

The 4th Workshop on Reduction of
Unintentional POPs
in East Asian Countries

Report

December 2010

Dioxins Control Office
Environmental Management Bureau
Ministry of the Environment, Japan

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1. Introduction

The Stockholm Convention on Persistent Organic Pollutants, with its goal of a continuous minimization and, where feasible, ultimate elimination of unintentionally produced persistent organic pollutants (unintentional POPs), requires parties to reduce their total releases of unintentional POPs from anthropogenic sources. In addition, the Parties are required to share the information and to provide the technical support consultation that will enable developing countries to develop and enhance their capacity to fulfill their obligation under the Convention.

Together with the promotion of reducing unintentional POPs through the facilitation of Best Available Techniques/Best Environmental Practices (BAT/BEP) in our country, we will hold “the 4th Workshop on Reduction of Unintentional POPs in East Asian Countries”, with the purpose of considering the measures and information sharing on the reduction of unintentional POPs in East Asian Countries, including Japan.



2. Outline of the Workshop

Title:

The 4th Workshop on Reduction of Unintentional POPs in East Asian Countries

Organizer:

Ministry of the Environment, Japan (MOEJ)

Date:

14th-15th December, 2010

Venue:

Mita Kaigisho, Tokyo, Japan

Participating countries/ organizations:

(East Asian Countries)

Cambodia, China, Indonesia, Lao People's Democratic Republic, Malaysia, Mongolia, Republic of Korea, Singapore, Thailand, Viet Nam, and Japan

(Invited countries/ organizations)

Germany, U.S.EPA, United Nations Environment Program (UNEP),
United Nations Industrial Development Organization (UNIDO)
United Nation University

Topics:

- 1) Improvement of the unintentional POPs inventories in East Asian Countries
- 2) The spread of monitoring technology of Dioxins and POPs
- 3) The present situation of application of BAT/BEP for the reduction measures in each country and development of technologies against U-POPs.
- 4) The latest international information regarding Stockholm Convention, and current topics on new POPs.

3. Program

DAY 1 (Tuesday, December 14, 2010, 9:20-17:25)

9:20- 9:45 Registration for Participants

9:45-11:15 OPENING SESSION

9:45- 9:55 Opening greeting (by the organizer)

Mr. Osami Sagisaka (Director-General, Environmental Management Bureau, Ministry of the Environment, Japan)

9:55-10:00 Election of a chairperson

(Chair: Prof. Shin-ichi Sakai, Kyoto University, Japan)

10:00-10:15 Photo session

10:15-11:15 Keynote Lecture

“Initial Assessments of PCDD/PCDF Inventories Made with the Toolkit.” (Dr. Heidelore Fiedler, UNEP)

“Reduction of Dioxin Emissions from Waste Incineration Process - Lessons learnt in Japan -“ (Dr. Hiroaki Takiguchi, Director, Dioxins Control Office, Environmental Management Bureau, Ministry of the Environment, Japan)

SESSION I (Part 1; 11:15-14:45)

Chairperson : Dr. Noriyuki Suzuki (Chief, Exposure Assessment Research Section, Research Center for Environmental Risk, National Institute for Environmental Studies)

Theme : Improvement of the unintentional POPs inventories in East Asian Countries

11:15-11:25 1-1. “Cambodia’s Activities Relating to Reduction of U-POPs and PCBs” (Mr. Pichhara Phet, Cambodia)

11:25-11:35 1-2. “U-POPs inventories from Pulp and Paper in Indonesia” (Mr. Sayid Muhadhar, Indonesia)

11:35-11:45 1-3. “Improvement of Unintentional POPs Inventories in KOREA” (Mr. Chulho Bae, Korea)

11:45-12:00 Questions and Answers

12:00-13:00 Lunch Break

SESSION I (Part 2; 13:00-14:45)

- 13:00-13:10** 1-4. “Implementation on BAT/BEP in industry in Lao PDR”
(Ms. Setouvanh Phanthavongsa, Ms. Darounny Vilaythong,
Lao PDR)
- 13:10-13:20** 1-5. “Assessment and Mitigation of an Agent Orange Dioxin
and Landmine/UXO Hot spot in Sekong Province, Lao PDR”
(Mr. Khonekeo Kingkhambang, Lao PDR)
- 13:20-13:30** 1-6. “The application of BAT/BEP as a reduction measures of
UPOPs” (Ms. Rohani Jusoh, Malaysia)
- 13:30-13:40** 1-7. “Reduction Measures of Unintentional POPs &
Application of BAT/BEP in Those Measures” (Mr. Battulga
Purevdorj, Mongolia)
- 13:40-13:50** 1-8. “Preliminary assessment on level and congener profile of
U-POPs sources in industries in Vietnam” (Mr. Pham Huu
Toan, Vietnam)
- 13:50-14:00** 1-9. “Experience of Inventory of Crematoria in Thailand” (Mr.
Aram Bhandhuwana, Thailand)
- 14:00-14:10** 1-10. “4th Workshop on the Reduction of Unintentional POPs
in East Asian Countries” (Ms. Khairunnisa Binte Yahya,
Singapore)
- 14:10-14:45** Discussion
- 14:45-15:00 Coffee Break

SESSION II (15:00-17:25)

Chairperson : Prof. Masatoshi Morita (Center of Advanced Technology for
the Environment, Faculty of Agriculture, Ehime University,
Japan)

Theme : The spread of monitoring technology of Dioxins and POPs

- 15:00-15:15** 2-1. “Official use of dioxin bioassays in Japan” (Dr. Hidetaka
Takigami, Japan)
- 15:15-15:30** 2-2. “Quality Control for Dioxins/PCBs/POPs Analysis in
Japan” (Dr. Toru Matsumura, Japan)
- 15:30-15:40** 2-3. “Distribution and Mobility of Endosulfan in paddy field”
(Dr. Patana Anurakpongsatorn, Thailand)

- 15:40-15:55 Coffee Break
- 15:55-16:10 2-4. “Sources of & Measures to Reduce Unintentional Production of Pentachlorobenzene (PeCB).” (Dr. Roland Weber, Germany)**
- 16:10-16:25 2-5. “Regional Monitoring and Assessment Network of POPs Pollution in Asian Countries” (Mr. Shinichi Arai, Japan)**
- 16:25-16:40 2-6. “Standard methods for PFOS and related chemicals in water samples to enable global monitoring - ISO25101 and Japanese Industrial Standard” (Dr. Sachi Taniyasu, Japan)**
- 16:40-16:55 2-7. “Present Status of Contamination by Emerging POPs and Dioxin Related Compounds in Asia-Pacific Region” (Dr. Shin Takahashi, Japan)**
- 16:55-17:25 Discussion**
- 18:00-20:00 Reception

DAY 2 (Wednesday, December 15, 2010, 9:20-15:30)

SESSION III (9:20-10:40)

Chairperson : Dr. Yasuyuki Shibata (Director, Environmental Chemistry Division, National Institute for Environmental Studies, Japan)

Theme : The present situation of application of BAT/BEP for the reduction measures in each country and development of technologies against U-POPs.

- 9:20- 9:35 3-1. “Technology Gaps for Transfer of BAT/BEP” (Dr. Mohamed Eisa, UNIDO)**
- 9:35- 9:50 3-2. “Reduce emission of UP-POPs from Sinter Processes in Pilot Scale” (Prof. Gang Yu, China)**
- 9:50-10:00 3-3. “Catalytic oxidation of HCB/PeCB by TiO₂-based V₂O₅/WO₃ catalyst” (Mr. Yang Yang, China)**
- 10:00-10:15 3-4. “Application of a semi-empirical molecular thermodynamic method for efficient development of POPs reduction technology” (Dr. Hidetoshi Kuramochi, Japan)**
- 10:15-10:40 Discussion**
- 10:40-11:00 Coffee Break

SESSION IV (11:00-12:20)

Chairperson : Dr. Shin Takahashi (Associate Professor, Center for Marine Environmental Studies, Ehime University, Japan)

Theme : The latest international information regarding Stockholm Convention, and current topics on new POPs.

