Report of the Persistent Organic Pollutants Review Committee on the work of its third meeting

I. Opening of the meeting

1. The third meeting of the Persistent Organic Pollutants Review Committee was held at the Varenbê Conference Centre in Geneva, Switzerland, from 19 to 23 November 2007. Mr. Reiner Arndt (Germany), Chair of the Committee, declared the meeting open at 10.00 a.m. on Monday, 19 November, and introduced Mr. Donald Cooper, the recently appointed Executive Secretary of the Stockholm Convention.

2. Mr. Cooper welcomed the members of the Committee and observers, praising the former for the generosity of spirit which had led them to dedicate their time and efforts to a matter of global importance, for which they would earn the world’s gratitude. He also welcomed new members of the Committee who were attending as observers and would take their seats officially on 5 May 2008, expressing confidence that they would uphold the high standards that the Committee had established to date, which he said were the envy of many other multilateral environmental agreements.

3. The Stockholm Convention, he said, was becoming increasingly important, and its future would be strongly affected by the work of the Committee. Interest in the work of the Convention was great, as exemplified by a meeting on mercury held in Bangkok the previous week, at which some participants had suggested that the best way for the world to meet the global challenge posed by mercury was to make it the subject of a protocol to the Convention. He then turned to the agenda of the current meeting, noting that in addition to deciding on matters pertaining to the listing of specific chemicals the Committee would be making policy decisions that would affect its working procedures, such as on the listing of precursors in the Convention annexes. He warned that, owing to the date of the fourth meeting of the Conference of the Parties and the requirement that any recommendations by the Committee to list chemicals in Annexes A, B or C of the Convention be submitted to the Parties at least six months before the meeting of the Conference at which they were to be considered, the Committee’s next meeting would have to take place earlier than originally planned and the Committee would have to work even more efficiently than usual to ensure success during the intersessional period. He thanked the Chair and Vice-Chair of the Committee, Ms. Jacqueline Alvarez, whose term would end before the Committee’s next meeting, for their strong leadership and in closing he announced that the Secretariat had recently launched on the Convention website (www.pops.int) a new electronic system for reporting under Article 15 of the Convention.
4. In his opening remarks, the Chair echoed Mr. Cooper in observing that the timing of the fourth meeting of the Conference of the Parties would make the work of the Committee in the coming months even harder than usual. He noted that for the first time the meeting was being attended by all 31 members of the Committee, three of whom, from Brazil, Fiji and Jordan, had been appointed to replace former members from those countries who had unfortunately had to step down and seven of whom would be retiring in the period prior to the Committee’s fourth meeting, requiring the Committee to plan for the smooth entry of their successors. He thanked all concerned for their efforts in the intersessional work without which the current meeting would not have been possible and he outlined the practical arrangements for the meeting.

II. Organizational matters

A. Adoption of the agenda

5. The Committee adopted the agenda set out below, on the basis of the provisional agenda which had been circulated as document UNEP/POPS/POPRC.3/1/Rev.2:

1. Opening of the meeting.
2. Organizational matters:
   (a) Adoption of the agenda;
   (b) Organization of work.
3. Review of outcomes of the third meeting of the Conference of the Parties of the Stockholm Convention relevant to the work of the Committee.
4. Operational issues:
   (a) Naming of commercial products and mixtures;
   (b) Listing of precursors;
   (c) Questions raised during the intersessional period and to be considered by the Persistent Organic Pollutants Review Committee:
      (i) Submission of information specified in Annex F of the Convention: revision of the outline for risk management evaluations;
      (ii) Communication to Parties of the recommendations of the Committee to amend the Convention by listing a chemical in Annexes A, B or C of the Convention;
      (iii) Translation costs and document length;
   (d) Introduction of new members of the Committee and discussion of arrangements for the transition between outgoing and incoming members in the intersessional period between the third and fourth meetings of the Committee;
   (e) Standard workplan for the preparation, in the intersessional period between the third and fourth meetings of the Committee, of draft risk profiles and draft risk management evaluations.
5. Presentations on socio-economic considerations.
6. Consideration of draft risk management evaluations:
   (a) Commercial pentabromodiphenyl ether;
   (b) Chlordecone;
   (c) Hexabromobiphenyl;
   (d) Lindane;
   (e) Perfluorooctane sulfonate.
7. Presentation on environmental transport and modelling.
8. Bioaccumulation assessment.
9. Consideration of draft risk profiles:
   (a) Commercial octabromodiphenyl ether;
   (b) Pentachlorobenzene;
   (c) Short-chained chlorinated paraffins;
   (d) Alpha hexachlorocyclohexane;
   (e) Beta hexachlorocyclohexane.

10. Consideration of a newly proposed chemical, endosulfan, for inclusion in Annexes A, B or C of the Convention.

11. Other matters.

12. Dates and venue of the fourth meeting of the Committee.

13. Adoption of the report.

14. Closure of the meeting.

B. Organization of work

6. The Chair drew attention to the objectives and possible outcomes of the meeting, as described in the scenario note for the meeting (UNEP/POPS/POPRC.3/INF/1), and to the tentative schedule for the week (UNEP/POPS/POPRC.3/INF/12). The Committee agreed to conduct the meeting in accordance with the schedule set out in document UNEP/POPS/POPRC.3/INF/12, with a number of modifications and subject to adjustment as necessary to reflect progress during the meeting.

7. The Committee agreed to conduct its work in plenary and to establish such contact groups and drafting groups as proved necessary. Contact group meetings would be open to observers; drafting group meetings for the preparation of draft decisions would be open only to members of the Committee.

C. Attendance

8. The meeting was attended by the following 31 members of the Committee: Ms. Anahit Aleksandryan (Armenia), Mr. Ian Rae (Australia), Ms. Amarilis Neder (Brazil), Mr. Désiré Ouédraogo (Burkina Faso), Mr. Robert Chenier (Canada), Mr. Abderaman Mahamet Abderaman (Chad), Mr. Jianxin Hu (China), Mr. Kouamé Georges Kouadio (Côte d’Ivoire), Mr. Ivan Holoubek (Czech Republic), Mr. Alfredo Cueva (Ecuador), Mr. Mohammed Ali Mohammed (Ethiopia), Mr. Jope Rinababo Davetanivalu (Fiji), Mr. Reiner Arndt (Germany), Mr. Masaru Kitano (Japan), Mr. Mohammad Khoshashneh (Jordan), Mr. Mohammad Aslam Yadalleh (Mauritius), Mr. Mario Yarto (Mexico), Ms. Farah Bouarghachta (Morocco), Ms. Liselott Säll (Norway), Mr. Dario C. Sabularse (Philippines), Ms. Hala Sultan Saif Al-Easa (Qatar), Mr. Thomas Brima Rick Yormah (Sierra Leone), Ms. Evelin Fabjan (Slovenia), Mr. Henk Bouwman (South Africa), Mr. José V. Tarazona (Spain), Mr. Bo Wahlström (Sweden), Mr. Jarupong Boon-Long (Thailand), Mr. Wayne Rajkumar (Trinidad and Tobago), Ms. Leena Ylä-Mononen (designated by the United Kingdom of Great Britain and Northern Ireland), Ms. Jacqueline Alvarez (Uruguay) and Mr. Ali El-Shekeil (Yemen).

9. The meeting was also attended by the following invited experts: Ms. Yang Xiaoling (State Environmental Protection Administration, China), Mr. Martin Scheringer (Institute of Chemical and Bioengineering, Switzerland), Ms. Andrea Rother (Occupational and Environmental Health Research Unit, School of Public Health and Family Medicine, University of Cape Town, South Africa), Mr. Michael McLachlan (Laboratory for Analytic Environmental Chemistry, Sweden).

10. In addition, the meeting was attended by representatives of the following countries as observers: Argentina, Australia, Austria, Brazil, Cambodia, Canada, China, Côte d’Ivoire, Egypt, Finland, France, Guatemala, Honduras, India, Japan, Netherlands, Poland, Portugal, Qatar, Slovak Republic, Spain Sweden, Switzerland, Syrian Arab Republic and United States of America. The European Community was also represented as an observer.

11. The Global Environment Facility was represented as an observer.


III. Review of the outcomes of the third meeting of the Conference of the Parties of the Stockholm Convention relevant to the work of the Committee

14. Introducing the item, the representative of the Secretariat summarized the information contained in document UNEP/POPS/POPRC.3/INF/3 on the outcomes of the third meeting of the Conference of the Parties relevant to the work of the Committee. The Committee took note of the information.

IV. Operational issues

A. Naming of commercial products and mixtures

15. Introducing the sub-item, the representative of the Secretariat outlined the information set out in document UNEP/POPS/POPRC.3/3, drawing attention to four possible approaches to naming mixtures and products for the purpose of listing in the annexes to the Convention which were listed in subparagraphs 2 (b)–(e).

16. The Committee then held a preliminary discussion on the implications of the four approaches, using commercial pentabromodiphenyl ether to illustrate the challenges posed by mixtures of substances. Responding to a comment from one observer, the Chair said that while the Conference of the Parties had decided with reference to isomers that the Committee should only review substances for listing that had been nominated by a Party, the Committee was competent to determine how it should handle mixtures of substances. He also noted that the Committee would have to describe in a transparent way the information on which the listing proposal was based and the arguments by which it could be supported.

17. There was consensus that the approach set out in subparagraph 2 (b) of document UNEP/POPS/POPRC.3/3, which was simply to name the commercial mixtures for listing under the Convention, was inappropriate as it would limit the scope of a given listing. Several members said that in determining how to define a commercial mixture it would be necessary to examine the practical consequences of each approach and to give a transparent and detailed explanation of the grounds for adopting a certain methodology; broader definitions of products or mixtures would require more sophisticated justifications. The Chair acknowledged that the quality and quantity of the information contained in risk profiles would influence the approach that could be taken to the naming of mixtures in commercial products.

18. While some members suggested that the approaches set out in subparagraph 2 (c) might sometimes be appropriate, many expressed a preference for the approach in subparagraph 2 (d), which provided for the naming of specific components of concern in a mixture or all components with a specified degree of substitution. That option, they said, balanced simplicity and transparency with comprehensiveness. Some members voiced concerns about the approach, however. The Chair suggested that when listing classes of substances it might be possible to refer to them in generic terms in the annexes of the Convention in order to avoid a very large number of chemicals being listed there; a more comprehensive list could then be provided in a separate technical document. In general, the Committee recognized a need for care in naming mixtures by class or classes of substances, as it might unintentionally include congeners not found in the nominated mixture.
B. Listing of precursors

19. Introducing the sub-item, the representative of the secretariat outlined document UNEP/POPS/POPRC.3/4, which discussed five possible approaches for listing precursors under the Convention. Noting that the Committee’s treatment of the issue would inform its discussions on perfluorooctane sulfonate (PFOS), the Chair observed that the first approach suggested in the document would require the listing and individual evaluation of each precursor, while the other approaches would allow precursors to be dealt with in groups.

20. In the ensuing discussion some members suggested that PFOS precursors should be grouped together and that when there was evidence that they would convert to PFOS in the environment they should be listed in the Convention. One member suggested that precursors should only be nominated for inclusion in the Convention if they had properties similar to PFOS itself. Others disagreed, saying it was difficult to prove that PFOS precursors themselves were persistent organic pollutants. Another member suggested that each precursor should be evaluated for degradation and listed. It was noted that detailed scientific information would be needed to prove transformation and could result in a lengthy review process. Some members suggested that PFOS precursors might be listed in Annex A to the Convention. Others suggested that they be included in Annex B.

21. The Committee took note of the proposed approaches for listing precursors in the Convention.

C. Questions raised during the intersessional period and to be considered by the Persistent Organic Pollutants Review Committee

1. Submission of information specified in Annex F of the Convention: revision to the outline for risk management evaluations

22. Introducing the sub-item, the representative of the Secretariat outlined the information set out in document UNEP/POPS/POPRC.3/6, highlighting amendments made to the draft risk management evaluation outline at an informal meeting of the Committee Chair and Co-Chair and the chairs and drafters of the ad hoc intersessional working groups, which had been held in February 2007 for the purpose of discussing the development of risk management evaluations as requested by the Committee at its second meeting.

23. During the informal meeting, it had been highlighted that little information had been forthcoming from Parties and observers on “movement towards sustainable development”, which was an element of section 2.4 of the outline, summarizing information on impacts on society of implementing possible control measures. The chairs and drafters had therefore agreed that it might be more appropriate to remove that element from the outline and instead to include in the concluding statement a reference linking the objective of sustainable development to the work of the Committee.

24. In the ensuing discussion there was consensus that it would be best to retain sustainable development in section 2.4 and that where no information on sustainable development was available a reference would be made in the concluding statement linking the objective of sustainable development to the work of the Committee.

25. A member also indicated that there was a need for including some production and use information in the risk management evaluation, notwithstanding the fact that such data were covered in the risk profiles. It was considered that given the limited length of a risk management evaluation it would be difficult to include all information on production and use. To ensure that summary information reflected differences between developed countries, developing countries and countries with economies in transition, however, the Committee agreed to add a footnote with text from Annex F to the Convention providing that “[s]uch information should reflect due regard for the differing capabilities and conditions among the Parties …”.

26. The Committee agreed to use the draft outline, as amended in plenary, in its work during the current meeting and to reexamine it, if necessary, to take into account the experience gained in doing so. The revised risk management evaluation outline is set out in annex II to the present report.
2. Communication to Parties of the recommendations of the Committee to amend the Convention by listing a chemical in Annexes A, B or C of the Convention

27. In considering the item, the Committee had before it a note by the Secretariat on communication to Parties of the recommendations of the Committee to amend the Convention (UNEP/POPS/POPRC.3/INF/25). The representative of the Secretariat said that given the timing of the fourth meeting of the Committee and the fourth meeting of the Conference of the Parties it was proposed that a letter be sent to communicate the results of the current meeting to all Parties and observers. The letter could describe the recommendations made, list the chemicals proposed for listing in the Convention and explain why they had been proposed and explain the implications of listing and the obligations that Parties would face in the event the chemicals were listed. The letter could also recall the goals of annexes A, B and C for ease of reference.

28. In the ensuing discussion the Committee agreed that the Secretariat would send a letter to the Parties as proposed. It was emphasized that the purpose of the letter was to inform countries about the implications of the listing of chemicals and to ask them to report any concerns to the Secretariat. It was agreed that the letter would recall Articles 21 and 22 of the Convention and remind Parties of their obligations prior to a meeting of the Conference of the Parties, that it should clearly state the reasons for proposing to list a given chemical and that it should include information on exemptions. It was also agreed that a separate letter would be sent for each chemical and that the letters would also be placed on the Convention website. A specimen letter prepared by the Secretariat and approved by the Committee is set out in annex III to the present report.

3. Translation costs and document length

29. In considering the item, the Committee had before it a note by the Secretariat on translation costs and document length (UNEP/POPS/POPRC.3/19). The representative of the Secretariat recalled that, owing to a limit on the length of meeting documents imposed under the rules of the United Nations, as well as the cost of translation, the Secretariat had been obliged to restrict the length of draft risk profiles and draft risk management evaluations to a maximum of 20 pages. He illustrated the latter concern by noting that the cost of translating pre-session documents for the current meeting had been more than $160,000.

30. The representative of the Secretariat agreed to the request by one member that the title and other matter preceding the operative text of documents not be included in the 20-page limit. In answer to another query, the representative explained that even annexes to working documents had to be translated but information documents did not. Thus it was possible to produce additional information in English only in information documents.

D. Introduction of new members of the Committee and discussion of arrangements for the transition between outgoing and incoming members in the intersessional period between the third and fourth meetings of the Committee

31. In considering the item, the Committee had before it a note by the Secretariat on designated members of the Persistent Organic Pollutants Review Committee (UNEP/POPS/POPRC.3/INF/4). The representative of the Secretariat recalled that, pursuant to decisions SC-1/7 and SC-3/9 of the Conference of the Parties, 14 new members of the Committee would replace outgoing members on the expiry of their two-year terms of membership on 5 May 2008. Seven of those incoming members were present at the current meeting as observers.

32. In addition, the following new members had been nominated by their Governments to fill the places of members who had been unable to complete their full terms: Mr. Jope Rinabobo Davetanivalu (Fiji), to replace Ms. Razia Zariff; Ms. Amarilis de Vicente Finageiv Neder (Brazil), to replace Ms. Adriana Maximiano; and Mr. Mohammed Khashashneh (Jordan), to replace Mr. Ziad Abu Kaddourah. Their terms of office would commence on 5 May 2008, subject to confirmation by the Conference of the Parties at its fourth meeting.

33. It was observed that it would be necessary to elect a new vice-chair to fill the seat of Ms. Alvarez, who as noted above was among those whose terms would expire prior to the next meeting of the Committee. It was agreed that it would be desirable for the incoming members of the Committee to participate in that election; as their terms did not commence until 5 May 2008, however, the election could not be held during the current meeting. The Committee accordingly agreed that, upon the expiration of Ms. Alvarez’ term on 5 May 2008, Mr. Cueva would perform the duties of Vice-Chair on
a provisional basis until the Committee’s fourth meeting, at which time the Committee would formally elect a new Vice-Chair.

E. **Standard workplan for the preparation, in the intersessional period between the third and fourth meetings of the Committee, of draft risk profiles and draft risk management evaluations**

1. **Draft risk profile**

   34. The agenda for the current meeting included consideration of one newly proposed chemical for listing in Annexes A, B or C of the Convention. As discussed in chapter X of the present report, the Committee suspended consideration of that chemical, endosulfan, until its fourth meeting. As a result there was no need for work on new risk profiles during the period between the Committee’s third and fourth meetings and likewise no need for the Committee to consider adopting a workplan for such work. The Committee agreed, however, to continue work on the draft risk profile for SCCP, the workplan for which is included in annex IV to the present report.

