm Convention. In addition, through direct contact with the German company Lanxess, one PFOS-related chemical with trade name was identified.

Gaps of trade names and mixtures

Information on trade names, companies, and HS codes for POPs as substances and in mixtures is mostly lacking for the totally banned newly listed POPs and PFOS, its salts and PFOS-related chemicals and if available partly outdated for DDT and lindane. This may be due to the fact that, for example, chlordecone, pentachlorobenzene, and hexabromobiphenyl have long been banned in many developed as well developing countries and alpha-HCH and beta-HCH were produced as unintentional by-products in the production of lindane.

A search in the literature gave no result for trade names of PentaBDE, OctaBDE, PFOS, its salts, PFOSF, and PFOS related chemicals, the industrial chemical POPs that are expected to be contained in articles. There is a need to collect this information through other processes.

Gaps might be addressed together with Rotterdam Convention activities: The Chemical Committee of the Rotterdam Convention decided at its seventh meeting (CRC7) in March 2011 to recommend the POPs chemicals endosulfan, perfluorooctane sulfonate, its salts and precursors, pentabromodiphenyl ether commercial mixtures and octabromodiphenyl ether commercial mixtures, for which two notifications met the criteria of Annex II of the Rotterdam Convention for listing in Annex III of the Convention, and to draft decision guidance documents for these chemicals for their eighth meeting in 2012.

The experience with a recent draft DGD for endosulfan from CRC6 shows that trade-related information, such as trade/common names and companies, is collected very extensively in this process and documented in the DGD. Therefore, it is expected that the DGDs for the other POPs proposed for listing will also contain information on trade names and companies which could be made available for the Stockholm Convention “General guidance for customs on use of commercial/trade names” at a later stage after CRC8**.** It would be useful if, for this newly collected information, the trade names would be related to the company.

1.2 Trade names of articles containing new POPs and gaps

For chemicals that are part of articles like commercial c-PentaBDE or c-OctaBDE and for articles containing PFOS for exempted uses or acceptable purposes, trade names for these articles would be helpful for enforcement/control purposes. This is obvious for articles where specific trade names are used such as for cars from a specific brand containing PentaBDE (here brand name; type and production year would be needed). Or for electronic goods (e.g. TV or computer) containing c-OctaBDE in the polymer.

Two POPs monitoring projects related to Stockholm Convention have recently published monitoring data of BFR/PBDE in articles related to articles:

- BFR in electronics: BFR have been screened with XRF in 400 E-waste plastic samples in Nigeria[82] in a project of the Basel Convention Regional Centre. Information on products (producer, year, area of origin, and BFR content) has been compiled. The articles were analysed for the individual BFRs. From these activities, a first data set on product names and PBDE content can be developed.
- PBDE in carpet rebound: Recently, a monitoring project of POPs PBDE in carpet rebound was performed with XRF for bromine screening and 26 samples were analysed for PBDE by GC/MS analysis. The levels of contamination and the name of products with higher levels have been published.[83]

Gaps of trade names of articles containing new POPs

The recent activities on identifying these articles (see work program on new POPs proposed by POPRC and agreed by COP5) show that very little information is available for trade names of articles. With the exemption of the above mentioned studies, there is no detailed information available on PBDE in articles. The European Automobile Manufacturers Association has made a survey on former PentaBDE and OctaBDE use in cars, but did not get information for the use before 2000 (after 2000 PentaBDE and OctaBDE has not been used in European car production)[84].

Also, producers of electronics have not revealed if and for which years they have used POPs BDEs in their products. Such information would therefore first need to be retrieved from the producers or generated by measurements.

The information on trade names of articles currently on the market and formerly sold (for articles still on the second hand market like cars or electronics) need to be retrieved from the producers or otherwise be collected.

Emphasis should especially be given to collecting information about PFOS, its salt, PFOSF and PFOS-related chemicals (e.g. POPs name, CAS number, trade names, and uses). Also, the former use of PBDE in the transport sector (company, model, and year) would be valuable. This information could also be asked for from the electronic sector (company, model, and year).

While such information might be useful for monitoring imports of cars, it likely would have only limited practical use for controlling used electronics since second hand electronics are often imported mixed as bulk in containers. To assess producer and product names for custom control seems not practical.

Published results for articles from recycled products like carpet padding study also have an uncertainty for other products from the same company with the same specification since the PBDE levels in recycled products might have considerable fluctuation. However, such studies are very useful as information on which companies are recycling PBDE-containing materials as a first indication of possible PBDE-containing goods.

Further, it should be mentioned that articles have been found which formerly contained newly listed POPs (e.g. lindane for head lice treatment) and now the producers have changed formulation, but kept the product name.

1.3 Custom codes (Harmonised System codes) and gaps

The HS codes for chemicals listed in Annex III of the Rotterdam Convention are available from the World

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[82] Sindiku et al. (2011) Screening E-waste plastic in Nigeria for BFR using XRF – towards a methodology for assessing POPs PBDE in Ewaste exports. Organohalogen Compounds 73. 785-788 (2011) http://www.dioxin20xx.org/pdfs/2011/1909.pdf

[83] DiGangi J, Strakova J, Watson A (2011) A Survey of PBDES in Recycled Carpet Padding. Organohalogen Compounds 73, 2067-2070. http://www.dioxin20xx.org/pdfs/2011/4511.pdf

[84] ACEA (2010) Personal communication ACEA - European Automobile Manufacturers Association, 2010.

Customs Council through the website of the Rotterdam Convention[85]:

- substance specific (for one or two substances): aldrin 2903.52, DDT 2903.62, dieldrin 2910.40, heptachlor 2903.52, hexachlorobenzene 2903.62, lindane (same as technical HCH) 2903.51, toxaphene (none)
- generic code (for ANNEX III entry) for mixtures containing these substances: 3808.50- generic code for PBB polybrominated biphenyls (hexa- CAS 36355-01-8, octa- CAS 27858-07-7, deca- CAS 13654-09-6) mixture 3824.84

For the other newly listed POPs, the following HS codes are available from the EU Customs database ECICS[86]:

- Chlordecone: 2914.70 Ketones and quinones, whether or not with other oxygen function, and their halogenated, sulphonated, nitrated or nitrosated derivatives
- Hexabromobiphenyl 2903.69 Halogenated derivatives of hydrocarbons, other
- Pentachlorobenzene 2903.69 Halogenated derivatives of hydrocarbons, other
- PFOS acid 2904.90 Sulphonated, nitrated or nitrosated derivatives of hydrocarbons, whether or not halogenated, other
- PFOS potassium salt 2904.90 Sulphonated, nitrated or nitrosated derivatives of hydrocarbons, whether or not halogenated, other
- Endosulfan: 2920.90 specific

The HS code, if chemical specific, can be used to identify the imported chemical. If the HS code relates to a group of chemicals also including a POPs, this information can be used for the customs risk analysis to identify possible illegal trade.

Gaps of custom codes (Harmonised System codes)

For most newly listed POPs, the custom code is not specific yet. Therefore, currently for these substances, custom codes have limited use. PFOS and PBDEs will also receive a custom code. Considering the dates of Rotterdam Convention COP meetings and the need to work with the world Customs Organization on this, it will take some time until PFOS and PBDE will receive a custom code (probably not before 2013 or so).