11:00-11:15 4-1. “PFOS and other perfluorochemicals: Emerging ionic POPs.” (Dr. Shoji F. Nakayama, USEPA)

11:15-11:25 4-2. “Brominated Flame Retardants (BFRs) in Vietnam: Environmental Contamination and Management.” (Ms. Hoang Thi Dieu Linh, Vietnam)

11:25-11:40 4-3. “Development of Environmental Fate Model for Hexabromocyclododecanes (HBCDs) with Isomerisation Process” (Dr. Yasuhiro Hirai, Japan)

11:40-11:55 4-4. “Updating the BAT/BEP Guideline-UPOPs, new POPs and beyond?” (Dr. Roland Weber, Germany)

11:55-12:20 Discussion

CLOSING SESSION (12:20-13:00)

Chair : Prof. Shinichi Sakai (Environment Preservation Center, Kyoto University, Japan)

“Comprehensive discussion about the inventories of U-POPs in East Asian Countries and reduction measures.”

Chair’s Summary (Draft)

Closing Remarks (Dr. Hiroaki Takiguchi, Director, Dioxins Control Office, Environmental Management Bureau, Ministry of the Environment, Japan)

13:20-15:30 Lunch & Excursion

END

4. Participants List

(Overseas Participants)

CAMBODIA	Mr. Phichhara Phet	Chief, Department of Environmental Pollution Control, Ministry of Environment
	Mr. Bou Chong	Deputy Chief of Industrial Safety Office of Department of Industrial Techniques, Ministry of Industry Mines and Energy_
CHINA	Prof. Gang Yu	Dean and Professor, Department of Environmental Science and Engineering, Tsinghua University
	Mr. Yang Yang	Ph.D.Candidate, POPs Research Centre, Department of Environmental Science and Engineering, Tsinghua University
INDONESIA	Mr. Sayid Muhadhar	Head of Registration and Notification for Hazardous Substances, Ministry of Environment
	Mr. Fery Huston	Head of Monitoring, Assistant Deputy for Hazardous and Toxic Substance Management, Ministry of Environment
	Ms. Yunik Kuncaraning Purwandari	Head of Subdivision for Evaluation of Hazardous Material in Industrial Sector, Ministry of Environment
	Mr. Krisna Kumar	Staff For Bureau for Planning and International Cooperation, Ministry of Environment
REPUBLIC OF KOREA	Mr. Chulho Bae	Team leader, Korea Environment Corporation
	Dr. Sangjin Shon	HQ of Research & Development Executive Director, Korea Environment Corporation
	Mr. Jinpyo Hong	Assistant Manager, Korea Environment Corporation
	Mr. Youngkyu Lee	Assistant Manager, Korea Environment Corporation
LAO PEOPLES' DEMOCRATIC REPUBLIC	Mr. Khonekeo Kingkhambang	Assistant National Coordinator and Focal Point of the Stockholm Convention, Water Resources and Environment Administration
	Ms. Setouvanh Phanthavongsa	Acting Director of Environment Quality Monitoring and Hazardous Chemical Center, Water Resources and Environment Research Institute (WREI), Water Resources and Environment Administration (WREA)
	Ms. Darounny Vilaythong	Deputy Director of Planning and Cooperation Division, Water Resources and Environment Research Institute (WREI), Water Resources and Environment Administration (WREA)
MALAYSIA	Ms. Rohani Jusoh	Environmental Control Officer, Department of Environment

MONGOLIA	Mr. Battulga Purevdorj	Project Officer, Ministry of Nature, Environment and Tourism
	Ms. Myagmarsuren Tudevbar	National consultant, Ministry of Nature, Environment and Tourism
SINGAPORE	Ms. Khairunnisa Binte Yahya	Scientific Officer, National Environment Agency
THAILAND	Dr. Patana Anurakpongsatorn	Assoc. professor, Faculty of Science, Kasetsart University
	Mr. Aram Bhandhuwanna	Environmental Scientist, Pollution Control Department
VIETNAM	Mr. Dang Thanh Le	Chief of Administrative Office, Pollution Control Department (PCD), Vietnam Environment Administration (VEA), Ministry of Natural Resources and Environment (MONRE)
	Mr. Pham Huu Toan	Officer, Center for Environmental Monitoring, Vietnam Environmental Administration (VEA), Ministry of Natural Resources and Environment (MONRE)
	Ms. Hoang Thi Dieu Linh	Officer, Pollution Control Department (PCD), Vietnam Environment Administration (VEA), Ministry of Natural Resources and Environment (MONRE)
UNEP	Dr. Heidelore Fiedler	Senior Scientific Affairs Officer, Chemicals Branch, DTIE International Environment House
UNIDO	Dr. Mohamed Eisa	Chief and Deputy Director, Environmental Management Branch
GERMANY	Dr. Roland Weber	CEO, POPs Environmental Consulting
USA	Dr. Shoji F. Nakayama	NRC Research Associate, U.S. Environmental Protection Agency

(Japanese Participants)

Mr. Shinichi Arai	Senior Research Fellow, Institute for Sustainability and Peace, United Nations University
Dr. Hidetoshi Kuramochi	Chief, Waste Testing and Assessment Section, Research Center for Material Cycles and Waste Management, National Institute for Environmental Studies
Prof. Shinichi Sakai	Professor, Environment Preservation Center, Kyoto University
Dr. Yasuyuki Shibata	Director, Environmental Chemistry Division, National Institute for Environmental Studies
Dr. Noriyuki Suzuki	Chief, Exposure Assessment Research Section, Research Center for Environmental Risk, National Institute for Environmental Studies
Dr. Shin Takahashi	Associate Professor, Center for Marine Environmental Studies, Ehime University
Dr. Hidetaka Takigami	Chief, Material and Substance Management Section, Research Center for Material Cycles and Waste Management, National Institute for Environmental Studies

Mr. Masao Takeuchi	Invited Senior Research Scientist, Combustion Control Group, National Institute of Advanced Industrial Science and Technology (AIST)
Dr. Sachi Taniyasu	Researcher, National Institute of Advanced Industrial Science and Technology (AIST)
Dr. Yasuhiro Hirai	Associate Professor, Environment Preservation Center, Kyoto University
Dr. Toru Matsumura	Executive Director / Chief of Environmental Risk Research Center, IDEA Consultants, Inc.,
Prof. Masatoshi Morita	Professor, Center of Advanced Technology for the Environment, Faculty of Agriculture, Ehime University
Mr. Osami Sagisaka	Director General, Environmental Management Bureau, Ministry of the Environment
Mr. Hidemasa Yamamoto	Senior Analyst on Trans-boundary Air Pollution, Environmental Management Bureau, Ministry of the Environment
Dr. Hiroaki Takiguchi	Director, Dioxins Control Office, Policy and Coordination Div, Environmental Management Bureau, Ministry of the Environment
Mr. Yoichi Toyama	Dioxins Control Office, Environmental Management Bureau, Ministry of the Environment

(Observers)

Mr. Toshikatsu Aoyama	Senior Coordinator, Global Environment Division, International Cooperation Bureau, Ministry of Foreign Affairs, JAPAN
Mr. Masafumi Kanazawa	Chief, Assessment section, Toray Engineering Co., Ltd. JAPAN
Dr. Akihisa Tabata	General Manager, Environmental Risk Research Center, IDEA Consultants, Inc., JAPAN
Mr. Tomonori Takeuchi	Japan Environmental Sanitation Center, JAPAN
Mr. Yuji Kashima	
Dr. Takuya Shiozaki	
Mr. Mariusz Grabba	Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, JAPAN
Ms. Sylwia Oleszek-Kudlak	
Mr. Nguyen Minh Tue	Center for Marine Environmental Studies, Ehime University, JAPAN
Mr. Kwadwo Ansong Asante	
Ms. Lawin Bastian	Environment Preservation Center, Kyoto University, JAPAN

(The Secretariat)

Ms. Mariko Osaka	Dioxins Control Office, Policy and Coordination Div, Environmental Management Bureau, Ministry of the Environment, JAPAN
Ms. Rie Araki	
Ms. Naomi Cho	
Mr. Tamas Takacs	W5 Staff Services Co., Ltd., JAPAN
Mr. Taku Ito	
Ms. Ai Hayashi	
Mr. Kazuhiko Tezuka	Environmental Information Communications Co., Ltd., JAPAN
Dr. Eiji Komatsu	
Ms. Yuriko Kudo	
Ms. Kaoru Arakawa	

5. Overview of Each Session

5-1. Opening Session

A welcome introduction was made by Dr. Hiroaki Takiguchi (Director, Dioxins Control Office, Environmental Management Bureau, MOEJ). Dr. Takiguchi invited Mr. Osami Sagisaka (Director-General, Environmental Management Bureau, MOEJ) to address a welcome greeting and opening remarks. He thanked everyone for their efforts and hopes these can be shared with all the countries, underlining international cooperation to reduce unintentional POPs in East Asian countries. He also mentioned that 4 new chemicals had been added to the Stockholm Convention, which exists since 2004.



