UNITED NATIONS ENVIRONMENT PROGRAMME

**Stockholm Convention on Persistent Organic Pollutants**

اتفاقية استكهولم بشأن الملوثات العضوية الثابت • 关于持久性有机污染物的斯德哥尔摩公约 • Convention de Stockholm sur les polluants organiques persistants
Convenio de Estocolmo sobre Contaminantes Orgánicos Persistentes • Стокгольмская конвенция о стойких органических загрязнителях

**Toolkit Expert Meeting**
Geneva, 5-7 December 2007

# REPORT OF THE TOOLKIT EXPERT MEETING

## Introduction

1. The Conference of the Parties at its third meeting held in May 2007 in Dakar, Senegal, adopted decision SC-3/6 on ongoing review and updating of the Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases. The Conference, among others, adopted the process for the ongoing review and updating of the Toolkit, as set forth in the annex to that decision, and requests the Secretariat to implement the process within available resources.

2. An important element of the process is that it is Party-driven and should operate through active participation of the nominated Toolkit experts. The process proposes to hold Toolkit expert meetings on yearly basis, as well as to establish expert panels to organize the work efficiently between the meetings.

3. In response to this request the Secretariat and Chemicals Branch of the United Nations Environment Programme's Division of Technology, Industry and Economics (UNEP Chemicals) organized jointly an expert meeting to further develop the Toolkit. The meeting was held from 5 to 7 December 2007 in Geneva, Switzerland, at International Environment House, 11-13, chemin des Anémones, CH-1219 Châtelaine. The meeting was conducted in English.

## I. Opening of the meeting

4. The meeting was declared open at 9.10 a.m. on Monday, 5 December 2007, by Mr. Donald Cooper, Executive Secretary of the Stockholm Convention. In his opening statement Mr. Cooper welcomed the participants and highlighted that the meeting is organized jointly by the Secretariat and UNEP Chemicals. He appreciated the professionalism of the UNEP Chemicals team and his good relations with their Head, Mr. Per Bakken, and expressed interest of the Secretariat in further cooperation in implementing the mandate given to the Secretariat by the Parties to the Convention. He said that the Toolkit review and updating process, as adopted by the Conference, is Party driven; hence, the nominated Toolkit experts' role in it is essential. It would be up to them to evaluate the present shortcomings and gaps but also to contribute to filling these. Besides national activities also UNEP projects are ongoing or planned.

5. These projects, however, are fully dependent on voluntary funding since the Conference of the Parties at its third meeting allocated budget for activities related to the Toolkit review and updating process to be implemented in the biennium 2008-2009 only in the Stockholm Convention Voluntary Trust Fund. He informed that so far the European Commission expressed interest to support the Toolkit activities and invited the Secretariat to submit a project proposal titled "Support to the Secretariat of the Stockholm Convention on Persistent Organic Pollutants for the further elaboration of the Dioxin and Furan Toolkit". The project proposal is currently under evaluation. The planned contribution of the European Commission is EUR 100,000 and it is expected that it will trigger further donations to achieve the total of US$ 497,000 budgeted for the biennium 2008-2009.

6. Mr. Cooper concluded by wishing the participants a successful meeting in order to achieve the common goal to have a Toolkit, which would provide a useful tool for Parties to establishing POPs release inventories not only to meet their reporting obligations under the Convention but also to have sufficient information to evaluate and prioritize their sources of releases of Annex C chemicals, to develop action plans to reduce and where possible eliminate these releases, as well as to evaluate effectiveness of these plans in the future.

7. Ms. Heidelore Fiedler from UNEP Chemicals welcomed the participants on behalf of Mr. Per Bakken, who was not able to attend the meeting.

8. Ms. Katarina Magulova from the Secretariat of the Stockholm Convention outlined the mandate given to the Toolkit Experts by the Conference of the Parties by its decision SC-3/6 as well as the objectives of the expert meeting.

# II. Organizational matters

## A. Organization of work

9. The aim of the meeting was further improvement of the Toolkit. The main objectives were to:

- Present the relevant national and international activities;
- Discuss specific Toolkit sub-categories;
- Identifying gaps and short-comings, proposing further activities;
- Evaluation of possible data quality criteria.

10. The agenda was adopted according to a proposed provisional agenda:

- Opening
- Presentation of national projects
- Presentations on planned and ongoing UNEP projects
- Group discussions of:
    - Toolkit category 3 (Fossil fuel and biomass fuel power plants; household heating and cooking);
    - Toolkit category 6 (Open burning of biomass and waste);
    - Identification of gaps, shortcomings, setting of priorities proposals for improvement;
    - Data quality criteria, validation of data quality;
- Synthesis of the group discussions;
- Workplan for the intersessional period;
- Set up of the necessary organizational structure.

11. The workshop agreed to conduct its work in plenary as well as in break-out groups. Detailed meeting programme is attached as annex I to the current report.

## B. Attendance

12. The meeting was attended by the following nominated Toolkit Experts[1]: Mr. Luis Tournier, Argentina; Mr. Gerhard Thanner, Austria; Mr. Sergey Kakareka, Belarus; Mr. João Vicente de Assunção, Brazil; Mr. David Niemi, Canada; Mr. Minghui Zheng, China; Mr. Gunther Umlauf, European Commission; Mr. Emmanuel Fiani, France; Ms. Ute Karl, Germany; Mr. Yasuhiro Hirai, Japan; Mr. Charles Mirikau, Kenya; Mr. Nee Sun Choong Kwet Yive, Mauritius; Ms. Beatriz Cárdenas, Mexico; Ms. Jargalsaikhn Lkhasuren, Mongolia; Mr. Youssef Bennouna, Morocco; Mr. Henk Bouwman, South Africa; Mr. Stellan Marklund, Sweden; Mr. Marwan Al-Dimashki, Syria; Ms. Chalongkwan Tangbanluekal, Thailand; Ms. Verónica Gonzalvez, Uruguay; Ms. Patsy Costner, International POPs Elimination Network; Mr. Michael Harris, World Chlorine Council.

13. The meeting was also attended by Mr. Adam Grochowalski, Poland, as invited expert and Mr. Roland Weber, International HCH & Pesticides Association, as observer. The list of participants is attached as annex II to this report.

# III. Presentation of national projects

14. The following presentations on national activities were made and are attached as annex III to the current report:

- Evaluation of Emission Factors for Category 3 (Ute Karl);
- French Measurement Campaign of PCDD/Fs, HCB and PCBs from Biomass Boilers (Emmanuel Fiani);
- Inventory of Dioxin and Furan releases in Potchefstroom, South Africa Experience with Toolkit Use (Henk Bouwman);

[1] Nominated experts included in the Toolkit Expert Roster contained in the document UNEP/POPS/COP.3/INF/24.

