International POPs Elimination Project

Fostering Active and Efficient Civil Society Participation in Preparation for Implementation of the Stockholm Convention

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Monitoring Community Exposure to PCBs Located at the Meralco Pasig Central Service Station

Advocates of Science and Technology for the People (AGHAM)

Ma. Theresa A. Concepcion, Secretary General, AGHAM
agham@tri-isys.com

Philippines

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About the International POPs Elimination Project

On May 1, 2004, the International POPs Elimination Network (IPEN http://www.ipen.org) began a global NGO project called the International POPs Elimination Project (IPEP) in partnership with the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Program (UNEP). The Global Environment Facility (GEF) provided core funding for the project.

IPEP has three principal objectives:

- Encourage and enable NGOs in 40 developing and transitional countries to engage in activities that provide concrete and immediate contributions to country efforts in preparing for the implementation of the Stockholm Convention;

- Enhance the skills and knowledge of NGOs to help build their capacity as effective stakeholders in the Convention implementation process;

- Help establish regional and national NGO coordination and capacity in all regions of the world in support of longer term efforts to achieve chemical safety.

IPEP will support preparation of reports on country situation, hotspots, policy briefs, and regional activities. Three principal types of activities will be supported by IPEP: participation in the National Implementation Plan, training and awareness workshops, and public information and awareness campaigns.

For more information, please see http://www.ipen.org

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Physical description of site

The Meralco Pasig Central Service Station is located in Pasig City-- one of the cities and municipalities that comprise Metro Manila in the Philippines. It is located along the eastern border of Metro Manila. Pasig City is bordered on the west by Quezon City and Mandaluyong City; to the north by Marikina City; to the south by Makati City, Pateros, and Taguig City; and to the east by the municipality of Cainta in the province of Rizal.

Pasig City is primarily a residential-industrial town but it is increasingly becoming a commercial area. It has been housing the Meralco Compound for decades now, which is home of the head offices of Meralco (Manila Electric Company), the largest electrical distribution company in the Philippines. Located along one of its major roads, Eulogio Rodriguez Jr. Avenue (C-5 road), are many industrial manufacturing plants.

Pasig City is comprised of 30 barangays (villages or the smallest unit of government in the Philippines) in an area of thirty-one square kilometers (31 km^2). The population was estimated to be 505,058 in year 2000, thereby having a population density of 16,292/km^2.

History of site

The Meralco Diesel Power Plant used to stand at the current site of Rockwell Mall in Makati. It was in the 1960s when the plant last operated to provide electricity for the residents of Makati. During the 1990s, the plant was dismantled, and the whole area was cleaned up for the building of Rockwell Mall and other structures currently located in the same vicinity.

It was in 1999 when Rockwell-Meralco secured a temporary storage permit from the Department of Environment and Natural Resources Environmental Management Bureau (DENR-EMB) to transfer the remaining PCBs (polychlorinated biphenyls) to the newly-built Meralco Pasig Central Service Station. The new Meralco compound is located in the former factory site of Kamara Steel in San Joaquin Pasig City. At the back of the compound is the Pasig River, and located nearby is an urban-poor community. Around the compound are other residential and commercial establishments.

According to the permit, 14,000 liters of liquid PCBs, and 5,000 cubic meters of PCB-contaminated soil will be stored in a warehouse in a compound. The effectiveness of

the permit from DENR-EMB was only six (6) months starting November 1999. According to Meralco, 88.9 metric tons of these PCB have been exported to Europe for processing.

Chemical characterization

Polychlorinated biphenyls (PCBs) are a class of organic compounds with a general structure of $C_{12}H_{10-x}Cl_x$. They contain 1 to 10 chlorine atoms attached to the biphenyl. Most PCB congeners are colorless, odorless crystals. However, the commercial mixtures are clear viscous liquids (the more highly chlorinated mixtures are more viscous, for example, Aroclor 1260 is a "sticky resin"). Although the physical and chemical properties vary widely across the class, PCBs have low water solubilities (insoluble) and low vapor pressures (nonvolatile). Since PCBs are insoluble in water, they can hardly migrate in the soil and into the groundwater. They are rather soluble in most organic solvents, oils, and fats. PCBs are very stable compounds and do not degrade easily, making them persistent in the environment.