After the opening remarks, Dr. Takiguchi continued by asking if everyone agreed to the assignment of Professor Shin-ichi Sakai of Kyoto University as chairperson. This was accepted unanimously and followed by a brief photo session of all the participants.



Chair Prof. Sakai invited Dr. Heidelore Fiedler to present the first keynote speech.

The first keynote speech

Title: “Initial Assessments of PCDD/PCDF Inventories Made with the Toolkit.”

Speaker: Dr. Heidelore Fiedler, UNEP

Dr. Fiedler presented a preliminary assessment of the status of international dioxin inventories that were made with the toolkit.

In 1999, UNEP published a compilation of about 50 inventories from developed countries, mainly emissions to air, which amounted to 10,500 g per year to air. In 2007, inventories were compared between 2 groups of inventories for dioxins and furans: developed countries have their own data and methodology (about 20 inventories) which are valid for about 800,000,000 people and sum up to 14,700 g emitted to air, and only a little bit more when taking into account all of the release vectors. Now there are about 62 inventories that were taken into the toolkit, which cover about half of the world's population, including China, Indonesia and others. These inventories show 22,000 g to air and more than double to all released vectors



(water, land, residues etc.). This makes it possible to see a significant difference when taking all vectors into account.

In 1999, the waste incineration, including municipal and hazardous waste incineration, accounted for the main source of dioxins and furans. Depending on the country, the main source of dioxins and furans emissions to air can be either waste incineration, open burning or power generation.

When categorizing according to the release vectors, air is dominant, but also residue ashes, or even water, and significant releases to products. Category 6 (open burning process) has the largest contribution in the classifications made with the 62 inventories of the toolkit. There are a few countries where category 6 has no contribution.

Political reason rather than scientific reason observed when certain countries report zero in open burning processes such as biomass burning, forest fires or agriculture burning because it can be assumed that these countries prohibit these processes and therefore do not report these. The same reason applies to open waste burning in certain countries.

In the update process of the UNEP Toolkit, the book format from 2005 will be transferred to an electronic edition which will be available online. It will be updated to reflect that the result of COP4 of Stockholm Convention has entered into force to reflect that the convention has entered into force since 2005. Also multi-layer system will be setup to enhance navigation. The plan to include emission factors for all the unintentional POPs for the dioxin like PCB, Hexachlorobenzene and Pentachlorobenzene will be developed where available. The plan to revise new emission factors for the dioxins and furans on a TEQ basis is considered. Also some of the classes will be refined or added. In the developments in Category 6 (biomass burning), the emission factors have been revised in several categories such as emission to land (reduction).

Final thanks and comments were offered.

Dr. Nakayama from the USEPA wanted to know if there was any measure to confirm the quality of the data. Dr. Fiedler replied that there were more than 62 inventories, but some had such absurd results that they were removed. She hoped that the toolkit would help getting better results in the future. Prof. Sakai also commented on the new vectors added to which Dr. Fiedler responded by saying that the definitions were being modified to obtain a common base, but that it was important to keep the amount of changes as low as possible to not increase the workload for inventory developers.

Chair Prof. Sakai invited Dr. Hiroaki Takiguchi to present the second keynote speech.

The second keynote speech

Title: “Reduction of Dioxin Emissions from Waste Incineration Process - Lessons learnt in Japan -“

Speaker: Dr. Hiroaki Takiguchi, Director, Dioxins Control Office, Environmental Management Bureau, Ministry of the Environment, Japan

Dr. Takiguchi explained that in the past Japan had difficulties with controlling emissions of waste incineration and intend to explain how Japan overcame that problem to share Japanese experience with other East Asian countries which has the same type of problems.



In 1983, a shocking report was issued by professor on dioxins in fly ash in Japan. In late 1990s, the public concern on Dioxins was very severe and sensationally reported by the media. In 1999, a law was voted by the Diet concerning Dioxin treatment. In 2008, there was a great reduction of Dioxins from waste incineration of 98% compared to the level of 1997.

In Japan, incineration is the most widely used method for waste management due to lack of space and high temperature/humidity during summer. In 2008, approximately 80% of the total municipal waste was incinerated.

He explained with showing slides about the Dioxins Emission Inventory of Japan. In 1997, over 90% of dioxin emission were came from waste incineration, and the drastic reduction was done which reduced the dioxin emission by 98% in 2008.

The trend of ambient dioxins level in air and water in Japan is that the ambient dioxin level decreases compared to 1997: today in air, 100%, water is close to 99%.

He presented the Dioxin Special Measures Law which was enforced in 2000, and presented the approach to Reduction of Dioxins Emissions. The regulations on waste incineration were outlined and commented.

He explained the comparison of the dioxin levels from municipal waste incinerators in 2000 and 2008, then introduced the Best Available Technologies to reduce dioxins. He presented the Systematic Management to reduce emissions, consisting of Reduction of incineration amount (3Rs), Promotion of wide-area waste treatment and Economic incentive by government. He commented that the average capacity and combustion efficiency of incineration plants is increasing, and the heat recovery for power generation from incineration process was introduced. Also, he commented that the re-synthesis of dioxins could be solved by spraying activated carbon powder in the after-flow and by installing a catalytic reaction tower.

He concluded by summarizing as follows:

- +incineration most widely used for treating waste in Japan;
- +Japan succeeded in reducing dioxin emissions from waste incinerators;
- +Japan wishes to share the experience of reducing emissions.

Comments and questions were made on this keynote.

Questions were made about the additional costs needed for reductions, the monitoring sites, about what happens to the dioxin when sprayed and the destruction efficiency, about data for PHs, Nitrated-PHs and Hydrogenated PHs.

5-2. Session I Presentations

Chairperson : Dr. Noriyuki Suzuki (Chief, Exposure Assessment Research Section, Research Center for Environmental Risk, National Institute for Environmental Studies)

Theme : Improvement of the unintentional POPs inventories in East Asian Countries

Presentation 1-1. “Cambodia’s Activities Relating to Reduction of U-POPs and PCBs”

Speaker: Mr. Pichhara Phet, Chief, Department of Environmental Pollution Control, Ministry of Environment, Cambodia.

Mr. Pichhara Phet from Cambodia reported on Cambodia's activities relating to reduction of U-POPs and PCBs. He commented on existing activities, such as the installation of a medical waste incinerator in Phnom Penh City, the shutdown of 2 crematories which were changed to electricity generators and the issuing of regulation to separate medical waste.



He presented current activities which include the transformation of open dump sites into controlled landfills, the development of 3R for quantity of waste generation, strategies implemented in school, communities etc. for waste collection, the change of the transformer capacities, the discontinuing of the repairing of broken PCBs' transformers.

Future activities such as the seeking of a fund to conduct a full inventory of 21 POPs and the continuation of improvement and building of new modern crematoria outside of the city were presented.

Presentation 1-2. “U-POPs inventories from Pulp and Paper in Indonesia”

Speaker: Mr. Sayid Muhadhar, Head of Registration and Notification for Hazardous Substances, Ministry of Environment, Indonesia.

