MERCURY ASSESSMENT for the PHILIPPINES

Using UNEP InventoryToolkit

Dr. Genandrialine L. Peralta, Consultant
Ms. Elvira Pausing, EMB Project Manager

APRIL 2008

Draft Mercury Inventory Assessment for the Philippines Using UNEP Toolkit
Environmental Management Bureau, April 28, 2008

This report should be read in conjunction with the UNEP toolkit Excel file for the Philippines which provides detailed data and calculations. The following narrative report is preliminary and will be refined after further stakeholder consultation. The independent local consultant for this UNEP-EMB project is Dr. Genandrialine L. Peralta, Professor, Department of Chemical Engineering and Coordinator of Environmental Engineering Graduate Program, University of the Philippines, Diliman. The Project Manager is Ms. Elvira Pausing, senior environmental management specialist of the Environmental Management Bureau, Department of Environment and Natural Resources, Philippines. Comments and additional inputs will be appreciated.

1.0 Introduction

Mercury is ubiquitous that is found in our environment on land, water, and especially air. There are numerous researches and publications on mercury and its compounds and their chemistry, toxicology, exposure and risk evaluations to human health, impacts on the environment, and sources and cycling to the global environment are now known more than before.

A global assessment report, spearheaded by the United Nations Environment Programme (UNEP), was prepared on mercury and mercury compounds with the objective to promote environmentally sound management and a contribution to increase awareness and understanding among the many decision makers of the major issues related to mercury and its compounds (UNEP 2002).

Some countries, such as the United States, Canada, and Mexico, have done their report on atmospheric mercury emissions from anthropogenic sources. For the US, an inventory as well as assessment evaluation of exposure, risks, and control technologies and costs were done (US EPA 1997). Risk management pollution prevention, remediation activities, and research and policy development activities were presented by Canada (Environment Canada 2000). In Mexico, a preliminary inventory on eighteen major sources was done (Asociados 2001).

In the Philippines, under Republic Act 6969 of 1990 and DENR Administrative Order (DAO) No. 29, Series of 1992, the Chemical Control Order (CCO) is being issued on the basis of authorities given to the Department of Environment and Natural Resources (DENR 1997). The CCO, in addition to all the other requirements, is concerned on

mercury and mercury compounds; their importation, manufacture, distribution and use. It is meant to control their use and dispersion into the environment to avoid adverse consequences.

The Environmental Management Bureau (EMB) of the DENR, as part of the CCO, has records of all the importer, manufacturer, distributor and purchaser, the end-use category of mercury or mercury -containing products, quantity of products supplied, and the quantity of wastes produced as a result of manufacturing and industrial use (DENR 1997). An inventory of mercury and mercury compounds is undertaken within the country.

2.0 Project Description

The UNEP Toolkit, for identification and quantification of mercury releases, is applied in the study. This report presents the major and subcategories sources of mercury in the Philippines. It includes pollution prevention measures and control technologies in reducing mercury uses and releases. From the mapped location of the various sources, populations at risk are identified.

In the UNEP Toolkit, data on production and usage of the various sources must be provided to come up with distribution estimates of mercury in the environment (UNEP 2005). This is where secondary information or indirect approaches are considered. On mercury source concentration and emissions, some default values are available in the UNEP Toolkit. In other sources where there is lack of data on source mercury concentration, published estimates of legitimate organizations such as the US EPA and the UNEP were used along with Philippine and international references.

3.0 Anthropogenic Sources of Mercury Emissions

Among the ten listed in the UNEP Toolkit, eight major sources are considered to be existent in the Philippines. Potential hot-spots are not included in the UNEP Toolkit Excel calculation file. It is noted though in the Toolkit Manual that if hot-spots are identifiable, these must be included in the inventory. These will be included in the final report after stakeholder consultation.

After identification of the major sources, subcategories are listed based on secondary data from various sources. Table 1 shows the major sources of releases.

Table 1. Major Sources of Mercury Releases

Sources
• Extraction and use of fuels/energy sources • Primary (virgin) metal production • Production of other minerals and materials with mercury impurities • Intentional use of mercury in industrial processes • Consumer products with intentional use of mercury • Other intentional product/process use • Waste deposition/landfilling and waste water treatment • Crematoria and Cemeteries

In the UNEP Toolkit, waste incineration and secondary metal production are presented as major sources. However, waste incineration is banned in the country and hospitals have stopped this practice of waste disposal (EMB 2003). No sources of secondary metal production were also identified.

