



## **PCBs: Progress Towards Elimination in Egypt**

**Arab Office for Youth and Environment (AOYE)**

[aoye@link.net](mailto:aoye@link.net)

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**Background:**

The group of chemicals known as polychlorinated biphenyls (PCBs) are one of the original twelve POPs covered by the Stockholm Convention. They possess properties including longevity, heat absorbance and form an oily liquid at room temperature that is useful for electrical utilities and in other industrial applications.

*At COP 8 of the Stockholm Convention, Parties were encouraged “to step up their efforts, inter alia by developing and implementing rigorous plans for the environmentally sound management of polychlorinated biphenyls throughout their life cycles, including their elimination and destruction, to meet the goals of the Stockholm Convention to eliminate the use of polychlorinated biphenyls in equipment by 2025 and to achieve the environmentally sound waste management of liquids containing polychlorinated biphenyls and equipment contaminated with polychlorinated biphenyls having a content above 0.005 per cent no later than 2028”.*

To ensure that all PCB uses are ceased by 2025, Parties will need support:

- To complete national inventories of all PCBs and related contaminated equipment;
- To improve the capacity and increase the knowledge of PCB equipment owners on proper maintenance of equipment to avoid further contamination.

The sound management of PCB waste includes both destruction and disposal techniques which should not lead to the increase of POPs emissions and releases. A great example of the non-combustion (NonCom) POPs Project is the construction of a destruction facility for PCBs in the Philippines. The project is supported by the Global Environmental Facility (GEF) and the United Nations Industrial Development Organization (UNIDO) and is a good practice example of collaboration between governmental agencies, intergovernmental organizations and the civil society. UNIDO Director General Li Yong cited the facility as “one of the examples of best practices in environmental protection.”

**Objectives of the project:**

To ensure that all PCB uses are ceased by 2025, and that current inventories of PCBs are destroyed using non-combustion methods.

## **Introduction and history of PCBs use and production in Egypt:**

PCBs are very chemically and physically stable compounds with slow environmental and metabolic degradation. These properties have qualified them for several other re-using opportunities in Egypt. Large amounts of different types of transformer oils were sold to the used-oil dealers during the period when many electricity companies were discarding their obsolete equipment. The transformer oils which vary from colourless, yellow to red are used in different applications depending on their quality. They are used, for example, for soaking insulating fibers to enhance their properties. The low quality oils are converted to lubricants and greases that are used in different workshops in Cairo.

PCBs are known in suburbs of Cairo as Zeit El Kahraba (Electricity Oil). During 1970s and 1980s, people used to use the transformer oils in their daily life. For example, it was good for the sewing machines since the oil does not collect dust. Zeit EL Kahraba was also used as vehicle motor-starters.

Since the production of PCB's was banned in 1979, Egypt has stopped the production and use of PCBs in early 1980's. In 2004, after the Stockholm convention, Egypt started getting rid of and discarding the heavily polluted PCBs material.

## **Current PCBs Use in Egypt:**

The academic effort in Egypt is mainly directed to studying and mapping the spatial and temporal presence and trends of the PCBs in the environment of Egypt. Due to the lack of standardized methodologies or any monitoring network, it is difficult to use the existing data to provide exact conclusions on the spatial and temporal trends of PCBs. The effort of different committees and authorized parties responsible for studying and surveying PCBs have been required to estimate and guess data since the users of PCBs are reluctant to give any information because they have deficient information on the subject and they are under the impression that they might be subject to fines and other liabilities by the government. The Ministry of Environment (MOE) has established the National Committee, which the Ministry of Foreign Investments and Industries is a member, to prepare the National Action Plan and other desk studies.

A substantial amount of PCB-contaminated equipment exists around the country. The study was conducted by TAUW – a consultant firm - in the POPs management project in 2009-2011 supervised by MOE in order to implement the NIP. During project preparation, it was estimated that there are approximately 100,000 transformers in the country. Based on the situation in comparable countries, the consultants estimate that 10-40 % of these could be contaminated by PCBs.

The TAUW study also confirmed that there was relatively few pure PCB-containing equipment which will be dealt with by the MEDPOL project. As a preparation study for the Sustainable persistent organic pollutants (POPs) Management Project, which was conducted as part of the National Implementation Plan (NIP), it was also revealed poor practices for local oil recycling, which included sale of recycled oils (lubricating oils and untested transformer oils) contaminated with PCBs and re-used for a variety of purposes. The practice has been banned since 2007.

### **PCBs Manufacturing in Egypt:**

PCBs production has stopped in compliance with international agreements in the first half of the 1980s. Under the governments' supervision on the industrial facilities, no PCBs are being manufactured in Egypt. But illegal applications are unknown.