Mr. Sayid Muhadhar reported on the U-POPs inventories from pulp and paper in Indonesia. He presented the different regulations on dioxin and furan in Indonesia, and commented on the term of technique for hazardous treatment by incineration method. Data of equipment of purchase was presented.



He introduced the different types of oil used in transformers, and a summary of quantitative test for PCBs was commented on. An overall estimate on release of dioxins from the ten categories was presented. The industry has the highest estimated release. The different government efforts were commented on, and the major issues were discussed.

Presentation 1-3. “Improvement of Unintentional POPs Inventories in KOREA”

Speaker: Mr. Chulho Bae, Team leader, Korea Environment Corporation, Republic of Korea

Mr. Chulho Bae presented the report on the improvement of unintentional POPs inventories in Korea. The POPs status in Korea was presented along with a brief historical explanation. The emission standards of dioxin in Korea according to the category were commented on.



Overview of the recent POPs examination and research was introduced. A comparison between the UNEP toolkit and Korea's figures was discussed. The decrease of emission to the air in Korea were presented. Future works and challenges were commented on.

A question was made by Prof. Sakai about small-scale incineration which was uncontrolled and wondered if there was an estimation of combustion compounds. Mr. Chulho and his colleagues replied that such data was unavailable, to which Prof. Sakai said that it was the same in Japan. This would require more research and monitoring.

Presentation 1-4. “Implementation on BAT/BEP in industry in Lao PDR”

Speaker: Ms. Setouvanh Phanthavongsa, Acting Director of Environment Quality Monitoring and Hazardous Chemical Center, Water Resources and Environment Research Institute (WREI), Water Resources and Environment Administration (WREA), Lao PDR.

Ms. Setouvanh Phanthavongsa reported on the implementation on BAT/BEP in industry in Lao PDR. Background information of Lao PDR such as the population density and the number of industries were introduced.



The baseline data for total dioxin and furan emissions was commented on. And the number of industrial boilers were presented by type of fuel.

The current status of direction legislation was commented, and current activities related to BAT/BEP were introduced.

A conclusion was presented about priority issues (five major area) related to POPs and priority actions (six major actions) to be taken.

Presentation 1-5. “Assessment and Mitigation of an Agent Orange Dioxin and Landmine/UXO Hot spot in Sekong Province, Lao PDR”

Speaker: Mr. Khonekeo Kingkhambang, Assistant National Coordinator and Focal Point of the Stockholm Convention, Water Resources and Environment Administration, Lao PDR.

Mr. Khonekeo Kingkhambang reported on an assessment and mitigation of an Agent Orange dioxin and landmine/UXO hot spot in Lao PDR. A background on Agent Orange and UXO was presented. Project goals and objectives were commented on, and the explanations about a field sampling program was given.



Presentation 1-6. “The application of BAT/BEP as a reduction measures of UPOPs”

Speaker: Ms. Rohani Jusoh, Environmental Control Officer, Department of Environment, Malaysia.

Ms. Rohani Jusoh reported on the control of dioxins and furans in Malaysia. She commented that not much had changed compared to the previous presentation about the control of dioxins and furans in Malaysia. The implementation of the environmental quality regulations for dioxins and furans from 2004 are still in progress. The emission limit for new and existing facilities were presented. Several enforcement activities were commented on, and legal actions and penalties were discussed.



At the end of the presentation, Dr. Takiguchi asked to elaborate on the Clean Air Regulation from 2009 which introduces BAT. The Clean Air Regulation was set out in 1995 and BAT implemented in 2009.

Presentation 1-7. “Reduction Measures of Unintentional POPs & Application of BAT/BEP in Those Measures.”

Speaker: Mr. Battulga Purevdorj, Project Officer, Ministry of Nature, Environment and Tourism, Mongolia.

Mr. Battulga Purevdorj reported on the reduction measures of U-POPs & application of BAT/BEP in those measures. Also, he presented NIP actions for reduction of dioxin and furan in Mongolia.

He commented on the introduction of BAT/BEP from the East-South East Asia Regional Forum on BAT/BEP, and the sources of U-POPs in Mongolia were presented.



The results of high resolution dioxins and furans analyses were discussed. Metallurgical production was pointed out as one of the main sources of dioxin and furan emissions. BAT/BEP

in metallurgical sector were presented, and suggestions to improve the reduction of emissions were discussed. NIP actions to reduce the unintentional emissions of hazardous substances from waste incineration by way of introducing BAT/BEP were commented on.

Composition of waste was mainly from food during summertime and mainly from ash during wintertime. The main source of waste comes from households, the industry having a very low impact since it is not very developed. The results of dioxins/furans analyses pointed out that medical waste had the highest concentration. 2 years before, almost all medical waste was burned in stoves in hospitals. Power generation and heating were presented as another big source of U-POPs.

The lack of regular monitoring, pollutants monitoring and dioxin/furan monitoring was commented. A policy on air pollution and several measures and projects to use CCB were presented.

A question was made by Korea about the transportation of medical waste in Ulaanbaatar. There is a company which owns trucks with special compartments and hospitals are asked to separate waste before collection.

Presentation 1-8. “Preliminary assessment on level and congener profile of U-POPs sources in industries in Vietnam.”

Speaker: Mr. Pham Huu Toan, Officer, Center for Environmental Monitoring, Vietnam Environmental Administration (VEA), Ministry of Natural Resources and Environment (MONRE), Vietnam.

Mr. Pham Huu Toan reported on the preliminary assessment on level and congener profile of U-POPs sources in industries in Vietnam. The link between the higher growth of industry and the pollution increases was commented on.



The objectives of the presentation were the preliminary assessment on level of U-POPs sources in industries and the comparison of emission sources of U-POPs in Vietnam.

The samples collection, the air sampling procedure, the materials, the methods and the analysis equipment were presented. The results of the aforementioned activities were discussed. The U-POP emissions from MSWI are higher than other industries. OctaCDF showed the second-highest level of emissions.

A question was made by Dr. Roland Weber to know if the comparison is done with emission factors of the UNEP toolkit. This was not the case as it had only been compared with the US and Thai Nguyen City.

Presentation 1-9. “Experience of Inventory of Crematoria in Thailand”

Speaker: Mr. Aram Bhandhuwanna, Environmental Scientist, Pollution Control Department, Thailand.

Mr. Aram Bhandhuwanna from Thailand reported on the experience of inventory of crematoria in Thailand.

Comments about cremation in Thailand were made, where 95% perform cremation. Cremation is considered as one of the ten major sources of dioxin and furan in Thailand. The usage of the toolkit from UNEP for measures in crematoria was discussed. The different types of crematoria and their average emissions of dioxin and furan on several scales were presented.



Recommendations for other countries were made regarding sampling duration and multiple forms of emission duration. The preliminary design of a central crematorium facility was shown and discussed. A crematoria database and its map were introduced. These will be provided to the people.

Questions were made by Korea about the measurement of release in crematoria facilities and how the release was sampled.

Presentation 1-10. “4th Workshop on the Reduction of Unintentional POPs in East Asian Countries.”

Speaker: Ms. Khairunnisa Binte Yahya, Scientific Officer, National Environment Agency, Singapore.

Ms. Binte Yahya reported on the reduction of unintentional POPs in East Asian countries, focusing on Singapore. The purpose of the presentation was defined as an update on the status of U-POPs in Singapore and an update of Singapore's efforts in U-POPs monitoring.



Comments were made about the current situation of POPs in Singapore where all except dioxin and furan are banned. The disposal of most POPs to landfill was discussed. The sources of emissions of POPs to air, land and water were presented. The air emission standards were commented on, and the monitoring of U-POPs at several locations in Singapore were discussed.

The sampling in cord blood was presented as a new way to monitor U-POPs thanks to the network of cord blood banks in Singapore.

Questions and comments were made by Prof. Sakai and Dr. Fiedler about the emission factor of ships as a source of emission. There was also a suggestion to use human milk to monitor by Dr. Weber.

