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Independent terminal evaluation

Technical assistance for environmentally sustainable management of PCBs and other POPs waste in the Republic of Armenia

UNIDO project No. GF/ARM/08/002

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This evaluation was managed by the responsible UNIDO project manager
with quality control by the Evaluation Group

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This document has not been formally edited.

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Special thanks to the National Project Coordinator Ms. Anahit Aleksandryan (Head of Hazardous Substances and Waste Policy Division , Ministry of Nature Protection of the Republic of Armenia) and her whole team for being available for the evaluation as a resource person and for providing all the necessary documentation and for clarifying details and queries.

Special thanks to Ms. Tamara Babayan, project assistant staff of UNIDO for providing the additional information and documentation requested.

The evaluation team trusts that the proposed recommendations will allow the project implementation team to optimize the utilization of its resources for the benefit of the project.

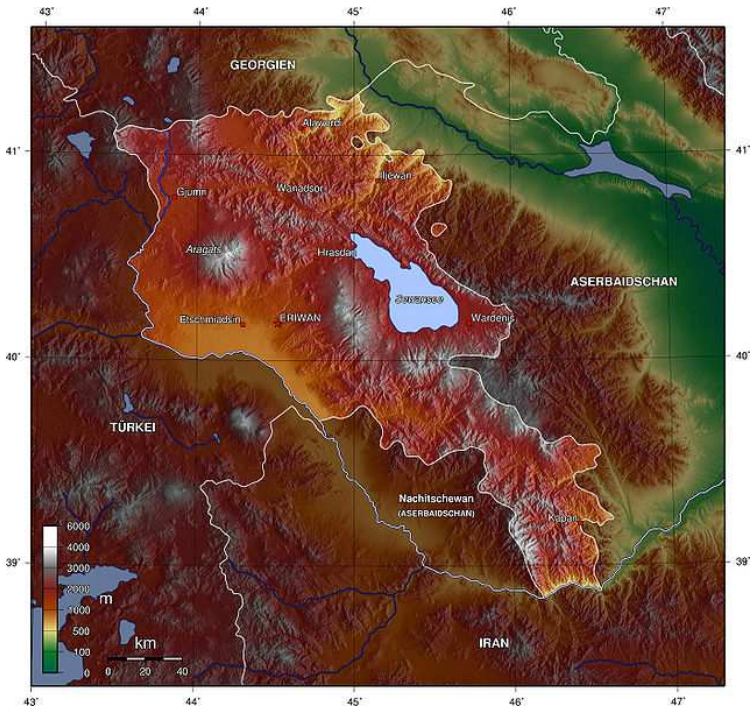
ABBREVIATIONS AND ACRONYMS USED IN THE REPORT

ADR	European agreement on the international road transport for hazardous goods
Askarel	Trade name of PCB cooling fluid (USA, Monsanto)
BAT	Best Available Technologies
BEP	Best Environmental Practices
Capacitor	Equipment or unit to supply lagging kilovars for power factor correction of an electric system; some capacitors were manufactured with PCB as cooling fluid
Capacitor Bank (General)	Practically there are three different ways of power factor (PF) correction: Capacitors for "individual" PF-correction; the capacitor is directly connected to the terminals of an equipment (motors, welding machine etc.) producing the "lagging kilovars"
Capacitor Bank (LV)	Capacitors for "group" PF- correction; the capacitor(s) is (are) connected to the LV-busbar of a transformer station, which feeds a number of consumers with individual motors, welding machines etc.
Capacitor Bank (MV)	Capacitors for "central" PF-correction; Large capacitor installation connected to the Middle- or High Voltage busbars of a substation where many individual electrical appliances (motors etc.) of various size operate at different times and periods.
Closed systems	Capacitors and transformers, where the PCB itself is in completely closed containers; PCBs rarely emit from closed systems (in good condition)
Congener	Depending on the number and position of the chlorine atoms in the biphenyl molecule, 209 isomers and homologue chlorine biphenyls are theoretically possible. A single compound from this group is called PCB congener.
Cooling fluid	Dielectric fluid
COP	Conference of Parties
DAC	Development Assistance Committee
EA	executing agency
EPAC	Environmental Public Advocacy Centre
ESM	Environmentally Sound Management
EU	European Union
GCMS	Gas chromatography/mass spectrometry
GEF	Global Environment Facility
HCH	Hexachlorocyclohexane
HPP	Hydro Power Plant
HSWMD	Hazardous Substances and Waste Management Department

HV	High voltage
IA	Implementing Agency
LV	Low voltage (230/400 V)
M&E	Monitoring and Evaluation
MENR	Ministry of Energy and Natural Resources
MNP	Ministry of Nature Protection
MoU	Memorandum of Understanding
MSP	Medium Sized Project
MV	Medium voltage (Normally in the range between 11 and 66kV)
NATO	North Atlantic Treaty Organization
NGO	Non Governmental Organization
NIP	National Implementation Plan
NPC	National Project Coordinator
OECD	Organization for Economic Co-operation and Development
OP	Operational program
Open systems	Applications where PCB is consumed during its use or not disposed of properly after its use or after the use of the products that contain PCB; Open systems emit PCB directly in the environment (e.g. softeners in PVC, neoprene and other rubbers containing chloride).
OSCE	Organization for Security and Co-operation in Europe
PCBs	Polychlorinated biphenyls
PCDDs	Polychlorinated dibenzo-p-dioxins or shortly dioxins
PCDFs	Polychlorinated dibenzofurans
PEN	POPs elimination network
PMT	Project Management Team
POPs	Persistent Organic Pollutants
PRTR	Pollutants Release and Transfer Register
Primary sources	A product to which PCB was added voluntarily to influence the product's characteristics (e.g. cooling fluids for transformers like Sovol, Sovtol, Askarel, Pyralene, Clophen, etc.); Such products emit PCB continuously.
PSC	Project Steering Committee
RECETOX	Research Centre for Toxic Compounds in the Environment, Masaryk University, Brno, Czech Republic
Secondary sources	A product that originally was free of PCB, but later contaminated by PCB emitting from primary sources (e.g. by emission from primary sources or use of contaminated pumps, hoses, etc.). Such products also emit PCB.
Sovol, Sovtol	Trade name of PCB cooling fluid (produced in former USSR)
SAICM	Strategic Approach for International Chemicals Management

SC	Stockholm Convention
Transformer	Equipment used to increase or reduce voltage; PCB containing transformers are usually installed in sites or buildings where electricity is distributed
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
UNITAR	United Nations Institute for Training and Research
UV	Ultra violet
WHO	World Health Organisation

ARMENIA



MAP OF ARMENIA

Source: http://www.pbase.com/hagluc/image/64445508

1. EXECUTIVE SUMMARY

1.1 Background

On 22 October 2003 the Government of the Republic of Armenia ratified the Stockholm Convention and proceeded to fulfil the country's obligations/commitments under the convention. UNIDO has assisted Armenia in developing its National Implementation Plan (NIP) for the Stockholm Convention. The NIP was endorsed by the Government of the Republic of Armenia on 13 January 2005. The document has identified large amount of stocks of POPs especially Polychlorinated Biphenyls (PCBs) and POPs pesticides. The management and elimination of these stocks were ranked as a top priority.

The project "Technical assistance for environmentally sustainable management of PCBs and other POPs waste in the Republic of Armenia" (further referred to as project) has been formulated and received financial support from the GEF, National Government and from other multilateral sources.

1.2 Objectives of the project

The overall objective of the project is to effectively and efficiently assist Armenia to implement the Stockholm Convention by strengthening the institutions, regulations and enforcement and to enhance the capacities for the sound management of POPs at national and local levels.

The concrete objectives are to establish/amend laws, regulations and standards; strengthen institutions for monitoring; establish/update inventories of POPs chemicals; improve research and development (R&D); promote technology transfer; facilitating data and information collection such as POPs Pollutants Release and Transfer Register (PRTR); develop a national methodology for risk assessment and a strategy for risk reduction for priority chemicals, including POPs (SAICM); enhance supervision, update the National Chemicals Management Profile, enforcement and evaluation for continuous improvement and awareness raising of stakeholders on POPs issues, thus creating an enabling environment in Armenia for the final disposal of POPs chemicals and related waste.

1.3 Resources

The total budget is as follows:

Source	Type of resource	Amount (US$)
GEF	Grant	805 000
Co-financing	In kind and cash	1 848 460
Total		**2 653 460**

The co-financing of 1 848 460 US$ was expected to be received from various sources as indicated below.

Source	Type of resource	Amount (US$)

Source	Type of resource	Amount (US$)
Government Contribution	Grant	135 000
Government Contribution	In kind	155 000
Waste Research Centre	Grant	10 000
Waste Research Centre	In kind	50 000
UNIDO	In kind	45 000
Government of Switzerland	Grant	200 000
UNITAR	In kind	50 000
UNITAR	Grant	50 000
EU/Armenia	Direct budgetary support	398 460
NATO	Grant	325 000
SAICM	Grant	300 000
Private Sector	Not known at project preparation	100 000
Local NGOs	In kind	30 000
Total		**1 848 460**

1.4 Results of the Implementation (Findings)

1.4.1 Summary of Conclusions:

The project was very successfully finished. The commitments of the stakeholders were high, the attainment of project objectives were in line with the project document.

The project implementation experienced some delay due to lengthy procurement of analytical equipment and due to the fact that many project activities were inter-related with other projects and delays in that project had also delayed. But finally, this connection with other projects, was very effective and contributed to the sufficient and successful fulfilment of the project targets.

The inventory of existing equipment (power transformers, auxiliary/house transformers, oil switches, voltage measuring transformers, arc-suppressing coil transformers) containing transformer oil, as well as reserve quantities of such oils was taken by the working groups in energy production and distribution companies of energy sector in the Republic of Armenia, as well as in industry sector of the country.

According to Inventory in the Republic of Armenia, total number of transformers is 9 867; the number of oil switches involved in the Inventory is 2 574.

The labelling using the adhesive stickers is not stable in time. Some of them was peel off. Much more suitable and stable will be probably labelling using the paints or combination of both possibilities especially from the point of view of the future controls.

Total number of collected samples of oil is 2 416; 1 820 were analyzed, the rest of analysis is ongoing. From these 1 820 (1820) samples, 390 (390) were positive with PCBs findings.

Additionally 60 environmental samples were collected for POPs pesticides in different environmental media (surface water, water of Lake Sevan, benthos, bottom sediment, soil) and analysed; 900 readings (results) were obtained.

60 samples of environmental media were taken for analyses of PCB content; 602 readings (results) were obtained for different PCB congeners.

Project Output 1.5 presupposed strengthening of existing laboratories for POPs analysis; nevertheless a new Analytical Laboratory has been established and is functioning now. The Government of Armenia provided appropriate space and infrastructure, repair works were done as well. The equipment and labware were supported from different sources (UNIDO Project, NATO Project and Brazilian Government).

The development of new legal instruments is in line with the project document.

- Regulation on obsolete pesticides (including POPs-pesticides) handling, including obsolete pesticides inventory taking, storage, transportation, re-packaging, identification, disposal" was prepared and enacted on the 17th February 2011. Signed by the prime minister on 10th March 2011 (decision No 195/2011).
- The «Guidance for PCB containing waste management» was prepared and approved by Protocol Decree of the Government of the RA on 20 October 2011 (No. 41).

In addition the following legislative/regulatory documents were prepared and adopted:

- Specific Indicators of Generation of Main Types of Industrial and Household waste;
- List of wastes generated from different technological processes;
- "Republic of Armenia National Chemicals Management Profile" was revised, up-dated and approved by the Government;
- «Cleaner Production Concept» was prepared and approved by Protocol Decree of the Government of the Republic of Armenia .
- Law "On Chemicals" was prepared and negotiated with country stakeholders and the Government of the Republic of Armenia
- "Guidance on Safe Conditions for Industrial and Municipal Wastes Placement and Treatment" was prepared and approved by Protocol Decision of the Republic of Armenia Government
- Risk reduction strategy was developed.

Awareness raising and providing access to information is one of the largest impacts the project has achieved so far. Ten Workshops were arranged and held within UNIDO Project and 14 Workshops were held in the frames of concurrently implemented relevant Projects under NATO, SAICM, UNEP, etc.

All the Workshop reports, including the Agenda, List of Participants, Discussion, Conclusion, Photo Collage are available in English and Armenian.

During the period of current Project implementation on the basis of research findings scientific publications were prepared and published in International Journals and Conference proceedings. Three books (Monographs) were published as well.

An exhibition/contest for children was arranged.

The project has a website where project related information will be accessible. These assure the possible replication of the project.

In the frames of project implementation specialized scientific publications were purchased and the access to this fundamental source of information was provided for the wide range of specialists of the relevant area.

The project management structure is in place, works at very high quality. Implementation follows the work plan; co-financing to the project is slightly above the expectations.

1.4.2 Recommendations

Concerning to the national POPs inventory:

The labelling was done using the adhesive stickers. However these stickers were not stable in time. Some of them were peeled off. Probably, much more suitable and stable will be labelling with paints or combination of both possibilities especially from the point of view of the future controls.

In the following years, the national inventory in the agreement with the newly adopted POPs of the Stockholm Convention, it is a necessary to oriented the national inventory to the new POPs, their sources, environmental and human levels, new types of wastes specific for these new types of pollutants such are for example e-wastes or car wastes.

Private sector involvement should be increased especially in the area of POPs disposal.

Concerning to the national POPs laboratory:

The established POPs Analytical Laboratory unfortunately exists in a small room, which is not sufficient for the laboratory that will be accredited and work with relatively high amounts of samples per year.

National support of the Armenian Government is extremely needed. It is necessary to decide which status laboratory will have – governmental, private. This is very important from the point of view of rules of accreditation – especially with the focus on salary for permanent staff, operational budget – chemicals, standards, columns etc. And also a number of samples connected with the regular monitoring, control measurements, etc.

1.5 Final statement

All Project tasks and proposed goals were successfully achieved; the Project outcomes set up solid grounds for global implementation of the Stockholm Convention. It will favour the improvement of the environmental and human health protection in the Republic of Armenia. The main critical problems of the POPs, POPs waste occurrence, inventory and future disposal in the country were identified; environmental risks at all levels were assessed. The project

prepared proposals to the Armenian Government to improve nature protection legislation and management. Final evaluation of the project goals realisation is **satisfactory**.

2. PRESENTATION AND ANALYSIS OF THE PROJECT (PD, 2009; MTE, 2011)

2.1 Project description

2.1.1 Project general information

Project Name	Technical assistance for environmentally sustainable management of PCBs and other POPs waste in the Republic of Armenia
Project's GEF ID Number	3571
Country	Armenia
GEF Focal Area and Operational Program	OP 14, POPs-2
Agency	UNIDO
Project Approval Date	November 2008
Date of Project Effectiveness	28th November 2008
Total Project Cost	2 653 460 US$
GEF Grant Amount	805 000 US$

2.1.2 The funding organization

The project was financed by the Global Environment Facility (GEF) and implemented by the United Nations Industrial Development Organization (UNIDO). The Hazardous Substances and Waste Policy Division of the Ministry of Nature Protection (Republic of Armenia) has been executing it at the national level.

GEF funded projects benefit to the global environment, linking local, national, and global environmental challenges and promoting sustainable livelihoods and development.

As part of its restructuring, the GEF was entrusted to become the financial mechanism for several international conventions such as the Stockholm Convention.

2.1.3 Project rationale

The rationale of the project originated from the needs identified during the inventory process conducted in the course of the NIP preparation, priorities and key objectives established by the NIP. Priority areas identified in the Armenian NIP include:

- Minimizing/elimination of POPs releases into the environment; minimizing POPs impact on human health;
- Updating of the National Register on POPs releases in order to facilitate implementation of Stockholm Convention;
- Disposal/ elimination of obsolete stocks of pesticides regulated by the Stockholm Convention;
- Replacement of PCB-containing oils and their disposal/ destruction in environmentally sound manner, preferably using the non-combustion technologies;
- Replacement of PCB-containing equipment and its disposal/ destruction in environmentally sound manner;
- Application of BAT/BEP principles as background for development of the strategy for future industrial progress;
- Collection of additional data required for evaluation/ ranking of contaminated sites and carrying out remediation measures;
- Establishment of POPs Central Analytical Laboratory to perform constant monitoring programmes, analyses and ecological control aimed to solve POPs problems relevant to implementation of Stockholm Convention;
- Working-out/ development of a conception for long-term POPs monitoring aimed to facilitate implementation of Stockholm Convention;
- Creation of National Inter-Departmental Council on implementation of Stockholm Convention and carrying-out policy on POPs issues, raising the level of coordination in activity of different Ministries/ Agencies involved in POPs-related issues, as well as for efficient information exchange;
- First-priority solution of the problem of ecologically sound destruction of POPs stocks and prevention of the possible environmental pollution and the impact to human health.

Confidence in UNIDO's assistance in the development of the NIP and its action plans provided the rationale to continue the implementation of the SC with this MSP.