SAMPLING METHODOLOGY

There are three types of samples collected from different locations, namely: soil, water and sediments.

1. Soil Sampling

Two spots were identified as sampling sites. They are located near the wall of the suspected PCB dumpsite. Using an auger, a hole was dug four feet below the ground level. The collected soil was mixed. Part of that soil was then set aside as the sample. Below is the table characterizing the type of soil sample at every sampling point.

Table 1. Soil Sampling Point 1.

	Depth (inches)	Soil Type
0	+ 1 ft (12 inches)	
1	20	Sandy clay
2	54	Silt
2	48	Silt
2	42	Clay
2	36	Clay
2	30	Clay
2	24	Clay
2	18	Clay
2	15	Clay

Distance from Meralco wall = 128 inches (10.5 ft.)
Filled soil level = 1.5 feet
2- reference height – 85 inches
1- reference height – 50 inches

Table 2. Soil Sampling Point 2.		
	Depth (inches)	**Soil Type**
0	+ 0.5 ft (6 inches)	
1	20	Sandy clay
1	17	Sandy clay
1	14	Sandy clay
1	11	Silt clay
1	8	Silt clay
1	2	Silt clay
2	33	Silt clay
2	30	Silt clay
2	24	Clay
Distance from Meralco wall = 157 inches (13.1 ft.) Distance from Soil Sampling Point 1 = 111 feet (~34 meters) Filled Soil level = 1.5 ft.		

2. Ground Water Sampling

Ground water was collected from artesian wells near the wall of the suspected PCB dumpsite. Ground water sample 1 was collected from a pump located 34 meters from the Meralco South boundary wall. Ground water sample 2 was approximately 200 meters from ground water sample 1, and was near an abattoir. Ground water sample 3 was approximately 10 meters from the point where ground water sample 2 was collected.

3. Sediment Sampling

Sediment sampling was conducted along Pasig River in order to determine the presence and/or migration of PCB. A grab sampler was used to recover surface sediment from the river bed. Sampling points were designed to test the hypothesis of a PCB point source near the river. Baseline value for the target contaminant was obtained from samples taken upstream of the suspected disposal site. Samples near and downstream the disposal site were also taken to identify the distribution of the contaminant within the river sediment.

Table 3. Sediment Samples.			
SEDIMENT SAMPLE	**LOCATION**	**TIME OF GATHERING**	**SAMPLE DESCRIPTION**
1	After the bridge, approximately 50 meters, across Birla White Cement	7:40 AM	Black sediments with shells and sand
2	Back of Meralco plant; approximately 50 meters before the second bridge	8:15 AM	Black sediments
3	Back of Meralco, approximately 10 meters before San Joaquin 1st Bridge	8:45 AM	Black sediments
4	Near Meralco area	9:20 AM	Black sediments with shells
5	After 2nd bridge	10:05 AM	Black sediments with shells and sand
6	10 meters before bridge 1	11:00 AM	Black sediments

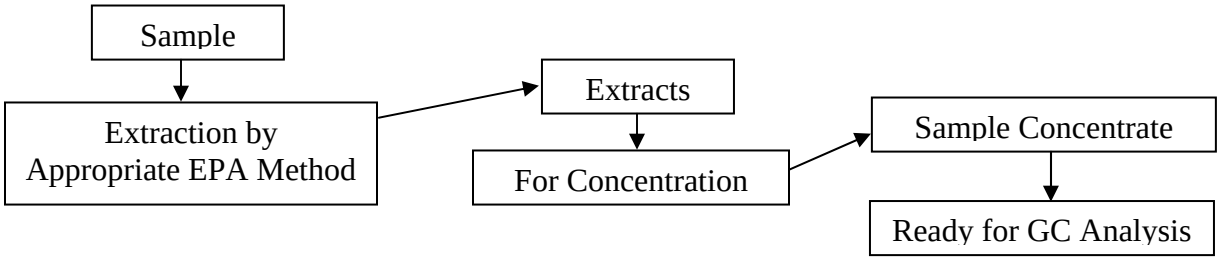
Samples collected were submitted to the laboratory immediately within 24 hours after collection for PCB analysis.

