Polybrominated diphenyl ethers (PBDEs)

Stockholm Convention Effectiveness Evaluation

2023 Highlights

Background Information

Hexabromodiphenyl ether and heptabromodiphenyl ether (hexa- and heptaBDE), and tetrabromodiphenyl ether and pentabromodiphenyl ether (tetra- and pentaBDE), collectively referred to as PBDEs or BDEs, are listed in Annex A of the Stockholm Convention with specific exemptions for use for recycling of articles that contain or may contain these chemicals.

PBDEs are a group of industrial aromatic organobromine chemicals that have been used since the 1970s as additive flame retardants in a wide range of mainly consumer products. PBDEs are highly persistent in the environment, bioaccumulative and have a high potential for long- range environmental transport. These chemicals have been detected in humans and biota in all regions. There is evidence of harmful effects in humans and wildlife.

Measures to Reduce and/or Eliminate Releases

It is likely that production and use of hexa- and hepta-bromodiphenyl ether (BDE) and tetra- and pentaBDE (BDEs listed under the Convention in 2009) have been reduced to very low levels. About 75% of all the world production of PBDEs was c-decaBDE. Total production of decaBDE from 1970 to 2005 has been estimated at between 1.1 and 1.25 million tonnes. Many countries have already restricted or initiated voluntary programs to phase out the production of decaBDE. Several Parties are registered for specific exemptions for the use of those BDEs, which are available until 2030.

Even though the production and use of decaBDE is decreasing, products containing this substance are continuously entering waste streams. They can be found in high concentration in some wastes, e-waste, end-of-life vehicles, construction materials and demolition waste, as well as in textile and furniture wastes. BDEs have been detected in a range of articles in use, including plastic toys that are not subject to flammability requirements, which suggests that their presence is unintentional and possibly a consequence of the recycling of plastics containing BDEs.

The management of recycled plastics and wastes that contain decaBDE has been identified as a challenge by Parties and is likely to continue even once production stops, as is the case for the BDEs listed in 2009. Given the presence of significant stocks of BDEs estimated to exist in articles in use and in the waste stream in developing countries, the lack of capacity to ensure the environmentally sound management of waste that may contain BDEs remains a major impediment to progress in their elimination.

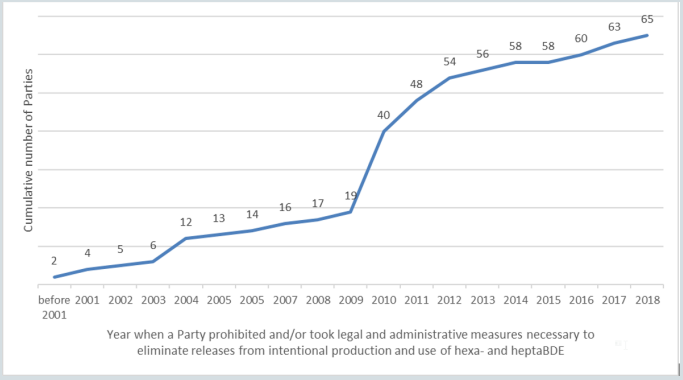

Figure 1. Cumulative number of Parties indicating that they have prohibited and/or taken legal and administrative measures necessary to eliminate releases from intentional production and use of hexaBDE and heptaBDE *(Source: EE-2 report in UNEP/POPS/COP.11/INF/36)*

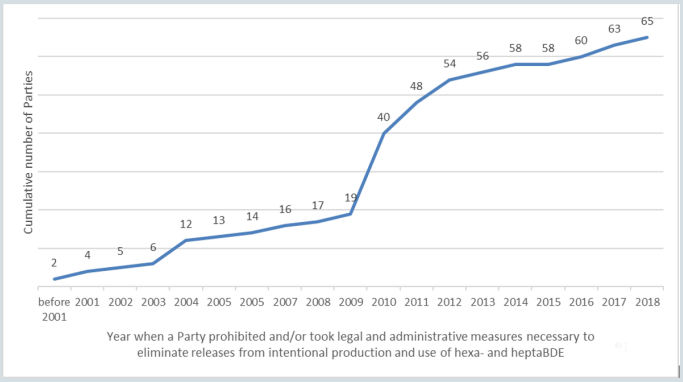

Figure 2. Cumulative number of Parties indicating that they have prohibited and/or took legal and administrative measures necessary to eliminate releases from intentional production and use of tetraBDE and pentaBDE *(Source: EE-2 report in UNEP/POPS/COP.11/INF/36)*

Secretariat of the Basel, Rotterdam and Stockholm Conventions
11-13, Chemin des Anémones
1219 Châtelaine, Switzerland
Tel: +41 22 917 8271
Email: brs@un.org
Website: www.brsmeas.org

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Changes in Concentrations Measured in the Environment and in Human Populations

Limited time trends for PBDEs are starting to become available. There are indications that the levels of the BDEs listed in 2009 are declining.

Air concentrations of PBDEs show increases over the 1990s, then a levelling off and a decrease in the early 2000s. Air concentrations of the first listed PBDEs have declined in Africa, Asia and the Pacific and the Eastern European regions. They have remained stable in the North American Great Lakes region and have increased in the Latin America and Caribbean region.