3.1 Extraction and Use of Fuels/Energy Sources

There are six identified subcategories in the extraction and use of the different energy sources. Biomass production and other fossil fuels extraction and use are not included. The subcategories are presented in Table 2.

Table 2. Subcategories in Extraction and Use of fuels/energy sources

Subcategories
• Coal combustion in large power plants • Other coal use • Extraction, refining and use of mineral oil • Natural gas – extraction • Geothermal power production

3.1.1 Coal Combustion in Large Power Plants

The Department of Energy (DOE) reported 4,177 MW coal power generation for 2006 (DOE 2006). This is equivalent to 10.773 million tons per year. Table 3 shows the list of the major coal plants in the country. Only a representative 3263 MW from the different sources listed was gathered. Other power plants existing are obviously missed. Locations of the mapped power plants are plotted in Figure 1.

On the other hand, from the 2005 Philippines Energy Data, the total coal consumption of the country was 10.103 million tons per year – 28% locally produced and 72% imported from other countries.

In the calculation of the mercury consumption, the data from DOE will be used and it was assumed that 28% locally produces and 72% imported from other countries or 3.016 million tons per year is locally produced and 7.757 million tons per year is imported from other countries.

The air pollution devices used vary from each plant, but majority used ESP, such as that of Masinloc. The Quezon Plant which is run by Quezon Power Ltd even has a low-NOx burner. However, those which are run by Mirant have wet – FGD system.

There was no mention of coal pre-washing prior to firing in the burners.

Table 3. Coal Power Plants Generation and Location

Power Plant	Generation, MW	Location
Pagbilao Unit 1	382.00	Pagbilao, Quezon
Pagbilao Unit 2	382.00	Pagbilao, Quezon
Calaca Unit 1	300.00	Calaca, Batangas
Calaca Unit 2	300.00	Calaca, Batangas
Masinloc Unit 1	300.00	Masinloc, Zambales
Masinloc Unit 2	300.00	Masinloc, Zambales
Sual Unit 1	300.00	Sual, Pangasinan
Sual Unit 2	300.00	Sual, Pangasinan
Quezon Power	511.00	Mauban, Quezon
Toledo Power Corp.	88.00	Toledo City, Cebu
Cebu TPP1-2 (Salcon)	100.00	Naga, Cebu

The default input factor in the UNEP Toolkit is 0.05-0.5 g Hg/ton coal (UNEP 2005). The maximum value in the range is used for the calculation. A total of 5,387 kg Hg/year is emitted. The output distribution is allocated mostly in the air, comprising 90%, and general waste for the remaining.

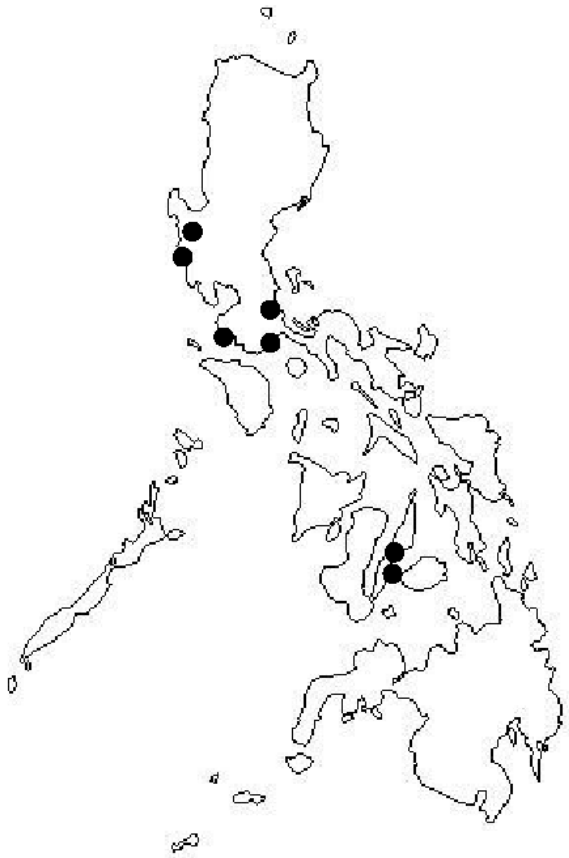

Figure 1. Location of Power Plants in the Philippines