1.4 GHS classification and labelling for chemicals and mixtures and Gaps

The report of UNEP on chemicals in products[87] states, while currently there is no single global information system for management of information about chemicals in products, the GHS is an international standardized system for communicating chemical hazards. It addresses classification of chemicals by types of hazard and proposes harmonized hazard communication elements, including labels and safety data sheets. Its limiting factor is that it applies solely to chemicals and chemical compositions and not to products in general – that is, articles.

According to the GHS, for a hazardous chemical or mixture the label should, inter alia, contain a product identifier for the hazardous chemicals and supplier identification. As a product identifier, the identity of a substance is to be provided by its common chemical name. The “common chemical name” may, for example, be the CAS name or IUPAC name, as applicable.

The Chemical Abstract Service (CAS) registry number provides a unique chemical identification and should

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[85] http://www.pic.int/TheConvention/Chemicals/AnnexIIIChemicals/HarmonizedSystemCodes/tabid/1159/language/en-US/Default.aspx

[86] http://ec.europa.eu/taxation_customs/dds2/ecics/chemicalsubstance_consultation.jsp?Lang=en&Cas=29457-72-5&Cus=&CnCode=&EcCode=&UnCode=&Name=&LangNm=en&Inchi=&Characteristic=&sortOrder=1&Expand=true&offset=0&range=25

[87] A Synthesis of Findings Under the UNEP/IOMC Project on Information on Chemicals in Products, UNEP / DTIE Chemicals Branch February, 2011 http://www.chem.unep.ch/unepsaicm/cip/Documents/CiP%20Project%20synthesis%20report__Final.pdf

be provided when available. Supplier identification consists of the name, address, and telephone number of the manufacturer or supplier of the substance or mixture.

For a mixture, the chemical identity, identification number (CAS number), and concentration or concentration ranges of all hazardous ingredients, which are hazardous to health or the environment within the meaning of the GHS, and are present above their cut-off levels, should be provided.[88]

All POPs are hazardous chemicals and their chemical name and CAS number, together with supplier information, should appear on the label. There exists no internationally agreed list of GHS classification and labelling of the newly listed POPs. To facilitate the customs control, the GHS classification and labelling as used by the EU has been integrated in Annex 4. The original data can be found in a database of the EU Commission, Joint Research Centre, Table 3.1[89] and the data for chlordecone, DDT, endosulfan, lindane, c-OctaBDE, c-PentaBDE, pentachlorobenzene, PFOS and its salts are available in Annex 4 with explanations of hazard classes codes, hazard statements codes, and the label information. Therefore, the EU has developed labelling for all of the POPs except HBB.[90] The GHS might be useful to some extent for controlling POPs in articles.

Gaps for GHS classification and labelling

While the GHS is an international standardized system for communicating chemical hazards, currently it is not yet the single global information system for management of information about chemicals in products. Currently, 67 countries are listed as implementing GHS. Many other countries are preparing for implementation. In particular, many developing countries might need some time for preparation and implementation.

Concentration levels below 0.1% are normally not covered in the GHS label. However, there are possibilities to lower this generic value. For POPs, such levels would need to be defined.

As described in *Guidance on labelling of products or articles that contain new POPs or use new POPs during manufacture*, the Conference of Parties (COP) of the Stockholm Convention could recommend to Parties to implement the GHS and to classify and label the allowed newly listed POPs based on all known hazards. A list for the GHS classification and labelling of all newly listed POPs that is available from the COP of the Stockholm Convention would facilitate the implementation of the GHS for POPs in Parties. This list could be prepared on request by the COP by the POPRC in cooperation with the UN ECOSOC Subcommittee of Experts on the GHS (SCEGHS). A first step could be initiated by the Secretariat of the Stockholm Convention to exchange information about the classification and labels for POPs used by Parties when implementing the GHS.

Addressing the gaps

The COP of the Stockholm Convention could ask POPRC in cooperation with SCEGHS to develop a science-based proposal for cut-off values for POPs based on the principles of the GHS: “The cut-off values can be reduced if the classifier has information that the hazard of an ingredient will be evident below the generic cut-off values/concentration limits, the mixture containing that ingredient should be classified accordingly. Adequate documentation supporting the use of any values other than the generic cut-off values/ concentration limits should be retained and made available for review on request”. These values could be recommended by the COP to be used by Parties when implementing the GHS. The Secretariat of the Stockholm Convention could initiate an exchange of information about the cut off levels for POPs used by Parties when implementing the GHS.

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[88] 1.4 GLOBALLY HARMONIZED SYSTEM OF CLASSIFICATION AND LABELLING OF CHEMICALS (GHS), *Fourth revised edition,* UNITED NATIONS, New York and Geneva, 2011

[89] http://esis.jrc.ec.europa.eu/index.php?PGM=cla

[90] Production of HBB stopped in 1976 and therefore has no relevance as a traded chemical.

1.5 Material safety data sheet and Gaps

A Material Safety Data Sheet (MSDS) (also known as PSDS, or Product safety data sheet) is a form with data regarding the properties of a particular substance. MSDSs are a widely used system for cataloguing information on chemicals, chemical compounds, and chemical mixtures. The chemical supplier (e.g. a manufacturer, importer, or formulator) should be able to provide detailed information about the chemical in a safety data sheet (SDS). In certain countries, the supplier has the obligation to provide information in an SDS on chemicals' health and environmental hazards, labelling, safe use and handling, among other things. SDSs have been prepared on many dangerous substances and preparations.

SDS should go together with the product to the user in the workplace. It should provide comprehensive information about a chemical substance or mixture for use in a workplace setting. It can be used by both employers and workers as a source of information about hazards, including environmental hazards, to obtain advice on safety precautions, and most importantly to identify appropriate risk reduction messages for the use in question. Advice by the supplier on the safe use of the chemical by the user requires information on the workplace situation of the user and expected exposures. The information in an SDS acts therefore as a reference source for the effective management of hazardous chemicals in the workplace.

The MSDS is product related and, sometimes, may not be able to provide specific information that is relevant for a specific use. In other cases, the SDS may be specific and detailed for a particular use. The MSDS is a resource that enables an employer to undertake worker and environmental protection activities, including training, that are specific to the individual workplace.

Gaps of material safety data sheet

The MSDS is within the GHS framework and does not give more information for identification than the GHS label does. As with the GHS, chemicals at concentrations below 0.1% are not listed in MSDS. Often only the main compounds are listed.

One experience within the newly POPs project in Nigeria was that for AFFF foam products no SDSs were delivered with the imports since no requirement for SDSs exists in the country. This might be the case for many developing countries.

1.6 Specific labelling of articles (RoHS certificates; POPs label) and gaps

Certificate for RoHS compliance

For compliance to RoHS, a compliance certificate/label exists. This covers PBDEs (PentaBDE, OctaBDE and DecaBDE) and HBB as well as certain heavy metals (lead, mercury, cadmium, and hexavalent chromium). Although the standard has been developed for Europe, companies comply worldwide to the standard due to import requirements for Europe.

The RoHS standard can be seen as success story; there are meanwhile several countries with RoHS-like legislation (including Australia, Canada, China, Japan, South Korea, and USA) making RoHS a "global legislation". The European RoHS directive has recently been updated and extended.