2. **Draft risk management evaluations**

   35. The representative of the Secretariat presented a draft workplan for the period between the third and fourth meetings of the Committee for the preparation of several draft risk management evaluations. She noted that the Committee’s future meetings would be held in October of each year, rather than in November as had been the case for previous meetings, which implied that in 2008 the Committee would have one month less than usual to conduct its intersessional work. As a result, the workplan provided that the draft evaluations would be made available for comments on three occasions rather than the usual four. The Committee agreed that as that was due to exceptional circumstances it would not set a precedent for subsequent workplans.

   36. One member said that, as a means of promoting the availability of information relevant to Annex F of the Convention and the development of risk management evaluations, members of the Committee should be encouraged to participate in regional, subregional and national meetings related to chemicals management and Parties and observers should be encouraged to promote capacity-building with regard to gathering and gaining access to information. Several members stressed that developing countries needed assistance to engage in the intersessional work and that it would be useful if the Global Environment Facility and other international financial institutions could provide it. The Committee agreed that it was very important that Parties provide requested data punctually and that drafting proposals and references to documents be very specific. The Committee also agreed that if the amount of information submitted by Parties on a chemical under consideration proved to be inadequate then the drafter of the risk management evaluation for that chemical would notify Parties of the need for more data when sending out revised versions of the draft evaluation.

   37. The Committee adopted the workplan, which is set out in annex IV to the present report.

3. **Intersessional work**

   38. In adopting its decisions at the current meeting, the Committee decided, in accordance with paragraph 6 of Article 8 of the Convention and paragraph 29 of decision SC-1/7 of the Conference of the Parties, to establish a number of intersessional ad hoc working groups to carry forward the necessary work on the chemicals under consideration. The composition of those groups is set out in annex V to the present report.

V. **Presentations on socio-economic considerations**

   39. Presentations on socio-economic considerations were made by Ms. Hanna-Andrea Rother, University of Cape Town, South Africa, and Ms. Yang Xiaoling, State Environment Protection Administration, China.

   40. In her presentation, on the social and economic impacts of lindane control measures in South Africa, Ms. Rother summarized the registration status of lindane in that country and gave an overview of current uses, indicating the available alternatives and the positive and negative impacts of control measures. She also provided an overview of the registration status of lindane in several African countries and indicated that the substance was only registered in three countries. She concluded that
listing lindane under Annex A of the Stockholm Convention would have limited social and economic costs for South Africa and would benefit developing country populations, protect the environment and promote sustainable approaches to pest control.

41. In the subsequent discussion one member indicated that several of the African countries that had not registered lindane had reported using the chemical. He indicated that there was therefore a need for improved capacity to obtain information in developing countries.

42. In her presentation, on the preliminary analysis of PFOS in China, Ms. Yang summarized the history of PFOS production in the country, noting a significant increase in output after 2002. She outlined the main application sectors and said that management of the substance was not a priority in China as there was little evidence of significant environmental impact. She warned that listing perfluorooctane sulfonate would create significant social and economic difficulties due to factory closure, the absence of viable alternatives and the high estimated cost of conversion.

VI. Consideration of draft risk management evaluations

A. Commercial pentabromodiphenyl ether

43. In considering the item, the Committee had before it notes by the Secretariat on the draft risk management evaluation for commercial pentabromodiphenyl ether (UNEP/POPS/POPRC.3/9), on comments and responses relating to the draft risk management evaluation for commercial pentabromodiphenyl ether (UNEP/POPS/POPRC.3/INF/11) and on other information related to uses and data sources provided by the intersessional working group on commercial pentabromodiphenyl ether (UNEP/POPS/POPRC.3/INF/23). Mr. Ian Rae, chair of the intersessional working group on pentabromodiphenyl ether, presented the draft risk management evaluation.

44. During the ensuing discussion, one member questioned the inclusion of possible non-regulatory actions in the draft evaluation, saying they would not guarantee the level of control required under the Convention. She also said that the reference in the evaluation to applying a “cost-benefit analysis” to the phase-out of commercial pentabromodiphenyl ether was incorrect. A member of the intersessional working group responded that the analysis was qualitative rather than quantitative and would help inform the evaluation. It was suggested that the report simply refer to an analysis of the costs and benefits.

45. One member said that the lack of information on production and use from developing countries noted in the report showed that there was a need to strengthen information-gathering capacity in those countries. Another said that information gathering on industrial chemicals was difficult for most countries, particularly with regard to the chemical components of produced articles.

46. The Committee agreed to establish a contact group to revise the draft risk management evaluation on commercial pentabromodiphenyl ether for consideration by the Committee. It also agreed to establish a drafting group to prepare a draft decision on commercial pentabromodiphenyl ether for consideration by the Committee. Both groups were chaired by Mr. Rae.

47. During further discussions following the deliberations of the contact and drafting groups, one member endorsed a suggestion that the risk management evaluation should include guidance on alternatives, saying that such guidance should be included in the evaluations for all compounds under consideration by the Committee. Ms. Liselott Säll (Norway) and Mr. Bo Wahlström (Sweden) offered to make an initial effort to prepare guidance for commercial pentabromodiphenyl ether and Mr. Wahlström added that use of the Swedish PRIO database, a tool for prioritizing risk reduction of chemicals, could facilitate that effort.

48. The Committee adopted decision POPRC-3/1, by which, among other things, it adopted the risk management evaluation for commercial pentabromodiphenyl ether, as orally amended, and agreed to recommend the listing of the substance in Annex A of the Convention. The decision is set out in annex I to the present report. The risk management evaluation is contained in document UNEP/POPS/POPRC.3/20/Add.1.

49. The Committee agreed that an information document would be prepared to assist the Conference of the Parties in its deliberations on how best to list commercial pentabromodiphenyl ether in the annexes of the Convention based on the decision of the Committee to recommend listing all brominated diphenyl ethers containing 4 and/or 5 bromines in the commercial mixture and specific marker chemicals within the mixture. A member pointed out that a full listing of chemicals found in
mixtures of commercial pentabromodiphenyl ether was contained in a reference now cited in the risk management evaluation (La Guardia et al. 2006, *Environmental Science and Technology* 40:6247-6254). The Committee also took note of another recent reference on the composition of pentabromodiphenyl ether (Qiu et al. 2007, *Environmental Health Perspectives* 115(7):1052).

B. **Chlordecone**

50. In considering the item, the Committee had before it the draft risk management evaluation on chlordecone prepared by the intersessional working group on chlordecone (UNEP/POPS/POPRC.3/10) and a compilation of the comments and responses received with respect to that evaluation (UNEP/POPS/POPRC.3/INF/12). Ms. Hala Al-Easa (Qatar), chair of the intersessional working group, summarized the information set out in the two documents. She highlighted the fact that chlordecone was no longer produced and that the primary effect of listing the substance would therefore be to prevent resumption of its production.

51. The Committee agreed that it did not seem currently practicable to incorporate kelevan, a precursor to chlordecone that was no longer produced, in the listing for chlordecone. One member said that the discussions on PFOS precursors might lead to the adoption of a general approach that would allow the listing of kelevan. The Chair responded that while a general approach might be adopted it would perhaps be simpler and more expeditious for kelevan to be nominated and evaluated individually.

52. The Chair recalled that by its decision POPRC-2/2 the Committee had invited the intersessional working group which had prepared the risk profile on chlordecone to explore any further information on long-range environmental transport and risk estimations and, if appropriate, to revise the risk profile for consideration by the Committee at its third meeting. Following the presentation on environmental transport and modelling at the current meeting under agenda item 7, the Committee concluded that no new information had become available on the long-range transport of chlordecone since the drafting of the chemical’s risk profile and that, accordingly, nothing should be added to the profile.

53. While there was consensus that chlordecone should be listed under the Convention, some members noted that the comparatively limited short-term benefits of banning the substance would necessitate a careful explanation to the Conference of the Parties of the rationale for listing the chemical.

54. The Committee agreed to establish a drafting group to revise the draft risk management evaluation on chlordecone for consideration by the Committee and to prepare a draft decision on chlordecone for consideration by the Committee. The group was chaired by Ms. Al-Easa.

55. The drafting group on chlordecone submitted a proposed revision of the last paragraph of section 2.2.3 of the risk profile on chlordecone (UNEP/POPS/POPRC.2/17/Add.2), on the potential for long-range environmental transport. The Committee took note of the revision. The revised risk profile is contained in document UNEP/POPS/POPRC.3/20/Add.10.

56. The Committee adopted decision POPRC-3/2, by which, among other things, it adopted the risk management evaluation for chlordecone and agreed to recommend the listing of the substance in Annex A of the Convention. The decision is set out in annex I to the present report. The risk management evaluation is contained in document UNEP/POPS/POPRC.3/20/Add.2.

C. **Hexabromobiphenyl**

57. In considering the item, the Committee had before it the draft risk management evaluation prepared by the intersessional working group on hexabromobiphenyl (UNEP/POPS/POPRC.3/11) and the comments and responses relating to that evaluation (UNEP/POPS/POPRC.3/INF/13). Ms. Leena Ylä-Mononen (designated by the United Kingdom of Great Britain and Northern Ireland), drafter for the intersessional working group, introduced the draft risk management evaluation. She highlighted that while hexabromobiphenyl was no longer produced or used in most places its production and use in some developing countries could not be ruled out. She said that the intersessional working group was in favour of listing hexabromobiphenyl in Annex A of the Convention in order to prevent its reintroduction into the environment.

58. The Committee agreed to establish a drafting group to revise the draft risk management evaluation on hexabromobiphenyl for consideration by the Committee and to prepare a draft decision on hexabromobiphenyl for consideration by the Committee. The group was chaired by Ms. Ylä-Mononen.
59. The Committee adopted decision POPRC-3/3, by which, among other things, it adopted the risk management evaluation for hexabromobiphenyl and agreed to recommend the listing of the substance in Annex A of the Convention. The decision is contained in annex I to the present report. The risk management evaluation is contained in document UNEP/POPS/POPRC.3/20/Add.3. The evaluation contains in its annex a detailed explanation of the Committee’s decision to adopt a “class approach” to the listing of hexabromobiphenyls.

D. Lindane

60. In considering the item, the Committee had before it the draft risk management evaluation for lindane prepared by the intersessional working group on lindane (UNEP/POPS/POPRC.3/12) and comments and responses relating to that evaluation (UNEP/POPS/POPRC.3/INF/14). Mr. Yarto, drafter for the intersessional working group, presented the draft risk management evaluation.

61. There was some discussion of the pharmaceutical use of lindane to treat head lice and scabies and the availability of alternatives. In that context, some members said that due attention should be paid to developing country needs when considering pharmaceutical exemptions. One member said that several developing countries had developed strategies for fighting malaria without DDT and that it was important to support similar strategies in the case of lindane. Some members said that lindane was used in certain developing countries to combat agricultural pests such as midges and locusts and that more time was needed to identify, test and introduce alternatives for such uses.

62. Several members said that the risk management evaluation should include more information on the successful use of alternatives for pharmaceutical uses, as well as information on why alternatives were effective in some circumstances but not in others. Some members noted a lack of information on lindane use in Africa, adding that assistance should be given to strengthen the capacity of developing countries to eliminate existing stocks and clean up contaminated sites. Mr. Yarto said that the presentation on the use of lindane in South Africa and the ensuing discussion had provided useful information on the use of lindane in Africa and that he looked forward to receiving further information through official channels.

63. The Committee agreed to establish a contact group to revise the draft risk management evaluation on lindane for consideration by the Committee. It also agreed to establish a drafting group to prepare a draft decision on lindane for consideration by the Committee. Both groups were chaired by Mr. Henk Bouwman.

64. Following their deliberations the contact and drafting groups presented a revised risk management evaluation and a draft decision for consideration by the Committee. During its consideration of the evaluation and the draft decision, the Committee discussed what action it should take regarding the proposed exemption for pharmaceutical uses of lindane and the extent to which the Committee should advise the Conference of the Parties.

65. Some members said that the rules relating to specific exemptions were clearly laid out in Articles 3 and 4 of the Convention and that no further action on the matter was required of the Committee. One member recalled paragraph 9 of Article 8 of the Convention, which stated that the Conference of the Parties should decide whether to list a chemical and specify its related control measures, taking account of the recommendations of the Committee. That procedure gave the Committee the option of providing additional information to the Conference of the Parties to assist it in specifying control measures. Some members said that additional control measures could be proposed that would apply specifically to lindane.

66. The Committee adopted decision POPRC-3/4, by which, among other things, it adopted the risk management evaluation for lindane and agreed to recommend the listing of the substance in Annex A of the Convention. The decision is set out in annex I to the present report. The risk management evaluation is contained in document UNEP/POPS/POPRC.3/20/Add.4.

E. Perfluorooctane sulfonate

67. Mr. Robert Chenier (Canada), chair of the intersessional working group on PFOS, introduced the draft risk management evaluation prepared by that group (UNEP/POPS/POPRC.3/13). He said that the key issues to address arising from the risk management evaluation were the listing of PFOS and PFOS precursors, uses with no reported technically feasible alternatives, uses for which alternative substances or technologies might be available but might need to be phased in and listing options. The
chair noted that the Committee would need to agree on whether PFOS should be proposed for inclusion in Annex A, subject to time limited exemptions or possible elaboration of a new part III to that annex, or in Annex B, with exemptions for certain uses, or in a combination of annexes A, B and C. He expressed doubt, however, about whether the substance fit within the terms of Annex C.

68. In the ensuing discussion, it was suggested that legal advice would be required to determine whether PFOS could be listed in Annex C in accordance with the terms of that annex and Article 5 of the Convention. The legal advisor from the Secretariat responded that Article 5 referred to anthropogenic sources, that PFOS sources were anthropogenic substances and that PFOS could therefore potentially be listed in Annex C with due amendments to that annex. Some stressed the very long degradation time of PFOS as an important factor that should influence whether and in what annex PFOS was to be listed. One member suggested adding a list of all known uses at the beginning of the risk management evaluation. The drafter for the intersessional working group explained that, owing to the 20-page limit for risk management evaluations, it had been necessary to be selective in including information and that other information on uses was contained in an information document provided to members on the Stockholm Convention website. A member suggested as a possible solution that additional information could be included in an annex to the final evaluation that would not be translated.

69. A few members and observers highlighted the lack of technically feasible and affordable alternatives to PFOS for certain uses; it was suggested that PFOS should be listed in a manner that would best promote the development of such alternatives and one member suggested that a mechanism to develop alternatives be established under the Convention. It was noted that the restriction of PFOS by the European Union had caused a surge in production in and exports from China to countries where alternatives were not readily available. In that context, several members suggested that it would be necessary to provide for some exemptions with the listing of PFOS.

70. The Committee agreed to establish a contact group to examine the risk management evaluation and, when determining the options for listing PFOS in the Convention annexes, to study production reduction, use limitation and substitution issues. It was noted that the contact group could take into account additional information provided at the current meeting so long as it was subsequently confirmed in writing. The Committee also agreed to establish a drafting group to produce a draft decision on PFOS. Both groups were chaired by Mr. Chenier.

71. During the discussions following the contact and drafting groups’ initial deliberations, a few members expressed concern over the inclusion of PFOS fluoride (PFOSF) in the risk management evaluation for PFOS, saying that PFOSF had not been subject to the screening process for Annex D of the Convention. Others said that information on all derivatives of PFOS had been included in the original Swedish proposal and that PFOSF had been covered in the risk profile and that it had therefore been evaluated under the Annex E headings. Mr. Wahlström confirmed that the original nomination for PFOS acid had included 96 derivatives but that the Committee had examined only a few of them specifically during the screening for Annex D criteria. The Annex E and F information request, however, had covered all such substances and the risk profile and risk management evaluation hence also covered all such substances. It was further emphasized that PFOSF easily degraded to PFOS. The Committee agreed that, given that PFOSF was a common precursor for PFOS derivatives and in view of its rapid degradation rate, listing PFOSF along with the PFOS acid and salts would be an effective measure to reduce PFOS contamination of the environment.

72. Following further work by the contact and drafting groups the Committee agreed that, given that PFOSF had been included in the proposal submitted by Sweden to list PFOS in Annex A of the Convention and that the Committee had previously invited Parties and observers to submit Annex E information pertinent to PFOS and PFOS-related substances and Annex F information for PFOS and potential PFOS precursors, the Committee had a sufficient basis at the current meeting for evaluating PFOSF against the screening criteria set out in Annex D of the Convention and for evaluating PFOSF and the PFOS salts against the headings of Annex E of the Convention. The Committee further agreed that PFOSF and the PFOS salts satisfied those criteria.

73. The Committee also agreed that PFOS and its salts and PFOSF could be listed in either Annex A or Annex B of the Convention. There was considerable debate, however, about whether the Committee should recommend listing in one or the other or both of those annexes, as well as whether it should recommend exemptions. Some members said it was incumbent on the Committee to do so; others, however, considered that it was a political question that was best left to the Conference of the Parties. In the end, the Committee agreed that, based on all the information currently available, it would recommend listing the substances in Annex A or Annex B without recommending whether it should be listed in one or the other or both at that time, since listing in each Annex could be effective in
addressing PFOS contamination of the environment. Parties would be asked to provide additional information on production and uses. It was also agreed that the Committee would not recommend specific exemptions at that time, but it was noted that the risk management evaluation contained substantial information on potential exemptions and their likely effects.

74. The Committee also considered further the draft risk management evaluation prepared by the contact group, as well as the draft decision prepared by the drafting group, and made a number of additional revisions to both.