The gap analysis of the project document have identified that the implementation should address the following barriers:

- Lack of an enabling policy and regulatory environment;
- Lack of mechanisms for sustainable raising of co-financing;
- Weak monitoring capacity for POPs;
- Lack of an effective mechanism for orienting R&D towards Convention implementation;
- Lack of an effective mechanism for technology transfer;
- Unavailability of and limited access to information;
- Weak institutional capacity for planning, guiding and enforcement for the Convention compliance;
- Under capacity in evaluation for continuous improvement of NIP implementation;
- Low public awareness on POPs;
- Lack of qualified human resources.

The GEF funding through the project was planned to consolidate ongoing activities of the Armenian Government in implementing its international obligations for the SC while addressing these barriers.

The project focuses on capacity building and strengthening of legislation and institutions; Environmentally Sound Management (ESM) of POPs, including identification of sites and other environmental media contaminated with PCBs and POPs pesticides; identification and requirements of clean-up of such sites and environmental media; selection of technologies for POPs management and disposal that meet the BAT/BEP requirements of the Stockholm Convention; enforcement of ban of DDT use (seizing illegal import of DDT); information exchange and stakeholder involvement and public awareness; and information and education. Given the different focus of the study in terms of POPs chemicals and environmental matrices covered, Armenia yet has to build capacity for the monitoring of POPs and POPs releases from industrial and agricultural sources, which is a priority for the implementation of the project by strengthening a laboratory for POPs monitoring.

The project does not intend to directly reduce or eliminate any POPs. It's primary importance and objective is to lay down the solid foundation for undertaking the measures of the NIP with regards to PCBs and POPs pesticides management.

Electrical power system of Armenia was a part of the unified energy system of the former USSR. The energy production sector was one of the most developed industrial brunches of the country. However, as a result of political and economical cataclysms, during the last years the electro energetic system of Armenia was functioning as an isolated system and fell into a deep energy crisis, which is entirely overcome now. Moreover, nowadays Armenia is a country exporting electric power.

The country demand for electric energy is fully secured. Armenia is taking efforts to expand the volumes of energy exported to Iran, Georgia and other countries. At present, the state sector still prevails in power engineering system. Simultaneously performed upgrading is aimed at formation of the private ownership institution, at regulation of pricing and development of market relations. The progress of power energy sector is achieved according to "Republic of Armenia Programme for electric energy development till 2020", which is focused to implement 3-level diversification policy aimed at ensuring energetic safety/security of Armenia:

- according to production sources: Thermal power plants (TPPs), Hydro power plants (HPPs) and Nuclear power plants (NPP);
- according to fuel provision: natural gas, heavy fuel, nuclear fuel;
- according to fuel transportation routes: gas pipe-line, import of petrochemicals;
- exploration of in-country energy resources.

Since 1970s, all 3 types of electric power stations function is Armenia: there are TPPs, HPPs, and an Armenian NPP.

The capacity of Armenian TPPs makes about 1 760 megawatt thermal (MWth). For TPPs as a main fuel natural gas is used, while heavy fuel is considered reserve fuel. Hrazdan TPP is the most powerful; its capacity makes 1 110 MWth. The plant was put into operation in a period from 1966 to 1974.

Yerevan TPP with capacity of 550 megawatt became operational in 1963-1966.

The HPPs system of Armenia has the installed capacity about 1 000 MWth and involves Sevan-Hrazdan Cascade with 6 power plants; the installed capacity makes 560 MWth. The system became operational in a period of 1949-1962.

The Armenian nuclear power plant (ANPP) has 2 "TTnR-440" reactors and capacity of 850 MWth. The first block became operational in 1976 and the second one in 1980.

2.1.4 Environmental Safety in Energy Sector

In the scope of activity performed by the energy distributing company of great importance is environmental safety/security, which is conditioned by the following:

- safety level increase at the ANNP;
- conservation of the ecosystem of Sevan Lake;
  - strict registration of environmental indices;
  - hazardous emissions control at TPPs, HPPs and switching substations;
  - implementation of new "green" technologies.

The last 2 factors are partially related to use of oils in transformers, oil circuit breakers, capacitors, compressors, as well as to turbine and generators oiling system.

2.1.5 Use of oils in Energy Sector

Transformer oil "T-1500" is used in the system:

- at the stations in transformers and oil circuit breakers;
- in high voltage electricity supply networks and distribution net of Armenia: in transformers and oil circuit breakers

Turbine oils of TsK-22N & TsK-30 are used:

- for turbines and generators greasing and in condense system at TPPs, HPPs, and ANPP.

Compressor oils are used in compressors blowing the air into the underground storage as well as in production stations. Oil containing equipment is exploited by the service personnel of a company, at which assets is the equipment.

2.1.6 Organizational arrangements for implementing the project

The Government of Armenia, through the Ministry of Nature Protection, nominated the Hazardous Substances and Waste Policy Division of the Ministry of Nature Protection (Republic of Armenia) as Executing Agency and the Waste Research Centre (WRC) to be Cooperating Agency in charge of coordinating activities at country level. WRC's expertise has been proven through its successful experience in hosting the "Establishment and Operation of a National Cleaner Production Programme in Armenia" Project (UNIDO, 2006-2008) and "Inventory, monitoring and analysis of PCBs, obsolete pesticides in Armenia for environmentally sound disposal" (NATO, 2008-2012).

Project Management Team (PMT) was composed for the day-to-day monitoring of implementation progress.

Project related decisions and monitoring at country level were conducted by a Project Steering Committee.

The overall implementation of the project was undertaken and monitored by UNIDO.

2.2 Analysis of concept and design of the project

2.2.1 National context

Armenia is a country with economy in transition. It ratified the Stockholm Convention on POPs (Persistent Organic Pollutants) 26th November 2003.

The country, with the assistance of GEF, developed the NIP as per Article 7 of the Convention. The convention foresees that each participant country shall develop a plan to implement its obligations in the framework of the Convention.

The article 12 of the Stockholm Convention states that appropriate technical assistance to parties with economies in transition shall be made available, to assist them, taking into account their particular needs, to develop and strengthen their capacity to implement their obligations under the Convention.

Further, according the article 13, new and additional financial resources shall be made available to enable parties with economies in transition to meet the agreed full incremental costs of implementing measures to fulfil their obligations under the Convention.

All relevant national stakeholders have participated jointly in the preparation of the NIP, which was officially endorsed on 13 January 2005.

According to the NIP Inventory on PCBs carried out in the energy sector, there are about 17 000 tons of oils, which are filled in currently functioning energy power facilities of State Distribution Power Stations and High Power Stations (power transformers, rectifiers/converters, high voltage switches and breakers, compressors, etc.). The revealed amounts of oils probably contain PCBs and therefore are subject to replacement with subsequent destruction in environmentally sound manner.

Besides the energy sector, mineral oils are widely used in various sectors of industry and in everyday life (lifting mechanisms, transformers, different types of compressors, etc.). According to data of the PCB Inventory, there are about 1 624 tons of oils at various industrial entities.

Armenia was always characterized by its developed agricultural production and was known for its intense pesticide application. On average 9-35.5 kg/ha pesticides were applied in each season which many-fold exceeded the average levels of pesticide application in the former USSR. It included the extensive use of organochlorine pesticides which were prohibited only in the 1980-es. As a result, there are areas contaminated by organochlorine pesticides (agricultural lands,

former pesticide storehouses, pesticide burial, dump sites, etc.) which was confirmed by analytical experiments performed in different environmental media.

Based on the priorities of the NIP the Government of Armenia decided that the implementation of the SC should start with the environment related Governance which should address in-depth information collection on POPs, creating capacity for POPs monitoring, putting in place the necessary regulatory infrastructure and planning for POPs phase-out.

2.2.2 Project Design

The information to design the project came from a) the NIP, b) ongoing activities of the Government addressing environment and chemical management, and c) a fact finding UNIDO mission.

The NIP called for putting in place appropriate legal and institutional infrastructures, information collection system on PCBs, POPs wastes and contaminated locations, establishment of a Central Analytical Laboratory for POPs monitoring, Interim storages for POPs wastes, disposal of POPs wastes and improved access to information.

Activities were, at the time of writing the project document and are ongoing to enact legislations addressing the Stockholm and Rotterdam Conventions and SAICM. Financial resources have been also requested and approved for updating the National Chemical Profile and for developing a pollutant Release and Transfer Register (PRTR). The Government had successfully applied for a NATO supported Project "Inventory, monitoring and analysis of PCBs, obsolete pesticides in Armenia for environmentally sound disposal", which will strengthen the Central Analytical Laboratory.

The fact finding mission confirmed the gaps the NIP identified and proposed to integrate these efforts of the Government through GEF's financial and UNIDO's technical expertise to achieve a larger impact at the country and at the global level.

In this regard the project design is sound. It builds on the resources and objectives of the Government, wisely and cost-effectively utilizes other international and bilateral finances. The project is purely capacity building at the national and local levels. The financial resources of the Government ought to be utilized efficiently. In this regard the project plans to improve the necessary information collection systems and the ways how information is kept and used for decision-making.

The most expensive sectors of the implementation of the SC are the POPs disposal operations and Annex C POPs releases reduction measures. Therefore these fields need to be carefully understood before the respective policies and strategies are designed and implemented. This also justifies why the project did not address even demonstration activities for POPs disposal.

The preliminary PCB inventory of the NIP is mainly based on the previous official documents. Due to lack of proper analytical infrastructure, the inventory process has been unable to undertake site inspections and physical testing. These shortcomings were identified during the project design and received great attention.

During the project development field visits were launched to collect as much information as possible to map the situation and to define the proposed actions. A workshop with the

participation of all principal stakeholders was organized in Yerevan and the concept of this project was discussed.

The preparatory work showed that the legal background for sustainable PCB management needed to be improved. In 2008 in Armenia there was no legal act concerning the handling, treatment of PCB containing equipment. At that time the management system for PCBs was also lacking.

At the time of the preparation of the project document, involved ministries and authorities were aware of the PCB and obsolete pesticides problem, but the local authorities lacked the necessary knowledge and expertise. Therefore the project planned several activities to improve the cooperation and information knowledge and skills among decision makers and professionals and government officials. To this end a National Inter-Agency (Inter-ministerial) forum for information exchange and well supported scientific decision making was planned.

Due to the uncertainty of the amounts of PCBs and POPs pesticides planning for their inventory, phase out and disposal is fair enough for a project of this type.

The involvement of the private sector was not clearly elaborated in the document, though there are activities that would create linkages between Government entities and the private sector. Private sector involvement is foreseen for BAT/BEP implementation through direct investments. As well as private sector, was planned to be involved in the activities as potential owners of PCB containing equipments. Their in kind contribution during the inventory exercise, sampling, labelling and was also accounted for.

The NIP identified that many owners of PCB-containing equipment did not have the established procedures and safety measures for servicing, maintenance and disposal of the equipment. The project aims to provide guidance to these owners by developing an Environmentally Sound Management (ESM) system of PCB containing equipment. With this it aims to eliminate the cross-contamination of non PCB-containing equipment and the releases of PCBs into the environment. The compulsory guidelines for the procedures for inventory taking, labelling, the reporting format of these activities as well as the guidelines for withdrawal and disposal of PCB-containing equipment and a feasible and sustainable solution for the management of PCBs were to be developed by the government.

To boost the acceptance of the ESM system the project undertakes several awareness raising campaigns. Site inspection tools, methods for PCB testing, laboratories, data reporting formats, maintenance practices of the electrical equipment and field monitoring guidelines were to be developed as parts of the ESM system.

Due to the environmental and health risks of PCBs and POPs pesticides the project planned to undertake risk analysis and education and training for the involved stakeholders, which is in line with the Convention's objectives stipulated in Article 10. Trainings and workshops were foreseen at governmental, local levels and enterprise levels, in order to build the necessary technical expertise for the practical implementation of the ESM system.

The project proposal foresaw the identification of the PCB maintenance locations that would be suitable for the interim storage of the collected PCBs and related wastes.

The project document aimed at identifying and securing feasible financial mechanisms to assist owners of PCBs in eliminating PCB-containing equipment and disposing PCB wastes.

The project implementation strategy was based on the following principles:

- Establish and well-defined cooperation among governmental authorities involved in environmental protection and industrial development including local authorities, the Ministry of Natural Protection of the Republic of Armenia, the private sector, universities/research institutions and NGOs.
- Accountability of the project related work and expenditures of all involved parties;
- Transparency through clearly defined monitoring indicators and evaluation methodologies including data generation throughout the project implementation.

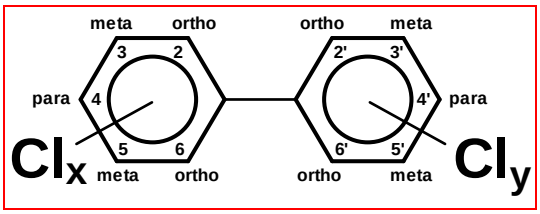
2.3 Polychlorinated biphenyls (Holoubek, 2012)

2.3.1 Background, physical-chemical and technological properties, environmental fate and problems

Polychlorinated biphenyls (PCBs) share with DDT the distinction of being among the first historically recognised persistent organic pollutants (POPs). Many of the same chemical and physical properties that had made them such desirable industrial compounds, also made them one of the most widespread contaminants in the environment

Taking into account the different number of chlorine atoms and different positions they can have in the molecule, theoretically 209 compounds (isomers and congeners) are possible. The backbone of their chemical structure is a biphenyl, consisting of two hexagonal "rings" of carbon atoms connected by carbon-carbon bonds. The specific manner in which the carbon atoms share electrons forming the hexagonal rings leads to the biphenyl being an "aromatic" compound. Polychlorinated biphenyls have between 1 and 10 chlorine atoms replacing hydrogen atoms on the biphenyl rings. The various number and positions of the chlorine atoms on the biphenyl molecule result in up to 209 possible chemical structures designated as congeners in the scientific literature.

Although 209 congeners of PCBs are theoretically possible, only about 130 individual congeners have been identified in commercial PCB mixtures at concentrations ≥0.05%. PCBs with the same number of chlorines with different substitution patterns are called isomers, whereas PCBs with different numbers of chlorines are termed congeners. Groups of congeners with the same number of chlorines are referred to as homologues. Identification numbers have been assigned to individual chlorobiphenyls from 1 to 209 and termed CB (chlorobiphenyl) numbers.



This means that PCBs are subdivided into groups based on the degree of chlorination or number of chlorine atoms per biphenyl molecule (e.g., trichlorobiphenyls (three chlorines) and tetrachlorobiphenyls (four chlorines)). The PCBs within a series of structures of specific chlorine content are known as homologues (i.e., the mono-, di-, tri-, tetra-, penta-, hexa-, hepta-, octa-, nona-, and decachlorobiphenyl homologues). Within a homologue group (e.g., the

trichlorobiphenyls), the individual chlorobiphenyl molecules are isomers of each other, meaning that they each have the same number of chlorine atoms, but these chlorine atoms are arranged at different positions on the biphenyl rings.

Nomenclature of PCBs:

Category	Number of individual compounds
CONGENER	209
HOMOLOG	10
ISOMER	1-46 *)

*) number of congeners in each group of isomers

Industrial PCBs were complex mixtures composed of up to 50 or 60 congeners (or individual chlorobiphenyls). The composition of the PCB mixture was governed by the reaction conditions and the properties of the reaction used to manufacture them. These conditions and properties lead to the specific last two numbers which generally, but not always, refer to the percent by weight of chlorine in the mixture. For example, Aroclor 1254 is 54% chlorine by weight. Manufacturers of PCBs in other countries used different commercial names for PCBs - for example, Kanechlor (Japan), Santotherm (Japan), Phenolclor (France), Pyralene (France), Fenclor (Italy), Soval (Soviet Union), Delor (former Czechoslovakia) and Clophens (Germany). It is important to note that use of Aroclor as a trade name was not restricted to PCBs but was used for other polyhalogenated aromatic mixtures as well.

Due to their appropriate physical-chemical properties (inert, insulating and lipophilic), PCBs were widely applied in industry, either in industry, either in closed systems (coolants and lubricants in transformers, dielectric fluids in capacitors, hydraulic fluids and heat-transfer media), or in open systems (plastificators, additives into carbonless copy paper, lubricants, inks, impregnating and paint agents, glue, wax, cement and plaster additives, lubrication of cast blocks, materials for dust separators, sealing liquids, flame retardants, immersion oils and pesticides. PCBs have been used since 1929 and are still in use today. The excellent properties of PCBs for industrial use also make them hazardous to the environment.

Most PCBs were produced during the period 1950 to 1983. The past widespread use of PCBs has resulted in their loss to the environment from evaporation and leakage from industrial applications, improper disposal and incineration methods, and from deliberate or accidental releases. Information on its usage breakdown is very limited, making it very difficult to derive estimates for its historical and contemporary sources. A current world-wide production estimate based on the inventory under Stockholm Convention of POPs is 1.7 million tons.

The chemical properties of PCBs, such as their stability and low reactivity, made them ideal for many industrial uses. PCBs are slow to biodegrade in the environment compared to many other organic chemicals and are generally persistent in all media. PCBs have relatively low water solubility and low vapour pressures, which allows them to separate from water and the atmosphere. Once released into the environment, PCBs tend to associate with the more organic components of the environment. For that reason, PCBs adsorb to organic matter in soils and sediments. As a result, PCBs can be found in almost every compartment in the environment. PCBs adhere to the surfaces of organic particles in the water column, resulting in their eventual deposition and accumulation in sediments. The highest concentrations of PCBs are typically found in fine-grained, organically rich sediments. Horizontal and vertical variations in PCB concentrations in sediments are common and are dependent on the history of PCB inputs to the ecosystem and on the temporal and spatial deposition patterns of fine- and coarse-grained sediments.