Gaps of RoHS certificate

The RoHS limit is 0.1% for POP PBDEs and HBB and therefore about an order of magnitude above the low POPs content of PCB (50 ppm) or POPs pesticide (50 ppm). Further, the definition and measurement of PBDEs in RoHS have some differences from the Stockholm Convention definition. In RoHS, for example, the OctaBDE homologue is also included, but not considered as POP in Stockholm Convention, and therefore the total content is calculated slightly different. Also, DecaBDE (by far the most abundant PBDE

in articles) is included in RoHS but not in the Stockholm Convention[91].

Labels for articles due to the POPs content (see also "Guidance on labelling")

Dedicated labels for articles for a specific material are known for plastic and asbestos. A specific label might also be developed for POPs. For POPs as substances or in mixtures, the label contains the name of the POPs if the concentration is above the cut off value. For POPs in articles which are not covered by the GHS, the *Guidance on labelling of products or articles that contain new POPs or use new POPs during manufacture* developed further proposals for labelling.

Resources for implementation include:

- Manufacturer to identify the POPs and label the article.
- User industry, worker, farmer, and public (using the information to protect human health and the environment).
- Government would need to provide awareness raising, training, as well as monitoring the obligation to label.
- The system requires an efficient customs monitoring to identify unlabelled imported articles and the control of manufacturers in manufacturing Parties producing the regulated articles.
- In principle applicable to all articles manufactured that contains a regulated POP.

Gaps of a "POP label"

A "POPs label" is not developed yet and it would take time and large efforts to develop such a label. It is questionable if the effort of a label only for POPs is justified considering the relatively small amount of goods to be labelled and the related efforts. Also, the effort to educate and train custom staff and other competent authorities and to motivate them to consider such labels seems not to justify the possible outcome.

1.7 RAPEX system and gaps

RAPEX (Rapid Alert System for Non-Food Consumer Products) is the EU rapid alert system for all dangerous consumer products, with the exception of food[92] and medical devices. Meanwhile, the alert system also covers pharmaceutical products and in this respect is also reporting to an international UN body (WHO). The system allows for the rapid exchange of information between Member States via central contact points and the European Commission on measures taken to prevent or restrict the marketing or use of products posing a serious risk to the health and safety of consumers. RAPEX covers reporting on measures ordered by national authorities, and measures taken voluntarily by producers and distributors.

The national authorities of Member States notify the European Commission, via RAPEX, of measures taken to prevent or restrict the marketing or use of consumer products posing a serious risk to the health and safety of consumers. Hazardous chemicals are addressed within RAPEX and chemical risk is ranked as the fifth category within RAPEX notification and has a relevant share (13%) (European Commission 2007). Each Member State has designated competent market surveillance authorities and granted them with the necessary powers to take measures in order to prevent or restrict the marketing or use of dangerous products. More specifically, the national authorities are competent to take samples of consumer products placed on the market, to test them in laboratories and – in cases where these products pose risks to consumers – order producers and distributors to stop their sale, withdraw them from the market and/or recall them from consumers.

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[91] DecaBDE is degraded over time to the lower brominated PBDE including POPs PBDEs (UNEP/POPS/POPRC.6/INF/20)

[92] For example, the Rapid Alert System for Food and Feed (RASFF) is used to exchange information about dangerous food and feed.

Gaps of RAPEX system

Currently POPs are not specifically addressed under RAPEX. RAPEX is currently mainly an instrument within the EU. However, as with pharmaceutical products it is already linked to UN (WHO). Also RAPEX China indicates that such a system has the potential of extension above the European region.

1.8 Customs Service automated audit system ASYCUDA and gaps

The Automated SYstem for CUstoms DAta (ASYCUDA)[93] programme provides technical assistance to Member States for managing international trade and transport operations in a modern automated environment. The strategic goals of the ASYCUDA Programme endeavour to leverage innovative capacities to respond to demands from members and partners and to ensure long-term sustainability of the Programme. The system has been installed or is being implemented in over 90 countries and regions.[94]

As reported in the Nigeria New POPs Project: *"We also investigated the import, export and consumption profiles of each new POP chemical in the country using the global harmonized system of coding chemicals (GHS code) and tracking their importation profile with Nigeria Customs Service automated audit system of clearing goods using ASYCUDA, which has been in operation in Nigeria Customs Service (NCS) since 2006. The chemicals listed in the Stockholm Convention are currently controlled in Nigeria under Chapter 29 of the "Customs, Excise Tariff, etc. (Consolidation) of 1988. NCS does not have a national system of harmonized custom codes for identification of the nine new POPs and their mixtures. It operates both the International Harmonized System (IHS) Code system of six digits and the extended system of ten digits which would enable substances listed in the Stockholm Convention to be precisely identified. Extremely hazardous chemicals require that permits be obtained before import and after import, 100% inspected, and clearance obtained to remove them from the port. Implementation of the GHS has now been easy for the Customs to operate as a result of training undertaken for designated officers of NCS. The Customs Audit System records list of importers, import code, monetary value, and quantities of each chemical imported in kilograms together with the tariff paid for clearance from the ports. In this case, the journey to be taken to the stakeholders is narrowed down to those that actually imported the substances and one can also know those chemicals that never came through the ports and as such an endless search for them is averted. Nevertheless, it is still necessary to ground truth such record to be sure that there was no illegal entry into the country. This should be applied with caution and extra care and to be very sure about the HS code of the chemicals and the computerized records to be provided by the Nigeria Customs."*

Gaps of the ASYCUDA system

As mentioned above, as gaps for HS and GHS, the newly listed POPs need to be comprehensively integrated in the system and appropriate concentration levels for labelling be developed (e.g. by GHS). It is unclear how efficient the ASYCUDA system is working in the countries where it is implemented.

[93] http://www.asycuda.org
[94] http://www.asycuda.org/countrydb.asp

Annex 2: Voluntary schemes for identification of chemicals in articles and their gaps to facilitate the control of import/export and monitoring of article possible containing new POPs

There is already a quite diverse range of instruments for communication on substances in articles from industry. Within a study on "Reporting Format on Substances of Very High Concern (SVHC) in Articles" from the German Environmental Agency[95], voluntary schemes have also been assessed for their capability for reporting on SVHC under the REACH (Registration, Evaluation and Authorisation of Chemicals) regulation. Some of them include reporting on (new) POPs or have the potential for new POPs to be included.[96]

These instruments have different aims and scopes and can, according to Kogg & Thidell (2010), be classified into the following groups:

- Instruments for communication within the supply chain
- Instruments for producer to consumer communication
- Instruments for producer to end-of-life management communication
- Instruments for communication from external stakeholders to consumers and the general public
- Initiatives for communication between external stakeholders and supply chain actors

The best developed systems with a wide coverage of chemicals are within the supply chains. Their potential use for other purposes should be assessed.

1.1 The Joint Article Management Promotion Consortium (JAMP)

The system[97] builds on standardised MSDS and MSDSplus, which are information transmission sheets for information on chemical substances contained in products. The chemical contained in products/articles is reported in standardized Article Information Sheets (AIS) for the information transfers further down the supply chains. The system offers a way to systematically list all substances of a chemical or product, including name, CAS-number, and concentration. If a substance (and its concentration) falls under a certain requirement (e.g. RoHS), this is automatically displayed in the sheet.

The system offers a way to systematically list all substances of a chemical or product, including name, CAS-number, and concentration. Warnings are displayed when a certain substance and concentration falls under one of the following regulations: Japanese Chemical Substance Control Law, Japanese Industrial Safety and Health Act, Japanese Poisonous and Deleterious Substance Control Law, RoHS Directive, ELV Directive, CLP (Annex VI Table 3.2 CMT-cat. 1,2), REACH (Annex XVII), and REACH SVHC.