- First Results from Ashes in Benin (Heidelore Fiedler);
- Environmental Concerns Related to the Burning of Olive Oil Production Residues in the Mediterranean Region (Marwan Dimashki).
- Emissions of PCDD/F from Otto Vehicles (João de Assunção)

# IV. Presentations on planned and ongoing UNEP projects

15. The following presentations on international activities, implemented by UNEP were made and are attached as annex IV to the current report:

- UNEP Project "Emission Factors from Open Burning of Biomass – Toolkit Category 6(b) (Heidelore Fiedler);
- UNEP Project "Hazardous Substances from Open Burning of Waste in Developing Countries" (Heidelore Fiedler);
- Study of Waste Composition and Waste Dump Fires in Mexico (Beatriz Cardenas);
- Waste Composition in China (Minghui Zheng);
- Experimental Realization of Waste Burns (Stellan Marklund).

# V. Outcomes of the discussions

16. The meeting agreed to split into two groups (expert panels) to discuss issues related to the Toolkit categories 3 and 6. The Secretariat provided introduction to the group discussion and assigned the groups with the following mandate: (i) Analyse and evaluate the information before them including the current Toolkit edition; (ii) Identify shortcomings and gaps, agree on priorities, and propose activities for improvement; (iii) Agree on a workplan for the Toolkit revision and updating process for the intersessional period.

17. The group on **Toolkit category 3 (Fossil fuel and biomass fuel power plants; household heating and cooking)** was chaired by Ms. Ute Karl and Mr. David Niemi served as rapporteur. The report of the group work is attached as annex V to the current report.

18. The group on **Toolkit category 6 (Open burning of biomass and waste)** was chaired by Mr. Stellan Marklund and Mr. Michael Harris served as rapporteur. The report of the group work is attached as annex VI to the current report.

19. The meeting decided to discuss the further issues in plenary. While discussing the **Procedure for identifying gaps, shortcomings, setting of priorities proposals for improvement** the participants agreed that the following aspects and possible approaches should be considered:

- *Vertical approach*: In depth analysis of already identified particular Toolkit category or sub-category through expert panel work (the same approach as performed during the group discussions of Toolkit categories 3 and 6);
- *Horizontal approach*: Identifying still existing gaps throughout the Toolkit, their prioritisation, initial screening of the priority issues through task team investigations, and possible decision on need for further in-depth investigation through expert panel work;
- *Priority setting criteria*: Potential contribution of the sector/category/sub-category to the total releases; severity of the local health and/or environmental impact; availability and cost-effectiveness of solutions (the available capacity of the Toolkit experts and availability of funding).

20. The meeting continued in plenary discussion of **Possible data quality criteria, validation of data quality** and highlighted the following main aspects of this issue:

- *Toolkit review and updating:* Evaluation of quality of emission factors included or to be included into the Toolkit is the mandate of the Toolkit experts, who should ascertain that only scientifically sound data are included into the Toolkit. However, the need to indicate different level of uncertainty of emission factors related to different Toolkit categories may arise (*e.g.*, when comparing emission factors for combustion of the same fuel in a power plant or by open burning) or where the emission factor is based only on a limited number of experiments;
- *Toolkit use:* Level of uncertainty in selecting the emission factor from the Toolkit;
- *Toolkit use:* Level of uncertainty in generating the activity data, "expert judgement";

- *Reporting:* Possibilities of indicating the level of uncertainty and or data quality while reporting the inventory results:
    - Reporting of ranges (gives good indication of uncertainty, however may create problems while summarising releases);
    - IPCC guidelines on reporting uncertainties of release inventories (Currently the most complex document on the issue, however developed for a different purpose (green house gas emissions trading)) and for the purpose of Stockholm Convention not suitable;
    - Simple qualifiers, *i.e.*, data quality codes (A-E).

# VI. Synthesis

21. While discussing the issues of concern and possibilities to improve the Toolkit it was highlighted by some of the participants that the Toolkit should not be overcomplicated but remain as user-friendly as possible. It was emphasized that for estimating national releases, emission factors and national activity data are equally important. Further, both have inherent uncertainties, which should be addressed by the Expert Group.

22. With respect to the activity data, certain information likely to be readily available or easily accessible, should be proposed as default. Preferably the same activity should be applicable to calculate releases to all media, without need for further re-calculations or conversions.

23. A tiered approach may be used: Simple approach to be used by countries where only limited information is available (*e.g.*, total activity rate and one default emission factor) and a more sophisticated solution where detailed information is available (*e.g.*, further splitting of activity data to apply more specific emission factors).

24. The lack of guidance as to how to generate the various activity data for use in the Toolkit was emphasized. It was recommended that such guidance being developed to assist countries in the development of their release inventories.

25. Several participants expressed their concern related to implications of the Toolkit revision and updating process with regard to already reported inventories, as well as to inventory revisions (recalculating the releases for a particular year if better activity data and/or emission factors became available) and updating (establishing release inventory for future time (time trend)). The Expert Group agreed that guidance will be necessary in order to harmonise the approach for inventory review and updating in support of data comparability and consistency.

26. For Toolkit categories 3 and 6, issues of concern and priorities to be addressed during the intersessional period were identified and outlined in detail in annexes V and VI, respectively.

27. In addition, it was found that the following subcategories of the Toolkit need better characterization especially with a view on developing country situations:

- Brick production with special emphasis on fuels used;
- Simple stoves (3-stones);
- Emission factors for vehicles using non-gasoline/diesel fuel and 2-stroke engines;
- Charcoal production and use;
- Metal industry (platinum, nickel);
- Small-scale (informal/artisanal) industry present in developing countries;
- Petroleum industry (catalyst regeneration);

28. Other issues of concern were:

- Lack of emission factors for PCB and HCB throughout the Toolkit.
- Minor mistakes and inconsistencies in the Toolkit (in particular in the Excel sheets).

# VII. Workplan for the intersessional period

29. The participants agreed that personal meetings of the Toolkit experts on yearly basis are very important and should be continued. However, intersessional work with clearly assigned roles and responsibilities remains essential for achieving considerable advances in the Toolkit review and updating

process. The following items were proposed and agreed for the intersessional workplan (December 2007-December 2008):

30. Category 3: Detailed workplan is outlined in annex V.

31. Category 6: Detailed workplan is outlined in annex VI.

32. Other issues of concern:

- Brick production with special emphasis on fuels used:
  A task team will investigate the issue further and evaluate its relevance and possibly develop a two-stage project (initial screening project and full project);
- Simple stoves (3-stones)
  A task team will investigate the issue further and evaluate its relevance (João de Assunção to provide statistical data);
- Emission factors for vehicles using non-gasoline/diesel fuel and 2-stroke engines:
  see paragraph 36;
- Charcoal production and use:
  A task team will investigate the issue further and evaluate its relevance. Minghui Zheng will provide initial measurements from charcoal factories. Marwan Dimashki highlighted the option to apply to the GEF Small Grant project to investigate the possible presence of PCDD/PCDF in the surroundings of the kernel oil extraction facilities (at UNDP Syria).
- Metal industry (platinum, nickel):
  A task team will investigate the issue further and evaluate its relevance.
- Small-scale (informal) industry used in developing countries
  This issue will be partially addressed by some of the task teams.
- Catalyst regeneration:
  New information is available for petroleum industry in the BAT Reference Document developed under the European IPPC Directive (BREF).

33. HCB, PCB: all experts are invited to provide available information. It was recommended that HCB and PCB emissionmeasurements should be included in all ongoing and planned projects to allow for derivatization of emission factors.