75. The Committee adopted decision POPRC-3/11, as orally amended, by which it decided that PFOSF met the screening criteria of Annex D of the Convention and that PFOSF and the PFOS salts met the requirements of Annex E. The Committee also adopted decision POPRC-3/5, by which, among other things, it adopted the risk management evaluation for PFOS, as orally amended, and agreed to recommend the listing of the substance in Annexes A or B of the Convention. The decisions are set out in annex I to the present report. The risk management evaluation is contained in document UNEP/POPS/POPRC.3/20/Add.5.

VII. Presentation on environmental transport and modelling

76. Mr. Martin Scheringer, an invited expert from the Swiss Federal Institute of Technology, Zurich, gave a presentation on a tool developed by the Organisation for Economic Cooperation and Development (OECD) for calculating the overall persistence and long-range transport potential of chemicals, which could be downloaded free of charge from the OECD website. He explained the process by which the tool had been developed, noting that it had been used to screen the ten substances currently being evaluated by the Committee for possible listing in the annexes to the Convention. The results of those tests indicated that all of the substances exhibited similar propensities for long-range transport and overall persistence as other substances already listed under the Convention.

VIII. Bioaccumulation assessment

77. In considering the item, the Committee had before it a note by the Secretariat on consideration of the screening criteria on bioaccumulation set forth in subparagraph (c) of paragraph 1 of Annex D of the Stockholm Convention (UNEP/POPS/POPRC.3/2). Introducing the item, the Chair recalled that at the second meeting of the Committee and the third meeting of the Conference of the Parties it had been requested that the Committee give due consideration to the full range of screening criteria listed in Annex D of the Convention. In response to that request, the Chair had proposed that the Committee at the current meeting address the issue of assessing bioaccumulation potential when a substance did not quite fulfill the quantitative criteria listed in subparagraph 1 (c) (i) of Annex D. The Committee’s task was to examine document UNEP/POPS/POPRC.3/INF/8 and determine whether the information contained therein could be used as future guidance on assessing bioaccumulation. He noted that the document was a living document and could be amended or updated based on experience gained.

78. Mr. Masaru Kitano (Meiji University, Japan) made a presentation on bioaccumulation evaluation, using prior decisions of the Committee relating to the criteria in Annex D to illustrate. In the ensuing discussion several members voiced concern about the use of toxicity in conjunction with biota data, as such an approach was not referred to in Annex D. One member cautioned that the criteria for bioaccumulation in Annex D were less restrictive than those described in the presentation. It was also suggested that evidence of a substance in species did not by itself necessarily mean that bioaccumulation had occurred or that bioconcentration should be considered together with toxicity.

79. One member urged care when comparing data as the natural environment and laboratory studies were not always comparable. Another member said that in field data the bioaccumulation factor was a better marker than the bioconcentration factor. Another said that more data should be obtained for warmer climates.

80. The Committee suggested several amendments to the discussion paper on bioaccumulation evaluation, using prior decisions of the Committee relating to the criteria in Annex D to illustrate. In the ensuing discussion several members voiced concern about the use of toxicity in conjunction with biota data, as such an approach was not referred to in Annex D. One member cautioned that the criteria for bioaccumulation in Annex D were less restrictive than those described in the presentation. It was also suggested that evidence of a substance in species did not by itself necessarily mean that bioaccumulation had occurred or that bioconcentration should be considered together with toxicity.

81. The drafting group presented a revised version of the additional information related to assessment of bioaccumulation data under Annex D of the Convention. After making a number of oral amendments, the Committee took note of the document as a useful aid to its work, with the
understanding that it was a living document that could be further revised at any future meeting in the
light of experience. The preliminary guidance paper on bioaccumulation evaluation for the related
criteria under Annex D of the Convention (presented without formal editing by the Secretariat) is set out
in annex VI to the present report. The Committee was informed that related issues would be discussed at
a workshop organized by the Society of Environmental Toxicology and Chemistry, to be held in
Pensacola, Florida, from 27 January to 1 February 2008, on identification of persistent bioaccumulative
toxic and persistent organic pollutants.

IX. Consideration of draft risk profiles

A. Commercial octabromodiphenyl ether

82. In considering the item, the Committee had before it the draft risk profile for commercial
octabromodiphenyl ether prepared by the intersessional working group on commercial
octabromodiphenyl ether (UNEP/POPS/POPRC.3/14) and the comments and responses relating to the
draft risk profile (UNEP/POPS/POPRC.3/INF/16). Mr. José Tarazona (Spain), drafter of the
intersessional working group, presented the draft risk profile.

83. In the ensuing discussion the issue was recognized to be extremely complex. Most who spoke
felt that sufficient evidence existed for certain congeners to be listed in the annexes to the Convention,
with some asserting that the risk profile needed to be strengthened by greater concentration on those
congeners for which scientific certainty existed regarding potential for bioaccumulation and long-range
transport. Some members expressed concern at the information gaps that remained.

84. Some members spoke of the need for care when comparing results obtained in laboratory studies
with levels observed in the wild, or drawing general conclusions from those results, given the very
different and widely varied conditions pertaining in the wild. Others said that while it was indeed
necessary to give due regard to the differences between data obtained in the field and those obtained in
the laboratory, it was important to make use of both to ensure the completeness of risk profiles.

85. The Committee agreed to establish a contact group to revise the draft risk profile on commercial
coctabromodiphenyl ether for consideration by the Committee. It also agreed to establish a drafting group
to prepare a draft decision on commercial octabromodiphenyl ether for consideration by the Committee.
Both groups were chaired by Ms. Alvarez.

86. The Committee adopted decision POPRC-3/6, by which, among other things, it adopted the risk
profile on commercial octabromodiphenyl ether. The decision is contained in annex I to the present
report. The risk profile on commercial octabromodiphenyl ether is contained in document
UNEP/POPS/POPRC.3/20/Add.6.

B. Pentachlorobenzene

87. In considering the item, the Committee had before it the draft risk profile for pentachlorobenzene prepared by the intersessional working group (UNEP/POPS/POPRC.3/15), a compilation of the comments and responses relating to the draft risk profile, (UNEP/POPS/POPRC.3/INF/17) and additional information provided by the intersessional working group (UNEP/POPS/POPRC.3/INF/21). Mr. Dario Sabularse (Philippines), chair of the intersessional working group on pentachlorobenzene, presented the risk profile, in which the working group recommended that the Committee prepare a risk management evaluation.

88. In the ensuing discussion, there was overall support for pentachlorobenzene going forward to
the risk management evaluation stage. Some members noted, however, that there were information gaps
in the risk profile.

89. There was some discussion of the comparison of exposure and effect data, with some members
supporting the inclusion of critical body burden data in the risk profile on the grounds that quantitative
evaluations, while not formally required under the Convention, would provide a more complete basis
for decision-making on the relative risk posed by a substance. One member said that such evidence was
particularly important with a substance such as pentachlorobenzene that had both intended uses and
unintentional sources and that including quantitative data would facilitate understanding of the toxicity
of the chemical at environmental concentrations. Quantitative data would also enable a clearer
estimation of the costs and benefits that might be expected from listing it. Other members, however,
expressed reservations about the applicability of laboratory test data when evaluating risks for higher order animals living under complex and diverse environmental conditions.

90. The Committee agreed to establish a contact group to revise the draft risk profile on pentachlorobenzene for consideration by the Committee. It also agreed to establish a drafting group to prepare a draft decision on pentachlorobenzene for consideration by the Committee. Both groups were chaired by Mr. Sabularse.

91. There was considerable discussion following the contact and drafting group deliberations. Several members stated that any comparison between inbred laboratory species and the environment was very difficult to make as only parts of the environment were sampled and a risk calculation was made on those selected parts only without knowing the extent of environmental contamination. It was also said that there was a problem with comparing levels of toxicity determined in lab animal species and determining what was likely happening to different species in the environment. Some members expressed concern with the inclusion in the risk profile of text from the World Chlorine Council on carbon sediment concentrations in sediments from Canadian lakes and exposure toxicity estimations derived from human reference doses and tolerable daily intakes, saying that it did not reflect the biodiversity of the environment and that the Council’s figures could give a false sense of security. In addition, the concepts on which the Council’s calculations were based were not universally accepted. One member observed that those points had already been made in the intersessional working group. Another said that the debate under way had only been made necessary by the reinsertion into the draft risk profile of text that had previously been rejected by the intersessional working group.

92. The Committee adopted decision POPRC-3/7, by which, among other things, it adopted the risk profile for pentachlorobenzene. The decision is set out in annex I to the present report. The risk profile is contained in document UNEP/POPS/POPRC.3/20/Add.7. The Committee also agreed on the content of a letter that would be sent by the Secretariat highlighting the gaps to be filled in relation to Annex E and assessment of unintentional sources and releases.

C. Short-chained chlorinated paraffins

93. In considering the item, the Committee had before it the draft risk profile on short-chained chlorinated paraffins prepared by the intersessional working group on short-chained chlorinated paraffins (UNEP/POPS/POPRC.3/16), a compilation of the comments and responses received with respect to the profile (UNEP/POPS/POPRC.3/INF/18) and detailed additional information provided by the intersessional working group (UNEP/POPS/POPRC.3/INF/22). Mr. Mohammad Aslam Yadallee (Mauritius), chair of the intersessional working group, summarized the information set out in the documents. He drew attention to the intersessional working group’s conclusion that the chemical was likely as a result of long-range environmental transport to lead to significant adverse human health and/or environmental effects such that global action was warranted.

94. Several members stressed that accurately identifying the complex commercial mixture of short-chained chlorinated paraffins posed a significant challenge and praised the intersessional working group for providing detailed information on the matter in document UNEP/POPS/POPRC.3/INF/22; some members suggested, however, that further refinement of the definition was needed. One member said that the profile’s data on persistence could also be improved with the inclusion of more detailed information on the conditions under which the relevant measurements were taken. While agreeing with that observation, another member stressed that limits on the size of risk profiles necessarily restricted the amount of information that could be included.

95. Several members voiced support for the intersessional working group’s conclusion that short-chained chlorinated paraffins met the criteria set out in paragraph 7 (a) of Article 8 of the Convention for it to be considered against the Annex F criteria. One member, however, said that the data set out in the draft risk profile were insufficient to demonstrate the requisite characteristics.

96. The Committee agreed to establish a contact group to revise the draft risk profile on short-chained chlorinated paraffins for consideration by the Committee. It also agreed to establish a drafting group to prepare a draft decision on short-chained chlorinated paraffins for consideration by the Committee. Both groups were chaired by Mr. Yadallee.
97. Following the contact and drafting group deliberations Mr. Yadallee reported that the group had not reached consensus on the human health effects of short-chained chlorinated paraffins but had agreed that they were likely, as a result of long-range environmental transport, to lead to significant adverse effects on the environment justifying global action, as required by paragraph 7 of Article 8 of the Convention. The group had also agreed on a number of corresponding revisions to the draft risk profile.

98. Considerable debate then followed. A majority of the members of the Committee expressed the view that short-chained chlorinated paraffins satisfied the criteria of paragraph 7 of Article 8 and that the Committee should accordingly proceed to solicit information and prepare a risk management evaluation for the chemical. A minority, however, disagreed. Several members in the latter group said that the risk profile for the chemical did not demonstrate either toxicity to humans or to higher predators or that the chemical was subject to long-range transport. Others questioned the environmental effects, saying for example that concentrations of the substance even near production facilities appeared to be very low. Another member said that the contact group had not had sufficient time to meet and that the data in the risk profile was incomplete.

99. In the light of the difference of opinion on the adequacy of the risk profile for short-chained chlorinated paraffins, and at the proposal of the Chair, the Committee agreed that it would continue its consideration of the draft risk profile at its next meeting and that in the meantime efforts would be made to obtain additional information and data, including in those areas that members had identified as lacking. One member opined that it was incumbent on members objecting to the adequacy of risk profiles to articulate specific reasons to support their views.

100. The decision adopted by the Committee is set out as decision POPRC-3/8 in annex I to the present report. The revised draft risk profile is contained in document UNEP/POPS/POPRC.3/16/Rev.1.

D. **Alpha hexachlorocyclohexane**

E. **Beta hexachlorocyclohexane**

101. The Committee had before it the draft risk profiles for alpha hexachlorocyclohexane and beta hexachlorocyclohexane prepared by the intersessional working group on those substances (UNEP/POPS/POPRC.3/15) and a compilation of the comments and responses received with respect to the profiles (UNEP/POPS/POPRC.3/INF/16). Mr. Ivan Holoubek (Czech Republic), chair of the intersessional working group, presented the draft risk profiles. He said there was conclusive evidence of long-range transport of the chemicals not only by air currents but also by ocean transport, which uniquely made the chemicals fall into both the group of “flyers” and that of “swimmers”.

102. Mr. Yarto expressed his appreciation to the chair and drafter of the intersessional group which had taken on the preparation of the risk profile owing to Mexico’s involvement in drafting the risk management evaluation for lindane.

103. In the ensuing discussion some members noted that the most pressing concern related to alpha hexachlorocyclohexane and beta hexachlorocyclohexane was the large amount of obsolete stocks and related contaminated sites. One member said that the persistence of the chemicals should be more clearly stressed in the risk profile. Noting that the two chemicals were also generated in the production of lindane, the Committee observed that if lindane were banned or severely restricted it would reduce the production of alpha and beta hexachlorocyclohexane. One member noted the existence of a limited process utilizing alpha and beta hexachlorocyclohexane for the production of trichlorobenzene but said that it was impractical owing to high production costs.

104. The Committee agreed with the conclusions of the intersessional working group that there was sufficient evidence to warrant inclusion of alpha hexachlorocyclohexane and beta hexachlorocyclohexane in the annexes to the Convention. The Committee agreed to establish a drafting group to revise the draft risk profiles on alpha and beta hexachlorocyclohexane for consideration by the Committee and to prepare draft decisions on alpha and beta hexachlorocyclohexane for consideration by the Committee. The group was chaired by Mr. Holoubek.

105. The Committee adopted decisions POPRC-3/9 and POPRC-3/10, by which, among other things, it adopted the risk profiles on alpha and beta hexachlorocyclohexane, as orally amended. The decisions are contained in annex I to the present report. The risk profile on alpha hexachlorocyclohexane is contained in document UNEP/POPS/POPRC.3/20/Add.8 and that on beta hexachlorocyclohexane is contained in document UNEP/POPS/POPRC.3/20/Add.9.
F. Future work on toxicant interactions

106. Referring to paragraph (b) of Annex E of the Convention, which lists as an element of the risk profiles prepared by the Committee a “[h]azard assessment for the endpoint or endpoints of concern, including a consideration of toxicological interactions involving multiple chemicals”, and noting that there had been considerable discussion at the current meeting on the subject of toxicant interactions, several members submitted a conference room paper suggesting that the Secretariat should make arrangements for an activity on the subject similar to that undertaken with respect to bioaccumulation (as described in chapter VIII of the present report). The Committee agreed that, as a starting point, the Secretariat should seek to arrange for a presentation to be made during the Committee’s fourth meeting on the subject of toxicant interactions.

X. Consideration of a newly proposed chemical, endosulfan, for inclusion in Annexes A, B or C of the Convention

107. The Committee noted that vital information required for the consideration of endosulfan had not been made available to it. The Committee agreed to suspend consideration of the chemical at the present meeting and to resume it at its fourth meeting, with the understanding that the required information would be made available in time for that meeting. It was understood that its agreement in this regard would not set a precedent.

108. The Committee also noted that members from China and Sierra Leone had submitted a conference room paper elaborating their views on the technical details of the proposal to list endosulfan by which they suggested that the information given therein was inadequate. It was suggested that the conference room paper be resubmitted for consideration by the Committee when it discussed the endosulfan proposal. The Committee invited members and observers to provide, in a timely fashion prior to the Committee’s fourth meeting, any further relevant information and data with complete references.

XI. Other matters

A. Support for effective participation in the work of the Persistent Organic Pollutants Review Committee

109. In considering the item, the Committee had before it a note by the Secretariat (UNEP/POPS/POPRC.3/8). Introducing it, the representative of the Secretariat drew attention to the activities that the Secretariat had been mandated by the Conference of the Parties to undertake in decision SC-3/9. Those included the development of a handbook and assistance in its use, help in accessing the internet for countries that lacked adequate connections and development of regional workshops for current and recently appointed Committee members.

110. In the ensuing discussion, many representatives said that developing countries and countries with economies in transition often lacked the capacity to gather and process environmental information; they paid tribute to the Conference of the Parties and the Secretariat for supporting efforts to overcome those problems. There was consensus that the Secretariat’s proposed initiatives would be very useful and some speakers called for developed country engagement in the development of the handbook.

111. While acknowledging that decision SC-3/9 conferred on the Secretariat a mandate to undertake only the specific tasks outlined above and that new measures would imply additional costs, the Committee agreed that further activities would help enhance participation if sponsors could be identified to provide the necessary financial support for their implementation. One member said that the Secretariat’s proposed activities should not be directed only at Committee members but also at industry and other interested sectors in developing countries. The Committee agreed that the participation of non-governmental organizations was important and should be encouraged. Several members called for the establishment of more effective data collection regionally, which would be facilitated by supporting regular regional meetings. Several members suggested that it would be useful to publicize the Committee’s work more effectively, for instance by including it on the agendas of meetings under other regimes, including the Strategic Approach to International Chemicals Management. Some members noted that strengthening regional activities would require additional funding and suggested that it would
be useful for the Committee to request the Conference of the Parties to consider whether steps could be taken toward making Global Environment Facility funds more accessible.

112. The Committee agreed to establish an intersessional working group to work with the Secretariat to develop the handbook.