### **Legal and Regulatory Methods to Restrict the Use and Production of PCBs:**

The national Implementation plan (NIP) has recommended amending laws and legislation to limit the use of PCBs.

In Law No. 4 of 1994 Chapter 1 Article No. 1 point No.14, the ban of use/export and production of all organo-chlorine pesticides including all POPs is included.

### **Examples of PCBs contamination impacting on the environment or human health in Egypt:**

There was a case study published on Science PG in 2018 on "Chemical and Biochemical Evaluation of Marine Pollution by Polychlorinated Biphenyls and Pesticides in Two Regions along the Egyptian Mediterranean Sea".

The study showed that the concentration range of total PCBs in fish muscles collected from Matrouh coast is 2.19-6.43 ng/g- dry weight, where this range in fish muscles collected from El-Max Bay is 38.33-57.52 ng/g- dry weight. The concentration of total PCBs in fish muscles collected from El-Mex Bay is 11.5 fold more than those collected from Matrouh coast.

### **Development of a National Implementation Plan (NIP) under the Stockholm Convention and main points in the NIP for the management and destruction on PCBs:**

The Ministry of Environment has developed a National Implementation Plan in 2003 which recommended the following:

- (A) Amend laws and legislation concerning POP's.
- (B) Inventory completion, collection and processing of information on the sources and the emissions of persistent organic pollutants, PCBs, dioxins and furans
- (C) Completion of the database on hot spots and remediation of contaminated sites
- (D) Disposal of obsolete pesticides and polychlorinated biphenyls
- (E) Improving coordination between the Ministry of State for Environmental Affairs (MOE) and other institutions
- (F) Strengthening inspections, monitoring, assessment and environmental reporting
- (G) Establishment of a mechanism for information exchange and community participation.

The NIP for POPs management in Egypt is under processing to be updated, it should be officially finished by September 2019.

### **Inventory of PCBs and contaminated equipment stockpiles:**

An inventory of PCB contaminated sites was developed. It was conducted in Greater Cairo, Alexandria, Suez, and Upper Egypt Governmental facilities.

According to the study made by JICA for the project implemented by MOE titled “Regional Environmental Management Improvement Project”, the academic effort in Egypt is mainly directed to studying and mapping the spatial and temporal presence and trends of the PCBs in the environment of Egypt. Due to the lack of standardized methodologies or any monitoring network, it is difficult to use the existing data to provide exact conclusions on the spatial and temporal trends of PCBs.

The Ministry of Electricity survey indicates that no PCBs exist in the electricity sector so far except for 3,666 capacitors and 26 transformers, which may contain PCBs, stored in the warehouse of the Alexandria Electricity Distribution Company. The main producers of different PCBs mixtures prior to 1980s, were contacted to inform about the PCBs mixtures and PCBs quantities that they have exported to Egypt and their past PCBs clients in Egypt. Based on the available data, it is difficult to confirm the quantities of PCBs that were exported to Egypt. Also, apart from manufacturing transformers, no statement can be made about industrial activities that used PCBs.

There is very little information available on the name and type of capacitors manufactured with PCBs, because they have not been made for many years, and many of the manufacturers are no longer operating, so much information on products containing PCBs has been lost.

On the other hand, Egypt is a part of a project called the “Global Monitoring Plan for persistent organic pollutants (POPs)”, it provides a harmonized organizational framework for the collection of comparable monitoring data on the presence of POPs from all regions, in order to identify changes in their concentrations over time, as well as on regional and global environmental transport.

### **Inventory and/or database of PCBs-contaminated sites and plans to decontaminate these sites:**

The inventory that is made was only in governmental facilities –mainly Ministry of Electricity Properties- that were chosen in the projects, there is no inventory for the total PBCs amount – including private sector- in Egypt.

The effort of different committees and authorities responsible for studying and surveying PCBs have estimated data since the users of PCBs are reluctant to give any information because they have deficient background on the subject and they are under the impression that they might be subject to fines or any other liabilities .According to MOE, the Ministry of Electricity together with the World Bank, a follow up by the project completed an inventory of suspected transformers that fall into a pre-set criteria by the project considering the date of manufacturing and other criteria that makes a transformer possibly contaminated by PCB’s.

A sampling plan has been made by the Ministry and the project. The following issues have been identified:

- Number of suspected transformers: 18,750

- Number of transformers that have been sampled: 11,396
- Number of transformers that have been analysed out of the total samples: 11,123
- Total number of contaminated transformers: 711
- Total weight of contaminated oil: 948 tons.

**Existing and/or past infrastructure in Egypt for destroying PCBs, and rate of success versus compounded environmental problems:**

Several projects have taken place to eliminate the PCBs in some Egyptian governorates.