34. Editorial corrections in the Toolkit: Heidelore Fiedler with assistance of Marwan Dimashki will collect all information and identified mistakes and perform the necessary corrections.

35. Data quality: The Secretariat will secure a background paper on this issue for consideration at the next meeting.

36. In addition, Mr. João de Assunção offered to circulate to all members a report concerning emission factors for vehicles using non-gasoline/diesel fuel. Mr. Yasuhiro Hirai will provide information about available emission factors for HCB and PCB, once the official submission of these data will be approved by the responsible authorities. Mr. Emanuel Fiani will make available to the group new information for petroleum industry (BREF document).

37. Members with direct access to well equipped dioxin laboratories will investigate possibilities of analysing a few indicative samples from the identified priority source categories.

### Fundraising

38. All experts (including the Secretariat and UNEP Chemicals) will investigate possibilities for fundraising to support related activities for example through direct contributions into the Stockholm Convention Voluntary Trust Fund, through funding of related national or international projects, or by hosting of Toolkit expert meetings (including covering of the travel costs of eligible participants as well as of the Secretariat and UNEP Chemicals).

## VIII. Set up of the structure for intersessional work

39. Two expert panels have been established:
**Expert Panel on Toolkit Category 3** -Fossil fuel and biomass fuel power plants; household heating and cooking (lead by Ms. Ute Karl, members: Marwan Al-Dimashki, Emmanuel Fiani, Sergey Kakareka, Charles Mirikau, David Niemi, Chalongkwan Tangbanluekal, Gerhard Thanner, Nee Sun Choong Kwet Yive, Minghui Zheng).
**Expert Panel on Toolkit Category 6** - Open burning of biomass and waste (lead by Ms. Heidelore Fiedler,

members: João Vicente de Assunção, Youssef Bennouna, Henk Bouwman, Beatriz Cárdenas, Patsy Costner, Verónica Gonzálvez, Adam Grochowalski, Michael Harris, Yasuhiro Hirai, Jargalsaikhn Lkhasuren, Stellan Marklund, Luis Tournier, Gunther Umlauf, Roland Weber).

40. The following task teams have been established to facilitate initial investigation of the identified additional issues of concern:

- Task team on brick production (lead: Gunther Umlauf, members: Charles Mirikau, Beatriz Cardenas, Pat Costner, Henk Bouwman, Adam Grochowalski)
- Task team on simple stoves (lead: João de Assunção, members: Gunther Umlauf, Charles Mirikau, Beatriz Cardenas, Pat Costner, Henk Bouwman, Adam Grochowalski)
- Task team on charcoal production and use (lead: João de Assunção, members: Gunther Umlauf, Charles Mirikau, Beatriz Cardenas, Pat Costner, Chalongkwan Tangbanluekal, Minghui Zheng, Marwan Dimashki)
- Task team on metal industry (lead: Emanuel Fiani, members: Beatriz Cardenas, Roland Weber).

41. The expert groups and task teams will work intersessionally, coordinated and facilitated by their leaders. The outcomes of their work will be presented and discussed at the next Toolkit meeting. Outcomes of the expert panel work should lead to proposals for review and updating of the Toolkit to be considered by the Conference of the Parties at its fourth meeting in May 2009.

# IX. Closure of the Meeting

42. The next Toolkit expert meeting was tentatively scheduled for the first week of December 2008. Several experts expressed their willingness to investigate possibilities of hosting the forthcoming Toolkit expert meetings.

43. Following the customary exchange of courtesies, the meeting was closed on Friday, 7 December 2007, at 13.35 hours.

**Annex I**

# Expert Meeting to Further Develop the Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases

## Geneva, Switzerland, 5-7 December 2007

## Programme

**Venue:** **International Environment House (IEH)**
**11-13, chemin des Anémones**
**CH-1219 Châtelaine (GE), Switzerland**
**Room 3 (Ground floor)**

| **Wed, 5 Dec 2007** | | |
|---|---|---|
| 8:30-9:00 | Registration | |
| 9:00-10:00 | Opening of the Meeting<br>Introduction of the participants<br>Adoption of the agenda<br>Objectives of the Expert Meeting<br>Organizational Matters | Mr. Donald Cooper, Executive Secretary of the Stockholm Convention<br>SSC and Chemicals |
| 10:30-11:00 | Mandate by Decision SC-3/6 "Review and Updating of the Toolkit" | Katarina Magulova, SSC |
| 11:00-12:30 | **Presentations of national projects**<br>Evaluation of Emission Factors for Category 3 | Ute Karl, Germany |
| | French measurement campaign of PCDD/Fs, HCB and PCBs from biomass boilers | Emmanuel Fiani, France |
| | Inventory of dioxin and furan releases in Potchefstroom, South Africa-experience with Toolkit use | Henk Bouwman, South Africa |
| | First results from ashes in Benin | Heidelore Fiedler, UNEP Chemicals |
| *12:30-14:00* | *Lunch* | |
| 14:00-16:30 | **Report on status of planned and on-going UNEP projects** | Katarina Magulova, SSC<br>Heidelore Fiedler, UNEP Chemicals |
| | European Commission support to the SSC for the further elaboration of the Dioxin and Furan Toolkit | |
| | UNEP Project "Emission Factors from Open Burning of Biomass – Toolkit Category 6(b)" | |
| | UNEP Project "Hazardous Substances from Open Burning of Waste in Developing Countries" | |

| | | |
|---|---|---|
| | Study of waste composition and waste dump fires in Mexico | Beatriz Cardenas, Mexico |
| | Waste composition in China | Minghui Zheng, China |
| | Experimental realization of waste burns | Stellan Marklund, Sweden |
| 16:30-17:00 | Introduction to the group discussions | SSC and Chemicals |
| **Thu, 6 Dec 2007** | | |
| 9:00-12:30 | **Break-out in Technical Working Groups (WG1 and WG2 in parallel)** | |
| | WG 1 – Panel 1: Revisiting emission factors for fossil fuels and biomass fuels | Chair:<br>Rapporteur: |
| | WG 2 – Panel 2: (a) Definition of biomass in fires<br>(b) Definition of waste composition in fires<br>(c) Characterization of fire type | Chair:<br>Rapporteur: |
| *12:30-14:00* | *Lunch* | |
| 14:00-17:30 | **Continuation of Working Groups (WG3 and WG4 in parallel)**<br>WG 3 – Panel 3 Process of identifying still existing shortcomings and gaps, setting of priorities, and proposals for activities for improvement | |
| | WG-4 – Panel 4 Possible data quality criteria for validation of data / information, in order to ensure that only scientifically sound information is included in the Toolkit | |
| **Fri, 7 Dec 2007** | | |
| 9:00-12:30 | Report from Working Groups; Synthesis<br>Workplan for Intersessional Period;<br>Set up the necessary organizational structure (expert panels)<br>Closure of Expert Meeting | |
| *12:30-14:00* | *Lunch* | |

# Annex II List of participants

## TOOLKIT NOMINATED EXPERTS

### AUSTRIA

Mr. Gerhard Thanner
Analytical Chemist, Organic Analysis
Federal Environment Agency/Umweltbundesamt GmbH
Spittelauer Lände 5
A-1090 Vienna
Austria
Tel.: +43 (1) 313 04 51 14 /
Fax: +43 (1) 313 04 52 22 /
Email: gerhard.thanner@umweltbundesamt.at;