113. The member from Sweden announced that his Government would provide 300,000 Swedish krona (approximately $50,000) for the development of the handbook.

B. Synergies

114. The representative of the Secretariat reported on ongoing work of the ad hoc joint working group on enhanced cooperation and coordination among the Basel, Rotterdam and Stockholm conventions. The ad hoc joint working group held its first meeting in March 2007 in Helsinki, Finland, and its second meeting would be held from 10 to 13 December 2007 in Vienna, Austria. He said that the group had identified a number of areas for cooperation and coordination. The Chair added that the group had looked at the possible advantages of cooperation between the secretariats, committees and subsidiary bodies of the conventions and that a “thought starter” on information sharing among technical and scientific panels such as the Committee and the Chemical Review Committee of the Rotterdam Convention had been submitted to the group for its consideration. The ad hoc working group was scheduled to complete its work at a third meeting in early 2008, in time for its conclusions to be submitted to the conferences of the Parties of the three conventions.

C. Roster of experts

115. The representative of the Secretariat summarized the process for the establishment of a roster of experts who were not members of the Committee but who were invited to support the work of the Committee, as described in document UNEP/POPS/POPRC.3/INF/5. She noted that 31 experts had been nominated from all Parties and suggested that Parties be encouraged to nominate additional experts.

116. The Committee took note of the roster of experts nominated by Parties, which was set out in the annex to document UNEP/POPS/POPRC.3/INF/5.

D. Concluding statements

117. Noting the experience that had been gained on the ten chemicals that had so far been examined by the Committee, the Chair suggested that the Committee might wish to prepare an intersessional paper on experience gained in applying Annex E of the Convention.

118. The Committee agreed that such a paper should be prepared intersessionally.

XII. Dates and venue of the fourth meeting of the Committee

119. The Committee agreed to hold its fourth meeting in Geneva from 13 to 17 October 2008. A meeting of the intersessional working groups would be held on Sunday, 12 October 2008, in English only.

XIII. Adoption of the report

120. The Committee adopted the present report on the basis of the drafts contained in documents UNEP/POPS/POPRC.3/L.1 and Add.1, as amended, and on the understanding that the Vice-Chair, serving as Rapporteur, would be entrusted with its finalization, working in consultation with the Secretariat.

XIV. Closure of the meeting

121. The Chair thanked all the outgoing members of the Committee, and especially the co-chair, Ms. Alvarez, for their active and successful participation in the first three meetings of the Committee. He then declared the meeting closed at 11.00 p.m. on Friday, 23 November 2007.
Annex I

Decisions adopted by the Persistent Organic Pollutants Review Committee at its third meeting

Decision POPRC-3/1: Commercial pentabromodiphenyl ether

The Persistent Organic Pollutants Review Committee,

Having evaluated the risk profile for commercial pentabromodiphenyl ether adopted by the Committee at its second meeting;

Having concluded that commercial pentabromodiphenyl ether is likely, as a result of long-range environmental transport, to lead to significant adverse effects on human health and/or the environment such that global action is warranted,

Having completed the risk management evaluation for commercial pentabromodiphenyl ether in accordance with paragraph 7 (a) of Article 8 of the Stockholm Convention,

1. Adopts the risk management evaluation for commercial pentabromodiphenyl ether set out in document UNEP/POPS/POPRC.3/20/Add.1;

2. Decides, in accordance with paragraph 9 of Article 8 of the Convention, to recommend to the Conference of the Parties that it consider listing in Annex A of the Stockholm Convention 2,2', 4,4'-tetrabromodiphenyl ether (BDE-47, CAS No. 40088-47-9) and 2,2',4,4',5-pentabromodiphenyl ether (BDE-99, CAS No. 32534-81-9) and other tetra- and pentabromodiphenyl ethers present in commercial pentabromodiphenyl ether, using BDE-47 and BDE-99 as markers for enforcement purposes.

Decision POPRC-3/2: Chlordecone

The Persistent Organic Pollutants Review Committee,

Having evaluated the risk profile for chlordecone adopted by the Committee at its second meeting;

Having concluded that chlordecone is likely, as a result of long-range transport, to lead to significant adverse effects on human health and/or the environment such that global action is warranted,

Having completed the risk management evaluation for chlordecone in accordance with paragraph 7 (a) of Article 8 of the Stockholm Convention,

1. Adopts the risk management evaluation for chlordecone found in document UNEP/POPS/POPRC.3/20/Add.2;

2. Decides, in accordance with paragraph 9 of Article 8 of the Convention, to recommend to the Conference of the Parties that it consider listing chlordecone in Annex A of the Convention without specific exemptions.

1  UNEP/POPS/POPRC.2/17/Add.1.
2  UNEP/POPS/POPRC.2/17/Add.2.
Decision POPRC-3/3: Hexabromobiphenyl

The Persistent Organic Pollutants Review Committee,

Having prepared the risk profile for hexabromobiphenyl adopted by the Committee at its second meeting \(^{3}\),

Having concluded at its second meeting that hexabromobiphenyl is likely, as a result of long-range environmental transport, to lead to significant adverse effects on human health and/or the environment such that global action is warranted,

Having completed the risk management evaluation for hexabromobiphenyl in accordance with paragraph 7 (a) of Article 8 of the Stockholm Convention,

Noting that, although it is not known to be produced or used anymore, it is important to prevent future production of hexabromobiphenyl and being of the view that any control measures should focus on identifying and managing articles and wastes containing hexabromobiphenyl and establishing effective measures to prevent its production in the future,

1. **Adopts** the risk management evaluation for hexabromobiphenyl set out in document UNEP/POPS/POPRC.3/20/Add.3;

2. **Decides**, in accordance with paragraph 9 of Article 8 of the Convention, to recommend to the Conference of the Parties that it consider listing hexabromobiphenyl in Annex A of the Convention without specific exemptions.

Decision POPRC-3/4: Lindane

The Persistent Organic Pollutants Review Committee,

Having evaluated the risk profile for lindane adopted by the Committee at its second meeting \(^{4}\),

Having concluded that lindane is likely, as a result of long-range environmental transport, to lead to significant adverse effects on human health and/or the environment such that global action is warranted,

Having completed the risk management evaluation for lindane in accordance with paragraph 7 (a) of Article 8 of the Stockholm Convention,

1. **Adopts** the risk management evaluation for lindane set out in document UNEP/POPS/POPRC.3/20/Add.4;

2. **Decides**, in accordance with paragraph 9 of Article 8 of the Convention, to recommend to the Conference of the Parties that it consider listing lindane in Annex A of the Convention.

Decision POPRC-3/5: Perfluorooctane sulfonate

The Persistent Organic Pollutants Review Committee,

Having evaluated the risk profile for perfluorooctane sulfonate adopted by the Committee at its second meeting \(^{5}\),

Having concluded that perfluorooctane sulfonate (PFOS) is likely, as a result of long-range environmental transport, to lead to significant adverse effects on human health and/or the environment such that global action is warranted,

Having concluded that one of the substances included in the original proposal to list PFOS in Annexes A, B or C of the Stockholm Convention, perfluorooctane sulfonyl fluoride (PFOSF), is the most common starting material for different PFOS derivatives, that the probability that PFOSF will degrade to PFOS is very high and that therefore listing PFOSF together with PFOS acid and its salts would be the most effective measure to reduce releases of PFOS to the environment,

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3 UNEP/POPS/POPRC.2/17/Add.3.
4 UNEP/POPS/POPRC.2/17/Add.4.
5 UNEP/POPS/POPRC.2/17/Add.5.
Having concluded in decision POPRC-3/11 that PFOSF fulfils the criteria in Annex D of the Convention,

Having decided in decision POPRC-3/11, in accordance with paragraph 7 (a) of Article 8 of the Convention, that PFOSF, through its transformation product PFOS, is likely, as a result of long-range environmental transport, to lead to significant adverse effects on human health and/or the environment such that global action is warranted,

Having completed the risk management evaluation for PFOS in accordance with paragraph 7 (a) of Article 8 of the Stockholm Convention,

1. **Adopts** the risk management evaluation for PFOS set out in document UNEP/POPS/POPRC.3/20/Add.5;

2. **Decides**, in accordance with paragraph 9 of Article 8 of the Convention, to recommend to the Conference of the Parties that it consider listing perfluorooctane sulfonic acid (CAS No: 1763-23-1), its salts and perfluorooctane sulfonyl fluoride (CAS-No: 307-35-7) in Annexes A or B of the Convention and specifying the related control measures;

3. **Invites**, in accordance with paragraph 7 (a) of Article 8 of the Convention, Parties and observers to submit to the Secretariat any additional information specified in Annex F and, in particular, information on manufacturing (current and estimated), other uses and alternatives before 5 February 2008.

**Decision POPRC-3/6: Commercial octabromodiphenyl ether**

*The Persistent Organic Pollutants Review Committee,*

**Having completed** the risk profile for commercial octabromodiphenyl ether in accordance with paragraph 6 of Article 8 of the Stockholm Convention,

**Taking into account** the high potential of the components of commercial octabromodiphenyl ether to persist in the environment, to bioaccumulate and biomagnify and to represent a hazard for humans and wildlife at very low levels,

1. **Adopts** the risk profile for commercial octabromodiphenyl ether contained in document UNEP/POPS/POPRC.3/20/Add.6;

2. **Invites** the intersessional working group on commercial octabromodiphenyl ether which prepared the risk profile to explore any further information on including octabromodiphenyl ether and nonabromodiphenyl ether related to risk estimations and bioaccumulation, including the environmental and health relevance of de-bromination, and, if appropriate, to revise the risk profile for consideration by the Committee at its fourth meeting;

3. **Decides**, in accordance with paragraph 7 (a) of Article 8 of the Convention, that the hexa- and hepta bromodiphenyl ether components of the commercial octabromodiphenyl ether are likely, as a result of long-range environmental transport, to lead to significant adverse human health and/or environmental effects such that global action is warranted;

4. **Decides**, in accordance with paragraph 7 (a) of Article 8 of the Convention, and taking into account that a lack of full scientific certainty should not prevent a proposal to list a chemical in the annexes of the Convention from proceeding, that the octa- and nona bromodiphenyl ether components of the commercial octabromodiphenyl ether are likely, as a result of long-range environmental transport, to lead to significant adverse human health and/or environmental effects such that global action is warranted;

5. **Decides further**, in accordance with paragraph 7 (a) of Article 8 of the Convention and paragraph 29 of decision SC-1/7 of the Conference of the Parties, to establish an intersessional working group to prepare a risk management evaluation that includes an analysis of possible control measures for commercial octabromodiphenyl ether in accordance with Annex F to the Convention;

6. **Invites**, in accordance with paragraph 7 (a) of Article 8 of the Convention, Parties and observers to submit to the Secretariat the information specified in Annex F for commercial octabromodiphenyl ether before 5 February 2008.
Decision POPRC-3/7: Pentachlorobenzene

The Persistent Organic Pollutants Review Committee,

Having completed the risk profile for pentachlorobenzene in accordance with paragraph 6 of Article 8 of the Stockholm Convention,

1. Adopts the risk profile for pentachlorobenzene found in document UNEP/POPS/POPRC.3/20/Add.7;

2. Decides, in accordance with paragraph 7 (a) of Article 8 of the Convention, that pentachlorobenzene is likely, as a result of its long-range environmental transport, to lead to significant adverse human health and environmental effects such that global action is warranted;

3. Decides further, in accordance with paragraph 7 (a) of Article 8 of the Convention and paragraph 29 of decision SC-1/7 of the Conference of the Parties, to establish an ad hoc working group to prepare a risk management evaluation that includes an analysis of possible control measures for pentachlorobenzene in accordance with Annex F to the Convention;

4. Invites, in accordance with paragraph 7 (a) of Article 8 of the Convention, Parties and observers to submit to the Secretariat the information specified in Annex F before 5 February 2008.

Decision POPRC-3/8: Short-chained chlorinated paraffins

The Persistent Organic Pollutants Review Committee,

Having considered the risk profile for short-chained chlorinated paraffins in accordance with paragraph 6 of Article 8 of the Stockholm Convention,

1. Decides that the information currently available to the Committee on short-chained chlorinated paraffins was considered insufficient to support a decision on the risk profile;

2. Decides to defer its decision on the draft risk profile for short-chained chlorinated paraffins set out in document UNEP/POPS/POPRC.3/16 to the fourth meeting of the Committee;

3. Decides, in accordance with paragraph 6 of Article 8 of the Convention and paragraph 29 of decision SC-1/7 of the Conference of the Parties, to establish an ad hoc working group to review and update the draft risk profile in accordance with Annex E of the Convention;

4. Invites, in accordance with paragraph 4 (a) of Article 8 of the Convention, Parties and observers to submit to the Secretariat additional toxicity and ecotoxicity information specified in Annex E of the Convention before 5 February 2008.

Decision POPRC-3/9: Alpha hexachlorocyclohexane

The Persistent Organic Pollutants Review Committee,

Having completed the risk profile for alpha hexachlorocyclohexane in accordance with paragraph 6 of Article 8 of the Stockholm Convention,

1. Adopts the risk profile for alpha hexachlorocyclohexane set out in document UNEP/POPS/POPRC.3/20/Add.8;

2. Decides, in accordance with paragraph 7 (a) of Article 8 of the Convention, that alpha hexachlorocyclohexane is likely, as a result of long-range environmental transport, to lead to significant adverse human health and/or environmental effects such that global action is warranted;

3. Decides further, in accordance with paragraph 7 (a) of Article 8 of the Convention and paragraph 29 of decision SC-1/7 of the Conference of the Parties to the Stockholm Convention, to establish an ad hoc working group to prepare a risk management evaluation that includes an analysis of possible control measures for alpha hexachlorocyclohexane in accordance with Annex F to the Convention;
4. Invites, in accordance with paragraph 7 (a) of Article 8 of the Convention, Parties and observers to submit to the Secretariat the information specified in Annex F before 5 February 2008.

**Decision POPRC-3/10: Beta hexachlorocyclohexane**

The Persistent Organic Pollutants Review Committee,

Having completed the risk profile for beta hexachlorocyclohexane in accordance with paragraph 6 of Article 8 of the Stockholm Convention,

1. Adopts the risk profile for beta hexachlorocyclohexane set out in document UNEP/POPS/POPRC.3/20/Add.9;
2. Decides, in accordance with paragraph 7 (a) of Article 8 of the Convention, that beta hexachlorocyclohexane is likely, as a result of long-range environmental transport, to lead to significant adverse human health and/or environmental effects such that global action is warranted;
3. Decides further, in accordance with paragraph 7 (a) of Article 8 of the Convention and paragraph 29 of decision SC-1/7 of the Conference of the Parties, to establish an ad hoc working group to prepare a risk management evaluation that includes an analysis of possible control measures for beta hexachlorocyclohexane in accordance with Annex F to the Convention;
4. Invites, in accordance with paragraph 7 (a) of Article 8 of the Convention, Parties and observers to submit to the Secretariat the information specified in Annex F before 5 February 2008.

**Decision POPRC-3/11: Perfluorooctane sulfonyl fluoride**

Whereas Annex D of the Stockholm Convention specifies that information should be provided on the transformation products of a substance proposed for listing in Annexes A, B or C of the Convention, where relevant,

Whereas the substance perfluorooctane sulfonyl fluoride (1-Octanesulphonyl fluoride, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro (CAS-No: 307-35-7))(PFOSF) was included in the proposal submitted by Sweden to list perfluorooctane sulfonate (PFOS) in Annex A of the Convention,6

Whereas it has been found that PFOSF is a starting material for the synthesis of PFOS and PFOS-related substances,

Whereas the Persistent Organic Pollutants Review Committee has evaluated PFOSF against the criteria in Annex D as described in the annex to the present decision,

Whereas the Committee at its first meeting invited Parties and observers to submit Annex E information pertinent to PFOS and PFOS-related substances,

Whereas the Committee reviewed the information in the risk profile for PFOS at its second meeting and decided, in accordance with paragraph 7 (a) of Article 8 of the Convention, that PFOS was likely, as a result of its long-range environmental transport, to lead to significant adverse human health and environmental effects such that global action was warranted,

Whereas the Committee invited, in accordance with paragraph 7 (a) of Article 8 of the Convention, Parties and observers to submit to the Secretariat the information specified in Annex F for perfluorooctane sulfonate and potential perfluorooctane sulfonate precursors, as well as other specific information related to potential perfluorooctane sulfonate precursors,

The Persistent Organic Pollutants Review Committee

1. Decides that PFOSF meets the criteria in Annex D of the Convention;
2. Decides that PFOSF and PFOS salts are likely, through their rapid transformation to PFOS and as a result of the long-range environmental transport of PFOS, to lead to significant adverse human health and/or environmental effects such that global action is warranted.

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6 UNEP/POPS/POPRC.1/9.
Annex to decision POPRC-3/11

Evaluation of perfluorooctane sulfanyl fluoride against the criteria of Annex D

A. Background

1. The primary source of information for the preparation of this evaluation was the proposal submitted by Sweden, contained in document UNEP/POPS/POPRC.1/9.

2. Additional sources of scientific information included critical reviews prepared by recognized authorities and peer-reviewed scientific papers.

B. Evaluation

3. The proposal was evaluated in the light of the requirements of Annex D regarding the identification of the chemical (paragraph 1 (a)) and the screening criteria (paragraphs 1 (b)–(e)):

(a) Chemical identity

(i) The chemical identity of perfluorooctane sulfanyl fluoride (1-Octanesulphonyl fluoride, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro (CAS-No: 307-35-7))(PFOSF) is clearly established.