PCBs are stable chemicals that may persist in the environment for many years. The natural degradation of PCBs is dependent on the chlorine content of the chemical. The greater the chlorine content, the less degradation will occur in soil but photodegradation will be enhanced from water surfaces and the atmosphere. The half-life of small, less chlorinated PCBs in the atmosphere is estimated to be 10-25 hours of direct noon sun while for more highly chlorinated PCBs, the half-life is approximately 6 years.

PCBs evaporate very slowly and they are not very soluble in water. Nevertheless, they have dispersed widely through both atmospheric processes and watercourses and trace amounts are found in soils, surface waters, sediments and air throughout the world. Whereas their stability was a welcome feature for industrial use, their resistance to degradation means that they have accumulated in the environment and their presence will persist long after their use has been phased out. PCBs are soluble in fat and they have been assimilated through the food chain into the body fats of animals. Elevated levels of PCBs have been reported in many aquatic and terrestrial species. Because of this tendency of PCBs to accumulate in animal tissues and concern over possible adverse effects on wildlife, they have been classified as "eco-toxic".

Although the use of PCBs is banned in most countries today, its persistence and its widespread use has led to them remaining in the ecosystem and being spread further, to rural and pristine areas of the globe. According to the global fractionation theory, chemicals emitted in warmer climates volatilise and are transported by air currents to colder areas where they are deposited onto soil and water.

In addition to the long-range transport of PCBs globally, there is also a circulation of PCBs from soil and point sources, which influences its concentration in the air at a more regional scale. The temperate industrialised nations, where through the 1960s and 1970s PCBs were manufactured and used extensively, are regarded as the source areas of PCBs on a global scale. Contaminated aquatic environments can also act as sources of persistent pollutants in the atmosphere, since such compounds are readily volatilised from water, PCBs will diffuse from the former to the latter, volatilising from contaminated soil or water bodies to the air, for example, or being deposited from contaminated air into cleaner soil or into water.

The uptake of PCBs in aquatic and benthic biota is mainly governed by the lipophilicity of the compound in question, which can be expressed by its octanol/water partitioning coefficient. Besides the direct partitioning of PCBs between water and the fat pool via the gills of fish and other organisms, food is a source of contaminants for aquatic biota. In addition, the physiological control of uptake, steric hinderance of large molecules, distribution of chemicals within organisms, biotransformation and biodegradation all affect the level of pollutants. Species-specific factors such as fat-content, age-distribution, growth-rate, and prey selection likewise affect PCB concentrations.

For terrestrial organisms, the passive process of exchange between the organism and the surroundings in the uptake and loss of organic pollutants, as is the case for aquatic biota, does not generally occur. The partitioning between air and the lungs of an organism is more limited, due to the respiration volume being low compared with that of gill-breathing aquatic organisms. The partitioning between an organism and water is also more thermodynamically favoured than between organisms in the soil, such as earthworms that can gain or lose chemicals via the soil water, the main route for the uptake of pollutants by terrestrial organisms is by ingestion. Aquatic mammalian predators seem to have higher concentrations of pollutants than terrestrial ones. Animals higher up in a food chain often have higher levels of PCBs and other PBT compounds (biomagnification). Top predators, especially in the terrestrial food chain, have a characteristic

PCB pattern in which only a few congeners dominate The elimination of PCBs from terrestrial organisms is mainly in terms of metabolisation.

Transformations of PCBs can also occur in aquatic systems by microbial degradation (in aerobic water columns and surficial sediments), reductive dechlorination (in anaerobic sediments), and metabolism via organisms that take up the PCBs (NRC, 2001). Metabolism by microorganisms and animals can cause the relative proportions of some congeners to increase while others decrease.

Because the susceptibility of PCBs to degradation and bioaccumulation is congener-specific, the composition of PCB congener mixtures that occur in the environment differs substantially from that of the original industrial mixtures released into the environment.

Generally, the less-chlorinated congeners are more water soluble, more volatile, and more likely to biodegrade. Therefore, lower concentrations of these congeners are found in sediments compared with the original concentrations of Aroclors that entered the environment. Higher-chlorinated PCBs are often more resistant to degradation and volatilization and sorb more strongly to particulate matter. Some of these more-chlorinated PCBs tend to bioaccumulate to greater concentrations in animal tissues than lower-molecular-weight PCBs. The more-chlorinated PCBs can also biomagnify in food webs, and other higher-molecular-weight congeners have specific structures that make them susceptible to metabolism by enzymes once these congeners are taken up by such species as fish, crustacea, birds, and mammals.

The biological activity of PCBs is congener specific, and, therefore, different mixtures of PCBs will have different biological and toxicological activities. Many of the effects of PCBs are mediated through interaction with the arylhydrocarbon receptor (AhR). 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) is the prototypical ligand for the AhR, and the effects mediated through the AhR are described as "dioxin-like." Like TCDD, non-orthosubstituted and, in some cases, mono-ortho-substituted congeners that are substituted in the 3, 4, or 5 lateral positions (3, 4, 5 or 3', 4', and 5' positions) can exist in a planar conformation (i.e., the coplanar PCBs) and bind to the AhR. The potency with which individual PCB congeners bind to the AhR is correlated with their ability to elicit dioxin-like effects. The potency with which individual PCB congeners elicit dioxin-like effects (compared with the potency of TCDD itself) gives rise to the concept of TCDD-toxic equivalents, or toxic equivalence factors (TEF).

The congeners that exhibit the highest TEF values tend to be the planar, most highly substituted forms, with lateral chlorine substitution. Noncoplanar congeners and congeners with low levels of chlorination are rated with very low TEF values; yet have been associated with immunological and neurobehavioral endpoints. The toxicity of the non-coplanar PCBs is not mediated by the AhR, and their toxicity is not accounted for in the TEF approach.

In addition to the effects of planar PCBs, studies have shown that noncoplanar PCBs elicit neurotoxic effects in exposed animals and in cell cultures. Recently, experiments have been conducted to investigate the mechanism or mechanisms that underlie the neurotoxic effects of noncoplanar PCBs. Some PCB congeners also appear to have estrogenic and antiestrogenic effects, possibly mediated by interactions with one or more steroid receptors. PCBs affect the metabolism of thyroid hormones through the induction of enzymes involved in thyroid hormone metabolism.

PCBs also affect the immune system. Effects on the immune system seem to occur through both AhR- and non-AhR-mediated mechanisms. PCBs might also increase oxidative stress, which might contribute directly to carcinogenesis.

Laboratory and field studies with wildlife have demonstrated a causal link between adverse health effects and PCB exposure. Chronic toxicity has been observed in fish, birds, and mammals; impacts include developmental effects, reproductive failure, liver damage, cancer, wasting syndrome, and death. There was also some evidence that PCBs can affect the immune system of birds and marine mammals through their diet.

Ecological exposure to PCBs is primarily an issue of bioaccumulation resulting in chronic effects rather than direct toxicity. PCBs bioaccumulate in biota by both bioconcentration (being absorbed from water and accumulated in tissue to concentrations greater than those found in surrounding water) and biomagnification (increasing in tissue concentrations as they go up the food chain through two or more trophic levels). At most contaminated sites, PCBs are predominantly bound to particles or strongly associated with an organic fraction.

Therefore aquatic organisms are exposed to a combination of dissolved, sediment-associated, and food-associated PCBs. However, in terrestrial ecosystems, lower trophic level organisms are exposed to PCBs primarily through the ingestion of soil and prey, although dermal absorption and inhalation might be important exposure routes for certain species. At each higher trophic level, certain PCB congeners are selectively enriched or depleted because of selective metabolism and excretion of metabolites. As a result, organisms at the top of the food chain are generally at the greatest risk of adverse effects due to exposure to PCBs. However, foraging preferences, species sensitivity, and other site-specific factors can modify the magnitude of those risks.

2.3.2 Technological characteristics (Wagner et al., 2011)

Due to their characteristics PCB mixtures (either pure or together with other substances) have been used in open, partially open and closed systems:

Applications in closed system

Insulation and/or cooling fluid in transformers
Dielectric fluid in capacitors
Hydraulic fluid in lifting equipment, trucks and high pressure pumps (mining industry especially)

Closed systems example transformer	Closed systems, example capacitor battery

Applications in partially open systems

Heat transfer fluids	Voltage Regulators
Hydraulic fluid	Liquid Files Electrical Cobles
Liquid Files Circuit Breakers	Vacuum Pumps
Switches	

Partially open systems, vacuum pump	Partially open systems, liquid filled cables
	

Furthermore PCBs were also used in «open systems» such as in corrosive protection paints, in the car industry, sealants in the construction industry, etc.

As these materials are not usually defined as hazardous waste at the time of disposal PCBs often find their way into the environment.

Applications in open systems

Lubricating fluid in oils and grease	Polymerization catalyst support for petrochemicals
Immersion oils for microscopy	Water-repellent impregnating agent and fire retardant
Laminating agent in paper production	Additive in glues, sealants and corrosion protection

Pesticide Formulation	Cable coatings/casings
Carrier for insecticides	

Open systems example sealants	Open systems, example corrosive protection paint
	

2.3.3 Safety assessment

Exposure to PCBs

There are three possibilities for PCBs to get into the human body through stomach and intestine, through the skin and through respiration.

Very small amount of PCBs is absorbed by the stomach and the intestine from the food we eat. When working with PCB containing equipment and PCB contaminated materials, it is vital to obey the following rules to prevent an increased intake of PCBs - foodstuff shall not be stored or consumed near PCB containing equipment or PCB contaminated materials. After handling PCBs containing equipment or PCB contaminated materials, hands shall always be washed with warm water and soap.

The biggest risk for people handling PCBs lies in the exposition of the skin, because it absorbs the substance very quickly. It is therefore important to avoid direct contact to PCBs by skin. From this reason, to protect skin from direct contact with PCBs, the appropriate Personal Protective Equipment (PPE) must always be worn. The choice of the adequate personal protective equipment depends highly on the tasks to be performed and the deriving risks.

PCBs are not very volatile, therefore the danger of absorbing PCB when facing small amounts of PCB can be neglected, as long as the ventilation is sufficient. If there is a spill of a bigger size, then a respiratory mask with a filter for organic vapours and dusts should be worn.

PCBs adhere to dust though, so when the situation implies that dust (e. g. from drilling in concrete) could be contaminated with PCBs, a respiratory mask with a filter for organic vapors and dusts must be worn. Protection with respiratory masks with a filter for organic vapors and dusts is a must when facing major spills or activities with contaminated dust involved.

A fire or an internal failure of PCB equipment can result in the production of the highly toxic gases Dioxin and Furan.

Protection of the Environment

When handling PCBs, all necessary safety precautions need to be taken in order to prevent a contamination of the environment. When taking samples of PCB suspected equipment or PCB suspected material, it must be worked tidily without losing or spreading sample material. Use oil absorbing carpet as foundation if needed.

All working material must be cleaned either with acetone or disposed of as hazardous waste, including PPE. Only metal and glass can be cleaned entirely, synthetic material and plastic, wood, etc. cannot be cleaned and have to be disposed of as hazardous waste. When confronted with leaking equipment or equipment in bad technical condition during the inventory, it must be ensured that the leak can be stopped or that the entrainment of the contamination can be prevented.

In areas with spills: The contaminated area shall be marked and fenced off if possible. Clothing and footwear shall be changed when entering or leaving the contaminated area in a designated place (compartment). If possible, the leak shall be located and sealed e.g. with a sealing paste. Furthermore, the leaking device shall be placed in a steel basin or drip tray when out of service otherwise absorbent pads shall be placed around and replacement foreseen as soon as possible.

In case of leakage due to damaged equipment, uncontrolled spillage must be prevented by the appropriate positioning of a drip tray, as a first measure. Small leaks should be sealed, and suitable safety equipment must be used while carrying out this work. It is therefore advisable to always keep suitable material (drip tray, rubber gloves, sealing material) in the vicinity of such equipment.

Visibly contaminated soil or concrete should be removed as quickly as possible in order to avoid further contamination. Surfaces of objects (vehicles, sidewalks, buildings, etc.) should be cleaned by using oil absorbent materials and by wiping the surface with solvents. After the cleaning, the surfaces must be analytically tested to check the cleaning success. The used cleaning materials should be placed in drums for disposal.

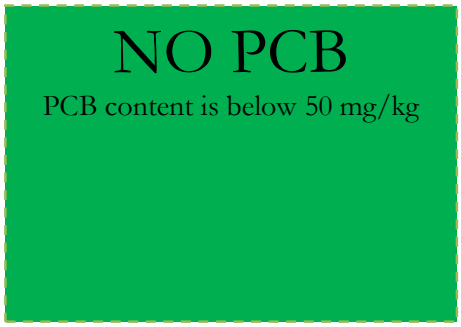
2.4. Regulatory requirements and assessment procedures (Wagner et al., 2011, Holoubek, 2012))

2.4.1 Labelling of Equipments with PCBs

When compiling the inventory, the inspected equipment shall be marked with labels as a precautionary measure. According to the result of the analysis of a sample or to the examination of the manufacturer's plate on a capacitor, a label as specified below will be affixed to the equipment.

This shall guarantee that the equipment can be separated easily and correctly for the disposal at the time of the dismantling activities. In addition, in case of an incident it ensures that the hazards of the situation can be assessed immediately at first glance from the colour of the label.

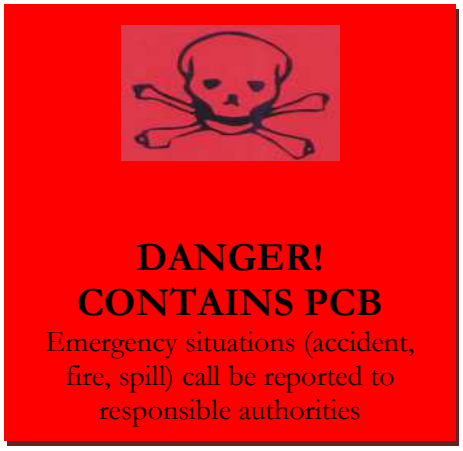
Label for PCB free **equipment**



The equipment has been checked.
Either the analysis of a sample has shown a PCB content of < 50 ppm or it has been possible to definitely determine that the equipment does not contain PCB e.g. by manufacturer's plate, nameplate, etc. (only possible with capacitors).

Label for PCB containing equipment

!



The red label is affixed to equipment where a PCB concentration of > 50 ppm has been analytically proven or if the equipment could clearly be identified as PCB containing by means of manufacturer's information e.g. name of cooling fluid.
(possible with transformers and capacitors).

Label for PCB suspected equipment

Emergency situations (accident, fire, spill) call be reported to responsible authorities
The equipment has been recorded, but not yet tested for PCBs, e.g. if a sampling is only possible after a phase out.
Such labelled equipment remains PCB suspected, a sample must be analyzed after dismantling respectively before disposal.

Example labelled transformers	Example labelled capacitors
	

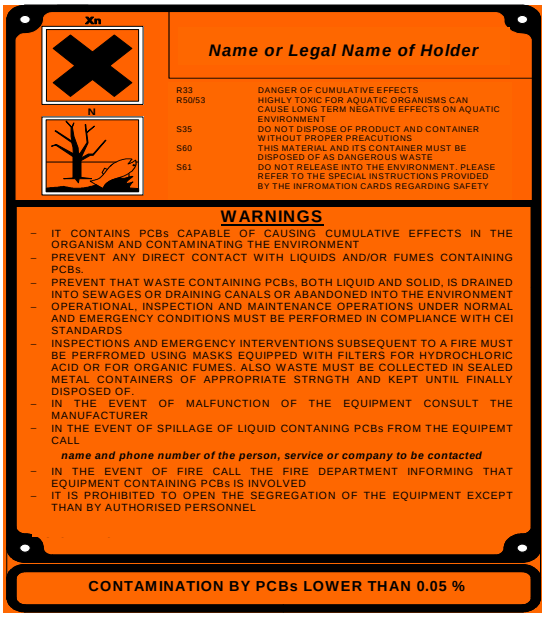
Obviously, the concentration of PCB will increase after some time because of remaining PCBs in the active parts of the equipment (transformer). Therefore, a reliable measurement of the concentration is only valid after a given time after the decontamination. The owner of decontaminated transformer should retest the oil in the transformer not before six months after treatment, and again after two years of operating time before a transformer can be reclassified. Labels will be made by the owners of the equipment in accordance with the provisions (regarding size and material of the labels) stipulated in the Inventory Regulations.

2.4.2 Label for equipment containing PCBs according to EC standards

According to EC standards, the label to be placed on equipment containing PCBs in volumes exceeding 5 dm3, must have a minimum height of at least 23 cm and a width of 17 cm and be divided into two parts of which the upper one (8 cm high) must have an orange background and the lower one a white background. In both parts the indication required must be written in black colour.