### ARGENTINA

Mr. Luis Alberto Tournier
Technical Scientific Advisor, Subsecretaria de Promocion i Jesarrollo Sustenable
Secretaria de Ambiente y Desarrollo Sustentable
San Martin 451
Ciudad Autonoma de Buenos Aires
1001 Buenos Aires
Argentina
Tel.: +54 (11) 43 48 82 00 int: 8709 / +54 (11) 43 48 86 34
Fax: +54 (11) 43 48 86 34 /
Email: ltournier@ambiente.gov.ar;
latournier@gmail.com

### BELARUS

Mr. Sergey Kakareka
Head, Laboratory of Transboundary Pollution and Climate
Institute for Problems of Natural Resources Use & Ecology
Skoriny 10
220114 Minsk
Belarus
Tel.: +375 (17) 266 34 27 /
Fax: +375 (17) 266 34 27 /
Email: sk001@yandex.ru;
kakareka@ns.ecology.ac.by

### BRAZIL

Mr. João de Assunção
Head of Department / Professor Dr, Department of Environmental Health
University of Sao Paulo
Avenida Dr. Arnaldo 715
01246.904 Sao Paulo
Brazil
Tel.: +55 (11) 55 32 03 75 / +55 (11) 30 61 77 12
Fax: +55 (11) 30 61 77 32
Email: jianya@usp.br; jva@terra.com.br

### CANADA

Mr. David Niemi
Head, Emissions Inventory Reporting and Outreach, Criteria Air Contaminants Section, Science and Technology Branch
Environment Canada
9th Floor PVM, 351 St. Joseph Blvd
Gatineau K1A 0H3
Canada
Tel.: +1 (819) 994 61 42 /
Fax: +1 (819) 934 41 58 /
Email: david.niemi@ec.gc.ca;

### CHINA

Mr. Minghui Zheng
Professor
Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences
No.18 Shuangqing Road, Haidian District
Beijing 100085
China
Tel.: +86 (10) 628 49 172 /
Fax: +86 (10) 629 23 563 /
Email: zhengmh@rcees.ac.cn;

### EUROPEAN COMMISSION

Mr. Gunther Umlauf
Rural, Water and Ecosystem Resources (RWER)
Joint Research Centre of the European Commission, Institute for Environment and Sustainability
Via E. Fermi 2749
I-21027 Ispra (Varese)
Italy
Tel.: +39 (0332) 78 60 40 /
Fax: +33 (0332) 78 63 51 /
Email: gunther.umlauf@jrc.it

## FRANCE

Mr.Emmanuel Fiani
Expert, Industrial and Agricultural Processes Department
French Agency for Environment and Energy Management (ADEME)
20, avenue du Grésillé
BP 90406
F-49004 Angers
France
Tel.: +33 (241) 91 40 14 /
Fax: +33 (241) 91 40 03 /
Email: emmanuel.fiani@ademe.fr;

## GERMANY

Ms. Ute Karl
Group Manager, Energy Environment Economics
European Institute for Energy Research - EIfER
Emmy-Noether-Strasse 11
D-76131 Karslruhe
Germany
Tel.: +49 (721) 61 05 13 35 / +49 (721) 608-4590
Fax: +49 (721) 61 05 13 32 /
Email: ukarl@eifer.org;

## JAPAN

Mr. Yasuhiro Hirai
Associate Professor, Environment Preservation Center
Kyoto University
Yoshidahonmachi, Sakyo
606-8501 Kyoto
Japan
Tel.: +81 (75) 753 77 12 /
Fax: +81 (75) 753 7 710 /
Email: hirai@eprc.kyoto-u.ac.jp;

## KENYA

Mr. Charles Mirikau
Chemistry Department
University of Nairobi
P.O. Box 30197
00100 Nairobi
Kenya
Tel.: +254 (722) 38 78 27 / +254 (20) 444 61 38
Fax: +254 (20) 444 61 38 /
Email: cmirikau@uonbi.ac.ke;
cmirikau@yahoo.co.uk

## MAURITIUS

Mr. Nee Sun Choong Kwet Yive
Senior Lecturer, Department of Chemistry
University of Mauritius
Réduit
Mauritius
Tel.: +230 (454) 10 41 / +230 (676) 12 55
Fax: +230 (465) 69 28 /454 83 64 /
Email: robert@uom.ac.mu; robsun10@yahoo.com

## MEXICO

Ms. Beatriz Cardenas
Directora de Investigación Experimental en Contaminación Atmosférica, Dirección General de Investigación y Capacitación Ambiental
Instituto Nacional de Ecología, SEMARNAT
Av. Periférico 5000
col. Insurgentes Cuicuilco
CP 04530 Del. Coyoacán
04530 Mexico D.F.
Mexico
Tel.: +52 (55) 56 13 37 87 / +52 (55) 59 70 5524
Fax: +52 (55) 56 13 38 21 /
Email: bcardena@ine.gob.mx;
bcar@xanum.uam.mx

## MONGOLIA

Ms. Jargalsaikhan Lkhasuren
Officer, Department of Environment and Natural Resources
Ministry of Nature and Environment
Government Building
Room 512
Baga Toiruu 44
210610A Ulaanbaatar 11
Mongolia
Tel.: +976 (51) 26 65 28 / +976 8800 71 70
Fax: +976 (51) 26 65 28 /
Email: L_jargals@yahoo.com;
Jargalsaikhan@mne.gov.mn

## MOROCCO

Mr. Youssef Bennouna
Manager-Environmental engineer
Etudes et Mesures les Cinq Domaines
80, Rue Oued Ziz Apt5-Agdal
10 000 Rabat
Morocco
Tel.: +212 (37) 68 03 60 / +212 (37) 65 59 20
Fax: +212 (37) 68 03 60 /
Email: ybennouna@menara.ma;
ybennouna@gmail.com

## SOUTH AFRICA

Mr. Henk Bouwman
Potchefstroom University
Private Bag X 6001
Potchefstroom 2520
South Africa
Tel.: +27 (18) 299-2377 / +27 (18) 299-2377
Fax: +27 (18) 2992370 /
Email: henk.bouwman@nwu.ac.za

## SWEDEN

Mr. Stellan Marklund
Professor, Chemistry Department
Umeå University
SE-901 87 Umeå
Sweden
Tel.: +46 (90) 786 57 15 /
Fax: +46 (90) 128133
mob: +46 (70)6307515
Email: stellan.marklund@chem.umu.se

## SYRIA

Mr. Marwan Al-Dimachki
POPs National Expert, National Project Director
General Commission for Environmental Affairs (GCEA), Ministry of Local Administration & Environment (MoLAE)
P.O. Box 3773
Mazraa
Damascus
Syria
Tel.: +963 (11) 44 67 77 73 /
Fax: +963 (11) 44 67 77 73 /
Email: marwan.dimashki@undpprojects.sy;
m-dimash@scs-net.org

