Report of the Inception Workshop for the Project "Management of Mercury and Mercury-Containing Waste"

City Angkor Hotel in Siem Reap, Kingdom of Cambodia
4-6 March 2009

UNEP/DTIE
Chemicals Branch
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1 OPENING AND WELCOME

The workshop took place from 4 to 6 March 2009 at the City Angkor Hotel in Siem Reap, Kingdom of Cambodia. Opening speeches were held by UNEP - Dr. Heidelore Fiedler, United Nations Environment Programme (UNEP), and the Government of Cambodia by H.E. Heng Nareth, Advisor to the Ministry of Environment, Cambodia.

In her opening speech, Ms. Fiedler explained that in 2008/2009, UNEP/DTIE Chemicals Branch is executing the project "Management of Mercury and Mercury Containing Waste" with the objective to increase the capacity of developing countries and other stakeholders in assessing, managing, and reducing the risks to human health and the environment posed by mercury and mercury-containing waste. The Norwegian Government is funding this project, which will be implemented in Burkina Faso, Cambodia, Pakistan, and the Philippines. Chile is also participating through additional funds from the UNEP Mercury Programme. The project's activities will build upon the national mercury inventories the participating countries had already developed. Another important element in the project will be the testing of the Draft Technical Guidelines on the Environmentally Sound Management of Mercury Waste developed by the Secretariat of the Basel Convention. Before starting the national activities, all participating countries, the international consultant and the back-up expert laboratory were invited to an inception workshop to be held in Cambodia from 4 to 6 March 2009 with the goal to set a common basis for the execution of the project. In closing she thanked the Government of Cambodia for organizing this workshop and H.E. Nareth for his presence at the opening ceremony.

H.E. Heng Nareth on behalf of the Ministry of Environment of the Kingdom of Cambodia welcomed the participants and wished the workshop fruitful and successful discussions. He addressed his country's commitment to support this project and the global actions against mercury.

Following the welcome addresses, the participants introduced themselves stating their affiliations and involvement in mercury issues. The participants included two experts from each of the pilot countries, the international expert and the mercury laboratory as well as stakeholders from other Ministries in Cambodia and UNEP. The list of participants is included in this report as chapter 10 - List of Participants.

Mr. Sambo Sarun, Cambodia, Ministry of Environment, gave some practical arrangements as to the flow of the workshop. The opening session concluded with a group photo.

The meeting proceeded in plenary according to the agenda (see chapter 9 - Agenda).

2 REVIEW OF EXISTING INFORMATION AND CONTEXT

2.1 Mercury waste: Project implementation and context

Ms. Fiedler, Chemicals Branch, presented the UNEP mercury program and the linkages between this project and mercury waste management partnership area. She also mentioned the outcome of the 25th session of the UNEP Governing Council and the GC decision to mandate UNEP Chemicals to initiate an intergovernmental negotiation process to develop a legally binding instrument on mercury. She presented the outline and the expected outcomes of this project and the sister project implemented by the Basel Convention regional Coordination Center in Montevideo, Uruguay for three Latin American countries, namely Argentina, Costa Rica, and Uruguay. The components of this global mercury waste management project can be briefly summarized as follows:

1. Review of quantitative and qualitative data from the national inventory for mercury sources;
2. Prioritization of mercury sources and the corresponding sectors;
3. Development of a national mercury waste management plan;
4. Environmentally sound management (ESM) application in selected sources and sectors;
5. Sampling and mercury analysis of environmental and human samples; and
6. Final national reports and final project report (including evaluation and lessons learned).

The presentation is annexed to this report as Chapter 12-1.

2.2 Initial observations from national mercury inventories

Dr. Mario Yarto, the international consultant, who will assist the pilot countries and UNEP throughout the project, summarized initial observations from the mercury inventories that the countries had developed in a previous UNEP project. The presentation is annexed to this report as Chapter 12-2. Initial observations include the following:

Cambodia: Stakeholder team established to undertake the inventory work; however, no specific information was provided. Cambodia used the minimum-maximum approach and estimated total emissions 800 kg to 15,000 kg per year. No own measured data were available to support the assumptions. Hot spots were not identified.

Pakistan: A stakeholder team was established although no detailed information was given. Among the national activities were surveys from local markets. No official records on mercury-containing products/equipment entering the country were available. The mercury emissions ranged from 10,800 to 37,000 kg per year. Specific guidance or management plan were not existent at national level. Pakistan has a number of mercury laboratories that undertook some analysis of matrices, jointly identified by the country team together with the international consultant for the inventory project. Certain sources could not be characterized in sufficient detail. Two chlor-alkali sites were identified as potential hotspots.