Gaps

The use of the common web-based platform for data sharing and exchange (JAMP-IT) is based on payment and membership.

1.2 The Global Automotive Declarable Substance List (GADSL)

The Global Automotive Declarable Substance List was compiled by representatives from the automotive industry (including its supplier base in the chemicals and plastics industries) who are organised in the Global Automotive Stakeholders Group. The aim of this group was to harmonise the various substance lists that were formally used in the industry, which resulted in the globally harmonised GADSL-list. The list

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[95] Project No. (FKZ) (37112 65 409) Feasibility Study "Reporting Format on SVHC in Articles", Consultancy for German environment agency (UBA), Draft Report on Work Package 1, Andreas Manhart, Dirk Bunke

[96] If system(s) would be developed or chosen to be further developed, the system should be structured as simple as possible with a unified reporting format to facilitate communication. Currently, the German environmental agency does an assessment in this respect.

[97] http://www.jamp-info.com/english

covers substances that are addressed by any substance-specific legislation worldwide and that are expected to be present in materials and parts in vehicles at point-of-sale. The list currently encompasses 139 substances which are either classified as D ("duty-to declare") or P ("prohibited").

The intent of GADSL is to become the company specific list for declaration of parts composition within the automotive industry. It provides a definitive list of substances requiring declaration with the target to minimize individual requirements and ensure cost-effective management of declaration practice along the complex supply chain. The scope is to cover declarable substances in the flow of information relevant to parts and materials supplied throughout the automotive value chain, from production to the end-of-life phase. The GADSL only covers substances that are expected to be present in a material or part that remains in the vehicle or part at point-of-sale.

This approach is a voluntary industry initiative designed to ensure integrated, responsible, and sustainable product development by automobile manufacturers and their supply chain.

Several newly listed POPs are already covered by the substance list: PFOS, c-PentaBDE, c-OctaBDE, HBB, PeCB, and lindane.

Gaps

The approach is specific to vehicles and the list covers only regulated substances relevant for the automotive industry. Regulated substances of other sectors and applications are not covered exhaustively.

1.3 International Material Data System (IMDS)

The International Material Data System (IMDS)[98] is a system that enables the communication, collection, and analysis of the materials used in vehicles and its parts. In contrast to most other intra-supply-chain communication systems, IMDS is not restricted to regulated substances, but aims to collect and manage the total material composition of vehicle parts to ultimately enable the calculation and tracking of the total material composition of vehicles. In addition, the system is also linked to the GADSL to support the proper management of regulated substances. Therefore, POPs are also listed in this system.

Gaps

IMDS[99] is currently a pure supply chain tool and only free of charge for suppliers. Vehicle manufacturers have to pay an annual fee ranging between 100,000 to 500,000 Euros. In addition, vehicle manufacturers pay a one-time fee of 100,000 Euro when they join the system. The applicability might be extended to other industries in future: HP tries to sell the system to other industries such aircraft, toy, and electronics manufacturing. Nevertheless, applying the system to other industries will need adjustments in all modules (e.g. list of materials, data entry template, and online database).

1.4 The Joint Industry Guide for Material Composition for Electronics Products

This guide[100] applies to products that are supplied to manufacturers of electrotechnical products, for incorporation into their products. It covers materials and substances that may be present in the supplied product. It does not apply to process chemicals (i.e. chemicals used and consumed during manufacture) unless those process chemicals constitute part of the finished product, nor does it apply to packaging (e.g. cardboard, plastic tray).

This guide represents industry-wide consensus on the relevant materials and substances that shall be disclosed by suppliers when those materials and substances are present in products that are incorporated into electrotechnical products.

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[98] https://www.mdsystem.com/magnoliaPublic/de/public/news.html

[99] http://www8.hp.com/us/en/services/services-detail.html?compURI=tcm:245-823413&pageTitle=international-materials-data-system#

[100] http://www.ce.org/Standards/browseByCommittee_6365.asp

Gaps

The list covers only regulated substances relevant for the electronics industry. Regulated substances of other sectors and applications are not covered exhaustively.

1.5 BOMcheck

BOMcheck[101] is a declaration tool that covers regulatory restricted and declarable substances relevant for electrical and electronic equipment. It comprises a "restricted and declarable substances list" and a data entry template that is linked to an online database. The system is usually used to communicate on regulated substances.

Gaps

The list covers only regulated substances relevant for the electronics industry. Regulated substances of other sectors and applications are not covered exhaustively.

1.6 Umbrella Specifications

Umbrella Specifications[102] are datasheets providing information on the total material composition of electronics parts like semiconductors, passive components, and connectors. The datasheets are compiled according to a format specified by the German Electrical and Electronic Manufacturers Association (ZVEI).

Gaps

Currently only used for electronic industry, but an extension seems possible.

1.7 Environmental Product Declarations (EPDs)

Environmental Product Declarations (EPDs)[103] aim to provide relevant, verified, and comparable information about the environment impacts from goods and services. EPDs are available for all types of products and services and give quantitative information derived from life cycle assessments and other product specific assessments.

Gaps

It is up to the producer to include specific information on hazardous substances. The currently available EPDs are not uniform regarding chemicals in products.

1.8 Ecolabels

A wide variety of ecolabelling systems have been developed, in part to compensate for the lack of internationally standardized information systems. Ecolabels are a voluntary system and typically do not contain specific information on the chemical content of a product, but might indicate what the article does not contain. Several types of ecolabels exist: those that indicate overall environmental preferability of one brand of product within a product sector and is based on life-cycle considerations; those that are self-declarations by manufacturers that mostly apply to a single attribute of a product; and those that provide quantified environmental data of a product under preset categories of parameters set (including absence of or within specified limits for certain chemicals) and verified by a third party and based on a lifecycle assessment.

In the following countries there exist eco-labelling systems:

- America: Canada, USA, Brazil

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[101] http://www.bomcheck.net/
[102] Examples are available online at: http://www.zvei.org/index.php?id=1158
[103] http://www.environdec.com/en/

- Asia Pacific: Australia, China (including Hong Kong and Taiwan), India, Israel, Japan, New Zealand, Philippines, Singapore, South Korea, Thailand
- Europe: Austria, Czech Republic, Croatia , France, Germany, Hungary, The Netherlands, Scandinavia, Slovakia, Spain and the EU (http://ec.europa.eu/environment/ecolabel/)

Related to this, the Global Ecolabelling Network is an association of national ecolabelling organizations from around the world. It serves as a platform for exchange of information and knowledge. It assists newly established ecolabelling organizations in developing structures and in matters of organization and quality assurance of processes. As an example, details on the German Blue Angel, the first and oldest environment-related label for products and services in the world, are provided below.[104]

Status, concept, aim:

- Initiative of the German Ministry responsible for environment in 1978
- Voluntary system, used in Germany by companies producing chemical products and articles
- Preventive system to distinguish the positive environmental features of products and services and to promote through information, both environmental protection and consumer protection
- The protection goals are environment and health, climate, water, and resources

Scope, impact:

- The ecolabel is awarded to products and services
- Information through the label is provided from the manufacturer to the distributor to the user
- Proposal for new ecolabels for products by industry, decision by independent Environmental Label Jury based on technical criteria developed by Federal Environmental Agency (EPA)
- Target audiences are industrial and public users that can use the label when buying products
- Examples of benefits due to the absence of certain hazardous chemicals in articles through the Blue Angel that have relevance for POPs are:
  - wooden toys being free from synthetic fragrances, flame retardants, and wood preservatives
  - composite wood panels with no alarming release of pollutants, and being free from halogenated organic compounds
  - mobile phones with pollutant-free plastic cases

The German Blue Angel ecolabel restricts the presence of PBDE and HBB (and chlorinated paraffins) in imaging equipment.