ANALYSIS

The PCB analysis for soil, water and sediment samples was contracted out to CRL Environmental Corporation located in Jose Topacio St., Clarkfield (CSEZ), Pampanga, Philippines.

CRL Environmental Corporation acquired the samples immediately within twenty-four (24) hours after collection. PCB analyses have been routinely done in CRL laboratories since 1999. According to CRL, theirs is the only laboratory in the Philippines recognized by the Department of Environment and Natural Resources' Environmental Management Bureau (DENR-EMB).

Gas Chromatography (GC) -Electron Capture Detector was the methodology used in the analyses of PCB. The assay procedure can be summarized in the following flowchart:



RESULTS AND DISCUSSION

Using Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, 1268 as polychlorinated biphenyl (PCB) analytes for all soil, water and sediment samples gathered and extracted, the laboratory results showed non-detection of the suspected organic chemical (refer to Tables 4-7).

It shall be noted however, that the laboratory results have been delayed for more than three (3) weeks due to irregularities in results obtained by the laboratory technicians. This information was relayed by the laboratory contact person when the projects leaders followed-up the results. According to them, initial tests showed some levels of PCB in samples of sediments submitted for analysis. As protocol, repeated tests have been run to ensure validity of initial findings.

Table 4. Results for Soil Samples 1 and 2.

ANALYTES	MDL (mg/Kg)	Soil Sample 1		Soil Sample 2	
		DLR	RESULTS	DLR	RESULTS
Aroclor-1016	33	33	ND	33	ND
Aroclor-1221	67	67	ND	67	ND
Aroclor-1232	33	33	ND	33	ND
Aroclor-1242	33	33	ND	33	ND
Aroclor-1248	33	33	ND	33	ND
Aroclor-1254	33	33	ND	33	ND
Aroclor-1260	33	33	ND	33	ND
Aroclor-1262	33	33	ND	33	ND
Aroclor-1268	33	33	ND	33	ND

Dilution Factor: 1.0
ND= Not Detected (Below DLR)
MDL= Method Detection Limit (ppm)
DLR= Detection Limit for Reporting (MDL x Dilution Factor)

Table 5. Results for Groundwater Sample 1, 2 and 3.

ANALYTES	MDL (mg/KG)	GW Sample 1		GW Sample 2		GW Sample 3	
		DLR	RESULTS	DLR	RESULTS	DLR	RESULTS
Aroclor-1016	0.5	0.5	ND	0.5	ND	0.5	ND
Aroclor-1221	1.0	1.0	ND	1.0	ND	1.0	ND
Aroclor-1232	0.5	0.5	ND	0.5	ND	0.5	ND
Aroclor-1242	0.5	0.5	ND	0.5	ND	0.5	ND
Aroclor-1248	0.5	0.5	ND	0.5	ND	0.5	ND
Aroclor-1254	0.5	0.5	ND	0.5	ND	0.5	ND
Aroclor-1260	0.5	0.5	ND	0.5	ND	0.5	ND
Aroclor-1262	0.5	0.5	ND	0.5	ND	0.5	ND
Aroclor-1268	0.5	0.5	ND	0.5	ND	0.5	ND

Dilution Factor: 1.0
ND= Not Detected (Below DLR)
MDL= Method Detection Limit (ppm)
DLR= Detection Limit for Reporting (MDL x Dilution Factor)