Philippines: Three consultation workshops were held; a multistakeholder team established. Inventory was developed on secondary data; shortcomings include the wide range of data in the Toolkit. Country profile was not included. Minimum-maximum estimates ranged from

13,000-24,000 kg per year. Major source was primary virgin metal production (32%) and extraction and use of fuel and energy (20%). No potential hotspots were identified at national level. Legislation on mercury in force that controls mercury import and distribution is in place.

Burkina Faso: Engagement of all sectors in the inventory project; technical groups were established according to specific category/subcategories. Questionnaire was used to gather data from the identified sources. Total releases estimated to be 4,500 kg per year. Barriers included lack of cooperation, non availability of certain associations, difficulty to adapt Toolkit to local conditions; lack of sensibilization at national level.

3 PRESENTATION OF NATIONAL MERCURY INVENTORIES

Each country presented their national mercury inventories; the presentations are available for download at the project's WebSite http://www.chem.unep.ch/mercury/Sector-Specific-Information/Waste_management_project_ppt.htm .

3.1 Burkina Faso

Mr. Desiré Oudragogou informed that 86% of the total mercury inventory is related to waste issues; *i.e.*, releases to land and water. Mercury to water is found in effluents from artisanal mining. The water can go to the river or is trapped in lakes; there are not many rivers in Burkina Faso. Wastewater will stay in small ponds and contaminants get concentrated; people would use these waters as drinking water or for irrigation; also for fish growing. Exposed is mainly the mining population living nearby. Until today, there are no mercury measurements from Burkina Faso available and data would urgently be needed for environment and humans.

Some products contain mercury like Jaribu (antiseptic soap), skin bleach, mercury containing batteries, have been identified. Mr. Yves Guibert was the international consultant to assist Burkina Faso in the inventory development. The presentation is annexed to this report as Chapter 12-3.

3.2 Cambodia

Mr. Sambo Sarun, Ministry of Environment, presented the outcome of the mercury inventory, which was developed with the assistance of Mr. Jacob Maag, COWI, as the international consultant. 11 Release categories were selected for the national inventory. Main release categories were 1. consumer products with intentional use of mercury (8,485 kg Hg yr^{-1}), 2. waste disposal (4,665 kg Hg yr^{-1}), and 3. primary metal production (1,182 kg Hg yr^{-1}); the total is 14,845 kg Hg yr^{-1}. Some input factors, such as for batteries were provided by the international consultant and based on data from Denmark.

In Cambodia, there are no sanitary landfills; waste disposal is mainly at dumps. These dumps do have neither wastewater or gas collection; therefore, taking an integrative sample may be difficult. Some mercury waste is deviated from landfilling; *e.g.*, acid lead batteries are taken up by scavengers that collect them for lead recycling; the same applies for plastic collectors.

The other batteries go to the dumpsite. The presentation is annexed to this report as Chapter 12-4.

3.3 Chile

Ms. Alejandra Salas of CONAMA reported about results from a CONAMA-coordinated joint UNEP, UNITAR, private sector (Chemicals Industry Association, cement industry, pulp and paper industry, power generation, *etc.*); NGOs (RAP-AL, Greenpeace and Participa); and academic institutions (for example, Atacama University and La Serena University) project. In the use of the Toolkit data from 2005 were considered.

The total mercury emissions range from 361,007 to 416,821 kg Hg yr^{-1}; throughout the inventory minimum and maximum values were used. Highest priority has primary metals mining (in the north of the country, specifically in Coqimbo region)). For two sectors, cement and mining sectors, own data have been used to develop the inventory. The work links to the PRTR project in Chile, regarding inclusion of releases to air and products with mercury in case of transfers. The presentations is annexed to this report as Chapter 12-5.

3.4 Pakistan

Mr. Ali Abid and Mr. Zhaigam Abbas presented the results of the Pakistan mercury inventory. Recommendations include: Hg-free alternatives should be encouraged; national environmental quality standards should be encouraged, mercury-free health-care should be encouraged; incentives by the government for manufacturer for non-Hg containing products.

Five provinces were selected for mercury sampling and analysis. Sampling procedures were established for liquids, solids, sludge, *etc.* Some data are measured, some are modeled. In Pakistan, the main source is from chlor-alkali industry. Phasing out the mercury cell technology will reduce the present mercury inventory by 50%. Plans to phase out mercury cells are scheduled. Other sources of mercury emissions include from the production of 26.7 mio tons of cement produced per year;medical waste incinerated per year accounts for 1,076 tons per year in one province; overall it is 4,118 t yr^{-1}.; relevant mercury emissions have been estimated.