The Persistent Organic Pollutants Review Committee has decided that PFOS fulfils the criteria in Annex D of the Convention (decision POPRC-1/7). The data below therefore all refer to the transformation product PFOS.

(b) Persistence:

PFOSF is transformed to perfluorooctane sulfonate (PFOS) in water through hydrolysis at ambient temperatures.

(i) None of the tests for degradation (hydrolysis, photolysis, and biodegradation) showed any indication of degradation of PFOS in aquatic or soil systems.

(ii) Monitoring data confirm the persistence of PFOS in environmental compartments.

There is sufficient evidence that PFOS meets the persistence criterion.

(c) Bioaccumulation

(i) Bioconcentration factor values for PFOS are lower than the screening criteria (in the range of 240−1,300 for steady-state conditions and up to 2,796 using kinetic estimation); PFOS is a surface active substance and, as a result, octanol water partition coefficient measurements are not relevant. Bioconcentration factor values are not good predictors of bioaccumulation for this substance because food uptake has been demonstrated to be a relevant route for aquatic organisms. Bioaccumulation is not related to lipophilicity and accumulation does not primarily occur in lipid tissues.

(ii) Toxicokinetic studies in aquatic and terrestrial vertebrates show very low elimination rates. In addition, PFOS has shown developmental effects in mammals at low levels (no observed adverse effect level (NOAEL) value of 0.1 mg/kg body weight/day in rats in a two-generation study).

(iii) Monitoring data confirm the bioaccumulation and biomagnification of PFOS in both terrestrial and marine mammals.
There is sufficient evidence that PFOS meets the bioaccumulation criterion.

(d) Potential for long-range environmental transport

(i) and (ii) Extensive monitoring data, including at sites remote from known sources, show that long-range environmental transport has occurred.

(iii) The estimated half-life in air is 114 days.

There is sufficient evidence that PFOS meets the criterion on potential for long-range environmental transport.

(g) Adverse effects

(i) No evidence has been provided.

(ii) PFOS has been shown to cause developmental effects in mammals at low levels. It is also toxic to aquatic organisms.

There is sufficient evidence that PFOS meets the adverse effects screening criterion.

C. Conclusion

4. The Committee concluded that PFOSF through its transformation product PFOS meets the screening criteria specified in Annex D.

References


2. UNEP/POPS/POPRC.1/9.


Annex II

Revised risk management evaluation outline

Executive summary

1. Introduction

1.1 Chemical identity of the proposed substance

• Mention which Party made the proposal and when it was made
• Spell out the specific chemical identity and particular considerations related to that identity

1.2 Conclusions of the Review Committee, Annex E information

• “the Committee has conducted and evaluated a risk profile in accordance with Annex E (add reference to the meeting and the decision) and has concluded that […]”

1.3 Data sources

• Short overview of data submitted by Parties and observers regarding the information specified in Annex F of the Stockholm Convention (N.B. a more elaborated summary of the submissions may be provided as a separate POPRC/INF document)
• Information on availability of national and international management reports

1.4 Status of the chemical under international conventions

1.5 Any national or regional control actions taken

2. Summary information relevant to the risk management evaluation

2.1 Identification of possible control measures

• Short list of possible control measures (such as production prohibition, production restrictions, all use prohibition, restriction of a specific use, phase-out of stocks and articles in use, release control measures, waste disposal and clean-up of contaminated sites)

2.2 Efficacy and efficiency of possible control measures in meeting risk reduction goals

• Technical feasibility
• Identification of critical uses
• Costs and benefits of implementing possible control measures, including environmental and health costs and benefits

2.3 Information on alternatives (products and processes) where relevant

• Description of alternatives
• Technical feasibility
• Costs, including environmental and health costs
• Efficacy, including benefits and limitations of alternatives versus nominated substance and identification of any critical uses for which there is at present no alternative
• Risk, including information on whether the proposed alternative has been tested/evaluated and any information on potential risks associated with untested alternatives over the life cycle of the alternative
• Availability
• Accessibility

7 Such information should reflect due regard for the differing capabilities and conditions among the Parties.
2.4 Summary of information on impacts on society of implementing possible control measures

- Health, including public, environmental and occupational health
- Agriculture, including aquaculture and forestry
- Biota (biodiversity)
- Economic aspects, including costs and benefits for producers and consumers and the distribution of costs and benefits
- Movement towards sustainable development
- Social costs (employment, etc.)
- Other impacts

2.5 Other considerations

- Access to information and public education
- Status of control and monitoring capacity

3. Synthesis of information

- Synthesis of information relevant to the risk management evaluation, in the form of a risk management strategy,\(^8\) with emphasis on an analysis of possible control measures for the chemical that leads to the concluding statement
- The analysis of possible control measures should evaluate the full range of potential control measures and conclude, where possible, whether the recommended strategy/strategies are cost-effective, market-neutral and provide benefits to human health and the environment

4. Concluding statement

- Conclusion from the risk profile (for example: “Having decided that [name of chemical] is likely, as a result of long-range environmental transport, to lead to significant adverse effects on human health and/or the environment such that global action is warranted);
- Having prepared a risk management evaluation and considered the management options;
- The Persistent Organic Pollutants Review Committee recommends that the chemical be considered by the Conference of the Parties for listing in Annex [A], [B], [and/or C].”
- Statement linking the objective of sustainable development as set forth in the plan of implementation of the World Summit for Sustainable Development\(^9\) to the process and work of the Persistent Organic Pollutants Review Committee

References to be provided

[...]

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8 This synthesis will include the integration of information on hazard identification, risk assessment, risk control measures evaluation, including a decision-making proposal on control measures, and recommendations for strategy implementation, supervision and review.

Annex III

Specimen letter to Parties and observers communicating the Committee’s recommendations to the Conference of the Parties for it to consider listing a chemical in Annexes A, B or C of the Convention, thereby amending Annexes A, B or C

Subject: Communication of the recommendations of the Persistent Organic Pollutants Review Committee to the Conference of the Parties to consider listing the [chemical name] in Annexes […] of the Stockholm Convention, thereby amending those Annexes

Dear Madam/Sir,


At its third meeting, the Persistent Organic Pollutants Review Committee had before it risk profiles prepared in accordance with Annex E of the Convention and the risk management evaluations prepared in accordance with Annex F of Convention for [chemical name].

The Committee completed its review of the available documents, considered the possible control measures, the available social and economic information, and comments and information submitted by Parties and observers relating to the considerations specified in Annex F. The Committee decided to recommend to the Conference of the Parties in accordance with paragraph 9 of Article 8 of the Convention that the conference consider listing [chemical name] in Annex […] of the Convention.

[Committee’s concluding statement for risk management]

Paragraph 9 of Article 8 of the Convention provides that, in the event that the Committee makes a recommendation on whether a chemical should be considered by the Conference of the Parties for listing in Annexes A, B and/or C, “the Conference of the Parties, taking due account of the recommendations of the Committee, including any scientific uncertainty, shall decide, in a precautionary manner, whether to list the chemical, and specify its related control measures, in Annexes A, B and/or C”. If the Conference of the Parties decides to list the chemicals in Annexes A, B and/or C, the respective annex or annexes will be amended in accordance with Articles 21 and 22 of the Convention. Amendments to Annexes A, B and/or C enter into force in accordance with paragraphs 3 and 4 of Article 22 and paragraph 4 of Article 25.

Please note that the text of any proposed amendment to the Convention must be communicated to Parties at least six months before the meeting at which it is proposed for adoption.

Parties are therefore invited to be prepared to discuss the listing of [chemical name] in Annexes […] of the Convention as recommended by the Persistent Organic Pollutants Review Committee. Parties are reminded that, in accordance with rule 19 of the rules of procedure for the Conference of the Parties, in order to take part in the decision-making process at the fourth meeting of the Conference of the Parties their representatives must be accredited with credentials issued either by a head of State or Government or by a minister for foreign affairs or, in the case of a regional economic integration organization, by the competent authority of that organization.

The annex to the present letter provides a summary of the implications for Parties of listing a chemical in Annexes A, B or C of the Convention, including the actions that Parties must take upon the entry into force of an amendment listing a chemical.

Parties are invited to notify the Secretariat by [date/month/year] of any relevant issue that they may wish to raise at the fourth meeting of the Conference of the Parties. The Secretariat will provide the Conference of the Parties with a compilation of the issues submitted. Submissions should be sent to the Secretariat of the Stockholm Convention, preferably by e-mail (ssc@pops.int), or by regular mail to:
If you have any questions regarding this information, please do not hesitate to contact Ms. Fatoumata Keita Ouane, Stockholm Convention Secretariat (e-mail: fouane@pops.int; telephone: +41 22 917 81 61).

Yours sincerely,

Donald Cooper
Executive Secretary
Stockholm Convention
Annex IV


<table>
<thead>
<tr>
<th>Scheduled date</th>
<th>Period from previous activity (weeks)</th>
<th>Activity (for each chemical under review)</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 November 2007</td>
<td>-</td>
<td>The Committee establishes an ad hoc working group.</td>
</tr>
<tr>
<td>27 November 2007</td>
<td>&lt;1</td>
<td>The Secretariat requests Parties and observers to provide information specified in Annex E for development of draft risk profiles.</td>
</tr>
<tr>
<td>15 January 2008</td>
<td>7</td>
<td>The Secretariat sends a reminder to Parties and observers regarding the request for information specified in Annex E.</td>
</tr>
<tr>
<td>5 February 2008</td>
<td>3</td>
<td>Parties and observers submit Annex E information to the Secretariat.</td>
</tr>
<tr>
<td>4 March 2008</td>
<td>4</td>
<td>The working group chair and drafter complete the first draft.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Drafter prepares the first draft and sends it to the chair: 26 February 2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Chair sends the first draft to the working group: 4 March 2008</td>
</tr>
<tr>
<td>25 March 2008</td>
<td>3</td>
<td>The working group members provide comments on the first draft to the chair and drafter.</td>
</tr>
<tr>
<td>8 April 2008</td>
<td>2</td>
<td>The working group chair and drafter complete review of the first comments from the working group and complete the second draft.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Drafter prepares the second draft and sends it to the chair: 4 April 2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Chair sends the second draft to the Secretariat: 8 April 2008</td>
</tr>
<tr>
<td>11 April 2008</td>
<td>&lt;1</td>
<td>The Secretariat distributes the second draft to Parties and observers for comments.</td>
</tr>
<tr>
<td>16 May 2008</td>
<td>5</td>
<td>Parties and observers submit their comments to the Secretariat.</td>
</tr>
<tr>
<td>3 June 2008</td>
<td>2</td>
<td>The working group chair and drafter review the Party and observer comments and complete the third draft.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Drafter prepares the third draft and sends it to the chair: 30 May 2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Chair sends the third draft to the working group: 3 June 2008</td>
</tr>
<tr>
<td>17 June 2008</td>
<td>2</td>
<td>The working group members provide final comments on the third draft to the chair and drafter.</td>
</tr>
<tr>
<td>1 July 2008</td>
<td>2</td>
<td>The working group chair and drafter review the final comments and complete the final draft.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Drafter prepares the final draft and sends it to the chair: 27 June 2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Chair sends the final draft to the Secretariat: 1 July 2008</td>
</tr>
<tr>
<td>4 July 2008</td>
<td>&lt;1</td>
<td>The Secretariat sends the final draft to Conference Services for editing and translation.</td>
</tr>
<tr>
<td>27 August 2008</td>
<td>7</td>
<td>Conference Services completes editing and translation.</td>
</tr>
<tr>
<td>1 September 2008</td>
<td>&lt;1</td>
<td>The Secretariat distributes the final draft risk profiles in the six official United Nations languages.</td>
</tr>
<tr>
<td>13–17 October 2008</td>
<td>6</td>
<td>Fourth meeting of the Committee</td>
</tr>
</tbody>
</table>
### B. Workplan for the preparation of draft risk management evaluation (2007–2008)

<table>
<thead>
<tr>
<th>Scheduled date</th>
<th>Period from previous activity (weeks)</th>
<th>Activity (for each chemical under review)</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 November 2007</td>
<td>-</td>
<td>The Committee establishes an ad hoc working group.</td>
</tr>
<tr>
<td>27 November 2007</td>
<td>&lt;1</td>
<td>The Secretariat requests Parties and observers to provide information specified in Annex F for the development of draft risk management evaluations.</td>
</tr>
<tr>
<td>15 January 2008</td>
<td>7</td>
<td>The Secretariat sends a reminder to Parties and observers regarding the request for information specified in Annex F.</td>
</tr>
<tr>
<td>5 February 2008</td>
<td>3</td>
<td>Parties and observers submit Annex F information to the Secretariat.</td>
</tr>
</tbody>
</table>
| 4 March 2008         | 4                                     | The working group chair and drafter complete the **first draft**  
|                      |                                        | - Drafter prepares the first draft and sends it to the chair: 26 February 2008  
|                      |                                        | - Chair sends the first draft to the working group: 4 March 2008     |
| 25 March 2008        | 3                                     | The working group members provide **comments on the first draft** to the chair and drafter.               |
| 8 April 2008         | 2                                     | The working group chair and drafter complete review of the first comments from the working group and complete the **second draft**  
|                      |                                        | - Drafter prepares the second draft and sends it to the chair: 4 April 2008  
|                      |                                        | - Chair sends the second draft to the Secretariat: 8 April 2008     |
| 11 April 2008        | <1                                    | The Secretariat distributes the second draft to Parties and observers for comments.                      |
| 16 May 2008          | 5                                     | Parties and observers submit their **comments** to the Secretariat.                                      |
| 3 June 2008          | 2                                     | The working group chair and drafter review the Party and observer comments and complete the **third draft**  
|                      |                                        | - Drafter prepares the third draft and sends it to the chair: 30 May 2008  
|                      |                                        | - Chair sends the third draft to the working group: 3 June 2008     |
| 17 June 2008         | 2                                     | The working group members provide **final comments** on the third draft to the chair and drafter.         |
| 1 July 2008          | 2                                     | The working group chair and drafter review the final comments and complete the **final draft**  
|                      |                                        | - Drafter prepares the final draft and sends it to the chair: 27 June 2008  
|                      |                                        | - Chair sends the final draft to the Secretariat: 1 July 2008     |
| 4 July 2008          | <1                                    | The Secretariat sends the final draft to Conference Services for editing and translation.                |
| 27 August 2008       | 7                                     | Conference Services completes **editing and translation**.                                               |
| 1 September 2008     | <1                                    | The Secretariat distributes the **final draft** risk profiles in the six official United Nations languages. |
| 13–17 October 2008   | 6                                     | Fourth meeting of the Committee                                                                       |
Annex V

Composition of intersessional working groups (2007–2008)

Working group on commercial octabromodiphenyl ether

Committee members
Ms. Anahit Aleksandryan (Armenia)  Dr. Robert Chénier (Canada)
Prof. Ian Rae (Australia)  Prof. Jianxin Hu (China)
Dr. Robert Chénier (Canada)  Dr. Alfredo Cueva (Ecuador), Chair from May 2008
Prof. Jianxin Hu (China)  Dr. Sylvain Bintein (France)**
Dr. Alfredo Cueva (Ecuador), Chair from May 2008  Prof. Masaru Kitano (Japan)
Dr. Mohammed Khashashneh (Jordan)  Dr. Sylvain Bintein (France)**
Ms. Evelin Fabjan (Slovenia)*  Dr. José V. Tarazona (Spain), Drafter
Prof. Ian Rae (Australia)  Prof. Bo Wahlström (Sweden)
Ms. εvelin Fabjan (Slovenia)*  Ms. Bettina Hitzfeld (Switzerland)**
Mr. Gary Fan (Australia)  Ms. Leena Ylä-Mononen (United Kingdom)
Mr. Lee Eeles (Australia)  Ms. Jacqueline Alvarez (Uruguay)*, Chair until May 2008
Ms. Zhifang Wang (China)  Dr. José V. Tarazona (Spain)
Mr. Timo Seppälä (Finland)  Prof. Bo Wahlström (Sweden)
Mr. Takashi Fukushima (Japan)  Ms. Bettina Hitzfeld (Switzerland)**
Ms. Misako Kurakata (Japan)  Mr. Wayne Rajkumar (Trinidad and Tobago)*
Dr. Maria Dolores Hernando Guil (Spain)  Mr. Cyrille Siewe (UNEP)
Dr. Tala Henry (United States of America)  Ms. Leena Ylä-Mononen (United Kingdom)

Observers
Mr. Gary Fan (Australia)  Dr. Susan Gardner (United States of America)
Mr. Lee Eeles (Australia)  Mr. Mark Trewhitt (CropLife International)
Mr. Zhifang Wang (China)  Dr. Joseph DiGangi (Environmental Health Fund)
Mr. Timo Seppälä (Finland)  Dr. Mariann Lloyd (International POPs Elimination Network)
Mr. Takashi Fukushima (Japan)  Dr. Jarupong Boon-Long (Thailand), Chair from May 2008
Ms. Misako Kurakata (Japan)  Mr. Wayne Rajkumar (Trinidad and Tobago)*
Dr. Maria Dolores Hernando Guil (Spain)  Ms. Leena Ylä-Mononen (United Kingdom)
Dr. Tala Henry (United States of America)  Mr. Cyrille Siewe (UNEP)

Working group on pentachlorobenzene

Committee members
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Annex VI

Preliminary guidance paper on bioaccumulation evaluation

(Presented without formal editing by the Secretariat)

1. Background

The bioaccumulation criteria in Annex D of the Stockholm Convention are as follows:

“(c) Bio-accumulation:
(i) Evidence that the bio-concentration factor or bio-accumulation factor in aquatic species for the chemical is greater than 5,000 or, in the absence of such data, that the log Kow is greater than 5;
(ii) Evidence that a chemical presents other reasons for concern, such as high bio-accumulation in other species, high toxicity or ecotoxicity; or
(iii) Monitoring data in biota indicating that the bio-accumulation potential of the chemical is sufficient to justify its consideration within the scope of this Convention”.