Table 6. Results for Sediment Sample 1, 2 and 3.							
ANALYTES	MDL (mg/Kg)	Sediment Sample 1		Sediment Sample 2		Sediment Sample 3	
		DLR	RESULTS	DLR	RESULTS	DLR	RESULTS
Aroclor-1016	33	33	ND	33	ND	33	ND
Aroclor-1221	67	67	ND	67	ND	67	ND
Aroclor-1232	33	33	ND	33	ND	33	ND
Aroclor-1242	33	33	ND	33	ND	33	ND
Aroclor-1248	33	33	ND	33	ND	33	ND
Aroclor-1254	33	33	ND	33	ND	33	ND
Aroclor-1260	33	33	ND	33	ND	33	ND
Aroclor-1262	33	33	ND	33	ND	33	ND
Aroclor-1268	33	33	ND	33	ND	33	ND
Dilution Factor: 1.0 ND= Not Detected (Below DLR) MDL= Method Detection Limit(ppm) DLR= Detection Limit for Reporting (MDL x Dilution Factor)							

Table 7. Results for Sediment Sample 4, 5 and 6.							
ANALYTES	MDL (mg/Kg)	Sediment Sample 4		Sediment Sample 5		Sediment Sample 6	
		DLR	RESULTS	DLR	RESULTS	DLR	RESULTS
Aroclor-1016	33	33	ND	33	ND	165	ND
Aroclor-1221	67	67	ND	67	ND	335	ND
Aroclor-1232	33	33	ND	33	ND	165	ND
Aroclor-1242	33	33	ND	33	ND	165	ND
Aroclor-1248	33	33	ND	33	ND	165	ND
Aroclor-1254	33	33	ND	33	ND	165	ND
Aroclor-1260	33	33	ND	33	ND	165	ND
Aroclor-1262	33	33	ND	33	ND	165	ND
Aroclor-1268	33	33	ND	33	ND	165	ND
Dilution Factor: 1.0 ND= Not Detected (Below DLR) MDL= Method Detection Limit (ppm) DLR= Detection Limit for Reporting (MDL x Dilution Factor)							

The results show that PCBs were not detected in any of the samples submitted for analysis. However, it must be noted that the limits of detection (MDLs) for this laboratory were relatively high, considering the fact that the contaminated soil in the containment area had relatively low PCB levels since the soil was already treated to some extent prior to entombment according to Meralco. Other factors can also explain why high levels of PCBs were not detected in this study.

Firstly, it could be due to the reported containment structure constructed by Meralco. The cement, however porous it may be, can somehow contain for several years the PCBs that were dumped deep into a pit inside the Meralco compound. On the other hand, during the time elapsed since the area has been identified as a hotspot zone [which has been running for six (6) to seven (7) years now], it is possible that PCBs could have been washed out of the area, possibly by heavy rains, or absorbed deep down the soil layers, even much deeper than the 1.5 to 2.0 meters where the composite soil samples were collected.

Secondly, previous conditions, such as earthworks conducted in the area of sampling, might have contributed also to the non-detection of PCB in the samples gathered. The soil that could have contained the PCBs might have already been eroded.

Thirdly, the representative samples collected and submitted for analyses may not really contain PCBs. Either [1]the samples collected are too few to represent the neighboring area of the hotspot site, [2]the location from which the sample are gathered may be far from the dumping site, or [3]the soil type, being clay and silt, and absorbent as they are, may tell us that the contamination of PCB is bound to the soil it has contaminated, and if the soil does not travel across a property, then it is possible also, that it may not spread out so easily.

Another factor is the PCBs characteristic of belonging to a group of chemicals containing 209 individual compounds known as congeners. The PCBs in the sample may have taken a different form from the nine (9) analytes used.

While the US EPA has established procedures in containing contaminants such as PCB, the same has not been observed in many situations in the country. The PCB-containment area has not been properly marked or defined.

Environmental and Health Consequences

Data on this aspect relied mainly on interviews among residents in the adjoining compound of Meralco. These respondents were promised confidentiality of the information they imparted to interviewers.

Regarding the artesian well in the adjoining area with Meralco, an interviewee said that in the 1970s, they used the water from this source for bathing, but now they only use it to bath the pigs in the nearby pen and for watering the plants.