Please find here below an example of the label to be placed on equipment containing PCBs subject to inventory. For the labelling of equipment containing PCBs with concentration exceeding 50 mg kg-1 but not exceeding 500 mg kg-1 subject to inventory, the wording «Contamination by PCBs lower than 0.05 %» must be added. For this purpose an additional label can be used or the wording can be added in appendix to the label itself, as illustrated.

Label for decontaminated PCB equipment



2.4.3 Storage and disposal

In a POPs contaminated areas database all spots are summarized that potentially could be contaminated by PCBs. It includes all locations where PCB or equipment containing PCB has been in use, repaired or stored. It must also be investigated, in what locations and circumstances PCB had been used in the past. Company archives about material flow or documents about former equipment can be a useful source of information. It is also worthwhile to interview employees of the company who are or were in charge of the acquisition or maintenance of potentially PCB containing equipment. Interviews should cover the types of purchased equipment, practices of maintenance, possible refills, stored drums with PCB for topping-ups, places of storage and workshops, incidents, etc. The information obtained must be checked visually to substantiate the suspicion of PCB. The places which have to be visited are:

- Current and former sites of potentially PCB containing equipment (check ground under the equipment for leaks especially),
- Current and former workshops,
- Current and former storage sites for potentially PCB containing equipment or spare insulation fluid,
- Sites of incidents (spills, internal failures, etc.), and
- Dumping sites.

All buildings where the PCB contaminated equipment is stored the following label should be affixed on building doors as indicated above.

3. METHODOLOGY OF THE EVALUATION (MTE, 2011; UNEP)

3.1 Purpose and objectives of the evaluation

The task of this final evaluation is a final assessment of the results/achievements of the project including the conclusions and recommendations of the MTE. Based on the discussion with project co-ordinator and team members, the review of project activities realisation including conclusions and recommendations were done. The evaluation report evaluates the project outputs, conclusions and recommendations obtained by the project during its activities and the possibilities of future sustainability, once the project was completed.

Main duties of this evaluation are:

- Study project documentation including experts and progress reports, work plans, relevant notes of meetings, specific project components plan, steering committee meeting notes etc.
- Study of the mid-term evaluation

The main focus of the evaluation is to assess the final project situation and to evaluate the future sustainability of the results.

The evaluation process were provide using the lessons and experiences from other countries for the eventual future design and implementation of similar projects aiming at building capacities for environmentally sound management.

Project completion and effectiveness of the project proposal measures and assess the implementation of project goals and feasibility of the project measures, was the main subject of the TE.

This evaluation was foreseen in the project document to be undertaken in the second part of May 2012. During the implementation of the project delay in the procurement of laboratory equipment from the NATO project was experienced. Due to this delay laboratory work could not start on time. In the meantime a decision was taken in the Government that instead of strengthening a laboratory a new one will be established. UNIDO, in light of these modifications, decided to postpone the mid-term evaluation. In the meantime an extension for 1 year was requested, thus the project terminated in May 2012.

This report is based on the following:

The project document dated on January 2009, indicating the basis and the strategy for the cooperation in this project.

The above mentioned activities should be complemented by the project with training, information, capacity building, policy advice, etc.

Information for the terminal review was received from the following sources:

- The documentation provided by the project parties.
- Mid-term evaluation

- The Project Progress Reports and Annual Reports for all the years of implementation, which were provided by the executing agency, the management of the project and the evaluation team with a valuable tool regarding the self-appraisal of the implementing parties of the results obtained and of the difficulties or obstacles encountered.
- Data on Inventory and Analyses on POPs
- Workshop and training reports prepared by the EA.
-

Ten Workshops were arranged and held within UNIDO Project and 14 Workshops were held in the frames of concurrently implemented relevant Projects under NATO, SAICM, UNEP, etc.

All the Workshop reports, including the Agenda, List of Participants, Discussion, Conclusion, Photo Collage are available in English and Armenian:

- Inception Workshop report dated 16 April 2009.
- Inception Workshop report on NATO SfP Project dated April 22, 2009.
- Inception workshop report for Sound Management of Chemicals dated 7-8 March 2009.
- Report on Training of State Inspection on Identification and Notification of PCB Contaminated Equipment dated: 24-26 July 2009.
- Report on "Risk assessment as a tool for risk management and reduction" Workshop dated 25-26 September 2009
- Report on Contest and exhibition for "Children against Hazards" dated: 27th November 2009.
- Report on Training "Risk assessment methodology (SAICM human health impacts)" 28-29 November 2009.
- Report on Training for Risk Assessment Methodology dated (UNIDO on environment and ecosystem) 16-18 December 2009.
- Report on Training "Analytical Capacity Strengthening for PCB identification and Inventory" dated 29th April 2010
- Report of "On-site Training on PCB identification and inventory" dated 13-15 July 2010.
- Workshop report on obsolete pesticides sound management dated 13-15 July 2010.
- Workshop report on strengthening analytical capacity for POPs identification and analysis 7 September 2010.
- Report of "Training on Chemicals management and responses" dated 22-23 October 2010.
- Awareness raising Workshop report (SAICM) 19-20 November 2010
- Report of Awareness raising workshop where Armenia/UNEP Partnership on Development of Chemicals Legislation and Industry Involvement in Armenia project proposal was also designed for SAICM Quick start programme dated 11 December 2010.
- Report on UNIDO Workshop "Best Available Technique/Best Environmental Practice (BAT/BEP) for disposal of POPs wastes in Armenia" dated March 24, 2011.
- Workshop/Training on Best Available Technique/Best Environmental Practice (BAT/BEP) and Risk Assessment" was arranged on September 27-28, 2011.
- The National awareness-raising workshop on the nine new POPs and the implementation of the Stockholm Convention in Armenia (hereinafter:

Workshop) was arranged by the United Nations Environment Program (UNEP) and held jointly with the Hazardous Substances and Waste Policy Division of the Ministry of Nature Protection (MNP) of the Republic of Armenia (RA) on May 26-27, 2011.

- Equipment enabling on-the-work-place training (October 24-28, 2011) was arranged with participation of the representative from "Shimadzu Corporation" as manufacturer of "Gas-Chromatograph/ Mass-Spectrometer GCMS-QP2010SE EI 230V CELV incl. GC-2010Plus' (Shimadzu Corporation, Japan) obtained in the course of the current NATO SpP Project.
- Polish Aid Workshop - Training "The support in developing system of sound chemicals management in Armenia in order to facilitate economic integration with the European Union" was arranged and held in Yerevan (Armenia) on December 12-16, 2011 in accordance with the agreement between the Republic of Armenia and the Government of Poland and within the "Polish Aid Project" implemented due to the grant of the Ministry of Foreign Affairs of Poland.
- BAT/BEP FORUM - The "Regional Workshop on the Introduction of BAT and BEP in the Thermal Processes in the Metallurgical Industry in response to the Stockholm Convention on POPs and CEECCA BAT/BEP Forum Board Meeting" were arranged and held in Yerevan (Republic of Armenia) on December 20-22, 2011.
- Inter-calibration on-the-job training (in the frames of on "Inventory, Monitoring and Analysis of Obsolete Pesticides in Armenia for Environmentally Sound Disposal" (NATO SfP - Armenia Pesticides ESP.EAP.SFPP 982812) Project) (April 2012)
- Report on "Terminal Project Results Evaluating Workshop" dated May 4, 2012.
- Report on "Results Evaluating Workshop" within NATO SfP Project dated May 26, 2012

- Discussions with the National Project Coordinator, the national consultants, the national counterparts and the staff of national institutions.
- Meetings with national counterpart institutions and high-ranking officials.
- Visits of some target beneficiaries and meetings with their managers, on their experience with the project.

The observations and findings of the final evaluation are the result of the deep study on above mentioned project documents, personnel meetings and own experiences from many visits in the Armenia during the period 2003-2012 and realisation of other POPs related projects in Armenia.

3.2 Composition and timetable of the mission

As the international consultant for the terminal evaluation was selected Prof. Dr. Ivan Holoubek, professor of environmental chemistry, Masaryk University, Brno, Czech Republic, director of the Research Centre for Toxic Compounds in the Environment (RECETOX), with more than 25 years of experiences in the field of persistent organic pollutants of all types including PCBs, their environmental fate, effects and risks, their determination and monitoring, disposal, remediation, waste management as well as the POPs international conventions and the evaluating achievements, success and shortcomings of technical cooperation projects dealing with these issues.

The location of the mission was in Yerevan and Hrazdan as most of the project stakeholders were based in the capital city.

The observations and findings of the Evaluator are the combination of the in-depth study of project documents and own observations during the mission travel and also from the previous visits of the country, which were connected with some other activities.

The mission consists from home work and visits of Armenia based on the mission proposal:

Main duties	Location	Time
Study of project documentation, including project proposal, progress and annual reports	Home based	20/05 – 20/06/2012
Meetings with project team, visit of selected stakeholders with the special attention to the project goals realisation, future development and future sustainability of the activities.	Yerevan	23 - 27/05/2012
Visit of the demonstration sites of the different project components, specially the areas dedicated to the management system for the safe and environmentally sound phase-out and disposal of PCBs.	Yerevan, Hrazdan	24 - 25/05/2012
The Evaluation Workshop – participants see Annex II	Yerevan	26/05/2012
Assess technically the project results, achievements and further needs for possible improvement.	Home based	20 – 30/06/2012
Prepare the first draft of the report in the co-operation with the national consultant and project team including conclusions of findings and recommendations.	Home based	01 – 10/07/2012
Prepare the final report including technical findings, conclusions and recommendations and submit to UNIDO		

The results of these discussions and the comments made by the participants have been taken, as far as possible, into account in this report.

4. ANALYSIS OF THE ACTIVITIES AND FINDINGS

4.1 Context, Concept and relevance of the project (project documents, MTE)

The project document was prepared on the basis of the National Implementation Plan and discussions with national experts and relevant governmental institutions in 2008. The NIP was endorsed on 13th January 2005 and concluded that capacity building at the national level is crucial for implementing the SC. The NIP also highlighted that the most pressing area of the implementation, where further information and planning is required, is the management of PCBs and POPs pesticides wastes. The NIP development was organized by Ministry of Nature Protection and this project aimed at utilizing the capacity that was created with GEF assistance.

At the time of starting the project the national proper capacity to undertake the preliminary identification of POPs sources and assessment of their quantities were not available. The NIP also highlighted the general socio-economic status of the country and provided a baseline for GEF's support. Overall, the establishment and maintenance of effective legal, scientific, economic, and political institutional framework for POPs management were significantly hampered because of insufficient human and financial resources. This deficiency was further compounded by the lack of adequate human resources at administrative and technical level that would be required to design, implement, monitor, and enforce relevant policies, regulations as well as to develop and formulate programs that would be crucial to implement the NIP.

The formulation of efficient POPs management framework to prevent, reduce or eliminate their releases and to introduce environmentally sound management of POPs wastes should be based on adequate scientific and socio-economic data and information which was partly missing at the time of project start. Basic information on obsolete pesticides, PCBs, POPs containing wastes, their fate in the environment and occurrence in abiotic and biotic compartments were not quite well known or unknown and documented. Suitable technologies for their disposal were not available. Decision makers therefore could not decide on how the stocks should be eliminated.

Concerning to PCBs, PCBs containing equipments and PCBs containing wastes, the level of available information was very low. The NIP inventory provided only very limited and not quide clear picture on the details of this problem. Policy makers could not take in account the threats posed by POPs on human health and environmental in the national context. The costs of identification of realistic measures required for efficient management of POPs could not be identified. Difficulties in providing adequate scientific and socio-economic data including the absence of pertinent, comprehensive and specific scientific data with special emphasis on the risk they pose to humans, wildlife and the environment and lack of tools for proper assessment of the socio-economic aspects related to this issue further escalated these weaknesses.

This background situation was a base for the development of this project and its implementation with the respect of the objectives of the beneficiaries' requirements, country needs and priorities, stakeholders and partners.

The project has created the legal capacity for obsolete POPs pesticides and PCBs management. One very useful tool was to provide the trainings to government officials at the central and local levels on the subject. Those that might be exposed to POPs during their duties received strong trainings to minimize the health risks. Also at the national level the environmental and human health related risks of POPs and other hazardous chemicals are now well understood. Laboratory capacity for POPs monitoring was planned and in a new laboratory the Analytical Laboratory due to the financial supports from other sources, was established.

The project has appropriately analysed the barriers Armenia was facing related to the management of PCBs and obsolete pesticides. On this basis the context of the intervention was correct. Institutional capacity has been strengthened at all key implementation partners, i.e. the Government (Ministry of Nature Protection, Agriculture, Energy and Natural Resources), Waste Research Centre, local authorities, Environment and Health Inspectorates of the Government. PCB management enterprises and owners of PCB-containing equipment and wastes have been identified and trained.

The project strongly contributed to harmonizing chemicals, especially POPs, related capacity building activities of the Government of the RA. This integrated approach which puts in place the PRTR system, the ESM system for PCBs and obsolete POPs wastes and addresses chemicals related risk assessment and management issues as well as developing strategies for disposal of POPs as part of a broader waste management scheme is seldom among capacity building projects. The complexity also appears on the co-financing side, since nine different organizations were taken aboard.

Project management activities of the EA assured adherence to the project document. Difficulties connected with the delay of analytical equipment from NATO co-financing sources was solved and laboratory is now working and able to analyze POPs samples,

The NIP upgrade is now ongoing based on the COP of the SC on POPs decision and due to the adoption of 10 new pollutants on the list of pollutants of the SC. National institutions and stakeholders participated on the special training workshop on this issue which was organized by the Secretariat of the Stockholm Convention on POPs in the co-operation with the Regional Centre for the CEECs region (RECETOX).

4.2 Extent to which the barriers have been removed

The extent to which the identified barriers of the project document have been addressed by the project is presented in the following table:

Barriers existing at the beginning of the project	Extent to which the problem has been faced by the project - MTE	Extent to which the problem has been faced by the project - TE
Lack of an enabling policy and regulatory environment	Several regulatory infrastructures have been drafted and enacted. The regulatory environment is more enabling than it was at project start-up. Activities are ongoing especially for formulating and enacting a PCB management related joint decree between the Ministry of Nature Protection and Ministry of Energy.	The problems related to environmentally sound management of chemicals and wastes, including the necessity to replace and destruct PCB-containing oils and equipment, as well as environmentally sound disposal of obsolete pesticides is of high importance and urgency for Armenia and as priority challenges are included in all strategy documents of the country, such as: - Millennium Development Goals (2000-2015); - Governmental Action Plan (2008 -2012); - Republic of Armenia National Implementation Plan (NIP) for the Stockholm Convention (2005-2010); - National Environmental Action Plan (NEAP) (2008-2012);

Barriers existing at the beginning of the project	Extent to which the problem has been faced by the project - MTE	Extent to which the problem has been faced by the project - TE
		-National Poverty Reduction Strategy; - Republic of Armenia Sustainable Economic Development Strategy; - Republic of Armenia Agricultural Sustainable Development Strategy; - European Neighborhood Policy (2009-2011); - Republic of Armenia National Security Strategy. - Individual Partnership Action Plan (IPAP): Armenia / NATO. Existing legislation was evaluated, as well as gap analysis conducted to identify national needs in view of the implementation of the Stockholm Convention. Proceeding from previously identified main gap, the «Law on Chemicals» was prepared as an urgent demand for the Republic of Armenia, negotiated with country stakeholders and the Government of the Republic of Armenia A number of normative regulatory documents was prepared, adopted by the Government and published (10)
Financial barriers to the implementation of NIP	The project has removed many barriers concerning the financing of POPs management related capacity building at the Governmental level. Still however there are many questions concerning the cost of the disposal of the obsolete pesticides and since the inventory of PCBs have not yet been completed, the cost of the phase out and disposal of PCBs. Project activities in the future will concentrate on these areas.	The following support of the POPs inventory including the newly adopted POPs from the international and national sources is a necessity. Also the financial mechanism of the waste disposal and phase out and contaminated sites remediation has to be developed. Inventory of POPs will continue – the finishing of the inventory of old POPs and starting the inventory of new ones including new types of wastes – e-wastes and car wastes mainly.
Weak monitoring capacity for POPs.	The project has trained many professionals from the inspection side of the enforcement. Laboratory personnel visited Brno Czech Republic summer school to be trained on the job in analysing POPs. A new laboratory was established under the WRC, where new equipment has been obtained. The laboratory is not fully functional. Further equipment has been ordered. PCB analysis on oils with a Dexsil L2000DX equipment is ongoing.	A new laboratory was established under the WRC, where new equipment has been obtained and installed. The laboratory is not fully functional. The laboratory room is not sufficient, laboratory needs more space if can be accredited.