## THAILAND

Ms. Chalongkwan Tangbanluekal
Assistant Professor / National Expert on Unintentional POPs,
Toxicology/Pathology
Faculty of Medicine, Ramathibodi Hospital,
Mahidol University,
270 Rama VI Road
Rajthevee, Bangkok 10400
Thailand
Tel.: +662 (354) 72 35 /
Fax: +662 (354) 72 35 /
Email: grltb@mahidol.ac.th

## URUGUAY

Ms. Verónica Gonzalvez Reyes
Chemical Engineer, Environmental Control División
Ministry of Housing, Land use and Environment (MVOTMA), National Directorate for Environment (DINAMA)
Galicia 1133, 2nd floor
11100 Montevideo
Uruguay
Tel.: +598 (2) 917 07 10 Ext 4102 / +598 (2) 9170710 Ext: 4105
Fax: +598 (2) 917 07 10 Ext 4170 /
Email: gveronic@gmail.com;
veronica.gonzalvez@dinama.gub.uy

# INVITED EXPERTS

Mr. Adam Grochowalski
University professor, Analytical Chemistry/Chemical Engineering
Krakow University of Technology
Warszawska 24 str.
31155 Krakow
Poland
Tel.: +48 (12) 62 82 112 / +48 602 500878
Fax: +48 (12) 62 82 036 /
Email: agrochow@chemia.pk.edu.pl;

## NON-GOVERNMENTAL ORGANIZATIONS (NGOS)

### INTERNATIONAL POPS ELIMINATION NETWORK

Ms. Patsy Costner
Senior Science Advisor
International POPs Elimination Network
512 Country Road 2663
72631 Eureka Springs, AR
United States of America
Tel.: +1 (479) 253 84 40 / +1 (479) 253 1626
Fax: +1 (479) 253 58 99 /
Email: pcostner@ipa.net; pcostner@gmail.com

### WORLD CHLORINE COUNCIL

Mr. Michael Harris
Consultant
World Chlorine Council (WCC)
16 Long Acre, Cuddington
Northwich CW8 2XP
United Kingdom
Tel.: +44 (16 06) 88 94 54 / +32 (2) 676 72 51
Fax: +44 (87 07) 06 52 78 /+32 2 676 72 41 /
Email: mikh@delco.idps.co.uk;
mikh43@googlemail.com

## OBSERVERS

Dr. Roland Weber
POPs Environmental Consulting
Visiting Professor Oerebro University
Ulmenstrasse 3
D-73035 Goeppingen
Germany
Phone: +49-(0)7171-189-809
Fax: +49-(0)1212-581-637-860
Mobile: +49-(0)174-712-5593
E-mail: roland.weber10@web.de

### STOCKHOLM CONVENTION SECRETARIAT

Mr. Donald Cooper
Executive Secretary
Secretariat of the Stockholm Convention
International Environment House
11-13, chemin des Anémones
1219 Châtelaine
Geneva
Switzerland
Fax: +41 22 917 80 98 /
Email: dcooper@pops.int

Ms. Fatoumata Keita-Ouane
Senior Scientific Affaris, Technical Team Leader
Secretariat of the Stockholm Convention
International Environment House
11-13, chemin des Anémones
1219 Châtelaine, Geneva
Switzerland
Tel.: +41 22 917 81 61 /
Fax: +41 22 917 80 98 /
Email: fouane@pops.int

Ms. Katarina Magulova
Programme Officer, Technical Team
Stockholm Convention Secretariat
International Environment House
11-13, chemin des Anémones
1219 Châtelaine, Geneva
Switzerland
Tel.: +41 22 917 81 70 /
Fax: +41 22 917 80 98 /
Email: kmagulova@pops.int

### UNEP, CHEMICALS BRANCH, DTIE

Ms. Heidelore Fiedler
Scientific Affairs Officer
United Nations Environment Programme (UNEP)
Division of Technology, Industry and Economics
(DTIE), Chemicals Branch
International Environment House-I
11-13 Chemins des Anémones
CH-1219 Châtelaine (GE)
Switzerland
Phone: +41 (22) 917-8187
Fax: +41 (22) 797 3460
Email: hfiedler@chemicals.unep.ch

# Annex III
# Presentations- national activities

- Evaluation of Emission Factors for Category 3 (Ute Karl);
- French measurement campaign of PCDD/Fs, HCB and PCBs from biomass boilers (Emmanuel Fiani);
- Inventory of Dioxin and Furan releases in Potchefstroom, South Africa-experience with Toolkit use (Henk Bouwman);
- First results from ashes in Benin (Heidelore Fiedler);
- Environmental concerns related to the atmospheric emissions and ash residues from the burning of olive cake after extraction of residual oil “Kernel-oil extraction and charcoal production Factories in the Mediterranean region” (Marwan Dimashki).
- Emissions of PCDD/F from Otto vehicles (João de Assunção- full report to be provided)

## Annex IV

## Presentations- UNEP projects

- UNEP Project “Emission Factors from Open Burning of Biomass – Toolkit Category 6(b) (Heidelore Fiedler);
- UNEP Project “Hazardous Substances from Open Burning of Waste in Developing Countries” (Heidelore Fiedler);
- Study of waste composition and waste dump fires in Mexico (Beatriz Cardenas);
- Waste composition in China (Minghui Zheng);
- Experimental realization of waste burns (Stellan Marklund).

# Annex V

**Expert Meeting to Further Develop the Standardised Toolkit for Identification and Quantification of Dioxin and Furan Releases**

**WG 1 – Panel 1** **Thursday 6th December 2007**

The Working Group (Panel 1) was convened as foreseen in the Agenda for the meeting with the charge to consider issues relating to Main Category 3 of the Toolkit (Heat and Power Generation) and in particular:

1. Consideration of updated emission factors within the category
2. Concordance between Toolkit and the calculation spreadsheet
3. Potential changes to facilitate use in developing countries.
4. Consideration of quality of the emission factors.

The Working Group met under the chairmanship of Ute Karl, Germany. David Niemi, Canada, acted as rapporteur.

The other participants in the Working Group were: Sergey Kakareka (Belarus), Chalongkwan Tangbanluekal (Thailand), Gerhard Thanner (Austria), Charles Mirikau (Kenya), Marwan Al-Dimashki (Syria), Emmanuel Fiani (France), Minghui Zheng (China), Nee Sun Choong Kwet Yive (Mauritius).

In commencing its work the Working Group welcomed and took careful note of the reminder from the Secretariat of the Stockholm Convention that the purpose of the Toolkit is to allow the creation of inventories without specifically performing dioxin analysis and that if the Toolkit is not kept simple the original objective will be lost.

The Working group initially discussed what available new information is available for inclusion in the Category 3. The following is to be provided during the intersessional work to update the Toolkit section:

1. Germany – Ute Karl – Summarized EF information from literature review.
2. France – Emanuel Fiani - Wood / Biomass combustion.
3. Canada – David Niemi – Detailed PCDD, PCDF and HCB.
4. Canada – David Niemi – Outdoor wood fired home boilers.
5. Poland – Adam Grochowalski – High chlorine coal combustion.
6. Kenya – Charles Mirikau – Charcoal information.
7. Thailand – Chalongkwan Tangbanluekal – Heat contents for biomass.
8. UNEP Chemicals – Heidi Fiedler - Benin results on solid residues from cooking.