5-3. Session II Presentations

Chairperson : Prof. Masatoshi Morita (Center of Advanced Technology for the Environment, Faculty of Agriculture, Ehime University, Japan)

Theme : The spread of monitoring technology of Dioxins and POPs

Presentation 2-1. “Official use of dioxin bioassays in Japan”

Speaker: Dr. Hidetaka Takigami, Chief, Material and Substance Management Section, Research Center for Material Cycles and Waste Management, National Institute for Environmental Studies, Japan.

Professor Hidetaka Takigami reported on the official use of dioxin bioassays in Japan. Commented that many owners of facilities under control do not report on the monitoring of the environment and sources because of financial problems.

In vitro bioassays for the detection of dioxin-like compounds was introduced. Examples of in vitro bioassays certified by organizations and governmental agencies were commented on. The correlation between WHO-TEQ and DR CALUX-TEQ for flue gas samples was discussed. The approval of bioassays for dioxin measurement in wastes as an official method was commented on.

Emission limits and the number of facilities were presented. The availability of the protocol manual in Japanese on the internet was announced. The English version would be available soon. An example of automatic sample preparation devices for bioassay was presented. The scheme of the accreditation for bioassay-laboratories in Japan was explained. The decrease of the pass rate for accreditation was commented on. A conclusion stating that bioassays were gaining a widespread use was made.



Presentation 2-2. “Quality Control for Dioxins/PCBs/POPs Analysis in Japan.”

Speaker: Dr. Toru Matsumura, Executive Director/Chief of Environmental Risk Research Center, IDEA Consultants, Inc., Japan.

Dr. Toru Matsumura reported on the quality control for dioxins/PCBs/POP analysis in Japan. The present situation for dioxins/DL-PCBs analysis in Japan was commented on. The organization chart of JEMCA (Japan Environmental Measurement & Chemical Analysis Association) was presented and explained.

The Round Robin Study for Dioxins, PCBs and POPs and its results were discussed. The statistics for PCDDs and PCDFs of 2009 were presented and



discussed. Commented on the Z-score appearance rate during R-7 round robin study in 2009. Technical certificating programs for engineers in environmental field were introduced in details and the lack of specialists was commented on.

A collaboration with Thailand's Bureau of Supporting Industrial Development was presented. Explained the importance of total QC for laboratories and collaboration between countries.

Presentation 2-3. “Distribution and Mobility of Endosulfan in paddy field.”

Speaker: Dr. Patana Anurakpongsatorn, Assoc. professor, Faculty of Science, Kasetsart University, Thailand.

Dr. Patana Anurakpongsatorn reported on the distribution and mobility of Endosulfan in the paddy field lysimeter model.

Endosulfan used in paddy fields to control golden apple snails in Thailand. And Thailand banned Endosulfan last year. Brief description of toxicity of Endosulfan. The snails are described and how they can eat all the seedlings in one night. She showed a construction for a paddy field with snails, and a diagram with concentrations of Endosulfan in snail, rice root, soil, and so on after 3 hours, 1 day, etc.

Dr. Morita explains about the importance of the contamination with Endosulfan because paddy fields are important in Asian countries.



Presentation 2-4. “Sources of & Measures to Reduce Unintentional Production of Pentachlorobenzene (PeCB).”

Speaker: Dr. Roland Weber, CEO, POPs Environmental Consulting, Germany.

Dr. Weber presented the key sources for Pentachlorobenzene (PeCB). He also explained the background information about U-POPs formation in thermal processes, a part of PeCB release is formed during de novo synthesis (thermal degradation of soot matrices) in thermal process in parallel to PCDD, PCDF, PCB. Pentachlorobenzene is adsorbed or destroyed in current flue gas treatment systems with (slightly) lower efficiency compared to PCDD/PCDF. The scale is different between PCDF/PCDD/PeCBz, i.e. 2 orders of magnitude of difference but formed in parallel. Adsorption technologies and destruction technologies available for dioxins, however, PeCBz does not reach 99% of destruction at several temperature. Misleading PeCB inventory by Bailey, et al. is that the PeCB inventory of combustion of biomass and degradation of other chemicals is rather 450 kg and not 45,000 kg. UPOPs and PeCBz and HCB are produced from the HCB waste from result of some case study.



Waste from certain solvent productions (tetrachloromethane, tetrachloroethene, trichloroethene (Environmental Canada 1993), and possibly other chlorinated solvents) have

generated thousands of tonnes of unintentionally produced POPs waste with HCB as a prime contaminant (“HCB waste”). It has recently been discovered that single factories have deposited or stored wastes at level of around 10000 tonnes of HCB waste and that environmental contamination from these wastes contain significant levels of PeCB.

In Ukraine, where the chemical landfill from an organochlorine manufacturer producing chlorinated solvents including tetrachloromethane and tetrachloroethene are estimated to contain approximately 11,000 tonnes of HCB waste. A recent investigation of the site found PeCB levels averaging approximately one order of magnitude lower than the levels of HCB but in some samples PeCB was reported at the same order of magnitude as HCB. The total quantity of PeCB deposited with the 11,000 tonnes of “HCB waste” could therefore be roughly estimated to 1,000,000 kg. This estimate of the quantity of PeCB in waste from a single factory producing chlorinated solvents would thus be an order of magnitude higher than the estimated total global annual total emission of PeCB from all other sources combined (85,000 kg) suggested in the Risk Profile on pentachlorobenzene in reliance on the information from the International Council of Chemical Associations/World Chlorine Council (ICCA/WCC 2007).

At another factory (in the Czech Republic) 80,000 drums of HCB waste was deposited in a landfill adjacent to the river Elbe (Ministry of Czech Republic 1991). Subsequent leaching of the waste into the river resulted in high concentrations of HCB accumulating in Elbe sediments downstream of the production and landfill area. The concentration of PeCB in river sediment downstream of the site was reported at levels of approximately 15% to those of HCB.

Case Study 2: PeCB from Quintozene/PCNB degradation: Quintozene/PCNB used extensively e.g. on golf courses as the pesticide degrades to some extent to PeCB (to about 3%). For Australia use was estimated to 3800-9000 tones/year corresponding to 114,000 -273,000 kg/year PeCB unintentionally produced by degradation. The most recent US data for agricultural use is from 1999 when 1,803 tonnes of Quintozene/PCNB (US EPA 2006) were used. It can therefore be estimated that US PeCB unintentional production and releases from the degradation of this Quintozene/PCNB (@3% yield) would be approximately 54,000 kg Reduction of current release by appropriate BAT/BEP destruction capacity.

Conclusion is that the degradation of applied pesticide Quintozene/PCNB is one of the largest issues. Dioxins released by sunlight is important to also look for HCB, PCB, PeCBz as a source of dioxins. Furthermore other solvents were not considered or assessed. It is therefore recommended that an updated estimate should be made based on measurements of PeCB. Until this has been conducted, the current estimates of PeCB and other unintentionally produced POPs in solvents should be treated as having a low confidence level.

Dr. Morita thanks Dr. Weber and praises his work. Explains that at some places near Tokyo producing cabbage and having used Quintozene/PeCB for some years, a silent spring has appeared with extinction of birds triggered by the pesticide use and that Dr. Weber should examine it.

Presentation 2-5. “Regional Monitoring and Assessment Network of POPs Pollution in Asian Countries.”

Speaker: Mr. Shinichi Arai, Senior Research Fellow, Institute for Sustainability and Peace, United Nations University (UNU), Japan.

Mr. Arai presented the Regional monitoring and governance in the Asian Coastal Hydrosphere (e.g. UNU-Shimadzu Project)

UNU has no laboratories and has to ask companies to do it for them. UNU-Shimadzu project was founded by Shimadzu, Co. Ltd., who is one of maker of detection equipment in Japan. Currently, 11 member countries participating from the Asian Pacific countries, e.g. in China, Sino-Japan Friendship Center for Environmental Protection. Five phases of project was conducted since 1996, currently monitoring PBDEs in sediment.



Workshops with members from other countries with training session for a week. Selected results of POPs in water in Thailand is rather high. Monitoring of shrimps in Vietnam presents that DDTs was observed, higher concentration during dry season. Also, DDTs was detected from Korea’s squid sample from around inland seas.