In May 2003, Egypt signed the Stockholm Convention.

In 2004, Stockholm Convention went into force.

In 2005, Egypt submitted its National Implementation Plan for POPs.

**The first project** was developed in 2006 and called the “Regional Environmental Management Improvement Project.” This was funded by the Japan International Cooperation Agency (JICA) in cooperation with the Egyptian Environmental Affairs Agency (EEAA) in Shubra el Kheima city, Nasr city, 6<sup>th</sup> of October, 2006.

**Activities implemented:**

- Training and raising awareness for 1500 trainees from the regional branches of EEAA, concerned Ministries and non-governmental organizations.
- Evaluating and inventorying electrical machinery (transformers & capacitors) in the electricity plants for the production, transport, distribution and storage.
- Analysis of oil samples from the electrical machinery as well as water samples from Ismailia canal using a chromatography.
- Development of a database “environmental pollutants” where POPs are included, in cooperation with the Danish International Development Agency “DANIDA”.

**The Second project**, titled “Sustainable Persistent Organic Pollutants Management Project,” was a continuation of the previous project, funded by the World Bank and the Global Environmental Facility, 2009 – 2010.

**Activities:**

- Destruction of High Risk Stocks of Obsolete Pesticide (US\$ 3.83 million)
- Decontamination of PCB-Containing Transformer Oils (US\$ 4.27 million)
- Carrying out an environmentally sound program for the safe packaging, removal, transportation, export and destruction of approximately 1,000 tons of identified highrisk stocks of pesticides and other high-risk obsolete pesticides, following a risk based prioritization approach, in state-of-the-art facilities overseas, including:
  - a) disposal of the stockpiles of about 220 tons of Lindane held at the Al-Adabeya port storage facility;
  - b) disposal of the stockpiles of about 440 tons of pesticides held at the El Saff storage facility; and

- c) The identification of all high risk stockpiles, and dispose of another approximately 350 tons of high risk stocks currently scattered across a number of sites.
- Technical Upgrading of Ministry of Agriculture and Land Reclamation (MALR) Central Agricultural Pesticides Laboratory to identify unlabeled products uncovered, as necessary, and to analyze pesticide samples.
- iii. Enhancing the environmental management system of MOE/EEAA to promote the identification, packaging, removal, transportation and destruction of high risk stocks of obsolete pesticides. This will include training of staff of EEAA and the Cooperating Ministries to track and monitor obsolete stockpiles and ensure the ultimate destruction of high risk stockpiles, Project monitoring and evaluation and enhancing EEAA and MALR system of tracking obsolete pesticides, and dissemination of results, including raising public awareness.

**The third project**, in 2011, was phase two of “Sustainable Persistent Organic Pollutants Management Project.”

**The fourth project** was carried out from 2009 – 2011 and was called, “Strengthen strategies to reduce inadvertent dioxins and furans in the Red Sea and Gulf of Aden,” with the cooperation with the regional organization for the conservation of the environment of the Red Sea and Gulf of Aden. PERSIGA Project, Dioxin & Furan toolkits BAT & BEP for Safaga dumping site, Petroleum company 2012:

The project activities included continuation of data collection of PCB’s in factories and safe disposal of polluted oils with small and medium concentrations of PCB’s by using mobile treatment equipment and new technologies such as chemical degradation methods. Implementing an inventory of new POPs. Using “tools kits” dioxins and ferons were accounted. In 2015, an organization of a training took place 500 individuals from concerned parties, concerned ministries and regional branches.

**The fifth project:** MEDPOL Project Integrated Management of PCBs disposed of 170 ton of PCBs from 2011 – 2016. It was a regional project including Albania, Bosnia and Herzegovina, Egypt and Turkey. Alexandria was the chosen area for implementation.

Activites:

- Finishing of the evaluation of the environmental effect of transfer and safe disposal of 185 tons and agreement upon it.
- Finalized the notification documents of 185 tons of equipment and oils highly polluted with PCBs and sending it to Spain via a specialized French transfer company.
- A report was conducted containing a plan to collect, store and transfer 185 tons for safe disposal via dechlorination.
- Training for the team and Egyptian companies that work in this sector on storage, transport and the measures needed from Basel agreement and receiving a certificate of safe disposal to achieve sustainability.

Finally, from 2017 until now, Egypt is updating its National Implementation Plan on POPs.