### 6.3 Main Category 3 – Heat and Power Generation

The Working Group decided to address its task by proceeding through the information provided in Toolkit Section 6.3, subsection by subsection, table by table. There were discussions about the information contained within the table and the text as well as any assumptions or limitations which should be spelled out in more detail for users of the Toolkit.

#### 6.3.1 Fossil Fuel Power Plants:

The following bullets summarize the major points of the discussions:

- Caption to Table 35 to also mention utility so as to reduce potential confusion.
- Utilize the updated factors from the list of information above.

- Need to specify what coals are high chlorine coals.
    - How to determine the chlorine content of the coal could be an issue.
    - Need to provide ranges of chlorine content, relative to what.

Utilizing the information at hand from Ute Karl, the table below was drafted with potential updates to the Toolkit.

Table 35: Emission factors for heat and power generation plants and heat/energy generating plants in *utility and* industry fuelled with fossil fuels.

| | Air | Water | Residue |
|---|---|---|---|
| 1. Fossil fuel / waste co-fired power boilers | No New Information | | |
| 2. Coal fired power boilers | | | |
| Small / Med < 50 MW | 10 | - | 4 μg/tonne[3] |
| High $Cl_2$[1] | 200 | - | |
| Large > 50 MW | 5 | - | 1 μg/tonne[2] |
| 3. Heavy Fuel Fired power boilers | Available info in-line with Toolkit | | |
| 4. Shale oil fired power plants | No New Information | | |
| 5. Light fuel oil/natural gas fired power boilers | No New Information | | |

[1] Chlorine (NaCl) content > 0.1 %
[2] Fly ash only, not bottom ash (per tonne of ash)
[3] Combined fly and bottom ash (per tonne of ash)

Note: Information from Poland: High chlorine coal is not increasing PCDD/PCDF emissions from large boilers.

During the discussions note was taken of the items for the intercessional work and data gaps to be resolved were kept track of and summarized below:

Work plan Items Section 6.3.1.

- The text of section 6.3.1 needs to be updated to reflect the new information in table 35.
- Need to specify that these are developed from emissions testing at facilities with PM and some SOx and NOx controls.
- Need to specify assumptions for those performing estimates with little additional information (i.e. if not known if the coal is high chlorine)
- Concordance of the Toolkit information to the Excel calculation spreadsheets.
- Update of the text.

GAPS for 6.3.1.

- Require an assessment of the chlorine content's impact on emissions from large power boilers.
- Need residue information for the FF/co-fired power boilers.
- Need information on the assumed control devices for each of the fuel types.
- Need an adjustment / EFs for uncontrolled (or minimal controlled) combustion of coal.
    - Provide recommendation on the EF for minimal controls.
    - At least some clarifying statements.

### 6.3.2 Biomass Power Plants

The following are some of the additional discussion items that arose:

Confusion exists between clean / contaminated wood waste for boilers in classes 1 and 3. Some suggestions for definitions:

Clean – virgin wood, little contamination of wood with manmade substances.
Contaminated – (generic definition that is easily understood) waste which has been contaminated with paints, preservatives, etc…

It was brought up and recognized by the Working Group that the BAT/BEP Group had dealt with these definitions and to we should ensure concordance between information and definitions.

Utilizing the information at hand from Ute Karl the table below was drafted with potential updates to the Toolkit, work to continue intersessionally.

Table 36: Emission factors for clean biomass based power generation

| Classification | Air | Water | Residue |
|---|---|---|---|
| Wood[1] | | | |
| Old technology | 50 | | *15*** |
| New technology | 5 | | *15*** |
| Herbaceous biomass[2] | 50 | | *70*[4] |
| Mixed biomass (waste) [3] | 500 | | ND |

[1] for older technology boilers emission factor may be as high as 50 μg TEQ / TJ
[2] Herbaceous – Straw, rice husks, (? Bagasse ?), cassava rhizome, etc.
[3] Mixed biomass – Need definitions
[4] μg TEQ/tonne of mixed residues, need appropriate units.
** μg TEQ/TJ need appropriate units.

Work plan 6.3.2.

- Verify and confirm the peat information for potential inclusion.
- Locate and derive definitions for inclusion.
- Review and research gaps to fill in information in the Toolkit.
- Revised text as appropriate.
- Concordance of the Toolkit information to the Excel calculation spreadsheets.

Gaps 6.3.2

- Bagasse – Only PCDD/PCDF in fly ash, not bottom ash, no information on the gases.
- How to handle changes in the emission factors.
    - This may cause changes in ranking of sectors.
    - May have significant impacts on countries' NIPs.
    - Procedure for providing updates to reported information.
    - Requires decisions from the COP.
- Need to include peat somewhere. Was included in BAT/BEP guidelines, used in Finland and Ireland in their inventories (8.5–9.64 μg TEQ/TJ for peat combustion ~40 MW was used as emission factor to air - confirm the information as to the assignment of the EG).
- Need definition of "mixed biomass".
    - Strengthening of the emission factor.
- Need - mixed biomass: EF for residue.
- Need - wood fired new technology: EF for residue.
- Need further information as to the use of EF "500" for "Mixed Biomass". Should this continue to be included in the Toolkit as such?

**6.3.4 Household Heating and Cooking with Biomass**.

The following are some of the additional discussion items that arose:

Peat – suggestion to use a coal emission factor. 17.5 μg TEQ/TJ from Finish inventory and is close to their 20 μg TEQ/TJ for wood. Request opinion of the group if should use 50 μg TEQ/TJ for this as well? Need further clarification and discussion.

Table 38: Emission factors for biomass based household heating and cooking.

| | Air | Water | Residue |
|---|---|---|---|
| Wood | | | |
| Pellet combustion | 50 | | *30*[1] |
| Wood combustion | 100 | | *30*[1] |
| Peat | | | |
| Charcoal | | | |
| Virgin biomass | 100 | | *10* |
| Contaminated Biomass | 1500 | | *1000* |

For contaminated wood, use the contaminated biomass EF.
[1] μg TEQ/tonne of residue

Work plan items 6.3.4.

- Work on clarification of the terminology used.
- Definitions as required.
- Review and research gaps to fill in information in the Toolkit.
- Revised text as appropriate.
- Concordance of the Toolkit information to the Excel calculation spreadsheets.

Gaps 6.3.4.

- Need definitions for the inclusion of the appropriate materials under the classification "Biomass". E.g where would "dung" be placed?
- EFs for peat and charcoal for releases to air and residue.
- Need to clarify all units!
- Change residue EF into μg TEQ/TJ

### 6.3.5 Domestic Heating and Cooking with Fossil Fuel

Similar discussions and issues raised were similar to the previous sections. Updates to the tables were provided.

