

POPRC-20/4: Polybrominated dibenzo-*p*-dioxins and dibenzofurans and mixed polybrominated/chlorinated dibenzo-*p*-dioxins and dibenzofurans

The Persistent Organic Pollutants Review Committee,

Having examined the proposal by Switzerland to list polyhalogenated dibenzo-*p*-dioxins and dibenzofurans in Annex C to the Stockholm Convention and having applied the screening criteria specified in Annex D to the Stockholm Convention,

1. *Decides*, in accordance with paragraph 4 (a) of Article 8 of the Convention, that it is satisfied that the screening criteria have been fulfilled for polybrominated dibenzo-*p*-dioxins and dibenzofurans and mixed polybrominated/chlorinated dibenzo-*p*-dioxins and dibenzofurans, as set out in the evaluation contained in the annex to the present decision;
2. *Also decides*, in accordance with paragraph 6 of Article 8 of the Convention and paragraph 29 of decision SC-1/7, to establish an intersessional working group to further review the proposal and to prepare a draft risk profile in accordance with Annex E to the Convention;
3. *Invites*, in accordance with paragraph 4 (a) of Article 8 of the Convention, Parties and observers to submit to the Secretariat the information specified in Annex E to the Convention before 2 December 2024.

Annex to decision POPRC-20/4

Evaluation of polybrominated dibenzo-*p*-dioxins and dibenzofurans and mixed polybrominated/chlorinated dibenzo-*p*-dioxins and dibenzofurans against the criteria of Annex D to the Stockholm Convention on Persistent Organic Pollutants¹

A. Background

1. The primary source of information for the preparation of the present evaluation was the proposal submitted by Switzerland, contained in document UNEP/POPS/POPRC.20/5.

B. Evaluation

2. The proposal was evaluated in the light of the requirements of Annex D to the Stockholm Convention regarding the identification of the chemical (para. 1 (a)) and the screening criteria (paras. 1 (b)–(e)):

(a) Chemical identity:

Adequate information on the chemical identity was provided in the proposal;

¹ The name of the group of chemicals as it appeared in the proposal submitted by Switzerland (UNEP/POPS/POPRC.20/5) was “polyhalogenated dibenzo-*p*-dioxins and dibenzofurans”. During discussions at the twentieth meeting of the Persistent Organic Pollutants Review Committee, the Committee, on the basis of its examination of the proposal, specified that the proposal related to “polybrominated dibenzo-*p*-dioxins and dibenzofurans and mixed polybrominated/chlorinated dibenzo-*p*-dioxins and dibenzofurans”, which is reflected in the title of the present evaluation. The scope of the evaluation by the Committee is the same as the scope of the proposal.

The scope of the evaluation covers polybrominated dibenzo-*p*-dioxins and dibenzofurans (PBDD/Fs) and mixed polybrominated/chlorinated dibenzo-*p*-dioxins and dibenzofurans (PBCDD/Fs), excluding polychlorinated dibenzo-*p*-dioxins and dibenzofurans (PCDD/Fs), which are already listed in Annex C to the Convention;

The chemical identity of PBDD/Fs and PBCDD/Fs is adequately established;

(b) Persistence:

- (i) The photodegradation half-life of tetrabromodibenzo-*p*-dioxin (TeBDDs) in surface soil exposed to daylight ranges between 3 and 6 months, while no significant degradation of PBDDs or PBCDDs is observed in soil kept in the dark, which indicates poor degradability;
- (ii) The estimated half-lives of PBDD/F and PBCDD/F congeners in water and soil exceed the thresholds of 2 and 6 months, respectively. The structural similarities to other persistent aromatics, especially PCDD/Fs, suggest that these chemicals are also persistent and poorly biodegradable;

There is sufficient evidence that PBDD/Fs and PBCDD/Fs meet the criterion on persistence;

(c) Bioaccumulation:

- (i) The estimated log K_{OW} values of PBDD/F and PBCDD/F congeners range from 7.0 to 11.5 and 6.5 to 10.5, respectively, indicating high potential for bioaccumulation;
- (ii) The long elimination half-lives in humans and mammals indicate the high bioaccumulation potential of PBDD/Fs and PBCDD/Fs. In addition, these chemicals have a high toxicity, which provides further evidence that there are reasons for concern;
- (iii) PBDD/Fs have been detected in organisms at higher trophic levels, such as seals and whales, and have been found in human tissues, suggesting bioaccumulation;

There is sufficient evidence that PBDD/Fs and PBCDD/Fs meet the criterion on bioaccumulation;

(d) Potential for long-range environmental transport:

- (i) and (ii)

PBDD/Fs have been detected in remote areas, such as Arctic regions, and in species from these areas, providing evidence of their long-range environmental transport;

- (iii) Modelling studies suggest that PBDD/F congeners undergo POP-like accumulation in remote regions.

PBDD/Fs and PBCDD/Fs undergo atmospheric oxidation with estimated half-lives in air ranging from 6.4 to 504 days and from 5.7 to 435 days, respectively, which meets the Annex D criterion of a half-life greater than two days;

There is sufficient evidence that PBDD/Fs and PBCDD/Fs meet the criterion on potential for long-range environmental transport;

(e) Adverse effects:

- (i) The toxicological profiles of PBDD/Fs and PBCDD/Fs are similar to those of PCDD/Fs, with demonstrated effects such as lethality, immunotoxicity and reproductive toxicity;

- (ii) 2,3,7,8-substituted PBDD/Fs and PBCDD/Fs exhibit the ability to activate the aryl hydrocarbon receptor (AhR). Many of the relative effect potencies (REPs) of PBDD/Fs and PBCDD/Fs are at least within an order of magnitude of the chlorinated analogues;

There is sufficient evidence that PBDD/Fs and PBCDD/Fs meet the criterion on adverse effects.

C. Conclusion

3. The Committee has concluded that PBDD/Fs and PBCDD/Fs meet the screening criteria specified in Annex D to the Convention.

References

1. WHO (1998). Polybrominated Dibenzo-*p*-dioxins and Dibenzofurans. Environmental Health Criteria 205.
2. van den Berg, M., et al. (2013). Polybrominated Dibenzo-*p*-Dioxins, Dibenzofurans, and Biphenyls: Inclusion in the Toxicity Equivalency Factor Concept for Dioxin-Like Compounds. Toxicological Sciences 133(2), 197–208.
3. Kannan, K., et al. (2012). Polybrominated dibenzo-*p*-dioxins and dibenzofurans. Dioxins and Health. Third edition. Wiley.
4. Lundstedt, S. (2016). Sources and levels of PBDD/Fs in the Swedish environment. Umeå University.
5. Breivik, K., et al. (2023). Identification of POP candidates among chemicals in plastic. Screening for LRTP using the Emissions Fractions Approach. NILU report 28/2023.
6. Kawai, T., et al. (2014). A New Metric for Long-Range Transport Potential of Chemicals. Environmental Science & Technology 48(6), 3245–3252.