Discussions revealed that Pakistan has chlor-alkali industry but no VCM production; therefore, they are interested in some measurements from this sector. No other country in this project has VCM or chlor-alkali production. The presentation is annexed to this report as Chapter 12-6.

3.5 Philippines

Ms. Eva Ocfemia presented the mercury inventory from the Philippines, which has been developed according to the UNEP Toolkit. Primary virgin metal production was identified as the major source (74.7 kg yr^{-1} or 31%), second is extraction and use of fuel and energy resources (47.9 kg yr^{-1} or 20%), and third is the other intentional use, *e.g.*, thermometers (46.7 kg yr^{-1} or 20%).

The major drawback of the Toolkit is the wide range of input factors (75% uncertainty between minimum and maximum values; however, only a factor of less than 2!!). There is no default emission factor for geothermal power (2nd largest user of geothermal power); data gap that needs to be filled because the US technology may not be applicable to the PHL situation.

There are three large geothermal power plants in the Philippines; the waters are re-injected; therefore, the mercury is not released. Exposure data for the (il)legal gold miners are presently not available. The presentations is annexed to this report as Chapter 12-7.

3.6 Discussion

The discussion showed that all countries had some difficulties in the application of the UNEP Toolkit although in general it was found useful. The weaknesses of the Draft Toolkit include the wide ranges for the input factors, the risk of double accounting with input *vs.* output as could be seen at the example for the batteries. Since it can be assumed that through mercury reduction measures, Hg concentrations in products may already have come down, Hg in products may be overestimated; changes in Hg content in products are not reflected in the UNEP Toolkit.

For fuels, it was concluded that the mercury content depends on the origin of the fuel. Notable is the fact that also geothermal and gas fuels have mercury emissions associated and need to be accounted for in the inventory.

The question came up what is the preferred method for inventory estimation: using ranges or best estimate for input factors. Whereas most countries reported emissions providing the minimum and maximum estimate, some favored a central/best estimate approach. Although no definite answer could be given, UNEP mentioned that equally important to the Hg input factor would be the scale of the activity at national level, and that any uncertainty associated with the local/national activity has the same effect as the uncertainty for the input factor. The participants recommended to report to UNEP information as to the local/national input factors to improve the Toolkit.

A preliminary conclusion from the inventory project is that at the country level experiences with the mercury issue and stakeholder participation will improve, further it is assumed that the Toolkit will improve to that the subsequent mercury inventories will be improved and be closer to country's reality than the first, preliminary inventories. It was cautioned that because of improved methodology and broader participation, the second (and possibly more) inventories may come out with higher numbers than the first inventory despite efforts to control mercury.

In the discussions it was found that some value would be given to summarize the inventories and calculate a *per capita* equivalent since the population in these five countries differed largely. As a first orientation was created that summarizes the national inventory results and calculates population equivalents.

Table 1: Summary of mercury emissions presented as national totals and *per capita* equivalents

	Burkina Faso	Cambodia	Chile	Pakistan	Philippines
Min (kg Hg yr^{-1})		769	361,007	10,842	133,856
Max (kg Hg yr^{-1})	4,498	14,845	416,821	36,898	234,031
Population (*mio)	15.26	14.24	16.7	172.8	94.0
Min (g Hg $person^{-1}$ yr^{-1})	0	0.05	21.62	0.06	1.42
Max (g Hg $person^{-1}$ yr^{-1})	0.29	1.04	24.96	0.21	2.49

4 GUIDELINES AND TOOLS (INTERNATIONAL)

4.1 Overview on Basel Draft Technical Guidelines on Mercury Waste

Dr. Mario Yarto, UNEP International Consultant, presented an overview on the Draft Basel Technical Guidelines on Environmentally Sound Management of Mercury Waste. The Draft Guidelines have been prepared by the Institute for Global Environmental Strategies (IGES), Japan. Mercury is listed in the Basel Convention, Annex 1:

- Y1 – Clinical wastes from medical care in hospitals, medical centres and clinics
- Y17 – Waste resulting from surface treatment of metals and plastics
- Y18 – Residues arising from industrial waste disposal operations
- Y29 – Mercury; mercury compounds

One of the objectives of this project is to contribute to the further development and improvement of the Basel Technical Guidelines but not to duplicate their content; rather developing sector-specific information on developing country experiences and local conditions.

4.2 Mercury Analysis in Human and Environmental Samples

Dr. Jörg Feldmann, University Aberdeen, gave an introduction and overview on mercury analysis. He introduced his research group that ha an emphasis on instrumentation (mainly mass spectrometry). The presentation is annexed to this report as Chapter 12-9.

He described the instrumentation and methods used for the determination of organic and total