Emissions from PBDEs continue from product usage, obsolete stockpiles, and waste disposal/dismantling/recycling practices, while open burning of wastes continue to release unintentionally produced POPs to the atmosphere.

PBDEs show an increase of levels in human tissues over time followed by a decrease.

The levels of listed PBDEs were determined in human milk samples between 2000 and 2019. Large differences in levels were found. The highest concentrations were detected in certain areas of the Western European and Others Regional Group in 2003. Decreasing tendencies were observed in nearly all countries.

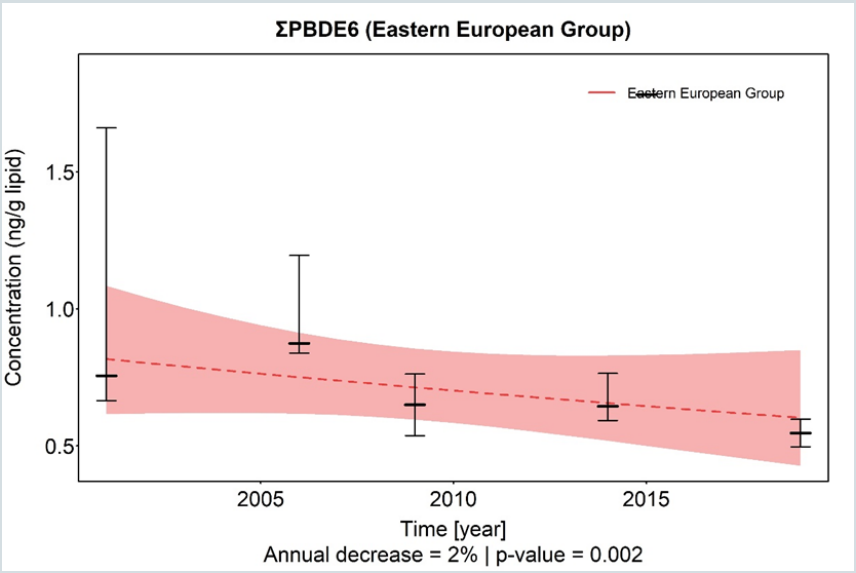

Figure 3. Theil-Sen exponential trends of $\sum PBDE_6$ concentration (ng/g lipid) in human milk in the Eastern European region. ($\sum PBDE_6$ includes BDE-47, BDE-99, BDE-100, BDE-153, BDE-154, BDE-175/183. Source: Schächtele et al. in press. cited in GMP-3 report in UNEP/POPS/COP.11/INF/38)

Changes Since the First Effectiveness Evaluation

Since the first effectiveness evaluation, more Parties have submitted their national implementation plan updates for the four BDEs listed in 2009. The data suggest that there are potentially large quantities of BDEs that will need to be managed in an environmentally sound manner, especially in developing countries and countries with economies in transition.

Available data for the four BDEs in articles show decreasing levels of these BDEs in articles in use or in the waste stream, which suggests that measures taken to control these substances have been effective in reducing their presence. Technology to screen and separate wastes that possibly contain BDEs is now commercially available.

Recommendations of the Effectiveness Evaluation Committee

✓ The Conference of the Parties should **highlight the need for Parties to give priority to implementing and/or strengthening measures for the ESM of wastes as required in Article 6,** including products and articles upon becoming wastes, that contain or are contaminated with BDEs. This could include the development and dissemination of guidance and low-cost, practical methods to monitor products and wastes, and the systematic collection and reporting of data on presence of POPs in articles and wastes. Such data could be made available to the regional organization groups of the GMP for POPs and included in NIP updates.

✓ Parties should be encouraged to **share their experience in implementing management measures for recycled plastics and wastes that contain BDEs,** including those that can be implemented in a cost-effective way in developing countries, and to contribute to capacity-building efforts in that regard.

✓ The Conference of the Parties should **forward the findings of the evaluation and review of BDEs** (UNEP/POPS/COP.10/INF/15) **and the report on the review of information related to specific exemptions for decaBDE** (UNEP/POPS/POPRC.18/INF/15) to the Executive Director of the UNEP and to the intergovernmental negotiating committee established pursuant to UNEA resolution 5/14 to develop an international legally binding instrument on plastic pollution, including in the marine environment.

The report on the review of information related to specific exemptions for decaBDE, including recommendations of the POPs Review Committee, and the Secretariat's report on the evaluation and review of BDEs, can be found in documents UNEP/POPS/POPRC.18/INF/15 and UNEP/POPS/COP.10/INF/15, respectively.

Guidance documents and guidelines have been developed by relevant bodies of the Stockholm and Basel conventions as part of the technical assistance activities to support Parties meeting their obligations, and are available at: http://chm.pops.int/tabid/5374 and http://www.basel.int/tabid/8025.

For more information on the second effectiveness evaluation of the Stockholm Convention, please refer to documents UNEP/POPS/COP.11/19/Add.1 and UNEP/POPS/COP.11/INF/36.

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