Table 39. Emission factors for fossil fuel based domestic heating

| | Air | Water | Residue |
|---|---|---|---|
| Coal | | | |
| Automatic feed | | | |
| HighCl[1] | 1000 | | *15* |
| Low Cl | 100 | | *5* |
| Manual feed | | | |
| High Cl[1] | 15 000 | | 15 |
| Low Cl | 200 | | *5* |
| Fuel oil | 10 | | |
| Kerosene | | | |
| Natural gas / LPG | 1.5 | | |

[1] Chlorine (NaCl) content > 0.1 %

Notes to Table(s):
- The automatic feed heaters incorporate advance combustion techniques.
- LPG – Suggestion using the natural gas EF on the basis of TJ

Work plan items 6.3.5.

- Work on clarification of the terminology used.
- Definitions as required.

- Review and research gaps to fill in information in the Toolkit.
- Revised text as appropriate.
- Concordance of the Toolkit information to the Excel calculation spreadsheets.

Gaps 6.3.5.

- Need the chlorine content to define "High" and/or countries.
- Need definitions for all terms.
- Need the residues in terms of TJ of fuel burnt instead of using "μg TEQ/tonne".
- Need to discuss and evaluate the large discrepancy between the Toolkit and new literature for the Residue EF values. Technical reasons for keeping or changing.
- Soot and fly ash – need this in terms of coal consumed.

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

Overall there was a concern expressed:

- to ensure the consistency of the units emission factors in both Toolkit and spreadsheet as well
    - Co-ordination of Section 6.3 emission factors between Toolkit and Spreadsheet – Marwan Al-Dimashki (Syria).
- Check the information availability for estimation of residue quantities and releases of PCDD/PCDF and update as required.

**Proposals for Improvements**

- A lead(s) is required for the update.
- Intersessional work to be performed by members to effect the changes.
- Confirm / check the heating values in the Annex.
- Add the heating values in from Thailand.
- Work on the work items for each of the sections.

***Plenary Discussions***

- Very different how the activities are available.
- Need to have a discussion on the calculations of the residue quantity for the calculation of the EF for the residues.
- Need to provide assumptions for the calculations (*e.g.,* types of devices)
- Include additional information.
- Need to consider how to get activity levels for any modifications of the emission factor categorization.
- Need HCB and PCB releases to the various media.
- Quality criteria needs to be added.

Expert Panel membership:

Ute Karl (Germany) ukarl@eifer.org
Sergey Kakareka (Belarus) kakareka@ns.ecology.ac.by
Chalongkwan Tangbanluekal (Thailand) grltb@mahidol.ac.th
Gerhard Thanner (Austria) Gerhard.thanner@umweltbundesamt.at
Charles Mirikau (Kenya) emirikau@uonbi.ac.ke
Marwan Al-Dimashki (Syria) marwan.dimashki@undpprojects.sy
Emmanuel Fiani (France) emmanuel.fiani@ademe.fr
Minghui Zheng (China) zhengmh@rcees.ac.cn
Nee Sun Choong Kwet Yive (Mauritius) Robert@uom.ac.mu
David Niemi (Canada) david.niemi@ec.gc.ca

# Annex VI

**Expert Meeting to Further Develop the Standardised Toolkit for Identification and Quantification of Dioxin and Furan Releases**

**WG 2 – Panel 2** **Thursday, 6 December 2007**

The Working Group (Panel 2) was convened as foreseen in the Agenda for the meeting with the remit to consider issues relating to Main Category 6 of the Toolkit (Open Burning Processes) and in particular:

1. Definition of biomass in fires.
2. Definition of waste composition in fires.
3. Characterisation of fire type.

The Working Group met under the chairmanship of Stellan Marklund, Sweden. Michael Harris, World Chlorine Council, acted as rapporteur.

The other participants in the Working Group were: Youssef Bennouna (Morocco), Henk Bouwman (South Africa), Beatriz Cárdenas (Mexico), Patsy Costner (International POPs Elimination Network); Heidelore Fiedler (UNEP Chemicals Branch); Verónica Gonzalvez (Uruguay); Adam Grochowalski (Independent Expert); Yasuhiro Hirai (Japan); Jargalsaikhn Lkhasuren (Mongolia); Luis Tournier (Argentina); Gunther Umlauf (European Commission); João Vicente de Assunção (Brazil); Roland Weber (Observer).

In commencing its work the Working Group welcomed and took careful note of the reminder from the Secretariat of the Stockholm Convention that the purpose of the Toolkit is to allow the creation of inventories without specifically gathering new data and that if the Toolkit is not kept simple the original objective will be lost.

The Working Group decided to address its task in two main sub-categories in line with the treatment adopted in the Toolkit:

1. Biomass burning, and
2. Waste burning and accidental fires.

## Biomass Burning

The Working Group recognised that this sub-category could be further divided either as to the type of fire or as to other parameters that had the potential to influence typical emission factors. After some discussion it was decided that sub-division by the type of fire was the most practical approach for any future revision of the Toolkit but that in using the Toolkit it would be important to consider several other parameters on a case-by-case basis.

<u>Classification as to the type of fire</u>:

1. Agricultural, e.g. sugar cane pre-harvest burning, potato post-harvest burning.
2. Prescribed or uncontrolled burning, e.g. many forest fires.
3. Prescribed or uncontrolled burning, e.g. many grass fires.
4. Prescribed or uncontrolled moorland fires – typically involving peat, very slow burning and long lasting.

In each of these four cases it would often be necessary to consider on an individual basis the differences between other parameters potentially influencing emission factors, *viz.*

1. Crown fires (‘flaming fires’, ‘hot fires’) vs. ground level or sub-soil smouldering (‘cool fires’). One or both scenario might be present in any specific case and the balance may depend *inter alia* on whether the fire is prescribed or uncontrolled.

2. Amount of trace substances (e.g. chlorine from any source, copper) and heterogeneous catalysis (e.g. from surface contact with soil).

As a guiding principle the Working Group stressed the importance of minimising the number of different emission factors used in the Toolkit, in particular bearing in mind the limited capacity of many countries for the determination of the relevant data. The four classes described above were seen as a minimum on order to assign meaningful emission factors. The importance of other parameters as outline in the preceding paragraph highlighted the impossibility of entirely dispensing with the use of expert judgement when the Toolkit is applied in practice.

The Working Group felt that there might be value in establishing some kind of standing panel of scientific experts who could serve as a resource upon which Parties could draw when applying the Toolkit. This might be low-cost mechanism using volunteer experts and conducted by telephone and or e-mail. The Working Group recommended that this matter might be further discussed by WG 3 (Panel 3) as foreseen under the agenda of the present meeting.

Data gaps

It was recognised that existing data would need to be disaggregated and that there was a possible need for future experimental exploration of relevant scenarios. It would be vital to prioritise such experimental work but the Working Group did not have time to address this issue and recommended this as a priority task for WG 3 (Panel 3) and/or for intersessional work. In all cases it will be crucial to characterise the combustion conditions as precisely as possible.

Recommendations for the disaggregation of existing data and possible future experimental scenarios are presented in Table 1 below:

**Table 1**

| **Fuel type** / **Parameters** | **Flaming wood** | **Smouldering wood** | **Flaming non-woody vegetation** | **Smouldering non-woody vegetation** |
|---|---|---|---|---|
| Dry / wet | | | | |
| Chlorine content and species | | | | |
| Catalysis – Cu? Heterogeneous? | | | | |
| Agricultural chemicals used | | | | |
| Type of such chemicals | | | | |

Other activities

The Working Group recommended a number of other activities, *viz.*

*Literature search*

To be done intersessionally. H Fiedler offered to coordinate with the Australian and the USA groups. Among the sources mentioned were:

1. Compilation from *Dioxin 2007.* As published in *Organohalogen*. H Fiedler offered to provide details …
2. Emission factors in *Atmospheric Environment* re fuel sources (viz. grasses).
3. A recent publication by Brian Gullett (USA).