Barriers existing at the beginning of the project	Extent to which the problem has been faced by the project - MTE	Extent to which the problem has been faced by the project - TE
Weak institutional capacity for planning, guiding and enforcement for the Convention compliance	The institutional capacity for enforcement of the SC related obligations have also been strengthened. This was mainly accomplished by trainings. The project so far has organized eight training workshops and many other workshops, where government enforcement authorities also participated. Activities are ongoing in this regard.	During the last ten years a lot of work connected with the NIP and SC on POPs measures was done, institutional capacities based on the intensive trainings increased.
Unavailability of and limited access to information	The project has so far addressed this barrier in four ways. 1) A project web site was established and all project related information is provided there for the interested. 2) Trainings and workshops have been organized for policy makers and professionals. 3) A contest and exhibition was organized for small children on "Children against hazards" which provided information to children and families. 4) 21 publications have been written including scientific papers and conferences brochures, books, etc. This is a remarkable contribution of the project and Armenia to the international knowledge on POPs.	Project information are available as a results of internet presentations and the publishing of project results in the scientific papers and conference proceedings. Set of workshop contribute to the more effective inter-institutional co-operation
Low awareness of POPs	The information level on POPs has significantly improved due to project activities, especially among those that have access to POPs or are in the management of these chemicals. Details are provided in the previous barrier.	The level of information, due to the intensive awareness raising campaigns via internet, media, publications are now much higher and deeper. But this process is neverending, it means that it will have to continue using the very good project results and other national effective and successful projects and project outputs.

4.3 Quality of stakeholders and target groups

The project was designed to create capacity at the national and local levels on the environmentally sound management of POPs and POPs wastes. In this regard the following beneficiaries have been identified and strengthened:

General population of the Republic of Armenia, due to

- Minimized releases of POPs,
- Reduced damage to the environment and human health
- Reduced pollution to water, soil, organisms and ecosystems resulting in better conditions for living, clean production of food stuffs;
- Better education and awareness raising among professionals and the public for protection their health and environment.

Institutions:

- Ministry of Nature Protection of the Republic of Armenia
    - including the Waste Research Centre, State Non-Commercial Organization
    - Monitoring Center
    - Inspectorate
- Ministry of Energy and Natural Resources of the Republic of Armenia, including:
- Ministry of Agriculture of the Republic of Armenia
- Ministry of Health of the Republic of Armenia;
- Local authorities (Self-governance).

Private and public sector enterprises:

- Direction of Construction Hrazdan -5 Enterprise (TPP), HayRusGazArd CJSC (Thermal Power Plant);
    1. Vorotan Hydro Power Cascade System CJSC
    2. Yerevan Thermal Power Plant CJSC
    3. International Energetic Corporation (MEK) CJSC;
    4. Armenian Electrical Nets (HEC) CJSC;
    5. High-voltage Electrical Nets (BEC) CJSC;
- ArmEnergoRepair CJSC
- Training Center of the Armenian Nuclear Power Plant.

The Waste Research Centre

In order to facilitate development and implementation of the policy and strategy in the area of waste management, as well as to secure environmentally sound management of chemicals and waste within the structure of the Ministry of Nature Protection the Waste Research Centre was established (Decision of the Government of the Republic of Armenia No. 670-N dated May 19, 2005). The Centre is engaged in issues relevant to waste inventory taking, classification thereof according to the hazard degree, carrying out research activity to study the unfavourable impact of waste disposal sites towards the environment, working out normative acts (regulations and standards) in the area of waste management, as well as gathering and analysis of information on low-waste and waste-free technologies, on entities at which wastes are generated, processed and used.

The WRC is the primary beneficiary of the implementation activities as moist of the activities are either involving this entity or strengthening it. During the implementation of the project a new laboratory has been established under WRC. This laboratory is the Central Analytical Laboratory, which receives now its equipment and furniture's to start its operations. Scientists have been recruited and trained. Their primary task will be to undertake researches that could provide data for informed decision taking in the field of environment.

4.4 Stakeholders' ownership

The Hazardous Substances and Waste Policy Division of the MNP, as an executing partner and the WRC as the cooperating partner of UNIDO, have strong ownership of the project. The managerial infrastructure for the implementation was put into place at project start-up from February to March 2009.

The newly established Analytical Laboratory on POPs very sufficiently contribute to the project realisation and future ongoing activities concerning to POPs national inventory.

Other ministerial institutions also very actively participated in the Project implementation. The public and private stakeholders, especially the operators and the electricity generation sector, were also important partners of the project. They were very active in the supporting the activities for the whole project time.

4.5 Project strategy

The objective of the project was to effectively and efficiently assist Armenia to implement the Stockholm Convention by strengthening the institutions, regulations and enforcement and to enhance the capacities for the sound management of POPs at national and local levels. As part of the capacity building the project aims to establish/amend laws, regulations and standards; strengthen institutions for monitoring; establish/update inventories of POPs chemicals; improve research and development; promote technology transfer; facilitating data and information collection; develop a national methodology for risk assessment and a strategy for risk reduction for priority chemicals, including POPs ; enhance supervision, update the National Chemicals Management Profile, enforcement and evaluation for continuous improvement and awareness raising of stakeholders on POPs issues, thus creating an enabling environment in Armenia for the final disposal of POPs chemicals and related waste.

UNIDO has provided the necessary expert help. Technical activities of the implementation were undertaken by a National Project Management Team and national experts. Team members and national experts always received trainings before their assignment started.

The capacity building activities at the Government bodies had so far been built on the available infrastructure and capacities of the institutions, thus utilized the international financial resources wisely.

The POPs inventory and reporting system were improved. Inventory forms were prepared and distributed among enterprises of energy and industry sector of Armenia in order to take inventory. Guidelines to holders of PCB-contaminated equipments was prepared and approved by the Government on how to carry out an inventory, notification and reporting.

Inventory of equipment and oils was done at enterprises of the energy production sector, as well as analyses of oils done for PCB content. In the industrial sector Inventory of equipment and oils was also done.

The labelling system for use by holders of PCB-containing equipment and waste was developed and implemented.

A database for information gathered in the POPs inventory and for future management of PCB contaminated equipment was established.

During the period of report Inventory of existing equipment (power transformers, auxiliary/ house transformers, oil switches, voltage measuring transformers, arc-suppressing coil transformers) containing transformer oil, as well as reserve quantities of such oils was taken by the working groups in energy production and distribution companies of energy sector in the Republic of Armenia.

Total number of transformers according to inventory in the Republic of Armenia is 9 867 and number of oil samples were 1 946. Total number of oil switches is 2 574 and 470 samples were collected in this case. Total number of samples from industry and energy sectors was 2 416 and 1 820 samples from this amounts were analyzed until now; 390 were positive with PCBs findings. Additionally 60 environmental samples were collected for POPs pesticides in different environmental media (surface water, water of Lake Sevan, benthos, bottom sediment, soil) and analysed; 900 readings (results) were obtained.

60 samples of environmental media were taken for analyses of PCB content; 602 readings (results) were obtained for different PCB congeners.

The project implementation strategy is sound. The implementing agency, UNIDO, is directly implementing the project through the national EA. The Hazardous Substances and Waste Management Department (HSWMD) of the Ministry of Nature Protection of the Republic of Armenia (MNP) is the coordinating entity on the national level as it is the focal point for the Stockholm Convention in Armenia. Project related decisions were undertaken by the Project Steering Committee. The PSC had annual meetings over the course of the implementation.

UNIDO in consultation with HSWMD appoints International Experts for those tasks for which expertise and experience is lacking at the national level.

The project document included a logical framework, which provided a sound and objective tool to monitor the implementation. Project achievements have been evaluated against the logical framework during the midterm and terminal evaluations.

The duration of the project was planned to be two years. Project finances from the GEF were received on 22nd November 2008. The preparatory phase for project implementation started in February 2009, with a meeting in UNIDO where the Project Management Team discussed the implementation approach, financial modalities and revised the work plan. The activities on the national level started in April 2009, with putting in place the project related management and coordination, as well as forming the Project Steering Committee.

UNIDO is directly implementing this project. All, GEF or UNIDO financed, equipment procurements were also undertaken directly by UNIDO.

The project implementation experienced some delay due to lengthy procurement of analytical equipment and due to the fact that many project activities were inter-related with other projects and delays in this project have also had delayed the implementation of this project.

In conclusion the project strategy is sound, though for projects that are interrelated with other projects; the work plan should be developed on a way that would allow for flexibility based on the delays or changes in the others work plan.

4.6 Inputs and budget

4.6.1 Financial inputs

The project co-financing was planned at US$ 1 848 460. The co-financing was foreseen from many sources. During the midterm evaluation the financial inputs of all co-financing sources were looked at. The following table summarizes the planned and the actual co-financing.

Source	Type of resource	Expected amount (US$)	Received amount (US$)
Government Contribution	Grant	135 000	138 500
Government Contribution	In kind	155 000	198 000
Waste Research Centre	In kind	50 000	40 000
Waste Research Centre	Grant	10 000	10 000
UNIDO	In kind	45 000	???
Government of Switzerland	Grant	200 000	200 000
UNITAR	In kind	50 000	50 000
UNITAR	Grant	50 000	50 000
EU/Armenia	Direct budgetary support	398 460	389 000
NATO	Grant	325 000	213 000
SAICM	Grant	300 000	283 000
Private Sector	In-kind	100 000	70 000
Local NGOs	In kind	30 000	30 000
Brazilian Government	Grant	0	80 000
Total		**1 848 460**	**1 751 500**

At the time of the mid-term evaluation 1 751 500 US$ co-financing was received. The actual co-financing ratio is 94.75 %. The grant co-financing of the Government was provided for the legislative documents prepared in 20092012. The Waste Research Centre in kind contribution was the salary of its employees, while its grant support was the procurement of equipment such as air conditioner and other laboratory infrastructure for the Analytical Laboratory.

The Swiss Government gave 200 000 US$ to UNITAR for assisting the preparation of the PRTR for Armenia. UNITAR utilized those resources and provided additional finances for the PRTR implementation, thus their support have been fulfilled.

EU/Armenia implemented sub-regional project on Waste Governance in Armenia. This regional project has been assisting the development of Manual for landfill operation guidance. Pilot region is Lori province (Armenia). It includes waste classification and manual for classification of the waste types. Development of a new MSW management for Yerevan.

NATO provided so far money for training of specialist in Brno in 2009 - 2012 summer schools for young specialist. The training concentrated on sampling, preparation, clean-up and analysis of POPs. The Gas-Chromatograph/Mass Spectrometer (Shimadzu, Japan) was provided. This input made 213 000 US$.

The last instalment of the SAICM contribution of 17 000 US$ is still pending. Their assistance was utilized in identifying the main sources of hazards in Armenia, industrial impacts of POPs and other chemicals on human health and developing risk assessment and risk reduction concepts.

Private sector in energy generation transmission and distribution are involved in the inventory process. They provided HR, transportation and technical expertise for taking the samples. Their contribution reached approximately 70 000 US$.

Local NGOs like EcoTox, Armenian Women for Health and Healthy Environment and Environmental Public Advocacy Centre (EPAC) have provided awareness raising and participated at the contest and exhibition for Children Against Hazards. Their contribution was in the value of 30 000 US$.

During the implementation the NPC has applied for support from the Brazilian Government in supplying additional laboratory equipment at 80 000 US$. The laboratory equipment has been received.

The expected contribution from UNIDO was in-kind and included staff salaries for the persons involved and preparation of the technical reports.

The GEF provided 805 000 US$ grant as support to the project.

The following table details the expected and actual co-financing inputs.

Co financing (Type/source)	**IA own Financing (mill US$)**		**Government (mill US$)**		**Other Sources * (mill US$)**		**Total Financing (mill US$)**	
	Proposed	**Actual**	**Proposed**	**Actual**	**Proposed**	**Actual**	**Proposed**	**Actual**
Grant			0.145	0.1485	0.875	0.709	1.2	0.8575
Credits								
Loans								

Co financing (Type/source)	IA own Financing (mill US$)		Government (mill US$)		Other Sources * (mill US$)		Total Financing (mill US$)	
	Proposed	Actual	Proposed	Actual	Proposed	Actual	Proposed	Actual
Equity								
In-kind	0.045		0.205	0.238	0.08	0.08	0.33	0.318
Other Non-grant instruments (direct budgetary support)					0.39846	Not Known	0.39846	Not Known
Other types (Not Known)					0.1	0.07	0.1	0.07
TOTAL	0.045		0.358	0.3865	1.45346	0.859	1.85646	1.2455

*Other refers to contributions mobilized for the project from other multilateral agencies, bilateral development cooperation agencies, NGOs, the private sector etc.

4.6.2 Human, technical and administrative inputs

UNIDO, as implementing agency, has provided a backstopping officer at its Headquarters. UNIDO in consultation with HSWMD has also appointed international experts and provided laboratory infrastructure during the implementation. Through UNIDO's procurement process one L2000DX equipment for PCB analysis was provided to the project with reagents.

HSWMD, as executing agency undertook technical and management related duties under the leadership of the National Project Coordinator. HSWMD also provided three technical experts to the inventory taking and one specialist who guided the work of the PMT. The project has established a project office at WRC. The NPC provided secretarial assistance to the Project Steering Committee as well. WRC provided a laboratory space for the analytical instruments and storage locations for the samples received during the inventory exercise. The electronic PCB database is located within the HSWMD's computers.

PCB owners provided their authorized personnel to the inventory teams, specifically in approaching the transformers and taking the samples.

The Brazilian Government has provided laboratory equipment and vehicle for the benefit of the project. The details of the equipment are as follows:

NN	Name	qty
1	Centrifuge (no less than 4000 rpm) with rotor and cups (4 pieces) of 200 ml volume each	1
2	Noiseless (silent) compressor for chromatograph activation	1
3	Distiller (distillation apparatus) with a receiver having capacity of 10	1

NN	Name	qty
4	drying cupboard for chemical ware (volume: 80-100 L)	1
5	Rotary evaporator for samples concentration	1
6	Automated extractors (from solid samples)	4
7	muffle furnace (minimum 600° C; volume: 5-7 L)	1
8	Shaker for flasks (volume : up to 0.5 L)	1
9	Laboratory grinder for grinding solid samples	1
10	sieving stack to sieve the samples	1
11	analytical balance with a set of weights	1
12	Laboratory balance with a set of weights	1
13	Refractometer	1
14	Hydrogen generator for chromatograph activation	1
15	Nitrogen generator for chromatograph activation	1
16	Ventilator for the chemical hood	2
17	UV-vis spectrophotometer with determination range 160-1000 *nm*	1
18	Land-rover	2

SAICM and UNITAR provided international expertise for trainings addressing the development of PRTR system for risk assessment for human exposure.

NGOs contributed actively to the project implementation by commenting on the strategies and legal documents, by exchanging experiences and expertise, through disseminating knowledge o POPs in 11 regions of Armenia through workshops and awareness raising activities.

4.7 Role of the Executing Agency

The National Executing Agency (EA) is the Hazardous Substances and Waste Management Department of the Ministry of Nature Protection of the Republic of Armenia. WRC undertakes the development of scientifically based recommendations aimed at minimizing the risks of obsolete pesticides to human health and environment in order to ensure environmental security of the general population, the preparation of regulations for sound management of PCBs-containing wastes, oils and obsolete pesticides, including handling, transportation, disposal, etc. Further the WRC's duty is to take samples from different environmental media for analyses. The Waste Research Centre has a successful experience in hosting the "Establishment and Operation of a National Cleaner Production Programme in Armenia" Project (UNIDO, 2006-2008) and "Inventory, monitoring and analysis of PCBs, obsolete pesticides in Armenia for environmentally sound disposal" (NATO, 2008-ongoing).

HSWMD is entrusted with coordinating project related activities as it is the national focal point for the Stockholm Convention in Armenia. MNP has significantly contributed to the design and drafting of this MSP proposal as well as the mobilization of co-financing. The HSWMD was/is the co-ordinating agency for implementation of many international projects (UNIDO, UNITAR, UNDP, UNEP, NATO) and represents well experienced and organized national body which confirm also during this UNIDO project fully responsibility and ability to manage of these types of international projects.

The activity of the EA and the coordinating entity during the implementation is excellent. All technical and project management related documentation is up-to-date and is high quality.

4.8 Effectiveness of the project

4.8.1 Benefits delivered

To the Governmental institutions

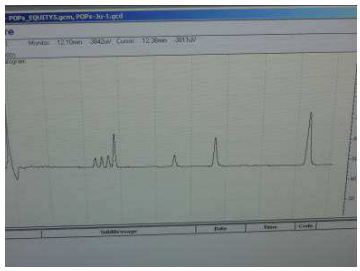
The project has strengthened the regulatory framework and introduced related standards. This improves the environmental quality, product quality by reducing POPs releases. The project has also improved the monitoring capacity at the country level which would help produce a more transparent inventory of POPs releases in Armenia. The cooperation between Governmental institutions was also improved. This also will lay the foundation for effective and efficient reduction and elimination of POPs in Armenia and will generate significant domestic and global benefits.

POPs Monitoring Network was developed. The network includes the enforcement bodies of the Government, through they resources are still limited for regular monitoring of POPs. The legislation was also reviewed to include new POPs on the list of chemicals under monitoring. But the effective design of the POPs monitoring does not exist until now.

Investigations of laboratories under all institutes, universities and research institutions have been undertaken. All accredited laboratories were identified and their capacities are documented.

Based on the review a decision was taken that a new laboratory would be established under WRC. Capacity has been built for PCB analysis and PCB inventory development. Laboratory infrastructure and additional reagents are still under procurement and laboratory is not ready to be accredited. The laboratory room is fully functional, but space is very limited and not fully suitable and acceptable for the operation under rules of accreditation and higher amounts of samples. GC/MS system was installed and is fully functional, but a lot of work has to be done due to the validation of sampling and analytical methods. Other issue is that the operation of the laboratory including the confirmed amount of samples and adequate financial support has to be done from the side of the Ministry and Government.