Among those criteria, (i) is quantitative and less ambiguous for its application. However, (ii) and (iii) are not quantitative and it is not clear how to apply these criteria. Due to such uncertainty, especially for those chemicals that do not fulfil (i), bioaccumulation has been seriously discussed, yet a common understanding has not been achieved. (See Appendix 1: Bioaccumulation data on existing POPs and POPs candidates.)

This paper considers how to apply bioaccumulation criteria (ii) and (iii) when the criterion (i) is not fulfilled.

2. Evidence of bioaccumulation in past POPRC and grouping

(1) Evidence of bioaccumulation in past POPRC

So far, for five chemicals it has been concluded that they fulfil the screening criteria despite their low BCF (<5,000). The important basis of POPRC evaluations are as follows: (See Appendix 2-1: Evidence of bioaccumulation in past POPRC meetings; and Appendix 2-2 Evidence of bioaccumulation of POPs candidates under (ii) and (iii))

PFOS:
(i) BCFs(ss) 240–1,300, BCFs are not good predictors of bioaccumulation
(ii) Very low elimination rates and developmental effects in mammals at low levels (NOAEL value of 0.1 mg/kg body weight/day in rats in a two-generation study) and (iii) biomagnification

Lindane:
(i) BCFs 13 to 1,240 (EHC), 327 to 893 (Japan), 43 to 4,240 (other),
(ii) High toxicity (NOAELs as low as 0.3 mg/kg body weight/day) – and ecotoxicity (NOEC below 1 µg/l) (Refs. 5 and 6), measured field levels in earthworms (0.3 mg/kg for a soil containing 80 µg/kg) comparable to mammalian toxicity data.
(iii) Reported in seabirds, fish and mammals in the Arctic. Concentrations in marine mammals are equivalent to or higher than PCBs and DDT reported in human breast milk among Inuits in the Arctic and in marine mammals.

Alpha-HCH:
(i) BCFs are 60 to 2,750 (whole body, dry weight basis), 313–2,400 (wet weight basis) (Refs. 8 and 9),
(ii) and (iii): The biomagnification factors for different trophic levels (zooplankton, invertebrates, fish, and mammals) are in the range of 1–16. Field studies in Arctic marine food webs show that alpha-HCH stereoselectively bioaccumulates in marine species and has the ability to biomagnify
to a greater extent than gamma-HCH, for which values of up to 4,220 have been reported; detected in blood and adipose tissue in humans. Detected in breast milk and placenta tissue, thus exposing offspring in critical periods of development; information suggests that the food chain bioaccumulation of alpha HCH is higher than for lindane.

**Beta-HCH:**
(i) BCFs 250–1,500 (whole body dry weight basis)
(ii) and (iii) Field studies in Arctic marine food webs have demonstrated that beta-HCH can bioaccumulate in upper trophic levels. Beta-HCH appears to be persistent in investigated species. Biomagnification factors for beta-HCH in marine food webs were mostly in the range of 1–18 (with a maximum value of 280). In birds and marine mammals in particular, beta-HCH can accumulate to higher levels than the other isomers. In the terrestrial Arctic food chain, beta-HCH can also biomagnify in mammals and was detected in adipose tissue and in breast milk in humans. Beta-HCH was also detected in placenta tissue thus exposing offspring at critical periods of development. Information confirms that the potential for bioaccumulation of beta-HCH is higher than that for lindane.

**OctaBDE:**
(i) High BCFs of homologues in commercial mixture
(ii) and (iii) Concentrations of 220–270 ng/g lipid weight in eggs of the peregrine falcon in northern Sweden and Greenland, the estimated half-life in humans is 100 days, the soil organism accumulation factor for octabromodiphenyl ether 197 has been calculated as 2.

(2) **Grouping of evidence**

The results of grouping the above evidence of bioaccumulation are as follows:

**BCFs are not applicable:**
PFOS

**Long half-life:**
PFOS and OctaBDE

**High Toxicity/High Ecotoxicity:**
PFOS and Lindane

**Biomagnification:**
PFOS, Alpha-HCH and Beta-HCH

**Detections in Biota:**
Lindane, Alpha-HCH, Beta-HCH and OctaBDE

**Detections in Human Body (blood, milk, fat tissue):**
Lindane, Alpha-HCH and Beta-HCH

**Exposure in Development Stage:**
Alpha-HCH and Beta-HCH

3. **Existing guidance for bioaccumulation evaluation**

Several guidance documents for bioaccumulation evaluation are available that include viewpoints not covered in (i). For example, an EU guidance document mentions how to evaluate scientific evidence equivalent to “B” (Bioaccumulation) criteria of PBT and vPvB substances (BCF =2,000 for PBT, 5,000 for vPvB). And Japan has bioaccumulation criteria to determine bioaccumulation potential under the Chemical Substance Control Law, which covers how to deal with cases where BCFs are less than 5,000. (See Appendix 3: The importance of biological half-life for the evaluation of bioaccumulation; and Appendix 4: Utilization of monitoring data for the evaluation of bioaccumulation.)
(1) EU guidance document (guidance for the preparation of an Annex XV dossier on the identification of substances of very high concern: extract)

a) Uptake and metabolism data from laboratory studies on other species, including mammalian species
b) Processes other than fat partitioning
c) Use of monitoring data

Measured data in biota provide a clear indicator that the substance is taken up by an organism. However, the analytical detection of substances in organisms is not in itself always an indicator that significant bioconcentration or bioaccumulation has occurred or is occurring that would lead to effects in biota.

Useful in this respect are data representing different trophic levels within a single food chain, where relative differences in concentration between the various levels can often provide useful information on the bioaccumulation potential.

An important factor to take into account with regard to monitoring data is the quality of the data. Many substances with PBT-type properties are difficult to analyse at low concentrations and the use of poor-quality data may lead to erroneous conclusions being drawn.

Another factor to take into account when considering the available data (from both certain laboratory studies and field data) is that the accumulation seen in any given situation can depend to a large extent on the lipid content of the species in question.

In terms of assessing whether the substance has a bioaccumulation potential that is equivalent to the B-criterion, a weight of evidence approach should be taken, drawing together the available data. Part of this assessment could include consideration of the degree to which the substance fails to meet the actual B or vB criteria if BCF data are available. It should be stressed that the equivalence of concern here is in relation to bioaccumulation potential and not solely occurrence in biota.

(2) Japan (Bioaccumulation criteria to determine Class 1 monitoring chemicals under CSCL)

a) Highly Bioaccumulative
   BCF value is higher than 5,000
b) Not Highly Bioaccumulative
   BCF value is less than 1,000 or Kow is less than 3.5.
   Kow is not applicable for surface reactive substances, mixtures with molecular weight distributions, organic metal compounds, low-purity samples (expect HPLC method) and inorganic compounds

c) If BCF values are between 1,000 and 5,000, the following test result should be considered if necessary to determine bioaccumulation potential.
   - Elimination test
   - BCF of fish parts (edible parts)

4. Other indicators

(1) Bioconcentration factor and bioaccumulation factor

The relationships between BCF and BAF are examined. In general, high BCF POPs show high BAF. However, the correlation between BCF and BAF is not clear. (See Appendix 5: The interrelation between BCFs and BAFs data of existing POPs and POPs candidates)

In principle, high quality field-derived Bioaccumulation Factors (BAF) are more reflective of environmental bioaccumulation because they include uptake from all exposure routes as well as any influence of metabolic processes. Sampling (BAFs) and testing (BCFs) conditions should be carefully evaluated in assessing the quality of the BAF and/or BCF data.

(2) Koa

Koa is discussed as an indicator of potential bioaccumulation in terrestrial animals. However, only Koa values of limited chemicals that show bioaccumulation are discussed at this stage, and a relationship between Koa and bioaccumulation in terrestrial animals is not yet established. Further research in this field should be encouraged. (See Appendix 6: The biological half-life data of existing POPs and POPs candidates)
(3) Metabolism

Metabolism is an essential element in the bioaccumulation assessment. In general, metabolism tends to reduce the potential for bioaccumulation, but differences among species should be considered.

Metabolites may accumulate in the body. Then, the potential for bioaccumulation must consider the accumulation of the parent and relevant metabolites (e.g., with BCFs or BAFs expressing the combined accumulation).

Chemicals which do not fulfil all POP characteristics may be of concern due to metabolism in biota. For example, a chemical with potential for long range transport which is transformed in biota to bioaccumulable and toxic metabolites may represent a risk for health and environment in remote areas.

5. Discussions based on guidance documents

Based on guidance documents, evidences of bioaccumulation in past POPRC evaluation are reviewed as follows:

**BCFs are not applicable**

The EU guidance document points out a bioaccumulation mechanism other than fat partitioning. As protein binding is considered for PFOS, the mechanistic explanation may be useful to determine the bioaccumulation potential when the (i) criterion is not fulfilled.

**Long half-life**

Japan’s criteria include this concept and this is also considered to be included in the EU document as “uptake and metabolism.” Information on half-life is useful to determine the bioaccumulation potential when the (i) criterion is not fulfilled. It should be noted that both guidance place limits on test data for consideration.

**High Toxicity /High Ecotoxicity**

The EU REACH Regulation applies a similar level of concern to PBT and vP/vB chemicals. This implies that for persistent chemicals with high toxicity and/or ecotoxicity, a BCF higher than 2000, or an equivalent level of bioaccumulation potential, should be sufficient for assuming a high concern.

**Biomagnification**

The EU guidance document states that biomagnification reflects the difference in concentration between trophic levels within a single food chain but quantitative criteria are not specified. Biomagnification is determined based on field monitoring data. Factors such as reliability of the data and lipid content of the species in question should be taken into account. Consideration on differences in the metabolism of marine species and terrestrial animals may also be needed.

**Detections in Biota, Detections in Human Body (blood, milk, fat tissue)**

The EU guidance document states “the analytical detection of substances in organisms is not in itself always an indicator that significant bioconcentration or bioaccumulation has occurred or is occurring that would lead to effects in biota.” Thus detection data in biota or human body itself would not be regarded as direct evidence of bioaccumulation. However, especially in cases where the monitoring data reveal the increase in level by age or detection in various species, such data should be carefully considered.

**Exposure at Developmental Stage**

This is not mentioned in guidance documents and this information is not direct evidence of bioaccumulation like detection in human body (blood, milk, and fat tissue) is. However, this situation indicates the need for careful consideration.

6. Conclusions

Based on the review of past POPRC evaluation and consideration of existing guidance documents, the following approach is considered appropriate.
(1) **Important evidence**

For the evaluation of the bioaccumulation potential of those chemicals that do not fulfil the (i) criterion, the following information is considered to be important evidence which fulfil (ii) or (iii) criteria. The proposal submission for listing chemicals in Annexes A, B and C should indicate which criteria is met by the data of that chemical.

**Certain level of BCF**
A certain level of BCF such as 1,000 or 2,000 may indicate good reason for careful consideration of the bioaccumulation potential of a chemical which does not fulfil the (i) criterion.

**Long half-life, unique mechanism of Bioaccumulation**
A long half-life and a mechanistic explanation on why the (i) criterion is not applicable may indicate good reason for careful consideration of the bioaccumulation potential of a chemical which does not fulfil the (i) criterion.

**High bioaccumulation in other species**
High bioaccumulation in other species may indicate good reason for careful consideration when the chemical does not fulfil the (i) criterion.

**Increase in concentration with trophic levels (biomagnification)**
Increase in concentration with trophic levels within a single food chain provide useful information on biomagnification. This suggests bioaccumulation through the food chain and may indicate good reason for careful consideration of the bioaccumulation potential of a chemical which does not fulfil the (i) criterion. Data from different studies representing different trophic levels from the same area and high levels in top predators may also indicate good reason for careful consideration. It should be noted that the source data come from monitoring, thus careful consideration on the use of monitoring data such as reliability may be needed.

**High toxicity/High ecotoxicity**
High toxicity/High ecotoxicity should trigger consideration.

**Detection in biota**
Detections in biota along with levels in their surrounding environment may indicate good reason for careful consideration. Measured data in biota provide a clear indicator that the substance is taken up by an organism. However, it should be taken into account that the detection of a substance in organisms is not in itself always an indicator of bioaccumulation. Relatively higher detection levels and comparison with detected levels of existing POPs may trigger careful consideration.

**Comparison of concentration found in biota with toxicity level**
A comparison of the detected level in the environment and the strength of (eco) toxicity is desirable. If these levels are close, it may indicate good reason for careful consideration. On the other hand due to the many uncertainties involved in such a comparison, substances for which the levels in the environment differ from effects levels in experimental animals should also be carefully considered. For this information, consideration of the factors such as reliability of themonitoring data may be needed.

**Other reasons for concern**
Detections in endangered species, in vulnerable populations, human body (blood, milk, fat tissue) and exposure in development stage are other reasons of concern.

(2) **Weight of Evidence**

The weight of evidence approach should be considered drawing together all available information.
### Appendix 1

**Bioaccumulation data on existing POPs and POPs candidates**

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>Aquatic species</th>
<th>Other species</th>
<th>Biological half-life (d)</th>
<th>log Koa</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>METI method 1)</td>
<td>BCF Other BAF (BSAF)</td>
<td>BAF (BSAF)</td>
<td>(-)</td>
<td></td>
</tr>
<tr>
<td>Aldrin</td>
<td>1,550 - 20,000</td>
<td>5,500 - 11,700 2)</td>
<td></td>
<td>8.08</td>
<td></td>
</tr>
<tr>
<td>Dieldrin</td>
<td>4,860 - 14,500</td>
<td>8,910 - 9,770 2)</td>
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<td>8.90</td>
<td></td>
</tr>
<tr>
<td>Endrin</td>
<td>2,360 - 12,600</td>
<td>5,890 - 7,410 2)</td>
<td></td>
<td>8.13</td>
<td></td>
</tr>
<tr>
<td>Chlordane</td>
<td>13,000 - 27,900</td>
<td>19,500 - 20,900 2)</td>
<td></td>
<td>8.92</td>
<td></td>
</tr>
<tr>
<td>DDT</td>
<td>5,100 - 25,900</td>
<td>2,880 - 91,200 2)</td>
<td>4,680 - 4,170,000 2)</td>
<td>9.82</td>
<td></td>
</tr>
<tr>
<td>HCB</td>
<td>6,000 - 30,000</td>
<td>3,720 - 245,000 2)</td>
<td>1,200 - 550,000 2)</td>
<td>7.38</td>
<td></td>
</tr>
<tr>
<td>Heptachlor</td>
<td>2,020 - 17,300</td>
<td>8,710 - 10,000 2)</td>
<td></td>
<td>7.64</td>
<td></td>
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<tr>
<td>Mirex</td>
<td>20,400 - 41,700 2)</td>
<td>224,000 - 5,750,000 2)</td>
<td></td>
<td>1.6 - 364 4)</td>
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</tr>
<tr>
<td>Toxaphene</td>
<td>600 - 21,900</td>
<td>2,690 - 933,000 2)</td>
<td>11,000 - 32,400,000 2)</td>
<td>0.3 - 1,020 4)</td>
<td></td>
</tr>
<tr>
<td>PCBs</td>
<td>36,300 - 38,900 2)</td>
<td>2,570 - 6,030 2)</td>
<td>0.001 - 1,168 4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCDDs</td>
<td>17,700 3)</td>
<td>1.8 3) BSAF = 11 - 34 3)</td>
<td>13.6 - 1,428 3,4)</td>
<td>bound to blood protein</td>
<td></td>
</tr>
<tr>
<td>PCDFs</td>
<td>200 - 1,500</td>
<td>240 - 3,100 3)</td>
<td>13.3 - 35,405 3,4)</td>
<td></td>
<td></td>
</tr>
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<td>Chlordecone</td>
<td>4,700 - 16,000</td>
<td>4,700 - 18,100 3)</td>
<td>22 - 165 4)</td>
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<td></td>
</tr>
<tr>
<td>Lindane</td>
<td>327 - 893</td>
<td>3 - 20,000 3)</td>
<td>10 - 12,600 3,4)</td>
<td>7.85</td>
<td>slow elimination via air-respiration</td>
</tr>
<tr>
<td>α-HCH</td>
<td>60 - 13,000 3)</td>
<td></td>
<td>1.6 - 6.9 4)</td>
<td>7.61</td>
<td>slow elimination via air-respiration</td>
</tr>
<tr>
<td>β-HCH</td>
<td>250 - 1,500 3)</td>
<td></td>
<td>2.5 - 154 4)</td>
<td>8.88</td>
<td>slow elimination via air-respiration</td>
</tr>
<tr>
<td>OcBDE</td>
<td>&lt;10 - 36 3)</td>
<td>BSAF = 1(hexa)-3(hepta) 3)</td>
<td>BSAF = 9.1±1.1(hexa)</td>
<td>100 3)</td>
<td>dietary absorption of large molecules</td>
</tr>
<tr>
<td>SCCP</td>
<td>2,500 - 11,000</td>
<td>&lt;1 - 138,000 3)</td>
<td>16,440 - 25,650 3) BSAF = 1.9 - 6.8 3)</td>
<td>7.1 - 86.6 3)</td>
<td></td>
</tr>
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<td>PeCB</td>
<td>577 - 23,000 3)</td>
<td>125 - 117,000 3,4)</td>
<td>53 3)</td>
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<td></td>
</tr>
</tbody>
</table>

Reference

Figure 1. The interrelation between BCF and BAF data of existing POPs and POPs candidates