*Use of existing data, e.g. surrogate indicator species*

B Cárdenas offered to provide information from Mexico on other substances that could perhaps be used as indicator species. This would be especially useful in disaggregating the dioxin burden between identified activities.

*Correction of 'suspicious' data points*

A mechanism is required for validation built into the use of the Toolkit, for example to identify outlier data and to assess whether it was valid or an artefact.

## Waste Burning and Accidental Fires

The Working Group decided that there was a need to restructure the subsidiary classifications under this sub-category in the Toolkit. The Working Group proposed a new structure as follows:

### Fires at dump and landfill sites[2]

This was identified as probably the most important outstanding data gap and the Working Group welcomed the work ongoing in China and Mexico, which was expected to provide further data on fuel types.

After some discussion the Working Group concluded that the general description provided in Section 6.6.2 of the Toolkit remained broadly correct but that some further classification was needed, as follows:

**Input to site predominantly domestic / commercial.**

**Input to site predominantly manufactured or engineered.**

**Mixed.**

### Backyard burning

**Barrel burning**

Good data is already available, including fuel type dependency.

**Open piles, bonfires, etc.**

### Burning of specific wastes of particular concern

**Electrical and electronic wastes**

**Contaminated wood / demolition**

The Working Group noted that the source intensity can be very high, e.g. chlorophenol treated wood.

**Other 'problematic' wastes**

### Fires in structures and transportation fires

[2] This class is to include atmospheric emissions and releases to land from waste disposal sites – whether the site is authorised or not and whether the fire is accidental or prescribed. See Section 6.6.2 of the Toolkit.

### Buildings

There are only limited data available but some work is in progress at the University of Umeå. Inevitably there would in practice be a range of emission factors. For example, fires involving a high loading of textiles would have higher emission factors. There would also be wide variations as to the location and type of building. Thus shack fires in a developing country would have very different characteristics to a fire in a 'typical' house in the developed world; thus there was a need in practice to distinguish between 'conventional' and 'indigenous' buildings. In order to avoid excessive sub-classification the Working Group recommended two sub-classes as follows:

1. Domestic housing
2. Warehouses and depôts

### Land vehicles, ships and aircraft

The Working Group believed that this was a relatively minor activity and surmised that it might also be a relatively a minor source.

### Tunnel fires

### Long-lasting mine fires and similar

The Working Group made generic recommendations for the disaggregation of existing data and for possible future experimental scenarios. It would be vital to prioritise such experimental work but the Working Group did not have time to address this issue and recommended this as a priority task for WG 3 (Panel 3) and/or for intersessional work. In all cases it will be crucial to characterise the combustion conditions as precisely as possible.

The matrix would be similar to the one for biomass burning but probably with only two categories required as to the type of fire. The Working Group recommended that the key parameters be finalised intersessionally and proposed a matrix as in Table 2 below.

**Table 2**

| Fuel type / Parameters | Flaming / Open | Smouldering / Enclosed |
|---|---|---|
| To be agreed | | |
| | | |
| | | |

## Activity Rates

Although the remit of the Working Group primarily concerned emission factors, it was felt appropriate to recall and highlight the fundamental equation

**SOURCE STRENGTH = ACTIVITY RATE * EMISSION FACTOR**

For the successful application of the Toolkit it was essential to remember that many countries will need guidance / assistance on the determination of activity rates as well as of emission factors.

With regard to activity rates the Working Group recalled that at the first Expert Meeting it had been noted that there might be value in using an a parametric analysis based on more readily available national statistics. While GNP may be far too crude and national surface area has little or not correlation, industrial activity levels would often correlate well, e.g. with the electricity generation capacity. The Working Group recognised that this sort of parametric approach might be considerably harder to apply for open burning where crop and vegetation profiles were so varied as were non-industrial waste disposal practices. This was seen as a probable important data gap and a further area where many countries might require assistance in order to complete their inventories.

### List of Actions Agreed and Recommended by the Working Group

## 1. Biomass Burning

1. Disaggregation of existing data and revision of Section 6.6.1 of the Toolkit in order to:

    a. Incorporate the revised division of this sub-category into four classes as agreed by the Working Group using the matrix shown as Table 1 of the report of the Working Group and to include, so far as is possible based upon currently available data, emission factors appropriate for each class.

    b. Incorporate text based upon the matrix shown in Table 1 of the report of the Working Group to indicate the need to consider other parameters on a case-by-case basis when applying the Toolkit and to indicate how this could affect the default emission factors assigned under (a) above, e.g. ranges or multipliers.

    c. Incorporate text indicating the indispensability of using expert judgement when applying the Toolkit in practical situations.

    d. Make any further amendments to the text in the spirit agreed by the Working Group to make the document as simple and user-friendly as possible without compromising its scientific integrity.

    Lead: Heidelore Fiedler.

2. Consideration of the modalities for the establishment of an Expert Panel to serve as a resource for Parties when applying the Toolkit to the extent that this work is not completed during the present Expert meeting. Action: No-one assigned.

3. Further definition and prioritisation of possible future experimental scenarios on the basis of the matrix shown in Table 1 of the report of the Working Group. Action: No-one assigned.

4. Literature search and coordination with the Australian and USA groups. Action: H Fiedler.

5. Provision of information on potential indicator species to assist in the disaggregation of the dioxin burden between identified activities. Action: B Cárdenas.

6. Development of a mechanism for identifying and either validating or rejecting ‘outlier’ data when the Toolkit is applied. Action: No-one assigned.

## 2. Waste Burning and Accidental Fires

7. Disaggregation of existing data and revision of Section 6.6.2 of the Toolkit in order to:

    a. Incorporate the revised division of this sub-category into five classes as agreed by the Working Group and to include, so far as is possible based upon currently available data, emission factors appropriate for each class.

    b. Incorporate text based upon the matrix shown in Table 2 of the report of the Working Group to indicate the need to consider other parameters on a case-by-case basis when applying the Toolkit

and to indicate how this could affect the default emission factors assigned under (a) above, e.g. ranges or multipliers.

c. Incorporate text indicating the indispensability of expert judgement when applying the Toolkit in practical situations.

d. Make any further amendments to the text in the spirit agreed by the Working Group to make the document as simple and user-friendly as possible without compromising its scientific integrity. Lead: Heidelore Fiedler.

8. Further definition of and prioritisation of possible future experimental scenarios on the basis of the matrix shown in Table 2 of the report of the Working Group. Action: No-one assigned.

## 3. Activity Rates

9. Identification of types of national data that might be used in a parametric approach to making initial estimates of activity rates for Category 6 of the Toolkit, noting that those data types identified in the first Expert Meeting were more suited to the estimation of activity rates for industrial sectors. Action: No-one assigned.