Visit of laboratory, 24/05/2012

To owners of POPs wastes

The project has provided many trainings and workshops for owners of POPs. The inventory started with collecting information on the electrical network. More than 68 industrial facilities have been visited by the PMT. Each visit meant training and taking the samples for PCB analysis. At the large electricity generating, transmitting and distributing entities the PMT visited countless locations, such as substations, power stations, etc. Each site training was provided by the local staff.

The labeling of electrical equipment is done; however a part of samples should be analyzed later on, because of delay in analytical equipment delayed procurement installation.

The project so far has been delivered the benefits perceived by the stakeholders.

Records from sites visits of PMT

Labelling system used in Armenia






Facility: Shaumyan-1 110 kV substation "Electric Network of Armenia"



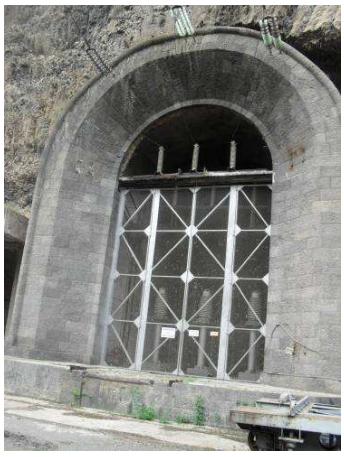
Facility: Yerevan-1 HPP "The International Energy Corporation"



Facility: Eghvard, Nairi section "Electric Network of Armenia"

Facility: Arzni HPP "The International Energy Corporation"

Records form sites visits of evaluator with PMT

Facility: ARG Hrazdan – electric and heating power plants






Facility: TEC Yerevan – electric power plants, old facility



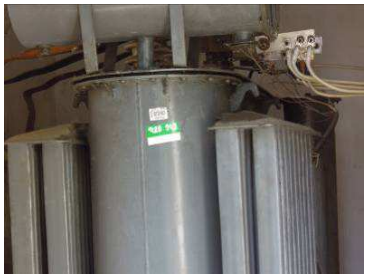








Facility: Yerevan electricity providing system



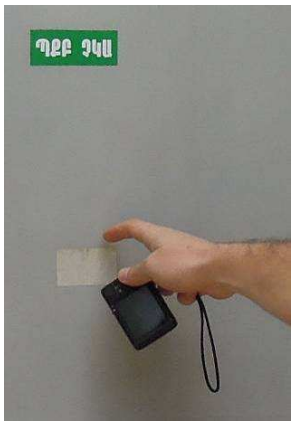



Recommendations from the visits

The labelling using the adhesive stickers is not stable in time. Some of them were peeled off. Much more suitable and stable will be probably labelling using the paints or combination of both possibilities especially from the point of view of the future controls.

Example from ARG Hrazdan (1,2) and TEC Yerevan (3)



4.8.2 Beneficiaries

The beneficiaries, who represented all proposed stakeholders, evaluated the project goals, outputs and outcomes as very useful. Project led to the significant changes of behavioural pattern, better understanding on PCB and POPs pesticides issues, owners of POPs, are aware of their obligations to phase out and dispose of their stocks. It is possible to predict that the private sector investment will increase.

The initial risks and assumptions were valid. The enactment of amended and new legislations took more time 2 years which were formerly planned due to the procedural reasons.

4.9 Efficiency of the activities

4.9.1 Primary outputs

Strengthened institutional capacity has been developed. In this regard the MNP has received the greatest attention. A new laboratory was established, human resources were strengthened. Other relevant Governmental entities have also been strengthened. Chemicals management has also improved; the tools for storing data have been or are in the process of development. Fund raising

activities have also started. The project received 80 000 US$ worth equipment from the Brazilian Government. The project document foresaw the laboratory equipment for the analysis of PCBs. The procurement procedure was several times repeated until it became successful. The payment modalities were negotiated at the time of the evaluation. This delayed the implementation of the project.

The legal infrastructure is also being put in place. This is undertaken in a harmonized manner with other chemicals related conventions and the legislations in the EU.

The project so far was very strong on public awareness activities. The level of POPs awareness in the governmental, public and private sectors that manage or own PCBs and POPs pesticides have greatly improved. Activities are ongoing.

The PMT planned to make inventory of all potentially PCB containing equipment. They have estimated that approximately 10 000 pieces of such equipment are in Armenia, finally the amount of 12 448 were described and put it to the national database. As was mentioned earlier, 2 416 samples from this amount of PCBs containing equipment were analyzed until 01 July, 2012.

Extension of the project from GEF has been requested and was approved. The revision of the work plan proposed in the MTE has led to the successful end of project.

4.9.2 Information dissemination

The project provided on site trainings to more than 68 enterprises. The number of trained people were contacted during the MDE including several meetings were held with the project stakeholders, especially during the development of the ESM system.

Several workshops and trainings were held during the implementation period and reports on these events are available:

UNIDO/GEF - Proje**ct** Technical assistance for environmentally sustainable management of PCBs and other POPs waste in the Republic of Armenia:

- Inception Workshop (Yerevan, Armenia, April 16, 2009).
- Training of State Inspection on Identification and Notification of PCB Contaminated Equipment (Tsaghkadzor, Republic of Armenia on July 24-26, 2009).
- Risk Assessment Methodology Training (Tsaghkadzor, Republic of Armenia, December 16-18, 2009).
- Training on Analytical Capacity Strengthening for PCB Identification and Inventory (Yerevan, Armenia, April 29, 2010).
- On-site Training on PCB Identification and Inventory (Yerevan, Armenia, July 13-15, 2010).
- Workshop on Obsolete Pesticides Sound Management (Yerevan, Armenia, July 13-15, 2010.
- Workshop on Best Available Technique/Best Environmental Practice (BAT/BEP) for Disposal of POPs Wastes in Armenia (Yerevan, Armenia, March 24, 2011).
- Workshop/Training on Best Available Technique/Best Environmental Practice (BAT/BEP) and Risk Assessment (Yerevan, Armenia, September 27-28, 2011).

- Regional Workshop on the introduction of BAT and BEP in the thermal processes in the metallurgical industry in response to the Stockholm Convention on POPs and CEECCA/BAT/BEP Forum Board Meeting (Yerevan, Armenia, 20-22 December, 2011).
- Terminal Project Results Evaluating Workshop (Yerevan, Republic of Armenia, May 4, 2012).

NATO – SfP project Inventory, Monitoring and Analysis of Obsolete Pesticides in Armenia for Environmentally Sound Disposal:

- Inception Workshop on Inventory, Monitoring and Analysis of Obsolete Pesticides in Armenia for Environmentally Sound Disposal (NATO SfP - Armenia Pesticides ESP.EAP.SFPP 982812**)** Project (April 22, 2009 in Yerevan, Armenia).
- Strengthening Analytical Capacity for POPs Identification and Analysis. Workshop (September 7, 2010, Yerevan)

Other training/workshops relevant to project task:

- UNEP - The National awareness-raising workshop on the nine new POPs and the implementation of the Stockholm Convention on POPs in Armenia – UNEP/SSC/HSWPD of the MNP (Yerevan, Armenia, 26-27 May, 2011).
- Polish Aid Workshop – The support in developing system of sound chemicals management in Armenia in order to facilitate economic integration with the European Union. (Yerevan, Armenia, 12-16 December, 2011).

SAICM – Project Armenia and UNEP Partnership Initiative for Sound Management of Chemicals and Implementation of SAICM in Armenia:

- Inception Workshop (Tsaghkadzor, Armenia. March 8-9, 2009).
- Training on Risk assessment as a tool for risk management and risk reduction (Tsaghkadzor, Republic of Armenia, September 25-26, 2009).
- Training on Risk Assessment to human health (Tsaghkadzor, Republic of Armenia November 28-29, 2009).
- Awareness-raising Workshop (Tsaghkadzor, Republic of Armenia, November 19-20, 2010).
- Awareness-Raising Workshop (Yerevan, Republic of Armenia, December 11, 2010).
- Training on Chemical risk assessment ((Yerevan, Armenia, 24-25 February, 2011).

The PMT was also very active on creating awareness at the scientific level. In this regard the following publications were achieved:

Aleksandryan, A. (2009): Residual Amounts of Certain Persistent Organic Pollutants in Foodstuffs and Environmental Media of the Republic of Armenia. In: Proceedings of the 10th International HCH and Pesticides Forum. "How many obsolete pesticides have been disposed of 8 years after signature of Stockholm Convention: 6-10 September 2009. RECETOX, Masaryk University, Brno, Czech Republic. Brno. 2010. p. 162-166.

Aleksandryan, A., Bunyatyan, Y., Hovhannisyan, R., Khachatryan, A. (2009): Residual Amounts of Certain Persistent Organic Pollutants in Foodstaffs and Environmental Media of the Republic of Armenia. In: Abstract Book of the 10th International HCH and Pesticides Forum. "How many obsolete pesticides have been disposed of 8 years after signature of Stockholm Convention: 6-10 September 2009. RECETOX, Masaryk University, Brno, Czech Republic. P. 66.

Aleksandryan, A., Khachatryan, K. (2009): Open burning of wastes at landfills as a source of Dioxins. 29th International Symposium on Halogenated Persistent Organic Pollutants. August 23-28, 2009. Beijing, China. Organohalogen Compounds, 2009, vol. 71, p. 267-270.

Aleksandryan, A. V. (2009): Main Potential Sources of Dioxins/Furans Generation at the Territory of Armenia. 29th International Symposium on Halogenated Persistent Organic Pollutants. August 23-28, 2009. Beijing, China. Organohalogen Compounds, 2009, vol. 71, p. 17-20.

Aleksandryan, A. V. (2009): Monitoring of organochlorine pesticides in Hydroecosystem of the Sevan Lake and Rivers of the Republic of Armenia [published in Russian]. Toxicological Bulletin. Moscow. November-December 2009. P. 25-31.

Aleksandryan, A. V. (2009): Dioxins: A Challenge of the Century. Monograph [published in Russian]. Yerevan. 188p. ISBN: 978-9939-53-504-3.

Aleksandryan, A. V. (2010): Monitoring of organochlorine compounds in the environment. Monograph [published in Russian]. Yerevan. 270p. ISBN: 978-9939-53-658-3.

Aleksandryan, A.V. (2010): Monitoring of organochlorine pesticides in food of animal origin in the Republic of Armenia [published in Russian]. Toxicological Bulletin. Moscow. March -April, No. 2, p.25- 29.

Khachatryan, A., Bunyatyan, Y. (2010): Monitoring of Polychlorinated Biphenyls in Armenia. In: Abstracts of the International Congress of Young Scientists. Yerevan, April 13-14, 2010. – The New Armenian Medical Journal, Vol. 4, No. 1, p. 70-71.

Khachatryan, K., Aleksandryan, A. (2010): Environmental regulation of landfills for prevention of Dioxins/Furans releases. In: Abstracts of the International Congress of Young Scientists. Yerevan, April 13-14, 2010. – The New Armenian Medical Journal, Vol. 4, No. 1, p. 71-72.

Khachatryan, A. V. (2010): Monitoring of Polychlorinated Biphenyls in the Republic of Armenia [published in Russian]. Toxicological Bulletin. Moscow. 2010. № 1, January - February 2010. P. 49-52. *This publication was awarded the 2nd prize among the manuscripts submitted for publication by young authors.*

Aleksandryan, A., Khachatryan, A. (2010): Armenia – Inventories of PCBs is the place to start. PCBs Elimination Network (PEN) Magazine. Issue 01. P.54.

Aleksandryan, A.V. (2010): Organochlorine pesticides monitoring in Armenia. In: Abstracts of the Conferences dedicated to the 90th anniversary of Yerevan State Medical University – The New Armenian Medical Journal, 2010, Vol. 4, No. 3, p. 130.

Khachatryan, A.V., Mickovski, A., Abrahamyan, A. L. (2010): Polychlorinated biphenyls in oils: Monitoring studies in Armenia. The New Armenian Medical Journal, 2010, Vol. 4, No. 3, p. 136.

Aleksandryan, A.V. (2011): Dioxin Emission as main Hazard of Waste Burning at Dumps. 1st World Scientific Conference. PETrA 2011 (Pollution and Environment – Treatment of Air). Prague, Czech Republic, May 17-20, 2011. 4 pp.

Aleksandryan, A.V. (2011): Thermal Processes of Metal Production: a Source of Dioxin Generation. Proceedings of the 31st International Symposium on Halogenated Persistent Organic Pollutants "POPs Science in the Heart of Europe" – Dioxin 2011 (Brussels, Belgium, 21-25 August, 2011). Organohalogen Compounds. 2011, Vol. 73, 83-86.

Aleksandryan, A., Khachatryan, A. (2011): Monitoring of Organochlorine Pesticides in Water Basins. The 23rd Conference of the International Society of Environmental Epidemiology. ISEE 2011. Barcelona, 13-16 September, 2011.

Aleksandryan, A., Khachatryan, V. (2011): Organochlorine Compounds: Trophic Chain Transfer. The 23rd Conference of the International Society of Environmental Epidemiology. ISEE 2011. Barcelona, 13-16 September, 2011.

Aleksandryan, A., Khachatryan, V. (2011): Soil Contamination by Organochlorine Pesticides and Health After-Effects. The 23rd Conference of the International Society of Environmental Epidemiology. ISEE 2011. Barcelona, 13-16 September, 2011.

Aleksandryan, A. (2011): Regulatory-legislative basis for health care wastes management in the Republic of Armenia [published in Russian]. International Conference "Challenges of Health Care Wastes Handling at Therapy and Prevention Facilities". Moscow 2011.

Aleksandryan, A. V., Khachatryan, A. V (2011): Bottom Sediment Pollution in Armenia. 13th EuCHeMS International Conference on Chemistry and the Environment. ETH Zurich, Switzerland, 11-15 September 2011, p. 295.

Khachatryan, A. V., Aleksandryan, A. V. (2011): Polychlorinated Biphenyls in Bottom Sediment. 13th EuCHeMS International Conference on Chemistry and the Environment. ETH Zurich, Switzerland, 11-15 September 2011. P. 313.

Rakhmanin, Y. A., Novikov, S. M., Avaliani, S. L., Aleksandryan, A. V., Shashina, T. A., Skvortsova, N. S., Kislitsyn, V. A. (Eds.) (2012): Fundamentals of risk analysis to human health from exposure to environmental factors, Yerevan. 2012. 216 pp. ISBN 978-9939-0-0295-8.

Dr. Anahit Aleksandryan made presentations at international symposiums and participated also in "Mini–Hearing on Obsolete Pesticides in Eastern European Countries, the Caucasus and Central Asian Countries in the European Parliament" in Brussels (Belgium) on 29 of June 2010. The hearing was headed by Esther de Lange MEP and Ria Oomen–Ruijten MEP and among other issues the situation at Nubarashen obsolete pesticides burial site was discussed.

In the frames of project implementation specialized scientific publications were purchased and the access to this fundamental source of information was provided for the wide range of specialists of the relevant area. In particular the books dealt with the topics "Harmful Substances in the Environment", "Hygienic Standards", including "Chemical Factors of the Environment" "Physical Factors of the Environments", "Biological Factors of the Environment", "Industrial Ecology and Reasonable Nature Use", etc.

4.9.3 Monitoring

Concerning project monitoring activities, there was very frequent and effective communication between the Implementing Agency and the National Project Coordinator. The NPC has sent all requested technical and progress reports to UNIDO. During the whole project period, UNIDO has undertaken several missions to assure timely implementation and the attainment of the results. The NPC has reacted timely on the circumstances when project approach needed adjustments. The project document indicated that quarterly progress reports should be filed at UNIDO.

The project implementation was efficient on the technical as well as on the managerial side.

4.10 Replicability, Training and Public awareness

Over the course of the implementation several activities were addressing transfer of information and knowledge. Several training programmes, workshops and publications were developed and undertaken. Information and awareness programmes were developed by the PMT under the guidance of the NPC.

One of the main achievements in this regard is the development and adoption of several legislative/regulatory documents and preparation of an ESM system for PCBs.

Ministry of Nature Protection jointly with the Ministry of Energy and Natural Resources (MENR) prepared a legally binding document (PCB Guidance). The project objectives are replicable in whole the country. Similarly legislation addressing the management of obsolete pesticides has recently been enacted.

Inventory activities cover the whole country. The oil containing electrical equipment database is developed and will be available on the Internet. Project website has been created.

Several workshops and training were performance that also assures the replicability of project activities. Environment related authorities and the private sector were invited to announce the integration of the project into the activities of the enforcement bodies as a programme.

Private sector involvement was ensured by the active participation in labelling and sampling performed within the inventory activity.

In the agreement with the conclusion of the MTE, I strongly support and recommend to use the possibilities for replication of the project.

4.11 Rating of the project performance regarding

The project document included a logical framework analysis to assess and monitor its performance. The terminal evaluation used the same concept to assess the rating of the accomplished performance as is recommended by UNEP.