Gaps

POPs are only addressed to some extent in current ecolabel schemes. Low POPs contents are not defined.

1.9 IEEE Standard US

Similar to ecolabel schemes, the IEEE standard intends to provide a clear and consistent set of performance criteria for the design of products, and to provide an opportunity to secure market recognition for efforts to reduce the environmental impact of these products. The US Environmental Protection Agency (EPA) manages this activity.

Gaps

The label is based on self-declaration and when the product enters into the market a third party verification system is foreseen. Since such verification systems are only within the US, an international application is questionable.

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[104] http://www.blauer-engel.de/en/blauer_engel/index.php

1.10 Product/article-related consumer information in the internet

A range of governmental and private initiatives have developed information systems on the internet on articles specifically for consumers. Chemicals are often a prominent part of the information. The following are some good examples with related web pages[105].

- Household Products Database: http://hpd.nlm.nih.gov
- GoodGuide: http://www.goodguide.com/
- HealthyStuff: http://www.healthystuff.org/
- Skin Deep: http://www.cosmeticdatabase.org
- Restricted Substance List and Toolkit of the American Footwear and Apparel Association: https://www.apparelandfootwear.org/ Resources/RestrictedSubstances.asp
- US EPA Design for Environment Program: http://www.epa.gov/dfe/index.htm

Gaps

Newly listed POPs are not specifically addressed in these databases.

[105] Kast and Bunke, Project No. (FKZ) (37112 65 409) Feasibility Study "Reporting Format on SVHC in Articles". Consultancy for German environment agency (UBA),

Annex 3: Names of producers/suppliers of all listed POPs

See Annex 3 of *Guidance for the control of the import of POPs*.

This annex provides a preliminary list of companies (producers or suppliers) offering POPs. Information was collected through the Internet.

Annex 4: GHS classification and labelling of chlordecone, DDT, endosulfan, lindane, octaBDE, pentaBDE, pentachlorobenzene, PFOS and its salts by the European Community

See Annex 4 of *Guidance for the control of the import of POPs*.

This annex provides the GHS classification and labelling of chlordecone, DDT, endosulfan, lindane, octaBDE, pentaBDE, pentachlorobenzene, PFOS and its salts by the European Community.

Annex 5: Database on newly listed POPs and DDT; the identity of PFOS and PFOS related chemicals; and chemicals that contain a POP listed in Annex A, B, or C

See Annex 5 of the *Guidance for the control of the import of POPs*.

The information is provided in a database comprised of a series of Excel tables:

- *Information on newly listed POPs and DDT*, which provides common name, chemical name, CAS number, Harmonized System code chemical, Harmonized System code mixture, UN transport number, trade names, company names, classification and labeling details, GHS cut-off values, Stockholm Convention control measures, and legal status within Party (to be filled in by Parties)
- *Identity of PFOS and PFOS related chemicals,* which provides chemical names and CAS numbers for PFOS, its salts, PFOSF and PFOS-related chemicals
- *Chemicals contaminated with POPs*, which provides the chemical name, CAS number, common names, name of POPs contaminant, and relevant Stockholm Convention Annex, for chemicals that contain a POP listed in Annex A, B, or C
- *Chemicals known to contain or suspected to contain a POPs listed in Annex C*

Annex 6: Companies to be inspected for production, use of new POPs, or processing of materials containing new POPs

The information presented below might be retrieved by national and local authorities for companies and institutions. The approach might be used for regular monitoring and for the inventory.

At inspection visits in addition to assessment of new POPs in products/articles, the (former) waste management should also be assessed and potentially contaminated sites be noted. More details can be found *Guidance for the inventory of PFOS and related chemicals* and *Guidance for the inventory of PBDEs listed under the Stockholm Convention*.

Table 1 of Annex: List of companies for inspection and tasks of inspecting competent authority to facilitate new POPs monitoring and control

Company/Institution	Task	Approach
PFOS		
PFOS/PFC producer	Names of marketed products and use areas of PFOS and related chemicals (possibly with amount) Current/Former management of production residues	Site inspection and questionnaires
Producers of Sulfluramide	Names and types of marketed products Current/Former management of production residues	Site inspection and questionnaires
Producers of AFFF foam	Use of PFOS in AFFF foam formulation Name of products containing PFOS Name of products using alternatives Current/Former management of production residues	Site inspection and questionnaires
Other formulators of PFOS containing materials	Use of PFOS in what application? Name of products containing PFOS Name of products using alternatives Current/Former management of production residues	Site inspection and questionnaires
Chromium plating And other plating industries	Product name of PFOS related chemicals in use Alternative products in use for impregnation Assessment of current discharges to water Current/Former management of production residues	Site inspection and questionnaires
(Former) Producers of specific impregnated paper and cardboard	Product name of PFOS related chemicals in use Alternative products in use for impregnation Assessment of current discharges to water Current/Former management of production residues	Site inspection and questionnaires
(Former) Producers of impregnated textiles	Product name of PFOS related chemicals in use Alternatives in use for impregnation Assessment of current discharges to water Current/Former management of production residues	Site inspection and questionnaires
(Former) Users of AFFF foam National fire-fighting services Air port fire-fighting services Refinery fire-fighting services Other potential users of AFFF	Name of AFFF foams containing PFOS Used alternatives to PFOS AFFF Assessment of fire-fighting practice areas Assessment of former fire incidents where	Site inspection and questionnaires

Company/Institution	Task	Approach
(see table X)		
POP-BDE		
(Former) Producers of POP-BDE and PBB	Assessment of former/current production of PBDE[106] Stocks of PBDEs at the sites Deposition practice for former production residues	Site inspection
(Former) users of POP-BDE: Polymer producers FR plastic	Assessment of current use of PBDE Deposition practice for former production residues	Site inspection and questionnaires
(Former) users of POP-BDE: Textile industry; PUR foam industry; car/transport industry,	Former use of PBDE; Product and article name in which PBDE have been used Assessment of current discharges to water. Current/Former management of production residues	Site inspection and questionnaires
E-waste recyclers	Separation of WEEE plastic. Management of WEEE plastic (recycling purpose; thermal recovery; deposition)	Site inspection and questionnaires
Companies processing recycled plastic from WEEE	Type of recycled plastic used Analytical data of PBDE in polymers Products made from recycled plastic	Site inspection and questionnaires
Companies processing end of life vehicles (ELVs)	Separation of PUR foam and plastic Management PUR foam and plastic (recycling; thermal recovery; deposition)	Site inspection and questionnaires
Companies recycling PUR foam	Products produced from recycled PUR foam Labelling of recycled PUR foam Management PUR foam (recycling; thermal recovery; deposition)	Site inspection and questionnaires
POP Pesticides		
(Former) lindane/HCH producer	Stocks of lindane and use for products & articles Use of lindane for pharmaceutical purpose Situation of deposits of HCH waste isomers	Site inspection
Endosulfan, chlordecone and DDT producer	Names of marketed products (possibly with amount) Current/Former management of production residues	Site inspection and questionnaires
PeCB/HCB and PCDD/PCDF		
Production of organochlorines known or suspected to contain PeCB/HCB, PCDD/PCDF as by-products (see Annex X)	Name of products possibly containing PeCB, HCB Levels of UPOPs in these products. Separation step of products and residues Current/Former management of production residues	Site inspection

[106] POP-BDEs are intermediately formed in the production of DecaBDE and might be contained in production waste of discarded batches.