Two study on trans-boundary pollution of POPs in Eastern Asia Region and its countermeasures. One case studies is in the termite affected area in China. Research on Mirex analysis conducted at manufacturers in China. The model study was developed on the frequency distribution of Mirex in soil in Liyang. Some concentration was over the EPA regulation.

Dechlorane Plus, widely used in China, similar to Mirex. And around factories, high concentrations was observed , but also movement from manufacturers.

Achievements of UNU has successfully helped Asian countries to build the monitoring system. Future directions is three C; Communication, Coordination and Cooperation.

Presentation 2-6. “Standard methods for PFOS and related chemicals in water samples to enable global monitoring - ISO25101 and Japanese Industrial Standard.”

Speaker: Dr. Sachi Taniyasu, Researcher, National Institute of Advanced Industrial Science and Technology (AIST), Japan.

Dr. Taniyasu presented the standard methods for PFOS and related chemicals in water samples to enable global monitoring.

General information about standard methods of international (ISO) and Japanese (JIS) was introduced, and the difference of ISO and JIS of the drinking water and industrial water, wastewater was explained. SOP for ISO 2006 and JIS 2008, 2009. JIS 2009 has big difference is



filtration from ISO. Results of inter-laboratory trials and internal standard recovery and repeatability of measurement were presented. She discussed on what kind of internal standard should be used. The usage two different methods in order to obtain reliable data since the ion suppression from the interference was suspected.

Application study was presented on the waste water sample in China (PFOS 8 ng/L, PFOA 19 ng/L). Influent and GRP per capita is related, so PFOS and PFOA concentration is related in high concentration activity.

The analysis result of ice core sample from Norway that showed a thousand times lower concentration than waste water sample was presented. Information about new POPs on ISO meeting will be held next year in Korea.

Presentation 2-7. “Present Status of Contamination by Emerging POPs and Dioxin Related Compounds in Asia-Pacific Region.”

Speaker: Dr. Shin Takahashi, Associate Professor, Center for Marine Environmental Studies, Ehime University, Japan.

Dr. Takahashi presented the current status of contamination by emerging POPS and Dioxin related compounds in Asia-Pacific Region.



He explained the issues of emerging POPs in Asian Countries, result of BFRs monitoring studies, and annual consumption of BFRs, etc. Monitoring studies started in several region of the world with aquatic species.

Mussels was applied as bio indicator for the Asia-Pacific Region and high level pollution was observed in Korea and Hong Kong. Archived samples from melon-headed whales stranded along the coasts of Japan was also used as bio indicator. Contamination by emerging POPs already widespread and increasing levels in Asia-Pacific region.

He presented another issues of the dioxin like activities concerning of waste pickers at the open waste dumping sites. Significantly higher concentrations of PCDD/Fs found in soils from dumping sites. Major sources of dioxin like activities is link to the e-waste recycling in Asia. Does e-waste recycling cause release of Dioxin Related Compounds?

Case study on house dust from Vietnamese e-waste recycling sites used bioassay method (DR-CALUX) to analyze dust was presented. The result of chemical analysis with DR-CALUX was presented. High CALUX-TEQ levels in e-waste recycling site house dust was observed, and also very high concentrations of PBDFs. Significant relationship of PBDEs and PBDFs was explained. Contribution of Dioxin Related Compounds (DRCs) to dioxin-like activities was presented. PBDF is an important contributor TEQ in case of house dust and other large portion of unknown activities. Unidentified PBDFs may have significant dioxin like activities. It is worse for children who live in e-waste recycling site.

The issues of emerging POPs is focused to Dioxin Related Compounds (DRCs) including

brominated dioxins and mix-halogenated dioxins, and further studies are necessary to identify potential POPs with their sources and to evaluate their toxic risk.

Dr. Morita thanks Dr. Takahashi. Due to lack of time, will accept one or two comments/questions. Dr. Nakayama comments about QA/QC of Dr. Taniyasu's presentation. What kind of sample waste water was taken? What was the sampling method? How much water was sampled? Dr. Taniyasu answered that she analyzed samples from a fixed amount of places, in winter time and summer time, from big cities. Dr. Heidelore asked "what does external standard mean?" Dr. Taniyasu answered that she used the internal standard method, but some compounds are not analyzed with the internal method, that's why they can use external standard. Compared different internal standards, suggested external standards if available.

5-4. Session III Presentations

Chairperson : Dr. Yasuyuki Shibata (Director, Environmental Chemistry Division, National Institute for Environmental Studies, Japan)

Theme : The present situation of application of BAT/BEP for the reduction measures in each country and development of technologies against U-POPs.

Presentation 3-1. "Technology Gaps for Transfer of BAT/BEP."

Speaker: Dr. Mohamed Eisa, Chief and Deputy Director, Environmental Management Branch, UNIDO.

Dr. Eisa presented the current status of UNIDO assistance for the elimination of PCBs/Pesticides, restriction, continued reduction, promotion (contaminated sites), and the total portfolio is US\$ 108 million.



Main domains of technology gaps of transfer of BAT/BEP is continuation challenges, strengthening of BAT/BEP networking, business development models, promotion of eco-towns *kitakyushu* model, continuation of challenges in developing countries linking of toxic chemicals to human health.

Gaps in BAT/BEP legislations in East Asian countries are not only one issues but some issues like legislation, driving force of technology, and not the same answer for everyone. For example, China's issues is regular monitoring /irregular online, and penalties are inexistent in certain places.

Partnership with Japanese companies in Russia and Uruguay for e-waste prevention which is some of the promotion of Eco-towns model.

The toolkit for contaminated sites on CD-ROM is good tool for the demands about countries on landfills.

One example of Gaps in BEP is the safe transport of transformers has to be worked on. BEP

gaps in ESM of POPs waste stockpiles is that the small businesses burn PCBs as fuel in boilers (dry cleaners, noodle making, fish cleaning) and the governments are not aware of this. Mobile demonstration of BAT/BEP technologies and fixed demonstration of technologies: BAT GAPS on the problem of intellectual property rights (IPR), also nimby phenomena which communities and NGOs are aware. NGOs pushed to establish baselines of soil sampling which is actually part of the governments duty.

The issues of the intellectual property will be important to transfer the technology from Japan to other regions.

Question and comment by Dr. Arai. “p.4 GAPS: How to harmonize the foods question and include the pops matter?” By Prof. Sakai “On the intellectual property rights, is any example?” Dr. Eisa answered “When transferring technologies, asks technology providers to come present their products in a workshop, becomes communication. 1 case in India: Toshiba, Hitachi, .were presenting their technology. 1 case in China, no single company came from Japan have intellectual property right problem. The domain of chemicals is quite modern. An example of a company in Japan which will not export its technology and will not accept treating chemicals from other countries. 2 factors: stringent emissions standard of PCBs in Japan 100x higher than in Japan and Closed. Larger sizes in Japan, need smaller and medium in developing countries. Negotiating how to scale down. Difficult because design companies are changing all the time, disappear and get fragmented.”

Presentation 3-2. “Reduce emission of UP-POPs from Sinter Processes in Pilot Scale.”

Speaker: Prof. Gang Yu, Dean and Professor, Department of Environmental Science and Engineering, Tsinghua University, China.

Prof. Gang Yu presented the reduction emission of UP-POPs from sinter processes in the pilot scale study.

Basic information & flue gas sampling of the sinter plant was explained. Results was that the concentration of U-POPs was higher in gas phase than solid phase. And the congener profile was that PCDF dominates.



The result of pilot-scale system for UP-POPs reduction showed that the reduction efficiency is better in gas phase than solid phase. The congener profile shows that PCDFs were still dominant.

Reduction efficiency comparison of SCR system with the honeycomb catalyst showed the profile of congeners that PCDDs were dominant instead of PCDFs

Presentation 3-3.“Catalytic oxidation of HCB/PeCB by TiO₂-based V₂O₅/WO₃ catalyst.”

Speaker: Mr. Yang Yang, Ph.D.Candidate, POPs Research Centre,

Department of Environmental Science and Engineering, Tsinghua University, China.