4.11.1 Objectives

The objective of the project was to effectively and efficiently assist Armenia to implement the Stockholm Convention by strengthening the institutions, regulations and enforcement and to enhance the capacities for the sound management of POPs at national and local levels.

The project has achieved most of its foreseen objectives. The performance can be rated as **highly satisfactory.**

4.11.2 Outcomes (Long-term impacts of the Project)

The project document has identified six potential long-term impacts as a result of project activities. The analysis, to the extent of these outcomes have been achieved, is provided in the following table.

Foreseen outcomes	Comments of the MTE	Comments of the TE
Relevant institutions are enabled to manage PCBs and POPs pesticides in an environmentally sound manner;	Relevant institutions have been strengthened, laboratory equipment partly provided, trainings have been completed and are planned in the future.	Institutional support of the POPs management issue is now well established, educated and trained continuously and represents a good base for the future effective management of these problems in the country.
POPs inventories are established and/or updated;	The inventory is ongoing, the capacity and expertise to undertake the inventory have been created.	The national inventory is done, but is still ongoing with a good official support and well trained inventory team.

Strengthened capacity of the Armenian Government to comply with the obligations of the Stockholm Convention;	Sufficient local expertise has been created; national legislation for sound management of POPs chemicals developed and adopted by the Government.	Sufficient local expertise has been created; legislation for sound management of POPs chemicals developed and adopted by the Government.
Concerned stakeholders, involved civil society and apply improved knowledge on the ESM of POPs and disposal activities;	Public awareness campaigns have been started, specifically addressing the target groups of the SC.	Public awareness campaigns are continuously organized, specifically addressing the target groups of the SC.
Improved capacity on POPs management issues, including disposal of PCBs and obsolete pesticides in an environmentally sound manner;	The elements of the ESM system at the policy level are in place. Inventory of PCB containing equipment is ongoing. POPs pesticides inventory is also ongoing. Laboratory capacity is partly developed.	The elements of the ESM system at the policy level are in place. Inventories of POPs pesticides and PCB containing equipment are done - Concept for liquidation of the obsolete pesticides burial site (Nubarashen burial site), Inventory of new POPs is under preparation. Laboratory capacity is partly developed.
A national action plan for the final disposal of POPs chemicals and hazardous waste is developed.	POPs disposal plan is pending.	POPs disposal plan is already under development.

At the outcome level the project was performed according to the work plan. The performance can be rated **satisfactory.**

4.11.3 Outputs

The project had five main components:

- Relevant institutions are enabled to manage PCBs and POPs pesticides in an environmentally sound manner
- Strengthened capacity of the Armenian Government to comply with the obligations of the Stockholm Convention
- Concerned stakeholders, involved civil society and apply improved knowledge on the ESM of POPs and disposal activities
- Improved capacity on POPs management issues, including disposal of PCBs and obsolete pesticides in an environmentally sound manner
- Project management, monitoring and evaluation

Each component included several outputs which were to be achieved through series of activities. The analysis concerning the project performance in this sub-chapter is based on the attainment of the outputs. To this end the logical framework provided clear indicators of success. The rating of the performance is provided for each component.

Activity No	Description	Output	MTE Observation	Terminal Evaluation
1	Relevant institutions are enabled to manage PCBs and POPs pesticides in an environmentally sound manner			
1.1	Institutional capacity for the ESM of PCB and POPs pesticides evaluated	Convention compliance requirements mainstreamed into existing environmental protection instruments at different agencies (national, local);	Evaluation of the institutional capacity for the Environmentally Sound Management (ESM) of PCB and POPs pesticides was completed POPs Information Management and Reporting System are in place. POPs Monitoring Network was developed.	Evaluation of the institutional capacity for the Environmentally Sound Management (ESM) of PCB and POPs pesticides was completed. POPs Information Management and Reporting System are in place. POPs Monitoring Network was developed, but the design of the national POPs monitoring is missing.
1.2	Managing data on chemicals and wastes.	Inventory forms, guidelines, methodologies; Trained State Inspection on identification and notification of PCB contaminated equipment; National Register on Wastes; National Register on Chemicals, including POPs; State Cadastre on Wastes (classification of wastes generated in Armenia, including POPs wastes); State Register on the sites/entities, at which POPs-containing wastes are generated, processed,	National Register on Chemicals, including POPs; State Cadastre on Wastes (classification of wastes generated in Armenia, including POPs wastes) (on file); State Register on the sites/entities, at which POPs-containing wastes are generated, processed, utilized, and disposed; Data Bank on technologies for destruction and decontamination of POPs-containing wastes Register of pollutants releases and	National Register on Wastes created and approved by the Order of Minister of Nature Protection of RA. Agency on waste and atmospheric emissions management at the MNP of the RA was established in accordance with the Decision of the RA Government (No. 1191-N of August 3, 2010) State Cadastre on Wastes (classification of wastes generated in Armenia is under preparation and on-going; State Register on the sites/entities, at which POPs-containing wastes are generated, processed, utilized, and disposed is under preparation and on-going; Data Bank on technologies for destruction and decontamination of POPs-containing

Activity No	Description	Output	MTE Observation	Terminal Evaluation
		utilized, and disposed; Data Bank on technologies for destruction and decontamination of POPs-containing wastes; Register of pollutants releases and transfer on POPs (PRTR);	transfer on POPs (PRTR).	wastes – on going Register of pollutants releases and transfer on POPs (PRTR) is designated (UNITAR Project).
1.3	POPs accounting, inventory and reporting system improved, PRTR set-up, PCB inventory improved.	Databases on PCB equipment/wastes, PRTP system;	POPs Pollutants release and transfer register was designed. The system allows data input and maintenance. Templates for gathering data on PCB-containing equipment and oils were developed. POPs inventory and reporting system was improved. Inventory forms were prepared and distributed among enterprises of energy and industry sector of Armenia in order to take inventory. Draft guidelines to holders of PCB-contaminated equipment was prepared on how to carry out an inventory, notification and reporting. In the industrial sector Inventory of equipment and oils is on-going.	POPs Pollutants release and transfer register (PRTR) is designed (UNITAR project). Templates for gathering data on PCB-containing equipment and oils were developed and disseminated among the enterprises of energy, industry, mining and other sectors. POPs inventory and reporting system was improved, inventory forms were developed and used. Based on the inventory results, the databases on PCB containing equipments and wastes in energy and industry sectors of Armenia were designed and developed. Guidelines to holders of PCB-contaminated equipment was prepared on how to carry out an inventory, notification and reporting and used during the inventory.
1.4	Efficient cooperation on POPs related issues and information/ knowledge	Inter-ministerial Committee on POPs; Policy makers are aware of	Inter-ministerial Committee on POPs was formed and is working.	Inter-ministerial Committee on POPs was formed and is working continuously. A lot of training workshops and publications

Activity No	Description	Output	MTE Observation	Terminal Evaluation
	and skills exchange for decision makers, professionals and public involvement ensured.	the POPs problem, particularly on PCBs and POPs pesticides List of stakeholders and stakeholder meetings Information exchange forum at the Ministry of Natural Protection web page;	Several training workshops and publications were provided for policy makers. Project stakeholders are identified and are actively participating in the project. The project web page has been created and is updated regularly.	were provided for policy makers, all potential stakeholders. Public information materials were also developed and used during informative campaigns. The project web page has been created and is updated regularly.
1.5	Capacity of existing laboratories for POPs analysis strengthened.	Laboratory capable of undertaking standardized POPs analyses, conducted studies; Report on the results of cross-laboratory inter comparisons and calibration;	The list of laboratories that perform analysis of various chemicals, including POPs in different environmental and bio-media was undertaken. The analysis of the actual capacity of these Laboratories was done, gaps and shortcomings found out, as well as needs of the Laboratories identified. This will allow to improve the existing state and to strengthen the analytical base. The conclusion was that a new laboratory should be established. The Government of Armenia provided space. The building has been renovated, UNIDO provided infrastructure. Part of the equipment was provided by the contribution of the Brazilian Government. The procurement of some analytical equipment is pending. The cross-laboratory inter comparisons and calibrations have not yet been started;	The list of laboratories that perform analysis of various chemicals, including POPs in different environmental and bio-media was undertaken, but it is not a part of the project document. The actual capacities of these laboratories will be a useful part of project outcomes. The new laboratory was established. The Government of Armenia provided space. The equipments and infrastructure were supported from different projects (UNIDO, NATO and Brazilian Government). But laboratory exists in small room, which is not sufficient for the laboratory, which will be accredited and which will work with relatively high amounts of samples per year. National support of the Armenian Government is very needed. It is necessary to decide which status the laboratory will have – governmental, private. This is very important from the point of view of rules of accreditation – especially with the focus on salary for permanent staff, operational budget – chemicals, standards, columns etc. and also a number of samples connected with the regular monitoring, control

Activity No	Description	Output	MTE Observation	Terminal Evaluation
				measurements etc. Laboratory is not ready for accreditation and the cross-laboratory inter comparisons and calibrations which is prerequisite for the accreditation procedure and work of this laboratory.
1.6	Sustainable financing mechanism for follow up activities secured.	Financing tools identified, funds secured. Public-private partnerships	This output has just been addressed, with the BAT/BEP training for POPs disposal, where potential private investors were also invited.	Sustainable financing mechanism for the ongoing activities is mainly connected with the proposed international projects.
2	Strengthened capacity of the Armenian Government to comply with the obligations of the Stockholm Convention			
2.1	Survey and evaluation of policy and regulatory framework for the environmentally sound management of PCBs and POPs pesticides.	Review of existing legislation regarding compliance with Stockholm Convention obligations; Evaluation of existing legislation as well as conduct of a gap analysis to define national needs in view of the implementation of the Stockholm Convention;	Survey and evaluation of policy and regulatory framework for the environmentally sound management of PCBs and POPs pesticides was carried out. Detailed review of existing legislation regarding management of chemicals and wastes in the Republic of Armenia was compiled. Evaluation of existing legislation was undertaken, as well as a gap analysis conducted to define national needs in view of the implementation of the Stockholm Convention, as well as for hazardous substances and wastes	Detailed Review of existing legislation regarding management of chemicals and wastes in the Republic of Armenia was compiled Existing legislation evaluated, as well as gap analysis conducted to identify national needs in view of the implementation of the Stockholm Convention. Proceeding from previously identified main gap, the «Law on Chemicals» was prepared as an urgent demand for the Republic of Armenia, negotiated with country stakeholders and the Government of the Republic of Armenia.

Activity No	Description	Output	MTE Observation	Terminal Evaluation
			management.	
2.2	Legal basis for POPs chemicals and wastes management improved, normative documents for sound chemicals and wastes management developed and adopted.	Development and/or amendment of identified laws, regulations, standards and technical guidelines; Development and adoption of a risk assessment methodology; Development and adoption of a risk reduction strategy; Development and adoption of a set of risk reduction measures; Development and adoption of a national action plan for the final disposal of POPs chemicals and hazardous waste.	Legal basis for chemicals and wastes management was improved: normative documents for sound chemicals and wastes management developed and adopted. Specific Indicators of Generation of Main Types of Industrial and Household waste (Protocol Decree of the Government of the Republic of Armenia on 19 November 2009; No. 48 "Confirming specific indicators of generation of main types of industrial and household waste confirming the List of Waste generated from different technological processes"). List of wastes generated from different technological processes (Protocol Decree of the Government of the Republic of Armenia on 19 November 2009; No. 48 "Confirming specific indicators of generation of main types of industrial and household waste confirming the List of Waste generated from different technological processes"). "Republic of Armenia National	<u>A number of normative regulatory documents was prepared and published:</u> Specific Indicators of Generation of Main Types of Industrial and Household waste; List of wastes generated from different technological processes; "Republic of Armenia National Chemicals Management Profile" was revised, up-dated and approved by the Government (UNITAR Project); The «Rules for the handling of obsolete pesticides» were prepared and approved by the Decree of the Government of the RA on 17 February 2011 (No. 195-N). The «Guidance for PCB containing waste management» was prepared and approved by Protocol Decree of the Government of the RA on 20 October 2011 (No. 41). Risk Assessment Methodology was developed in collaboration with the concurrently implemented "Armenia and UNEP Partnership Initiative for Sound Management of Chemicals and Implementation of SAICM in Armenia" Project". Concept on hazardous chemicals impact risk reduction to human health and the environment was prepared (within SAICM Project). Concept for liquidation of the obsolete pesticides burial site (Nubarashen burial site), Cleaner Production Concept» was prepared and approved by Protocol Decree of the Government of the Republic of Armenia (No. 49 of December 15, 2011).

Activity No	Description	Output	MTE Observation	Terminal Evaluation
			Chemicals Management Profile" was revised, up-dated and approved by the Government (approved by Protocol Decision of the Government of the Republic of Armenia on February 19, 2009; No. 8); The Order for regulation of obsolete pesticides, including POPs pesticides management has been prepared. Regulation on obsolete pesticides (including POPs-pesticides) handling, including obsolete pesticides inventory taking, storage, transportation, re-packaging, identification, disposal" prepared and enacted on the 17th February 2011. Signed by the prime minister on 10th March 2011 (decision No 195/2011). The Guidance for PCB management in the Republic of Armenia (Drafted) will be submitted for approval May or June 2011. Risk Assessment Methodology» was developed in collaboration with the concurrently implemented "Armenia and UNEP Partnership Initiative for Sound Management of Chemicals and	Law "On Chemicals" was prepared and negotiated with country stakeholders and the Government of the Republic of Armenia Guidance on Safe Conditions for Industrial and Municipal Wastes Placement and Treatment" was prepared and approved by Protocol Decision of the Republic of Armenia Government (No. 16 of April 26, 2012)

Activity No	Description	Output	MTE Observation	Terminal Evaluation
			Implementation of SAICM in Armenia" Project". Concept on hazardous chemicals impact risk reduction to human health and the environment» was prepared. Landfill operation Guidelines have been prepared jointly with the assistance of the EU October 2010.	
3	Concerned stakeholders involved civil society and apply improved knowledge on the ESM of POPs and disposal activities			
3.1.	Educational and training programmes embracing POPs problems and chemical safety issues for concerned stakeholders.	Development of the information campaign program, training modules for professionals and public; Adoption of the information campaign program, training modules in close cooperation with relevant authorities (Occupational Safety Authority etc.); Identification of individual selected project stakeholders for participation in the awareness raising and training programme; Set up a close cooperation with local NGOs, Ministry of Education, Universities and research centres,	Information campaigns and training programmes were developed. As part of the preparation for the trainings and workshops stakeholders from the government, public, private and NGO sector were identified and invited. Through these events a wide range of cooperation was established with the NGOs, Education institutions, international experts, and research centres. A new web site was created to reflect Project related activity. Activities are ongoing in this regard.	Information campaigns and training programmes were developed and used during the various informative campaigns on the governmental, public, private and NGO levels. Through these events and campaigns a very wide range of cooperation was established with the NGOs, Education institutions, international experts, and research centres. Project web site reflects all project related activities.

Activity No	Description	Output	MTE Observation	Terminal Evaluation
		national and local media to disseminate information;		
3.2	Educational and awareness raising activities on POPs issues, risks, consequences and required mitigation measures for decision makers and professionals developed and put in place .	Presentations of credible scientist and researchers for decision makers on POPs issues, their health and environmental impacts; Establishment of a network of scientists to exchange information on international chemicals management; Conduct of safety rules trainings for different groups of people professionally exposed to POPs and hazardous chemicals, as industry employees, staff of the power and heat generating and distributing companies, and units responsible for handling and disposal of waste; Conduct of risk assessment, risk management courses for persons in charge at selected Ministries, agencies, research institutes and other relevant stakeholders;	Training on "Risk assessment as a Tool for Risk Management and Risk Reduction" was arranged and held on September 25-26, 2009. Training on "Risk Assessment Methodology" was arranged and held on November 28-29, 2009. Training on BAT/BEP for disposal of POPs wastes were held on 24th March 2011 in Yerevan.	A lot of very well prepared and from the point of view of the impact very effective and useful workshop were prepared and performed e.g.: - Training of Armenian Specialists" was arranged and held at RECETOX, Masaryk University, Brno (Czech Republic) from January 24 to 29, 2011. - 7th Summer School of Environmental Chemistry and Ecotoxicology in Brno, Czech Republic from June 27 to July 2, 2011. - Intercalibration on-the-job training for Armenian Specialists was arranged on April 9-13, 2012 Armenian specialists visited the Research Centre for Toxic Compounds in the Environment (RECETOX), Masaryk Brno, Czech Republic
3.3	Awareness raising activities held on POPs issues for different population groups (general public, pupils, students, doctors) and mostly vulnerable to	Motivating media channels to disseminate POPs information in cooperation with Government, research and scientific centres and NGOs; Preparation of materials	The Contest and Exhibition "Children against Hazards" was arranged and held in Yerevan (Armenia) on November 27, 2009.	Awareness raising activities held on POPs issues for different population groups and mostly vulnerable to POPs exposure were prepared and realised as a result of broad national co-operation with academia, NGO and also as a results of various POPs campaigns organized by the Secretariat of

Activity No	Description	Output	MTE Observation	Terminal Evaluation
	POPs exposure (children and women)	(leaflets, articles, interviews, posters, presentations, etc.) on POPs environmental and human health impacts; Organize and hold public meetings, presentations at schools, lectures at universities, sites visits, project results presentations etc.		the SC on POPs.
4	Improved capacity on POPs management issues, including disposal of PCBs and POPs pesticides in an environmentally sound manner.			
4.1	Management system for the identification, record keeping and tracking, collection, packaging, transport, interim storage and disposal of PCB developed and operational in energy and industry private sector; and POPs pesticides waste in the "Waste Research Centre" of the Ministry of Nature Protection.	Operation and update of the database with PCB contaminated equipment and POPs wastes, interactive use of stored data with management and supervisory entities; Identification of national/local capacities for safe collection, packaging, transport and safe interim storage of POPs wastes; Identification and proposal of best available measures how to upgrade waste storage sites (PCB and pesticides) and avoid spreading of contamination;	Transformers and PCBs related information is kept on paper and in an excel database. Establishment of a database server for storing information on potentially PCB containing devices is planned with on-line internet access that would allow for entering and extracting data. BAT/BEP planning is ongoing.	The databases of PCBs containing equipments in different sectors are designed and development is ongoing process.