Annex 7: Some regulation limits for new POPs in products and articles

1.1 EU POPs regulation [107]

Excerpts from "COMMISSION REGULATION (EU) No 757/2010 of 24 August 2010 amending Regulation (EC) No 850/2004 of the European Parliament and of the Council on persistent organic pollutants as regards Annexes I and III", "Annex I" on tetrabromodiphenyl ether, pentabromodiphenyl ether, hexabromodiphenyl ether, and heptabromodiphenyl ether:

Example: Tetrabromodiphenyl ether $C_{12}H_6Br_4O$ (analogous for Penta- to HeptaBDE)

"Specific exemption on intermediate use or other specification:

1. For the purposes of this entry, Article 4(1)(b) shall apply to concentrations of Tetrabromodiphenyl ether equal to or below 10 mg/kg (0,001 % by weight) when it occurs in substances, preparations, articles or as constituents of the flame-retarded parts of articles.

2. By way of derogation, the production, placing on the market and use of the following shall be allowed:

(a) without prejudice to subparagraph (b), articles and preparations containing concentrations below 0.1 % of tetrabromodiphenyl ether by weight when produced partially or fully from recycled materials or materials from waste prepared for re-use;

(b) electrical and electronic equipment within the scope of Directive 2002/95/EC of the European Parliament and Council.

3. Use of articles already in use in the Union before 25 August 2010 containing Tetrabromodiphenyl ether as a constituent of such articles shall be allowed. Article 4(2), third and fourth subparagraphs shall apply in relation to such articles."

Example: Perfluorooctane sulfonic acid and its derivatives (PFOS) $C_8F_{17}SO_2X$ (X = OH, Metal salt (O-M +), halide, amide, and other derivatives including polymers)

"Specific exemption on intermediate use or other specification:

1. For the purposes of this entry, Article 4(1)(b) shall apply to concentrations of PFOS equal to or below 10 mg/kg (0,001 % by weight) when it occurs in substances or in preparations.

2. For the purposes of this entry, Article 4(1) (b) shall apply to concentrations of PFOS in semi-finished products or articles, or parts thereof, if the concentration of PFOS is lower than 0,1 % by weight calculated with reference to the mass of structurally or micro-structurally distinct parts that contain PFOS or, for textiles or other coated materials, if the amount of PFOS is lower than 1 µg/m 2 of the coated material.

5. If the quantity released into the environment is minimised, production and placing on the market is allowed for the following specific uses provided that Member States report to the Commission every four years on progress made to eliminate PFOS:

(a) until 26. August 2015, wetting agents for use in controlled electroplating systems;
(b) photoresists or anti reflective coatings for photolithography processes;
(c) photographic coatings applied to films, papers, or printing plates;
(d) mist suppressants for non- decorative hard chromium (VI) plating in closed loop systems; (e) hydraulic fluids for aviation.

6. Once standards are adopted by the European Committee for Standardisation (CEN) they shall be used as the analytical test methods for demonstrating the conformity of substances, preparations and articles to paragraphs 1 and 2."

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[107] REGULATION (EC) No 850/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 29 April 2004 (Amended version 26.08.2010).
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2004R0850:20100826:EN:PDF

1.2 European RoHS directive

Excerpts from "DIRECTIVE 2011/65/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment" [108]

Article 4: Prevention

"1. Member States shall ensure that EEE placed on the market, including cables and spare parts for its repair, its reuse, updating of its functionalities or upgrading of its capacity, does not contain the substances listed in Annex II.

2. For the purposes of this Directive, no more than the maximum concentration value by weight in homogeneous materials as specified in Annex II shall be tolerated. The Commission shall adopt, by means of delegated acts in accordance with Article 20 and subject to the conditions laid down in Articles 21 and 22, detailed rules for complying with these maximum concentration values taking into account, inter alia, surface coatings."

ANNEX II: Restricted substances referred to in Article 4(1) and maximum concentration values tolerated by weight in homogeneous materials

Polybrominated biphenyls (PBB) (0.1 %)

Polybrominated diphenyl ethers (PBDE) (0.1 %)

Lead (0.1 %)

Mercury (0.1 %)

Cadmium (0.01 %)

Hexavalent chromium (0.1 %)

1.3 Basel Convention low POPs content

The "Updated general technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants (POPs)" [109] contain for the old listed POPs that were intentionally produced

– aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, HCB, mirex, PCB and toxaphene –

a provisional low POPs content of 50 mg/kg.

For PCDD/PCDF a provisional low POPs content of 15 µg TEQ/kg.

Provisional low POPs content for the newly listed POPs are under consideration by the Basel Convention.

1.4 PFOS in sewage sludge/bio-solid

Reported for Austria and Germany (North Rhine-Westphalia). [110]

Perfluorooctane sulfonic acid and its 0.1 mg/kg = 0.1 ppm

[108] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:174:0088:0110:EN:PDF

[109] http://www.basel.int/Implementation/TechnicalMatters/DevelopmentofTechnicalGuidelines/AdoptedTechnicalGuidelines/tabid/2376/Default.aspx; http://basel.int/meetings/sbc/workdoc/techdocs.html

[110] ESWI (2010) Study on waste related issues of newly listed POPs and candidate POPs. Update 13. April 2011

1.5 HCB in articles and products (Canada)

Canada has regulated HCB in their Prohibition of Certain Toxic Substances Regulations (Environment Canada 2005) [111]

Hexachlorobenzene 20 ppb

These consider products like chlorinated solvents, metal chlorides and others.

If a product can not meet the limit (e.g. pigments listed in table 5) then permits are given.

1.6 PCDD/PCDF in certain agricultural chemicals (Japan)

Maximum residue limit in agricultural chemicals in Japan[112]:

Maximum level of 0.1 ng TEQ/g for each of the seventeen 2,3,7,8-PCDD/PCDF-congeners (Table 1, below) and each of the 12 dl-PCBs congeners.

Table 1: Maximum residue levels for each PCDD/PCDF congener in agrochemicals

Congener	Japanese Criteria (μg/kg)
2,3,7,8-TCDD	0.1
1,2,3,7,8-PeCDD	0.1
1,2,3,4,7,8-HxCDD	1
1,2,3,6,7,8-HxCDD	1
1,2,3,7,8,9-HxCDD	1
1,2,3,4,6,7,8-HpCDD	10
OCDD	300
2,3,7,8-TCDF	1
1,2,3,7,8-PeCDF	3
2,3,4,7,8-PeCDF	0.3
1,2,3,4,7,8-HxCDF	1
1,2,3,6,7,8-HxCDF	1
2,3,4,6,7,8-HxCDF	1
1,2,3,7,8,9-HxCDF	1
1,2,3,4,6,7,8-HpCDF	10
1,2,3,4,7,8,9-HpCDF	10
OCDF	300

[111] Environment Canada (2005) Prohibition of Certain Toxic Substances Regulations, 2005.