Mr. Yang Yang presented the catalytic oxidation of HCB/PCB which is effective to destroy dioxin and PCB.

Experimental section, the solid state PCB and HCB used in apparatus and the influence of temperature on destruction efficiency is 250° for HCB 95% destruction. Space velocity is an important factor. O₂ concentration is another important factor. Influence of NO is important impact, increases to stimulate the reaction of the Mars mechanism. Influence of DeNO_x reaction is HCB/PeCB destruction efficiency decreases.

Mr. Shibata thanks Mr. Yang Yang and asks for questions or comments. The bag filter of catalyst used in experiment are one of the commercial product, and not developed themselves.

Dr. Heidelore asked “The temperature of 350°. Why NO_x at 200° while DeNO_x should be at above 400°?” Answer is that “The low dust and in range of research, we stopped experiment at 200° because had a satisfactory result.”



Presentation 3-4. “Application of a semi-empirical molecular thermodynamic method for efficient development of POPs reduction technology.”

Speaker: Dr. Hidetoshi Kuramochi, Chief, Waste Testing and Assessment Section, Research Center for Material Cycles and Waste Management, National Institute for Environmental Studies, Japan.

Dr. Kuramochi presented his research on the application of semi-empirical molecular thermodynamic model to calculate the POPs parameters.

He introduced the semi-empirical molecular thermodynamic models what is a kind of coefficient model named UNFAC. The merit of usage of the activity coefficient model was explained and the model include all activity coefficient of POPs (vapor liquid, liq-liq, sol-liq). Many similar model were proposed by many researchers, but he use UNIFAC model and think it is the best to explaining model.

UNIFAC parameters are the size and group-interaction. Group assignment for POPs were explained with the example of chlorinated Dioxins (12 groups in total).

Calculation results were explained for solubility of POPs in various solvents. Calculation results to deal with multi-component systems were explained. UNIFAC model can predict effect of mixed model on solubility. Other calculation results that the case of exposure during washing and dosing of appropriate treatment.



Summary was that UNIFAC model was able to well predicted the solubility and vaporization of POPs in various solvents.

Dr. Patana questioned that applicability of this model in Thailand. Dr. Kuramochi answered that it is of course, and the target chemicals must be divided according to original model.

Dr. Gang Yu questioned which technology is better according to results. Dr. Kuramochi answered that UNIFAC is better to predict phase partitioning, by using solvent washing and solvent extraction.

5-5. Session IV Presentations

Chairperson : Dr. Shin Takahashi (Associate Professor, Center for Marine Environmental Studies, Ehime University, Japan)

Theme : The latest international information regarding Stockholm Convention, and current topics on new POPs.

Presentation 4-1. “PFOS and other perfluorochemicals: Emerging ionic POPs.”

Speaker: Dr. Shoji F. Nakayama, NRC Research Associate, U.S. Environmental Protection Agency, USA.

Dr. Nakayama presented about the PFOS and other perfluorochemicals: Emerging ionic POPs

(Note: Since it has not been approved by his Agency, the proceeding of Dr. Nakayama's presentation is not published here.)



Presentation 4-2. “Brominated Flame Retardants (BFRs) in Vietnam: Environmental Contamination and Management.”

Speaker: Ms. Hoang Thi Dieu Linh, Officer, Pollution Control Department (PCD), Vietnam Environment Administration (VEA), Ministry of Natural Resources and Environment (MONRE), Vietnam.

Ms. Hoang Thi Dieu Linh presented the survey result of BFRs in Vietnam which survey was cooperated with Ehime University. The general information of Vietnam was introduced. She mentioned that annual world's consumption of BFRs in 2001 and Asia's consumes nearly 40% of it. She explained the purpose of her study on BFRs as a link between old and new POPs and mentioned that more comprehensive studies of the new chemicals is necessary.



As the result of her study, that PBDE concentrations in mussels of Vietnam is much lower

than Hong Kong and Korea, also PBDE in lower range among Asian countries. On the POPs and PBDEs residue in fish from Mekong River, south Vietnam, she mentioned that dump site fish have higher concentrations, so dumping sites are potential sources. On PBDEs residues in soil from open dumping sites in Asian countries, PBDE and HBCD is much higher in Bau Dui recyclers area. She explained the status of POPs management in Viet-Nam, Laws, lists for new POPs and drafting new regulations.

Dr. Takahashi thanks and ask comments about hot spots for new pops, and opens discussion.

Dr. Weber asked more information on dumping site, and how far sampling sites was from Mekong river. She replied that It's a municipal waste site and she will check the distance from the river. Dr. Weber made comments on the case of Swiss that river fish are contaminated upstream and downstream for 20 and 30 km. from landfill sites.

Dr. Fiedler asked that Viet Nam have the capacity to analyze BFRs or the analysis was done by Ehime University. She replied that they have capacity now in Viet Nam's laboratory.

Dr. Nakayama asked about fire standards in Viet Nam for textile, PBDE, plastic company from Taiwan. She replied that no standards for fire but trying to convince fire scientists that they don't need those chemicals. Dr. Nakayama asked about the main sources for PBDE at waste sites. She replied that she thought the during recycle processes.

Presentation 4-3. “Development of Environmental Fate Model for Hexabromocyclododecanes (HBCDs) with Isomerisation Process.”

Speaker: Dr. Yasuhiro Hirai, Associate Professor, Environment Preservation Center, Kyoto University, Japan.

Dr. Yasuhiro Hirai reported the result of his study on the Environmental Fate Model for HBCDs. The model is based on the Mackay-type level III multimedia model and used at steady state condition. The model was extended to incorporate the isomerisation process. Residence time of HBCDs in environment media (air, water, soil) were discussed with isomerisation. He summarized that the residence time of HBCD in air and water were estimated too short for the isomerisation process. On the other hand, the residence time in soil was estimated long enough for the isomerisation time. He also mentioned that the isomerisation in the abiotic environment has limited impact on the isomer patterns of HBCDs.



He concluded that the selective bio-concentration process and/or thermal process in the production stage could be more important for the isomer patterns of HBCDs.

Presentation 4-4. “Updating the BAT/BEP Guideline-UPOPs, new POPs and beyond?”

Speaker: Dr. Roland Weber, CEO, POPs Environmental Consulting, Germany.

Dr. Weber presented on the upgrading the BAT/BEP Guideline from the relevant point with the U-POPs and new POPs.

His presentation contents were; 1) Mandate of the SC Secretariat to update the BAT/BEP guidance document and tasks, 2) New POPs - BAT/BEP for production, use, substitution, recycling and end of life treatment, 3) POPs destruction technologies and options for BAT/BEP approach, 4) Synergies with other efforts such as mercury and GHG reduction through BAT/BEP, and 5) Integrated approach considerations. He explained the general tasks to update the guideline and several new POPs are needed BAT/BEP at their industrial process.



He explained that a procedure for the ongoing review and updating of the guidelines and guidance on BAT&BEP to Article 5 and Annex C contains following elements: the *general tasks* to be performed in the review and updating process; the *stakeholders* involved in the process; the *activities, procedures and specific tasks* to be performed in the process, along with the roles particular stakeholders play in them; and the *periodicity* in which the particular activities and tasks are to be performed.

He explained that the general tasks to be undertaken in the review and updating process are:

- Enhancing the guidelines to identify and more fully address the needs and circumstances of developing countries and regions, particularly with respect to sources of relevance to developing countries of substances listed in Annex C to the Convention;
- Providing additional information on available alternatives, including indigenous ones, and on the use of substitute or modified materials, products and processes, with respect to Annex C sources;
- Evaluating emerging technologies and technology improvements;
- Harmonizing activities with the PCDD/PCDF Toolkit review and updating process;
- Evaluating possible implications after new POPs are listed;
- Providing information on BAT&BEP for industrial POPs production and use under specific exemptions and acceptable purposes;
- Optimize synergies with other efforts such as mercury and greenhouse gas (GHG) reduction through BAT&BEP (avoid negative effects on releases of other pollutants while taking mitigation measures)

Therefore these tasks will also have to address activities related to new POPs e.g.:

- PFOS and related BAT/BEP for industrial PFOS production and use under specific

exemptions and acceptable purposes or

- PBDE and related technical challenges in monitoring PBDE containing waste flows, separating PBDE or PBDE containing materials and end of life treatment of PBDE containing materials.