Another respondent confided that plants in the area, like the mango trees, are not as robust and tend to get dwarfed. Furthermore, the indian trees grow in reverse.

A current employee of Meralco permitted an interview and was asked if the company regularly tests the water in the area. The interviewee said that water sampling is done on a monthly basis by the LLDA (Laguna Lake Development Authority). He said a pipe is being installed during testing and that they also get water from the tanks to be tested. According to him, Meralco always passed the quality standards set.

When interviewees were asked about the common sicknesses they encounter in the area, the responded that they experience common cold and cough, and mosquito-related problems.

Responsible party

MERALCO is a private business. It even holds the monopoly of providing the Filipino public the electricity and power which is very vital in any economy. Likewise, there is the government which first and foremost, has the primary responsibility of ensuring that a public utility such as electrical power is being provided to its citizens.

In any event, the one who owns the enterprise, Meralco in this case, should be the primary responsible entity in the clean up of the wastes which resulted as a natural consequence of its production processes in the company.

On the other hand, the Department of Environment and Natural Resources, through the Environmental Management Bureau, is the government agency responsible for the management of PCBs in the Philippines. However, there are certain agencies that have some activities pertaining to PCB management, such as:

- Department of Trade and Industry
- Department of Interior and Local Government through the Local Government Units
- National Electrification Administration
- Philippine Export Zone Authority
- Bureau of Customs (BOC) of the Department of Finance
- Philippine Coast Guard of the Department of Transportation and Communication
- Philippine Ports Authority
- Department of Health
- Bureau of Working Conditions of the Department of Labor and Employment

Plans for cleanup

The encapsulation of PCB contaminates in Meralco Central Service Station at Brgy. San Joaquin, Pasig City is the only plan considered and implemented, so far, by Meralco. There is no other known literature that tells further management and clean-up plans or activities for the identified PCBs.

Recommendations of NGO

Polychlorinated Biphenyls or PCBs are one of the most persistent and potentially worrying groups of pollutants in our environment. The widespread use of PCBs in various industrial applications presents a major environmental issue because of the toxicity associated with bioaccumulation.

All options in management and disposal should be well studied and considered by the government for enforcement to responsible companies or individuals with PCB wastes. This may include chemical dechlorination, chemical reduction, solvent extraction and soil washing, water oxidation, solvated electron technology and photocatalysis.

Regulatory enforcement should be in place. Recognizing the need for a better management strategy for handling PCBs, laws, orders, and guidelines should not only be made, but implemented to the letter as well. Responsibilities and liabilities for the improper management and handling of PCBs and their wastes should be articulated and obligated, especially to companies like Meralco. Furthermore, the government should require companies to provide an annual reporting, inventory, phase-out, storage, treatment and eventual disposal plans and activities.

More specifically, continuous monitoring of identified hotspot sites should be enforced. The containment structure of PCB-contaminated soil should be regularly checked for possible cracks that may lead to leakage. Likewise, biological sampling for the potentially-exposed residents in the surrounding area may also be done in the future. This may be complemented by biological studies among livestock and poultry that also abound in the community.

A laboratory with greater capability and sensitivity to detect PCBs, preferably with MDLs at ppb levels should be sought where samples can be sent. The laboratory should have also a wider range of PCB analytes to increase the likelihood of detection.

For international agencies, lobbying and more stringent regulations must be invoked strongly to national governments, so as to create more pressure for effective and efficient implementation of clean-up, rehabilitation and compensation of victims. In specific terms for Meralco, the cemented containment, which was believed to be a temporary storage site, having acquired only a *temporary storage permit* (that started in November 1999) from DENR-EMB, should already be removed, and the contaminated soil contained therein should be disposed properly. It is the liability of Meralco to have the remaining PCB exported to Europe for processing, as the country still lacks the technology for such.

Also, with so many hotspot areas identified in the country, technologies must be acquired so that PCBs can be managed and processed. Proposed technologies in the pipeline, like the non-combustion project, should be implemented immediately.