Figure 2. The biological halflife data of existing POPs and POPs candidates
## Appendix 2-1

### Evidence of bioaccumulation in past POPRC meetings (BCF<5,000)

<table>
<thead>
<tr>
<th></th>
<th>PeBDE</th>
<th>PFOS</th>
<th>HeBB</th>
<th>Chlordecone</th>
<th>Lindane</th>
<th>α-HCH</th>
<th>β-HCH</th>
<th>OesBDE</th>
<th>SCCP</th>
<th>PeCB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bio-accumulation in other species</strong></td>
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<tr>
<td>The bioaccumulation of lindane has been observed for most taxonomic groups, from plants and algae to vertebrates.</td>
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<tr>
<td>Modelled BMFs for wolves, depending on their age, ranged from 9 to 109.</td>
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<tr>
<td>In soil biota, the soil organism accumulation factor for octabromodiphenyl ether 197 has been calculated as 2.</td>
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<tr>
<td><strong>Toxicity</strong></td>
<td>High toxicity</td>
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<tr>
<td>Developmental effects in mammals at low levels (NOAEL = 0.1 mg/kg/day in rats in a two-generation study)</td>
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<tr>
<td>The environmental consequences of the combination of this bioaccumulation potential with a high toxicity (NOAELs 0.3 mg/kg/day) and ecotoxicity (NOEC &lt;below 1 μg/l) should be considered.</td>
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<td>When measured field levels in earthworms (0.3 mg/kg for a soil containing 80 μg/kg) are weighed against mammalian toxicity data using a realistic food intake ratio of 0.63, the comparison indicates an area of ecotoxicological concern which should be further explored.</td>
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<td>Toxicokinetic data on domestic birds indicate accumulation during food exposure and a half-life for adipose tissue of 53 days. (*)</td>
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<td>High ecotoxicity</td>
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<td>Very low elimination rates toxicokinetic studies in aquatic and terrestrial vertebrates (*)</td>
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<td>Toxicokinetic data in mammals and monitoring data in biota confirm the bioaccumulation potential. (*)</td>
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<tr>
<th>Biological half-life</th>
<th>PeBDE</th>
<th>PFOS</th>
<th>HeBB</th>
<th>Chlordecone</th>
<th>Lindane</th>
<th>α-HCH</th>
<th>β-HCH</th>
<th>OcBDE</th>
<th>SCCP</th>
<th>PeCB</th>
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<tbody>
<tr>
<td>Human</td>
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<td>The estimated half-life in humans is 100 days.</td>
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<tr>
<td>Animal</td>
<td></td>
<td>Very low elimination rates (toxicokinetic studies in aquatic and terrestrial vertebrates)</td>
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<td>An excretion half-life in mammals of several months</td>
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<tr>
<td>Monitoring data in biota</td>
<td>BMF or trophic transfer</td>
<td>Data from around the world demonstrate increasing levels of PentaBDE congeners with rising trophic position. Recent publications confirm food chain transfer in the Arctic. *</td>
<td>Monitoring data confirm the bioaccumulation and biomagnification of PFOS in both terrestrial and marine mammals. *</td>
<td>BMFs for α-HCH for different trophic levels (zooplankton, invertebrates, fish, and mammals) are in the range of 1–16. In Arctic marine food webs, it has been demonstrated that α-HCH stereoselectively bioaccumulates in marine species and has the ability to biomagnify to a greater extent than γ-HCH, for which values of up to 4,220 have been reported.</td>
<td>BMFs in marine food webs were mostly in the range of 1–18.</td>
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* Toxicokinetic data on domestic birds indicate accumulation during food exposure and a half-life for adipose tissue of 53 days. (*)
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<tr>
<th>PeBDE</th>
<th>PFOS</th>
<th>HeBB</th>
<th>Chlordecone</th>
<th>Lindane</th>
<th>α-HCH</th>
<th>β-HCH</th>
<th>OcBDE</th>
<th>SCCP</th>
<th>PeCB</th>
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<tbody>
<tr>
<td>Detections in higher trophic levels</td>
<td>Monitoring data confirm the bioaccumulation and biomagnification of PFOS in both terrestrial and marine mammals. (*)</td>
<td>Detection of high levels of the chemical in fish and birds</td>
<td>Reported in seabirds, fish and mammals in the Arctic (*)</td>
<td>Field studies in Arctic marine food webs have demonstrated that beta-HCH can bioaccumulate in upper trophic levels. (<em>) In the terrestrial Arctic food chain, beta-HCH can also biomagnify in mammals. (</em>)</td>
<td>Despite its large molecular weight, the molecule is found in top predators at levels similar to those of bioaccumulable tetra and penta BDE. (<em>) Concentrations of 220–270 ng/g lipid weight in eggs of the peregrine falcon in northern Sweden and Greenland have been reported. (</em>)</td>
<td>Levels of short-chained chlorinated paraffins in marine mammals from various regions of the Arctic have been reported, as well as from Canada and Greenland. (*)</td>
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<tr>
<td>Detections in other species</td>
<td>Toxicokinetic data in mammals and monitoring data in biota confirm the bioaccumulation potential. (*)</td>
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<td></td>
<td>β-HCH appears to be persistent in investigated species.</td>
<td>Field data provide evidence for the potential for bioaccumulation of heptabromodiphenyl ether.</td>
<td></td>
<td>There is also evidence of short-chained chlorinated paraffins accumulating in fish species from Lake Ontario, Canada. (*)</td>
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<tr>
<td>Detections in remote areas or the Arctic</td>
<td>Recent publications confirm food chain transfer in the Arctic. (*)</td>
<td>Reported in seabirds, fish and mammals in the Arctic(*)</td>
<td></td>
<td>Field studies in Arctic marine food webs have demonstrated that beta-HCH can bioaccumulate in upper trophic levels. (<em>) In the terrestrial Arctic food chain, beta-HCH can also biomagnify in mammals. (</em>)</td>
<td>Despite its large molecular weight, the molecule is found in top predators at levels similar to those of bioaccumulable tetra and penta BDE. (<em>) Concentrations of 220–270 ng/g lipid weight in eggs of the peregrine falcon in northern Sweden and Greenland have been reported. (</em>)</td>
<td>Levels of short-chained chlorinated paraffins in marine mammals from various regions of the Arctic have been reported, as well as from Canada and Greenland. (*)</td>
<td>There is also a good amount of monitoring data in Arctic mammals, birds, fish, lake sediments and moss, in remote areas.</td>
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<td></td>
<td>PeBDE</td>
<td>PFOS</td>
<td>HeBB</td>
<td>Chlordcone</td>
<td>Lindane</td>
<td>α-HCH</td>
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<td><strong>Detections in breast milk</strong></td>
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<td>Reported in human breast milk among Inuit in the Arctic and in marine mammals</td>
<td>Detected in blood and adipose tissue in humans</td>
<td>Detected in adipose tissue and in breast milk in humans. Detected in placenta tissue, exposing offspring at critical periods of development.</td>
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<tr>
<td><strong>Comparative detection level of other POPs</strong></td>
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<td>Lindane concentrations in marine mammals are found at equivalent levels or even higher levels than some of the more hydrophobic contaminants such as PCBs and DDT.</td>
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<td>In birds and marine mammals in particular, β-HCH can accumulate to higher levels than the other isomers.</td>
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<tr>
<td><strong>Others</strong></td>
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<td>Additional information suggests that the food chain bioaccumulation of alpha-HCH is higher than for lindane.</td>
<td>Available information confirms that the potential for bioaccumulation of β-HCH is higher than that for lindane.</td>
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<td></td>
<td>Pentachlorobenzene has been detected in the air in remote areas, including Arctic air, with a concentration range from 0.017 to 0.138 ng/m³.</td>
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</table>

Entries with * fall under multiple categories.
Appendix 2-2

Evidence of bioaccumulation of POPs candidates under (ii) and (iii)

<table>
<thead>
<tr>
<th></th>
<th>PFOS</th>
<th>Lindane</th>
<th>Alpha HCH</th>
<th>Beta HCH</th>
<th>Octa BDE</th>
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<td></td>
<td>Evidence that the bioconcentration factor or bioaccumulation factor in aquatic species for the chemical is greater than 5,000 or, in the absence of such data, that the log Kow is greater than 5;</td>
<td>Data found in Environmental Health Criteria 124 (Ref. 5) indicated that bioconcentration factors ranged from 13 to 1,240. The bioconcentration factor values, obtained and peer-reviewed by Japan, were between 327 and 893, in accordance with OECD Test Guidelines. Other references provide measured bioconcentration factors in mussels, daphnia and fish species ranging from 43 to 4,240, depending on the lipid content of the organism. Regarding the bioaccumulation factor, the only information provided was a value of 12,900 in the Mexican proposal, which may be based on the physico-chemical properties and environmental data for lindane. The log Kow value in the Mexican proposal is 3.5;</td>
<td>(i) The log Kow reported in the proposal is 3.8 (Ref. 1). Bioconcentration factors for invertebrates can reach values of 60 to 2,750 (whole body, dry weight basis) (Ref. 4). Bioconcentration factors for fish were in the range of 313–2,400 (wet weight basis) (Refs. 8 and 9);</td>
<td>The log Kow reported in the proposal is 3.7. The bioconcentration factor for fish was determined to be 1,460. Other reported bioconcentration factors for fish were in the range of 250–1,500 on a whole body dry weight basis (Ref. 5);</td>
<td>The log Kow value for the commercial product has been determined to be around 6.29 (Ref. 3). Experimental results presented in the European Union risk assessment report indicate that octa and heptabromodiphenyl ethers have low bioconcentration factors (less than 10–36); these results have been confirmed by data presented and peer-reviewed by the Japanese Government. Nevertheless, other brominated diphenyl ethers present in commercial octabromodiphenyl ether have been found to have higher bioconcentration factors, for example, 11,700–17,700 for pentabromodiphenyl ethers (Ref. 3) and 1,000–5,600 for hexabromodiphenyl ethers (Ref. 3);</td>
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</table>

(i) Bioconcentration factor values for PFOS are lower than the screening criteria (in the range of 240–1,300 for steady-state conditions and up to 2,796 using kinetic estimation) (Ref. 1). PFOS is a surface active substance and, as a result, octanol-water partition coefficient measurements are not relevant (Ref. 2). Bioconcentration factor values are not good predictors of bioaccumulation for this substance because food uptake has been demonstrated to be a relevant route for aquatic organisms (Ref. 3). Bioaccumulation is not related to lipophilicity and the accumulation does not primarily occur in lipid tissues; | (i) Bioconcentration factor values are not good predictors of bioaccumulation for this substance because food uptake has been demonstrated to be a relevant route for aquatic organisms (Ref. 3). Bioaccumulation is not related to lipophilicity and the accumulation does not primarily occur in lipid tissues; | (i) Bioconcentration factor values are not good predictors of bioaccumulation for this substance because food uptake has been demonstrated to be a relevant route for aquatic organisms (Ref. 3). Bioaccumulation is not related to lipophilicity and the accumulation does not primarily occur in lipid tissues; | (i) Bioconcentration factor values are not good predictors of bioaccumulation for this substance because food uptake has been demonstrated to be a relevant route for aquatic organisms (Ref. 3). Bioaccumulation is not related to lipophilicity and the accumulation does not primarily occur in lipid tissues; | (i) Bioconcentration factor values are not good predictors of bioaccumulation for this substance because food uptake has been demonstrated to be a relevant route for aquatic organisms (Ref. 3). Bioaccumulation is not related to lipophilicity and the accumulation does not primarily occur in lipid tissues; |
| (i) | The bioaccumulation of lindane has been observed for most taxonomic groups, from plants and algae to vertebrates. The environmental consequences of the combination of this bioaccumulation potential with a high toxicity – no observed-adverse-effect levels (NOAELs) as low as 0.3 mg/kg body weight/day – and ecotoxicity – aquatic ecosystem no-observable-effect concentration (NOEC) below 1 µg/l (Refs. 5 and 6) – should be considered. For example, when measured field levels in earthworms (0.3 mg/kg for a soil containing 80 µg/kg) are weighed against mammalian toxicity data (Ref. 5) using a realistic food intake ratio of 0.63 (Ref. 7), the comparison indicates an area of ecotoxicological concern which should be further explored; |
| (ii) | Toxicokinetic studies in aquatic and terrestrial vertebrates show very low elimination rates (Refs. 1 and 4). In addition, PFOS has shown developmental effects in mammals at low levels (no observed adverse effect level (NOAEL) value of 0.1 mg/kg body weight/day in rats in a two-generation study) (Ref. 1); |
| (iii) | Monitoring data confirm the biomagnification of PFOS in both terrestrial and marine mammals (Ref. 4); |
| Monitoring data in biota indicating that the bioaccumulation potential of the chemical is sufficient to justify its consideration within the scope of this Convention; | Monitoring data confirm the bioaccumulation and biomagnification of PFOS in both terrestrial and marine mammals (Ref. 4); |
| (i) Lindane has been reported in seabirds, fish and mammals in the Arctic (Ref. 1). Lindane concentrations in marine mammals are found at equivalent levels or even higher levels than some of the more hydrophobic contaminants such as polychlorinated biphenyls (PCBs) and DDT (Ref. 1). In addition, lindane has been reported in human breast milk among Inuit in the Arctic and in marine mammals (Ref. 8); | The biomagnification factors for alpha-HCH for different trophic levels (zooplankton, invertebrates, fish, and mammals) are in the range of 1–16 (Refs. 10 and 11). According to field studies in Arctic marine food webs, it has been demonstrated that alpha-HCH stereoselectively bioaccumulates in marine species and has the ability to biomagnify to a greater extent than gamma-HCH, for which values of up to 4,220 have been reported (Ref. 12); Alphah-HCH has also been detected in breast milk and adipose tissue in humans (Ref. 13). The food chain bioaccumulation of alpha HCH is higher than for lindane (Ref. 12); |
| Field studies in Arctic marine food webs have demonstrated that beta-HCH can bioaccumulate in upper trophic levels (Ref. 1). Beta-HCH appears to be persistent in investigated species (Refs. 1, 6, and 7). Biomagnification factors for beta-HCH in marine food webs were mostly in the range of 1–18 (with a maximum value of 280). In birds and marine mammals in particular, beta-HCH can accumulate to higher levels than the other isomers (Refs. 1, 6 and 8). In the terrestrial Arctic food chain, beta-HCH can also biomagnify in mammals. Modelled biomagnification factors for wolves, depending on their age, ranged from 9 to 109 (Ref. 9); Beta-HCH has been detected in adipose tissue (Ref. 10) and in breast milk in humans (Refs. 11, 12 and 13). It has also been detected in placenta tissue exposing offspring at critical periods of development (Ref. 14); In addition, available information confirms that the potential for bioaccumulation of beta-HCH is higher than that for lindane (Ref. 1). |
| Field data provide evidence for the potential for bioaccumulation of heptabromodiphenyl ether. Concentrations of 220–270 ng/g lipid weight in eggs of the peregrine falcon in northern Sweden and Greenland have been reported (Refs. 4 and 5). This evidence demonstrates that, despite its large molecular weight, the molecule is found in top predators at levels similar to those of bioaccumulable tetra and penta bromodiphenyl ether. In addition, the estimated half-life in humans is 100 days (Ref. 6), suggesting a potential for bioaccumulation. In soil biota, the soil organism accumulation factor for octabromodiphenyl ether 197 has been calculated as 2 (Ref. 2). | Field data provide evidence for the potential for bioaccumulation of heptabromodiphenyl ether. Concentrations of 220–270 ng/g lipid weight in eggs of the peregrine falcon in northern Sweden and Greenland have been reported (Refs. 4 and 5). This evidence demonstrates that, despite its large molecular weight, the molecule is found in top predators at levels similar to those of bioaccumulable tetra and penta bromodiphenyl ether. In addition, the estimated half-life in humans is 100 days (Ref. 6), suggesting a potential for bioaccumulation. In soil biota, the soil organism accumulation factor for octabromodiphenyl ether 197 has been calculated as 2 (Ref. 2). |

(i) Evidence that a chemical presents other reasons for concern, such as high bioaccumulation in other species, high toxicity or ecotoxicity;
Appendix 3

The Importance of biological half-life for the evaluation of bioaccumulation

1. Biological half-life data

   Biological half-life is defined as the time needed for the chemical to become half of its original amount by metabolism in and excretion from the body.

   With rare exceptions, the resulting metabolites are more hydrophilic, such that they are excreted more rapidly than the parent substances. Therefore, half life is an important parameter for reducing the bioaccumulation potential.

2. Importance of biological half-life data

   Example 1: Guidance on identification of SVCH (substances of very high concern)

   The European Chemical Agency (2007) has published guidance on identification of SVCH. With respect to the bioaccumulation criterion, the BCF in aquatic organisms is used as an indicator of the bioaccumulation potential of the substance. Data that could also be used to demonstrate or support a high bioaccumulation potential in relation to equivalent concern include half life data: “Uptake and metabolism data from laboratory studies on the other species, including mammalian species”

   Example 2: The evaluation of bioaccumulation potential using log Kow

   For lipophilic substances, correlations are assumed to exist between log Kow and BCF values. However it is apparent that there are significant discrepancies between measured and calculated BCF values, which become more pronounced with increasing log Kow (United Nations (2005)).

   The reasons for these discrepancies are attributed to reduced membrane permeation kinetics, reduced biotic lipid solubility for large molecules, experimental artifacts such as equilibrium not being reached, and analytical errors.