## **Government awareness of non-combustion methods for PCBs destruction and attempts to establish such technology in Egypt:**

The Egyptian government is aware of the new solutions and technologies to eliminate/breakdown PCBs, specifically the National Research Institute and the Scientific Research Academy may have researched several cost effective solution but implementation is difficult in Egypt because it needs a number of allowances and permission and a large budget. Incineration of PCB polluted soil is used in cement incinerators, such as trials made in the incinerators of The Egyptian Cement Company (Suez) where they found that the outcome of emission and solid slag were within acceptable parameters. According to the CRPL laboratory, the dioxins and furans emissions from Suez Cement Company respect the emissions limits which means the incinerator is probably equipped with a flue gas treatment system. In other projects, the PCBs were sent out of the country for incineration and breakdown.

## **Possibility to apply non-combustion technologies for PCBs destruction in Egypt, commonly available non-combustion techniques for PCBs destruction, and/or perceived barriers to implementing non-combustion techniques:**

Until now, Egypt has not used non-combustion technologies to destroy PCBs, though this may soon change. The PCBs found in Egypt are transported to foreign countries for destruction. Though activities under *Decontamination of PCB-Containing Transformer Oils Component goals of the Sustainable persistent organic pollutants (POPs) Management Project* were to focus on the procurement of equipment for dechlorination and purification of PCBs-contaminated oils, there are no results to indicate that has happened yet. Another obstacle is the high cost of alternatives.

Non-combustion techniques of PCBs are not known in Egypt, and have never been used before, so we communicated with the concerned party in EEAA to start considering the suitable non-combustion techniques that can be used in Egypt and add it to the National Implementation Plan.

Following a conversation that occurred with Dr. Salah Soliman, who is responsible for the updating of the NIP, we learned that they are now discussing the use of non-combustion techniques in Egypt, especially the chemical degradation methods, such as de-chlorination. A group of experts are assigned to study the case of the 1000 tons of polluted oils that contain PCBs and decide which chemical degradation equipment will be applicable to use in Egypt whether in-situ or mobile.

## **Recommendations for dealing with PCBs in Egypt:**

- Raising awareness for the government that POPs in general have direct effects on human health and initiate solutions that can be of any interest for the concerned parties;
- Ministries, parliamentarians or private sector to get funding for eliminating the remaining PCB's/ POP's in Egypt using environmentally sound methods; and
- Implementing a project in heavily polluted areas with PCBs to identify the effects of it on the human health of the surrounding community.

Projects were implemented to clean-up the contaminated areas (transformers and capacitors), but no projects were made to identify the effects of PCBs pollution on human health in the



communities around the heavily polluted areas. Universities and research centers implement studies on the effects of PCBs and POPs on human health, but not national projects.

#### Resources:

- Ragab S., El Sekailiy A., El Nemr A., (2016) *Concentrations and sources of pesticides and PCBs in surficial sediments of the Red Sea coast, Egypt*, *Egyptian Journal of Aquatic Research*, 42,365-374.
- Eissa F., Mahmoud H., Ghanem K., Ahmed A., (2013), *Levels of Polychlorinated Biphenyls in Surface and Drinking Waters in Some Egyptian Governorates*, *World Applied Sciences Journal* 27(6):694-700.
- Megahed A., Dahshan H., Abdelkader M., et al., (2015) *Polychlorinated Biphenyls Water Pollution Along the River Nile, Egypt*, *The Scientific World Journal*, volume 15. Article 389213.
- Salem D., Khaled A., ElNemr A., (2013), *Assesment of Pesticides and Polychlorinated Biphenyls (PCBs) in Sediments of the Egyptian Mediterranean Coast*, *Egyptian Journal of Aquatic Research*.
- Hamouda A., (2018), *Study of Environmental and Social Impact Assessment for the Re-mobilization of POPs*, The World Bank, Global Environmental Facility, Egyptian Environmental Affairs Agency.
- Shreidah M., El Sikaily A., El Moneom N., et al., (2018), *Chemical and Biochemical Evaluation of Marine Pollution by Polychlorinated Biphenyls and Pesticides in Two Regions Along the Egyptian Mediterranean Sea*, *International Journal of Environmental Monitoring and Analysis*. Volume 6, Issue 3, June 2018, Pages: 95-109
- Sustainable Persistent Organic Pollutants Management Project, 2014, The World Bank.
- United Nations Environmental Programme UNEP, MEDPOL, Global Environmental Facility GEF (2013) PCBs Inventory.
- Global Monitoring Plan on Persistent Organic Pollutants - <http://www.pops-gmp.org/>.
- Josour link: <http://raednetwork.org/josour2030/reports/12597-2/>
- Video link on youtube: <https://youtu.be/Z14Aa1fogrI>
- Link of multimedia at Josour: <http://raednetwork.org/%d8%a7%d9%84%d9%88%d8%b3%d8%a7%d8%a6%d8%b7-%d8%a7%d9%84%d9%85%d8%aa%d8%b9%d8%af%d8%af%d8%a9/>