From practical aspects the optimization of synergies with other international efforts such as mercury and GHG reduction could have a large potential to consider a more integrated approach on pollution prevention and control. He concluded that such an approach would have practical advantages in implementation for authorities and industry and also should have advantages considering the cost of implementation for the industry.

He also mentioned that Europe will do this for each industry through IPPC and makes it easy to decide on permits and solid base to plan facilities. Also horizontal BREFs to monitor in EU, and it is best to combine all the pollutants to implement.

Prof. Sakai asked what do the five horizontal BREFs mean, ICS, MON, EFS, ECM, ENE. Dr. Weber mentioned that the detail could be downloaded from the website of IPPC, however BREFs document are very big document (about 600 pages). Dr. Weber also commented that one of his colleagues can answer on the question about the Economics and Cross-Media Effects. Dr. Gang Yu commented that these document will be very helpful for reference for Chinese industries if they were translated.

Dr. Takahashi closes the session and hopes that it will be promoted in Asia and all over the world. Thanks everyone.

5-6. CLOSING SESSION

Chair : Prof. Shinichi Sakai

(Environment Preservation Center, Kyoto University, Japan)

“Comprehensive discussion about the inventories of U-POPs in East Asian Countries and reduction measures.”

Prof. Sakai presented the draft of chair's summary. He mentioned that the key issues of this workshop were as follows;

- 1) Continuous POPs reduction activities
- 2) Simple analysis method
- 3) Concern of the new POPs and UPOPs

He explained each items one by one.

Prof. Sakai asked comments about the draft summary. Dr. Weber commented that the recycling should not be the new source.

Dr. Fiedler commented the caveat about the rating system of analytical capacity from Japan and China compared with other countries, also she said that it's a bit contradictory to say that other Asian countries don't have a high level of analysis. Dr. Takigami explained the merit of simplified analysis method in the context of alternative chemical analysis method. Dr. Fiedler emphasized again that this summary should not deny that other Asian countries have a high level of analytical equipment.

Mr. Arai commented hopes that the collaboration will continue and also the holding of this workshop.

Dr. Takiguchi said that he will send the draft summary to all and hoped that everyone can send back comments before finalizing the document on December 22nd. Dr. Takiguchi made closing remarks that thanks everyone for the good discussion, and ability to understand every country's situation, with same goals to reduction of U-POPs.



**The Fourth Workshop on Reduction of Unintentional POPs
in East Asian Countries**

(December 14-15, 2010, *Mitakaigisho*, Tokyo, Japan)

Chair's Summary

The Fourth Workshop on Reduction of Unintentional Persistent Organic Pollutants (POPs) in East Asian Countries was held in Tokyo, Japan, on 14 and 15 December, 2010, organized by the Ministry of the Environment of Japan (MOEJ). The workshop was attended by administrative officers and experts from eleven East Asian countries (the Kingdom of Cambodia, the People's Republic of China, the Republic of Indonesia, Japan, the Republic of Korea, the Lao People's Democratic Republic, Malaysia, Mongolia, the Republic of Singapore, the Kingdom of Thailand, and the Socialist Republic of Vietnam). Participants also joined from the United Nations Environment Programme (UNEP), the United Nations Industrial Development Organization (UNIDO), the United Nations University (UNU), the United States Environmental Protection Agency, and the Federal Republic of Germany, as well as several observers, including the Ministry of Foreign Affairs of Japan, universities, and private companies. Participants expressed their appreciation to the Ministry of the Environment of Japan for hosting the Workshop, which was chaired by Prof. Shinichi Sakai, of Kyoto University, Japan.

The first workshop of this series, held in 2006, was an opportunity for representatives from East Asian countries to meet and share information on the implementation of emission inventories and on Best Available Techniques and Best Environmental Practices (BAT/BEP) to promote continuous efforts for the reduction of emissions of unintentional POPs in each country. In the four years since the first workshop, global circumstances relating to POPs and unintentional POPs have changed significantly. Moreover, nine new chemicals, including pentachlorobenzene (PeCBz), polybromodiphenyl ethers (PBDEs) and perfluorooctane sulfonate (PFOS), were listed as new POPs at the Fourth Conference of the Parties (COP4) to the Stockholm Convention in 2009. Among these chemicals, PeCBz is a new unintentional POP. East Asian countries have made steady progress in capacity building for the analysis of unintentional POPs and have enhanced their monitoring systems. Some countries have tried to monitor new POPs. Many other countries have limited capacity to do so, but have taken measures to reduce the emissions of unintentional POPs from waste treatment. In recent years, electrical and electronic wastes (e-wastes) recycling industries have been expanding in East Asian countries. Brominated flame retardants (BFRs) in e-waste increase risks to human health and ecosystems near e-waste recycling sites.

The fourth workshop mainly discussed the following topics: (1) the need to continue the steady

development of emission inventories of unintentional POPs, and to steadily implement emission reduction measures in East Asian countries; (2) the need to develop and apply simple and low-cost analytical methods especially for screening purposes, as highly accurate POPs analyses are costly and time-consuming; and (3) approaches countries have been taking to address new POP issues.

Concerning the first point, discussions in the workshop showed that East Asian countries have made efforts to develop their emission inventories and promote the use of BAT/BEP to reduce emissions of unintentional POPs. In their inventories, the estimation of unintentional POPs emissions to the air in the category 1 (waste incineration) and the Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases (UNEP 2005) is likely to become more important. Some countries (e.g., Korea and Thailand) have made progress with actual measurements, have improved emission factors by replacing those cited in the toolkit with their own data, and have used their own emission factors to estimate emissions for their inventories. Some countries have developed reduction measures using BAT/BEP and their emission inventories. In the field of waste management, many countries have replaced old waste incineration facilities with new ones. It is necessary to steadily update emission inventories in order to quantitatively evaluate the results of reduction measures.

Concerning the second point (analytical techniques), participants found that due to limited budgets and resources, some countries have a challenge to secure enough analytical instruments and specialists to monitor unintentional POPs. Many agreed that the analysis of unintentional POPs requires advanced techniques, so it is realistic to aim for gradual improvements. In principle, the Stockholm Convention does not recommend the use of bioassays for environmental or human bio-monitoring. Each type of POP designated in the Convention has a different chemical structure, so it is important to identify each POP and quantify its concentrations mainly using high-resolution analytical technologies. On the other hand, the development and use of simple and low-cost analytical methods (e.g., bioassay methods) can be practical for establishing comprehensive indicators for similar toxicological mechanisms, for confirming the status of environmental pollutants, and for preventing human exposure. The bioassay method has been adopted for POPs monitoring in food in Europe, and for monitoring releases from sources in Japan. Countries that already have extensive experience with conventional monitoring systems can play a leading role in developing these kinds of simple analytical methods, and in sharing information about these systems with other countries. Bioassays can also be used for screening tests when there are large numbers of samples.

Concerning the third point (new POPs), it was acknowledged that the number of chemicals categorized as POPs and unintentional POPs under the Stockholm Convention may increase in

the future. Participants expressed concern that recycling processes of e-wastes (e.g., end-of-use personal computers and televisions that contain BFRs) have adverse effects on human health and the environment. It is essential to develop substance flow management and common guidelines for recycling processes, in order to prevent the processes from becoming new emission sources. Also, some East Asian countries have serious problems with POPs such as dioxins from pesticides and herbicides (e.g., Agent Orange). These emerging problems should be approached by accumulating information on the actual state of pollution, using appropriate countermeasures and practices.

In conclusion, participants expressed the view that this workshop has played an important role in supporting East Asian countries to share information on emission inventories, the promotion of BAT/BEP, and monitoring techniques, all towards the common goal of reducing unintentional POPs emissions. They pointed out that the outcomes of this workshop should be reflected in discussions at COP5 of the Stockholm Convention.