   The metabolism is also considered as one of these reasons. Fish are able to metabolize many different classes of xenobiotics and some of the enzymes catalyzing these reactions have been identified and characterized. A metabolite, which is the product of a biotransformation reaction, has different physical and chemical properties to its parent substance. Bioaccumulation potential may be reduced by altering a substance to a more hydrophilic derivative.

   Example 3: The evaluation of biomagnification potential

   Refer to Utilization of monitoring data for the evaluation of bioaccumulation

3. Factors affecting biological half-life data

   In fish bioconcentration tests, estimates of half life can be calculated on the basis of a change in chemical concentration, or a change in chemical content (body burden) per unit time. The difference between the two units of calculation is due to an increase in body weight, or “growth dilution,” during the study. Growth can become an important factor in studies on persistent chemicals where levels are monitored over a long period (Niimi, A.J. (1987)).

   Furthermore, factors such as interspecies differences, the time interval between cessation of chemical exposure and the first sampling, the use of radiolabeled compounds, and the use of first- and multi-order kinetics could influence half life estimates.

   In toxicokinetics study, half life data are usually derived from plasma concentrations. Urinary, biliary or fecal excretion can also be measured. Lipophilic chemicals are at first eliminated into feces, and so half life may appear to be short. However, the portion that is taken up by the body can remain in the lipid tissue for a long time, resulting in much longer half life.
References


Appendix 4

Utilization of monitoring data for the evaluation of bioaccumulation

1. Utilization of monitoring data

Care must be taken in using monitoring data for the evaluation of bioaccumulation potential. European Chemical Agency (2007) has published guidance with regard to using monitoring data from field studies.

“Measured data in biota provide a clear indicator that the substance is taken up by an organism. However the analytical detection of substances in organisms is not in itself always an indicator that significant bioconcentration or bioaccumulation has occurred or is occurring that would lead to effects in biota.

The interpretation of such data in terms of actual bioaccumulation or biomagnification factors can be especially difficult when the sources and levels of the exposure (for example through water as well as food) are not known or cannot be estimated reasonably.”

2. Consideration in using monitoring data for the evaluation of bioaccumulation

a) Biomagnification factor (BMF) by foodweb transfer

Although there are various definitions for biomagnification, it was described in POPRC1 (2005) as

“Biomagnification is the process by which chemical concentrations are normally expressed on a lipid normalized basis. Biomagnification results from the trophic level transfer of a chemical through the diet from a lower to a higher trophic level.

Given the great variability in approaches to calculating the biomagnification factor (BMF), the potential for biomagnification should be used instead of BMF for the evaluation of the bioaccumulation criterion. If a biomagnification potential is identified, it should be considered as a specific concern in the evaluation of criteria 1 (c).

Lipid based concentration should be used in comparing the concentration between trophic levels by BMF. BMF values based on whole body weight tend to be lower than lipid based BMFs.

BMF=lipid based concentration of the chemical in an organism/lipid based concentration of the chemical in food

Schwarzenbach, R.P. (2003) reported some examples of specific organochlorine compound concentrations in organisms forming simple food chains or food webs. When BMF>1, transfer to higher level predator is considered to have occurred. However, metabolism and depuration rates in microorganisms such as planktons are fast, so disequilibrium between trophic levels is hard to be established.

BMF tends to increase as the lipid solubility of the chemical increases. This is generally due to slow elimination process. For chemicals with relatively low lipid solubility such as HCH (Kow=3.8), elimination process is faster and so potential for biomagnification decreases.

BMF can be lower than 1 in high level predators that are capable of metabolizing the chemicals. For example, birds can biotransform HCH more readily than its prey, and so BMF of HCH in seabirds is 0.3.

b) Time trend of the monitoring data

Time trend data can also provide very useful information in terms of whether the levels of the substance is building up over time in the environment, although again the interpretation of such data may not always be straightforward.
c) **Comparison with the measured concentrations of existing POPs**

Comparison with the measured concentrations of highly bioaccumulative substances such as existing POPs can provide benchmarks for potential to bioaccumulate.

d) **Sample data detected at high levels**

Although organic compounds are generally accumulated in liver or lipid tissue, data detected in other parts of the body (e.g. blood protein) can help to identify chemical’s specific accumulation behaviour and to interpret the mechanism of accumulation.

While BCFs are usually derived from the experiments with aquatic organisms, data detected at high levels in other organisms (e.g. terrestrial organisms) can help to find organisms susceptible to bioaccumulation and to interpret the mechanism of accumulation.

### 3. Evaluation of the quality of monitoring data

An important factor to take into account with regard to monitoring data is the quality of the data. Many substances with POP properties are difficult to analyze at low concentrations and the use of poor quality data may lead to erroneous conclusions being drawn. The Arctic Monitoring and Assessment Programme (AMAP, 2001) has published recommendations with regard to assessing the quality of monitoring data for use in determining spatial and temporal trends and other types of data interpretations. The following four categories of data are proposed, based on quality assurance considerations.

a) Evidence of certification or documented quality assurance on all stages of the data gathering process.

b) Some parts of quality assurance(QA)/quality control(QC) process can be documented (but may not be fully described in e.g. published reports).

c) No data available on QA/QC procedures, but results are consistent with other reports concerning the same sample types.

[d) No evidence of QA or of data compatibility with the certified data flux.

AMAP recommend that only data in categories A or B should be accepted for investigation of spatial and temporal trends or other types of basic data interpretations. Category C data can be used to show relative trends, assuming that they are internally consistent. Category D data should not be used in the assessment process.

### 4. Factors for monitoring data variabilities

There are many factors that could affect monitoring data and some of these factors are closely related to each other. Borga et al. (2004) suggested implications of those factors as summarized below:

**Lipid**

Lipid content of an organism varies with environmental factors such as seasonality as well as individual factors such as the age, sex, body size and reproductive stage. Although lipid normalized concentrations are used in bioaccumulation studies to account for the variation, the influence of those factors should be considered.

Organisms living in cold temperature areas such as the Arctic tend to accumulate large amount of lipid in their body to store energy as a strategy for survival in cold climate. Most of the POPs are highly lipid soluble, and partition into lipid phase, so they are detected at high levels in arctic biota.

**Seasonality**

In the Arctic, seasonal changes in solar irradiation intensity affect accumulation of POPs.

Formation and melting of ice, or change in the organic matter content of the water due to seasonal increase or decrease in primary production influence bioavailability of POPs in the water column.

Increased primary production results in abundance of food that leads to increased body size and/or lipid content of the organisms. The increased lipid enables increased storage of lipophilic chemicals.
Life cycle
For pelagic organisms, increase in body size reduces relative surface area and thus reduces elimination through body surface.

For growing organisms, especially birds and mammals, apparent concentration of POPs decrease with the increase in body size (growth dilution).

For mature organisms, the concentrations of POPs tend to increase with age because many of these substances are recalcitrant and eliminated very slowly.

Changes in diet or habitat by age can alter the POPs’ accumulation and/or elimination process.

Female mammals at reproductive stage eliminate POPs accumulated in their body through fetus and milk.

Habitat
Habitats vary in characteristics such as the composition of the aquatic system (e.g. depth of water column and sediment) and partitioning of the chemical between compartments.

POPs tend to adsorb to particles and deposit into sediment, and so they are found to be higher in benthic organisms than in pelagic organisms at the same trophic level. The deep-sea fish living in habitats with more interactions between sediment and water accumulate more POPs than surface-water fish.

Organisms that migrate are exposed to various levels of POPs during their lifetime depending on regional differences.

Metabolism (Biotransformation)
The rate of metabolism rather than uptake determines the chemical’s potential to bioaccumulate and biomagnify

High bioaccumulation factor does not necessary suggest high potential for biomagnification if the chemical can be metabolized.

The ability of an organism to metabolize is highly chemical-specific and differs among species, age, body size, sex, etc.

There is a possibility that metabolites are more persistent, bioaccumulative and/or toxic than the parent compound.

Trophic position
When an organism at higher trophic position consumes its prey, chemicals accumulated by prey taken up from food

For persistent and bioaccumulative substances like POPs, slow elimination from the body of the organisms at each trophic level results in increased concentration in the organisms at next level.

BMFs tend to increase with the rise in trophic level But, metabolic transformation of the chemical in the predator causes the predator to achieve a concentration lower than that in its prey (Trophic dilution).

References:


Appendix 5

Relationships between BCFs and BAFs

1) Bioconcentration factors (BCF)
   - Measured in laboratory experiments under controlled conditions.
   - Exposure solely from water - applicable to aquatic species only.
   - Net result of uptake via respiratory surface (e.g. gill membrane in fish) vs. depuration through respiration, fecal elimination, biotransformation, etc.
   - Generally calculated as the ratio of the chemical concentration in the organism to that in the water at a steady state. Kinetic method is used when a steady state is not reached.

2) Bioaccumulation factors (BAF)
   - Measured in laboratory (model ecosystem) experiments or field studies.
   - Exposure from ambient media (air, water, sediment, soil) and diet – also applicable to non-aquatic species.
   - Net result of uptake via both routes (respiratory surface and food) vs. depuration.
   - Calculated as the ratio of the chemical concentration in the organism to that in the ambient medium.
   - BAF of benthic organism is expressed as biota-sediment accumulation factor (BSAF).
   - Ratio of the chemical concentration in the organism to that in its food (prey) is expressed as biomagnification factor (BMF).
   - Results of dietary bioaccumulation experiments (feeding studies) are expressed in BMFs.

3) Correlation between BCF (bioconcentration factor) and BAF (bioaccumulation factor) values
   - BAFs tend to be higher than BCFs for many chemicals possibly because of the increased routes of exposure.
   - Table 1 lists summary statistics for five chemicals selected as a case study to compare BCFs and BAFs for the same chemical in fish species (Arnot, J.A. et al. (2006)). For chemicals that are known to biomagnify in food webs, field BAFs can be up to almost 2 orders of magnitude greater than the BCFs from laboratory experiments. But certain chemicals are observed to have greater BCFs than BAFs.

Table 1. A case study comparison of acceptable fish bioconcentration factor (BCF) and bioaccumulation factor (BAF) values for 5 chemicals. (Arnot, J.A. et al. (2006))

<table>
<thead>
<tr>
<th>Chemical (endpoint)</th>
<th>Log $K_{ow}$</th>
<th>n</th>
<th>Range log values (SD)</th>
<th>Median log value</th>
<th>Mean log value (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorobenzene (BCF)</td>
<td>2.84</td>
<td>2</td>
<td>1.13–1.34 (0.15)</td>
<td>1.24</td>
<td>1.24 (0.11)</td>
</tr>
<tr>
<td>Chlorobenzene (BAF)</td>
<td>2.84</td>
<td>3</td>
<td>1.81–2.88 (0.55)</td>
<td>2.09</td>
<td>2.76 (0.32)</td>
</tr>
<tr>
<td>Lindane (BCF)</td>
<td>3.72</td>
<td>33</td>
<td>2.16–3.32 (0.35)</td>
<td>2.84</td>
<td>2.80 (0.06)</td>
</tr>
<tr>
<td>Lindane (BAF)</td>
<td>3.72</td>
<td>4</td>
<td>3.43–3.97 (0.25)</td>
<td>3.90</td>
<td>3.80 (0.13)</td>
</tr>
<tr>
<td>Hexachlorobenzene (BCF)</td>
<td>5.73</td>
<td>21</td>
<td>3.57–4.70 (0.32)</td>
<td>4.26</td>
<td>4.12 (0.07)</td>
</tr>
<tr>
<td>Hexachlorobenzene (BAF)</td>
<td>5.73</td>
<td>26</td>
<td>3.91–5.74 (0.48)</td>
<td>4.75</td>
<td>4.74 (0.09)</td>
</tr>
<tr>
<td>p,p'-DDT (BCF)</td>
<td>6.91</td>
<td>5</td>
<td>4.17–4.72 (0.27)</td>
<td>4.65</td>
<td>4.48 (0.12)</td>
</tr>
<tr>
<td>p,p'-DDT (BAF)</td>
<td>6.91</td>
<td>7</td>
<td>5.84–6.62 (0.27)</td>
<td>6.33</td>
<td>6.31 (0.10)</td>
</tr>
<tr>
<td>DEHP (BCF)</td>
<td>7.73</td>
<td>6</td>
<td>2.43–2.98 (0.18)</td>
<td>2.79</td>
<td>2.76 (0.07)</td>
</tr>
<tr>
<td>DEHP (BAF)</td>
<td>7.73</td>
<td>2</td>
<td>1.86–2.83 (0.60)</td>
<td>2.35</td>
<td>2.35 (0.49)</td>
</tr>
</tbody>
</table>

Note: n, number of observations; SD, standard deviation; SE, standard error of the mean; p,p'-DDT, 1,1-(2,2,2-trichloroethylidene)bis(4-chlorobenzene); DEHP, 1,2-Butanediolcarboxylic acid, bis(2-ethylhexyl) ester.

4) Uncertainties in assessing field-derived BAF values
   - Historical background concentration is unknown.
   - Bioavailability of the chemical depends on site-specific conditions (temperature, organic carbon content…)
   - Influence of temporal and spatial factors (seasonality, geographical characteristics, etc.)
   - Variation among species (diet, trophic position, habitat, metabolism, etc.)
• Variation in the status of individual organism (age, sex, reproductive stage, body size, lipid content, etc.).
• Difficulties in measurement of the chemical in the ambient medium when the concentration is extremely low (i.e. near the detection limit).
• Influence of combined exposure with other chemicals.

References:
Appendix 6

Octanol/air partition coefficient and bioaccumulation

1. Introduction

Since POP-like substances have the tendency to partition into lipid rather than water phase, the octanol-water partition coefficients (Kow) have been used as an indicator of bioaccumulation potential. Chemicals with low Kow have been judged to have low bioaccumulation potential in aquatic organisms because they are easily eliminated into the water. However, it was reported that for terrestrial organisms that breathe air instead of water, chemicals with high Koa can have high bioaccumulation potential despite low Kow values because they are not easily eliminated into the air.

2. Log Koa and bioaccumulation

According to Kelly et al. (2007), substances with relatively low Kow values such as HCH (Kow=10^{3.8}), tetrachlorobenzenes (Kow=10^{4.1}) and endosulfan (Kow=10^{3.8}) which did not biomagnify in the aquatic food web showed a high degree of biomagnification in the terrestrial food web or in air-breathing organisms of the marine mammalian food web. Similar findings were also reported for PFOS (Kow<10^{5}). This may be due to high Koa (≥10^{6}) causing slow respiratory elimination coupled with not so low Kow (>10^{2}) causing slow elimination in urine or nitrogenous wastes in air-breathing organisms.

The analysis by the same authors showed that air-breathing organisms exhibit higher BMFs than those in water-respiring organisms because of their greater ability to absorb and digest their diet, which is related to differences in digestive tract physiology and body temperature.

<table>
<thead>
<tr>
<th>Substance</th>
<th>bg Kow</th>
<th>bg Koa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldrin</td>
<td>3.01</td>
<td>8.08</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>5.2</td>
<td>8.9</td>
</tr>
<tr>
<td>Endrin</td>
<td>5.2</td>
<td>8.33</td>
</tr>
<tr>
<td>cis-Chlorobenzene</td>
<td>1.6</td>
<td>6.92</td>
</tr>
<tr>
<td>p,p'-DDT</td>
<td>6.9</td>
<td>9.82</td>
</tr>
<tr>
<td>HCB</td>
<td>5.6</td>
<td>7.38</td>
</tr>
<tr>
<td>Hepachlor</td>
<td>5.27</td>
<td>7.64</td>
</tr>
<tr>
<td>Lindane</td>
<td>3.7</td>
<td>7.85</td>
</tr>
<tr>
<td>α-HCH</td>
<td>3.81</td>
<td>7.61</td>
</tr>
<tr>
<td>β-HCH</td>
<td>3.8</td>
<td>8.88</td>
</tr>
<tr>
<td>δ-HCH</td>
<td>4.34</td>
<td>8.84</td>
</tr>
<tr>
<td>Endosulfan</td>
<td>3.62</td>
<td>8.64</td>
</tr>
<tr>
<td>p,p'-DDE</td>
<td>5.7</td>
<td>9.68</td>
</tr>
<tr>
<td>p,p'-DDD</td>
<td>5.5</td>
<td>10.3</td>
</tr>
</tbody>
</table>

Log Kow and Log Koa of existing POPs and POPs-like substances
3. **Measurement of Koa**

Shoeib et al. (2002) measured Koa of 19 organochlorine pesticides.

Nitrogen gas (flow rate: 200–300mL/min.) was saturated with octanol by sparging through a column approximately 20cm in height, and then passed through a cooling coil to an octanol trap to ensure condensation of excess octanol before reaching the generator column.

The cooling coil, octanol trap, and generator column were all submerged in a thermostat-controlled (±0.1 °C) water bath that was always at least 10 °C cooler than the octanol used to saturate the gas stream.

The generator column consisted of glass beads coated with 300μl of the sample mixed octanol solution. Equilibrated gas-phase chemicals in the gas stream exiting the generator column were collected on an adsorbent trap, which contained approximately 20 g of C18-bonded silica.

Flow rates were measured at the outlet of the adsorbent trap to determine total sample volumes.

Traps were extracted with 15 ml of 50:50 hexane: dichloromethane (v/v) and then reduced in volume to approximately 500 μl with a gentle stream of nitrogen. Concentrated extracts were analyzed using gas chromatograph.

4. **Other information on Koa**

Kelly et al. (2007) reported that Koa of the HCHs vary greatly among isomers. Values of log Koa relative to α-HCH (assigned a value of 1) are 19, 1.7, and 22 for β-, γ-, and δ-HCH isomers, respectively. Also, logarithmic relationship was found between Koa and reciprocal of the absolute temperature.

**References**