[112] Japanese Government (2002) Agricultural Chemicals Regulation Law No.14, 3 (Nouyakutorisimari hou No.14, 3 (in Japanese)) http://www.env.go.jp/council/10dojo/y104-25/mat06.pdf

1.6 PBDD/PBDF in certain agricultural chemicals (Germany)

The German ordinance on prohibition of certain chemical (Chemikalienverbotsverordnung) has defined a limit for PBDD/DF in products (Table 2 of Annexes). (German Federal Ministry of Justice 2003)[113]

Table 2 of Annexes: Limit value for PBDD/DF in materials according the German ordinance for chemicals.

Compd class	Compounds	Limits
Class I	2,3,7,8-TBDD, 2,3,7,8-TBDF, 1,2,3,7,8-PBDD, 1,2,3,7,8-PBDF	Sum class I < 1 µg/kg
Class II	1,2,3,7,8-PBDF, 1,2,3,6,7,8-HBDD, 1,2,3,7,8,9-HBDD, 1,2,3,4,7,8-HBDD	Sum (I + II) < 5 µg/kg

1.7 GHS cut off values for some POPs as applied by the European Union

POP	cut off value (%) / (ppm)	
chlordecone	0.1 / 1000	
DDT	0.1 / 1000	
endosulfan	0.1 / 1000	
lindane	0.01 / 100	(M factor of 10)
octaBDE	0.1 / 1000	
pentaBDE	0.1 / 1000	
pentachlorobenzene	0.1 / 1000	
PFOS and its salts	0.1 / 1000	

1.8 POPs free initiative

Concerning the definition of "POPs free" and outcomes of the initial phase of a pilot project to gather information on products free of persistent organic pollutants and to promote the use of available substitutes and alternatives, the following excerpts from UNEP/POPS/COP.5/ INF/34[114] are presented below:

"10. The key criterion to be met if a product were to be classified as free of persistent organic pollutants was that it should not contain or consist of chemicals listed in Annex A, B or C to the Convention. A special definition was devised solely for the pilot project and was not to be used outside the project". (See para 5. below)

"11. All products for consideration in the pilot project were to be tested to ensure the absence of persistent organic pollutants to a defined limit of detection as outlined above. Information on products that passed the test was released to the public."

all POPs:	0.5 mg/kg = 0.5 ppm
all POPs in specific matrix	2 mg/kg = 2 ppm
PCDD/PCDF	0.1 µg TEQ/kg = 0.1 ppb

[113] German Federal Ministry of Justice (2003) Chemikalienverbotsverordnung (ChemVerbotsV), Verordnung über Verbote und Beschränkungen des Inverkehrbringens gefährlicher Stoffe, Zubereitungen und Erzeugnisse nach dem Chemikaliengesetz BGB1.,13. June 2003 p. 867 (with revision of regulation from 21 July 2008 (BGBl. I S. 1328).

[114] www.pops.int, UNEP/POPS/COP.5/INF/34

Annex 8: Examples of bi-directional information systems on dangers in articles

Two systems which might serve as example for bi-directional information systems on dangers in articles (including chemical danger) are cooperating on regional level (EU or countries within EU). This is the European Community Rapid Information System (RAPEX system) and the Information and Communication System for Market Surveillance (ICSMS). They are shortly described in this Annex.

1.1 RAPEX System [115,116]

RAPEX is the EU rapid alert system for all dangerous consumer products, with the exception of food[117] and medical devices. Meanwhile, the alert system also covers pharmaceutical products and in this respect is also reporting to an international UN body (WHO).

The system allows for the rapid exchange of information between Member States via central contact points and the European Commission of measures taken to prevent or restrict the marketing or use of products posing a serious risk to the health and safety of consumers.

The reporting is on both measures ordered:

a) By national authorities, and

b) Measures taken voluntarily by producers and distributors are covered by RAPEX.

The national authorities of Member States notify the European Commission, via the RAPEX system, of measures taken to prevent or restrict the marketing or use of consumer products posing a serious risk to the health and safety of consumers, which may be available in more than two European countries.

The most frequently notified consumer products are: toys, motor vehicles, electrical appliances, lighting equipment, cosmetics, and children's equipment, clothing, and household appliances. (European Commission, 2007)

The five most frequently notified risk categories were: injuries (approx 23%), choking (approx 15%), electric shock (approx 15%), fire (approx 13%), **and chemical risk (approx 13%). Therefore, chemical risk is ranked as fifth category within RAPEX notification and has a relevant share (13%)** (European Commission, 2007).

Each Member State has designated competent market surveillance authorities and granted them with the necessary powers to take measures in order to prevent or restrict the marketing or use of dangerous products. More specifically, the national authorities are competent to take samples of consumer products placed on the market, to test them in laboratories and – in cases where these products pose risks to consumers – order producers and distributors to stop their sale, withdraw them from the market and/or recall them from consumers.

In addition, each country participating in the RAPEX system has also established a single national RAPEX Contact Point which coordinates the operation of the RAPEX system at national level.

When the national authorities or a producer/distributor take measures which prevent or restrict the marketing or use of a dangerous consumer product, the RAPEX Contact Point submits to the Commission (using a standard notification form) information about this product and provides details on: product identification (name, brand, model, description, picture); risks posed by the product (type of risk, results of laboratory tests and risk assessment); measures adopted to prevent risks (type of measure, scope,

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[115] European Commission (2010) COMMISSION DECISION laying down guidelines for the management of the Community Rapid Information System 'RAPEX' established under Article 12 and of the notification procedure established under Article 11 of Directive 2001/95/EC (the General Product Safety Directive) (notified under document C(2009) 9843) (2010/15/EU). Official Journal of the European Union L 22/1,. 26.01.2010.

[116] European Commission (2007) Keeping European Consumers Safe 2007 Annual Report on the operation of the Rapid Alert System for non - food consumer products RAPEX

[117] For example, the Rapid Alert System for Food and Feed (RASFF) is used to exchange information about dangerous food and feed.

duration, date of entry into force); and distribution channels of the notified product (manufacturer, exporter, importer, distributors, countries of destination).

The European Commission examines the information provided with regard to its compliance with the GPSD and the RAPEX Guidelines and checks its completeness. The result of this process is called validation. In particular, a notification is not validated if another country has already notified measures against the same product and same risk – i.e. if the RAPEX network has already been alerted.

If the examination conducted by the Commission leads to validation, information is circulated to the national RAPEX Contact Points in all countries participating in the system. All RAPEX Contact Points then forward this information to the competent national authorities, which then check whether the notified product is present on the market and if it is necessary to take appropriate action. The results of these market surveillance activities, including additional information relevant for other national authorities, are then reported back to the Commission through the RAPEX system. This feedback is called "reactions".

Role and obligations of producers and distributors

The RAPEX system is also used to exchange information about the preventive or restrictive actions taken "voluntarily" by producers and distributors in relation to dangerous products, which they have placed on the market. Voluntary action in this context means measures taken without the intervention of the public authority. Producers and distributors are in a prime position to assess whether a product they put on the market is dangerous because, as professionals, they have the information about the product and have contact with consumers. Therefore, once they become aware that a product is dangerous, they must immediately inform the competent authorities and the RAPEX Contact Point in their country, clearly identifying the product in question, the risks it poses, and the information necessary to trace it. They must also inform the authorities of any measures taken to prevent further risks to consumers. First contact with the national authorities should be established as soon as possible and even before all the required information is available.

This information is then conveyed via the RAPEX system by the RAPEX Contact Point to the European Commission and then on to other countries participating in the RAPEX system.

The obligation of economic operators to inform the authorities about dangerous products is a key element in the market monitoring procedure set up by the GPSD. National authorities are able to monitor whether the companies have taken appropriate measures to address the risks posed by dangerous products and to assess if additional measures are necessary.

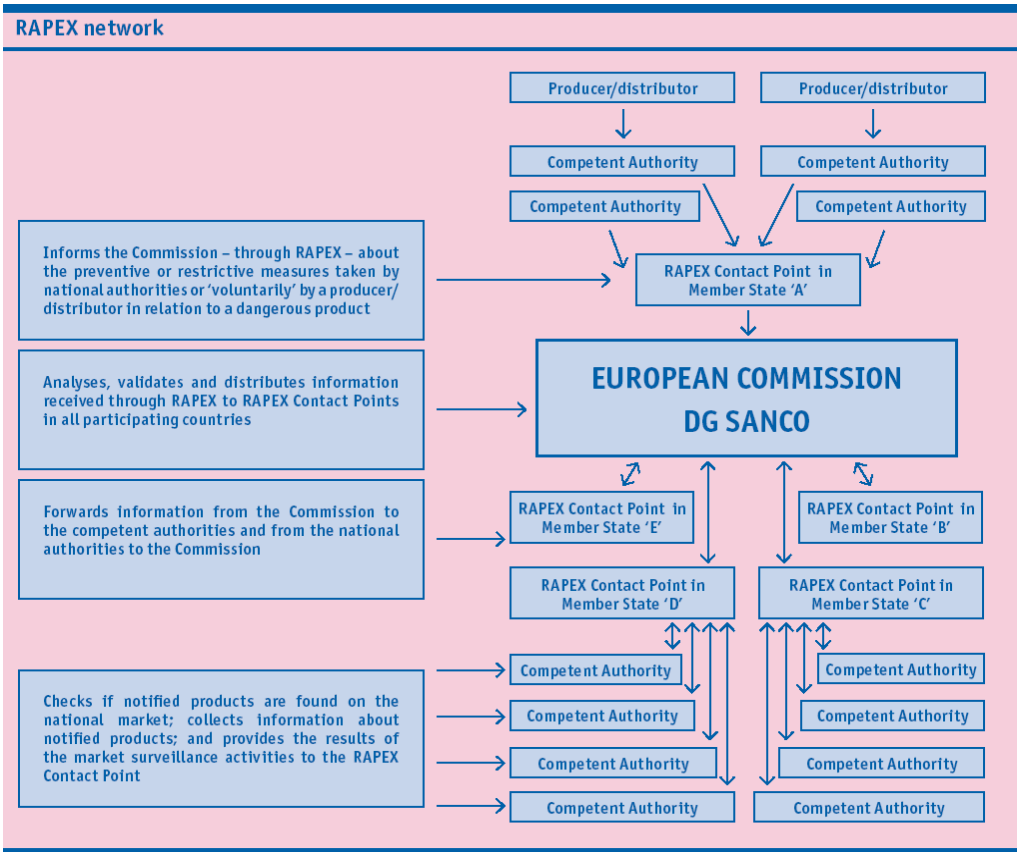
Information to consumers

The Commission publishes weekly overviews of RAPEX notifications on products posing serious risks to consumers on the RAPEX website: http://ec.europa.eu/rapex. These overviews provide information on the product, the nature of the risk posed, and the measures taken to prevent these risks. This information enables consumers to check whether the products they use or plan to purchase have been subject to RAPEX notifications.

This information policy along with the information on the webpage further facilitates the bi-directional communication.

An overview on the RAPEX network is given in Figure 1 below.

Figure 1: Illustration of the bi-directional cooperation between the European Commission, the national RAPEX Contact Points and national market surveillance authorities (European Commission, 2007 [118])



1.2 Information and Communication System for Market Surveillance (ICSMS) [119]

The Information and Communication System for Market Surveillance (ICSMS) is established from the European Commission as a bi-directional information system of the surveillance bodies monitoring consumer products. Its main task is to provide and exchange product information via the internet.

The original reason for the establishment was the lack in communication for market surveillance bodies. The transfer of information from other bodies usually had to travel through long, bureaucratic channels and communication was mainly via a complex official route. Before the establishment of ICSMS system, the products imported all over Europe were tested by several different surveillance bodies without any coordination among them. This only national based monitoring was relatively ineffective and created unnecessary extra work which was expensive and time and resource consuming.

The establishment of the ICSMS system created the basis for an effective and efficient cooperation between the market surveillance bodies in Europe and an effective bi-directional information system also informing other stakeholders including the public (consumers). For the first time, ICSMS makes it possible for official agencies to act in concert. Networking all European market surveillance bodies enables the rapid exchange of information which is up-to-date and practical, via decentralised data entry in a database. Unsafe products can be removed from the market immediately.

Supported by the internet, it enables a comprehensive exchange of information between all the market surveillance bodies and gives access to information to other stakeholders. For the first time, it is possible to make wide-scale market interventions wherever products of a dubious nature are concerned. Coordinated action by the various bodies provides greater efficiency and duplicate and multiple inspections can be avoided. Therefore more time is available for the different authorities to concentrate

[118] European Commission (2007) Keeping European Consumers Safe 2007 Annual Report on the operation of the Rapid Alert System for non - food consumer products RAPEX

[119] https://www.icsms.org

on other products which have yet to be tested.

ICSMS enables all users to carry out a specific search. A search can be made, for example, according to individual products, and according to test results for entire product groups. Test results can be obtained for products from specific countries; information can be obtained for products coming under certain directives, safeguard clause notifications, RAPEX notifications, as well as information about manufacturers, importers, and dealers. Confidentiality aspects are protected by an appropriate system of access authorisations.

The product information contains the following details:

- General information such as the notifying Member State and the notifying body
- Product details such as customs tariff number, EAN code, type number, serial number, place of manufacture, country of origin
- Party responsible for bringing the product into circulation
- Directives and relevant standards
- Proof of conformity
- Test results
- Formal and safety defects
- Classification of defects
- Depth and scope of testing
- Accidents
- Measures taken
- Additional documentation, such as test reports, photographs, declarations of conformity, or extracts from operating instructions

ICSMS consists of a closed and a public area. The closed area is for the use of market surveillance bodies, customs authorities, and the EU Commission – i.e. official agencies. It contains product information, test results, official measures taken, etc. The public area is for the use of consumers and manufacturers. It contains, for example, official information about dangerous products, as well as voluntary industry recalls and postings made by manufacturers drawing attention to pirated copies. Here the consumer can quickly find

As well as this information section, ICSMS has a communication section. Here, comments or supplementary remarks can be entered about the products and the test results. Data for the public area can be generated automatically from the closed area. A forum is also planned, enabling consumers to inform the surveillance bodies directly of their complaints and opinions.

Wherever necessary, consumers, and traders can be informed without the need to go through complicated bureaucratic channels. The ICSMS claim that “Product safety becomes reality at a click of a mouse – for the surveillance bodies and for the consumers.”