Activity No	Description	Output	MTE Observation	Terminal Evaluation
4.2	Review of all affordable BAT and BEP options for the Republic of Armenia formulated feasibility study for the phase out and disposal of POPs wastes carried out.	Review of available disposal technologies and methods; Evaluation and selection of suitable and affordable BAT/BEP technology for disposal of POPs waste; Based on analytical data available from different type of waste the feasibility study will be carried out for proposed kind of technology;	The first workshop in this regard has been held. The feasibility study is on-going.	The effective and sufficient workshops were organized, but now is necessary to transfer the project results to the Armenian strategic documents such as National environmental policy, implementation of the SC etc. – especially from the point ov view of adoption of BAT/BEP principles as a one of the key principles of the sustainable development of the country.
4.3	National accredited analytical laboratory in operation	Performance of sampling campaign form selected priority areas to cover all possible POPs media - environmental compartments, foodstuffs and biological media; Identification and determination of POPs and other chemicals in these media; Processing data for its analysis and evaluation;	Sampling campaign has been started. 1224 samples have been collected. The analysis is ongoing. The laboratory was visited where the process was observed.	The situation concerning to laboratory, the working conditions and status were mentioned in 1.5. The overview of obtained results: - Technological samples: Total number of transformers according to the national inventory is 9 867 pieces. The total amount of samples from these transformers is 1 946. Total number of oil switches according to the national inventory is 2 574 pieces. The total amount of samples from these equipments is 470. Total number of collected samples is 2 416, until 01 July 1 820 were analyzed, the rest of analysis is ongoing. From these 1 820 samples, 390 were positive with PCBs findings. - Environmental samples 15 organochlorine pesticide and PCBs were analyzed in different abiotic and biotic

Activity No	Description	Output	MTE Observation	Terminal Evaluation
				environmental samples. 60 environmental samples were collected for POPs pesticides in different environmental media (surface water, water of Lake Sevan, benthos, bottom sediment, soil) and analysed; 900 readings (results) were obtained. 60 samples of environmental media were taken for analyses of PCB content; 602 readings (results) were obtained for different PCB congeners. 13 samples of soil from the obsolete pesticides burial site were analysed and 195 readings (results) were obtained. It was collected 15 samples of water from lake Sevan and rivers of its basin, 2 samples of benthos, 11 samples of bottom sediments, 22 soil samples from the vicinity of former pesticides shops and storehouses in different provinces of the country, 13 soil samples from the obsolete pesticides burial site, totally 60 samples.
5	Project management, monitoring and evaluation			
5.1	Project monitoring management structure established	Establishment of Project Steering Committee and National Project Management Team Recruiting of technical experts to form the project expert team Training of all members of project management teams	Project Steering Committee was established and functional. The first meeting was held in April 2009. Second meeting was held in May 2010. The next meeting is planned in May 2011. National Project Management Team was established under Convention Implementation	Project Steering Committee was established National Project Management Team was established under Convention Implementation Focal Point Policy experts, as well as technical experts in POPs and monitoring and research were recruited In selected provinces (marzes) local project management modules were established Series of management workshops were carried

Activity No	Description	Output	MTE Observation	Terminal Evaluation
			Focal Point (Ms. A. Aleksandryan). The Team embraced the National Coordinator, Scientific and Technical assistants, Translator, and the Secretary. Training of the National Project Management Team is ongoing. They participate in all technical trainings of Project. The first managerial trainings took place in UNIDO in February 2009 just after project start-up.	out to fine-tune the progress and performance of the project The Inception Workshop was arranged and held The Inception Workshop Report was prepared Annal PSC meetings were arranged and held Project management information system (IMS) was established, including project website to disseminate information to various stakeholders, in particular: Information exchange Forum, topics related to POPs (PCBs) environmentally sound management, relevant event
5.2	Project monitoring and evaluation procedures established	Holding Inception Workshop Issuing Inception Report Issuing Project Annual reports Holding review meetings Carrying out visits to operating facilities Project Information and Management System, websites	Inception workshop was held in Yerevan on 16th April 2009. The Inception Workshop Report was prepar3ed and is on file. The first meeting was in May 2009. The second was in May 2010. For 2011 two meetings are planned one in May and one in December. 68 facilities and 3 major utilities were inspected. Project website to disseminate information to various stakeholders" Information exchange Forum (web page) is set up.	Management structure of the UNIDO/GEF "Technical assistance for environmentally sustainable management of PCBs and other POPs waste in the Republic of Armenia" Project was established by the representatives of the Ministry of Nature Protection (MNP) of the Republic of Armenia jointly with UNIDO officials. 6 meetings of the Project Steering Committee were held to decide urgent issues related to successful Project implementation. Progress and Annual reports were prepared and submitted to UNIDO on regular basis.

As the result of the above the project performance of each component may be rated as follows:

Component No.	Title	Rate of performance
1	Relevant institutions are enabled to manage PCBs and POPs pesticides in an environmentally sound manner.	S
2	Strengthened capacity of the Armenian Government to comply with the obligations of the Stockholm Convention.	MS
3	Concerned stakeholders involved civil society and apply improved knowledge on the ESM of POPs and disposal activities.	MS
4	Improved capacity on POPs management issues, including disposal of PCBs and POPs pesticides in an environmentally sound manner.	S
5	Project management, monitoring and evaluation	HS

Overall rate of project performance regarding the achievement of the outputs is **satisfactory.**

4.12 Contribution of the project to GEF focal area strategic targets

The GEF-4 focal area strategies document of 2007 May was used to assess the contribution of the project towards the GEF strategic targets since the project started under GEF-4.

According to OP#14, the GEF shall provide funding, on the basis of agreed incremental costs, for three types of activities to address POPs issues – capacity building, on-the-ground interventions and targeted research. The activities under capacity building include: 1) strengthening of human and institutional capacity; 2) strengthening and harmonization of the policies and regulations; 3) strengthening of monitoring and enforcement capacity; 4) developing capacity to assess technologies and management practices, and promoting and facilitating the transfer of viable and cost-effective options and management practices; 5) developing and implementing public awareness/information/environmental education programs; and 6) facilitating dissemination of experiences and lessons learned and promoting information exchange. All of these objectives have been addressed by the project.

While the project does not intend to directly reduce or eliminate any POPs, it has been laying down the solid foundation for the fulfillment of Armenia's commitments to the Convention. The midterm review concludes that the project is fully in line with GEF OP#14 strategies specifically the one on capacity building for NIP implementation.

4.12.1 Global environmental benefits

The project has been creating capacity in Armenia to respond to articles of the Stockholm Convention effectively and efficiently. Through the improved regulatory framework and institutional capacity Armenia's management of POPs have been upgraded. Country is now able to produce a reliable inventory of PCBs and POPs pesticides. The project results were a broadly published and these activities strongly contributed to the awareness raising and contribute to the global knowledge on POPs, their sources, levels, subregional occurrence and thus generate

significant benefits for the protection of the global environment and human health. The project has facilitated the goals of other global treaties, the Rotterdam Convention on the Prior Informed Consent Procedures for Certain Hazardous Wastes and the Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal and the Strategic Approach to International Chemicals Management (SAICM).

4.13 Possibilities of sustainability

Project sustainability has four pillars: legal, technical, financial and institutional.

4.13.1 Legal

The project has developed an environmentally sound management system for PCBs and for obsolete pesticides. Latter received approval by the Government, the ESM system for PCBs is approved. Several other legal measures were put in place such as the national PRTR system, the risk assessment and reduction measures, etc.

4.13.2 Technical

The necessary technical capacity for POPs monitoring is developing. The Central Analytical Laboratory has been established and will be soon operational, but a strong governmental support – formal, legal, technical and financial is needed.

4.13.3 Financial

The financial sustainability of the project is still to be accomplished. It is expected that the private sector will engage in the POPs disposal operations.

4.13.4 Institutional

Extensive trainings at different levels of the Environment management sector were very important and useful part of the project and led to the very effective institutional co-operation and effective common solution of the national environmental problems.

4.14 Indicators of success

The analysis of success based on the indicators for each project component, which were established in the project document, is included in the following table.

Indicator	Sources of Verification (MDE)	Sources of Verification (TE)
Outcome 1: Relevant institutions are enabled to manage PCBs and POPs pesticides in an environmentally sound manner		
1. Institutional capacity for the ESM of PCB and POPs pesticides evaluated. 2. Data on chemicals and wastes managed. 3. POPs accounting, inventory and reporting system improved, PRTR set-up, PCB inventory improved. 4. Efficient cooperation on POPs related issues and information/ knowledge and skills exchange for decision makers, professionals and public involvement ensured. 5. Capacity of existing laboratories for POPs analysis strengthened. 6. Sustainable financing mechanism for follow up activities secured.	List of procured equipment, training workshop reports Databases Inventory forms, labels, scientific publications on the results. Project implementation review Visit to the laboratory, list of equipment and training workshop reports	Middle term evaluation List of procured equipments Organized training and other workshop s and reports from these activities Existing, developing and upgraded databases Inventory forms used for labelling, labelled equipments. Scientific publications and conference presentations of the results Project annual and progress reports Visit to the laboratory, list of equipment and training workshop reports
Outcome 2: Strengthened capacity of the Armenian Government to comply with the obligations of the Stockholm Convention		
1. Survey and evaluation of policy and regulatory framework for the environmentally sound management of PCBs and POPs pesticides. 2. Legal basis for POPs chemicals and wastes management improved, normative documents for sound chemicals and wastes management developed and adopted.	Reviews, evaluations and gap analysis report Laws, regulations, standards and technical guidelines Methodologies, strategies, action plans Project technical report for 2009 Project website	Reviews, evaluations and gap analysis of MDE and Annual reports List of the adopted laws, regulations, standards and technical guidelines List of prepared methodologies, strategies, action plans Project website
Outcome 3: Concerned stakeholders involved civil society and apply improved knowledge on the ESM of POPs and disposal activities		
1. Educational and training programmes embracing POPs problems and chemical safety issues for concerned stakeholders. 2. Educational and awareness raising activities on POPs issues, risks, consequences and required mitigation measures for decision makers and professionals developed and put in place . 3. Awareness raising activities held on POPs issues for different population groups (general public, pupils, students, doctors) and mostly vulnerable to POPs exposure (children and women).	Training workshop reports are on file. Scientific publications are on file. Awareness raising workshop reports are on file. Inventory forms from private industries.	Training workshop reports presented in Annual reports and MTE Scientific publications presented in this TE and Annual reports Awareness raising workshop reports – see list in the text of TE Prepared and applied inventory forms from private industries.

Indicator	Sources of Verification (MDE)	Sources of Verification (TE)
Outcome 4: Improved capacity on POPs management issues, including disposal of PCBs and POPs pesticides in an environmentally sound manner.		
1. Management system for the identification, record keeping and tracking, collection, packaging, transport, interim storage and disposal of PCB developed and operational in energy and industry private sector; and POPs pesticides waste in the "Waste Research Centre" of the Ministry of Nature Protection. 2. Review of all affordable BAT and BEP options for the Republic of Armenia formulated feasibility study for the phase out and disposal of POPs wastes carried out. 3. National accredited analytical laboratory in operation	PCB database, currently an excel spreadsheet. To be improved. BAT/BEP cost-benefit analysis (pending) Analytical laboratory certification is pending.	PCB database, currently exist as an Excel spreadsheet and now transform to the electronic form. BAT/BEP cost-benefit analysis (prepared as a part of other project) Analytical laboratory is established, equipped, the preparation for accreditation procedure has started, but it is a necessary to solve a lot of formal and technical problems.
Outcome 5: Project management, monitoring and evaluation		
1. Project monitoring management structure established 2. Project monitoring and evaluation procedures established	Inception Workshop meeting minutes and report Annual Project Report of April 2009. Minutes of the Steering Committee meeting	Reports from organized workshops Progress and Annual Project Reports Minutes of the Steering Committee meetings

5. CONCLUSIONS AND RESPECTIVE RECOMMENDATIONS ON GENERAL OUTCOMES AND SPECIFIC OUTPUTS

5.1 Overview of conclusions and recommendations

Based on the observation and the analysis on the achievements of the project the Evaluation Team came up with the following conclusions and recommendations concerning:

- Concept and Design of the project
- Implementation of the activities
- Relevance and Strategy
- Monitoring and Reporting
- Awareness rising and training
- Financing
- Sustainability.

No	Conclusion - MTE	No	Recommendation - MTE	Conclusion - TE	Recommendation - TE
1	The project has so far been very successful. The commitments of the stakeholders are high, the attainment of project objectives are in line with the project document.			The project was very successfully finished. The commitments of the stakeholders were high, the attainment of project objectives were in line with the project document.	
2	The project implementation experienced some delay due to lengthy procurement of analytical equipment and due to the fact that many project activities were inter-related with other projects and delays in that project had also delayed the implementation of this MSP. Project completion by	1	**To UNIDO and WRC** For projects that are interrelated with other projects, the work plan should be developed on a way that it would allow for larger flexibility in case delays or changes occur.	The project implementation experienced some delay due to lengthy procurement of analytical equipment and due to the fact that many project activities were inter-related with other projects and delays in that project had also delayed. But	

No	Conclusion - MTE	No	Recommendation - MTE	Conclusion - TE	Recommendation - TE
	February 2012 is realistic. Extension of the project from GEF has been requested and was approved.			finally this connection with other projects was very effective and contribute to the sufficient and successful fulfilment of the project targets	
3	The inventory exercise is ongoing. At the time of evaluation 1224 samples have been taken, which is approximately 13% progress rate. Knowing that the process had recently been started, the inventory of all planned electrical equipment is realistic within the extended project time frame.	2	**To UNIDO and WRC** The wok plan should be revised and maybe extra human resources provided for the inventory exercise so that it is completed on time.	The inventory exercise is still ongoing, but a lot of work was done until now. Total number of collected samples is 2 416, until 01 July 1 820 were analyzed, the rest of analysis is ongoing. From these 1 820 samples, 390 were positive with PCBs findings. Additional 60 environmental abiotic and biotic samples were collected and analyzed 1 500 results were obtained.	
4	The intervention of the project is logical; the activities were grouped into five outputs, which build on each-other. The outputs were also appropriately selected, however in some cases the activities were overlapping or were unclear, such as activity 3.1.2 and 3.1.3.	3	**To UNIDO:** The project preparation should in the future be more precise specifically on explaining each activity.	The intervention of the project is logical; the activities were grouped into five outputs, which build on each-other.	

Specific Conclusions and Recommendations concerning the outcomes foreseen by the project

Outcome 1: Relevant institutions are enabled to manage PCBs and POPs pesticides in an environmentally sound manner

No	Conclusion	No	Recommendation		
5	Institutional capacity at the Governmental level has been created	4	**For MNP** The capacity the project created	Institutional capacity at the Governmental level has been	Established national POPs laboratory unfortunately exists in small room,

No	Conclusion - MTE	No	Recommendation - MTE	Conclusion - TE	Recommendation - TE
	for POPs management. A new Central Analytical Laboratory has been established. It was not fully functional at the time of the mid-term review.		within WRC in the field of POPs management should be maintained and possibly utilized for other related activities. The Central Analytical Laboratory should continuously be maintained as it will be able to provide information for decision making which is non available elsewhere.	created for POPs management. A new Central Analytical Laboratory has been established. It is fully functional now, but some additional steps are needed.	which is not sufficient for the laboratory, which will be accredited and which will work with relatively high amounts of samples per year. National support of the Armenian Government is extremely needed. It is necessary to decide which status laboratory will have – governmental, private. This is very important from the point of view of rules of accreditation – especially with the focus on salary for permanent staff, operational budget – chemicals, standards, columns etc. and also a number of samples connected with the regular monitoring, control measurements etc. Laboratory is not ready for accreditation and the cross-laboratory inter-comparisons and calibrations which is prerequisite for the accreditation procedure and work of this lab.
Outcome 2: Strengthened capacity of the Armenian Government to comply with the obligations of the Stockholm Convention					
No	**Conclusion**	**No**	**Recommendations**		
6	The development of new legal instruments is in line with the project document. Regulation on obsolete pesticides (including POPs-pesticides) handling, including obsolete pesticides inventory taking, storage,	**5**	**<u>For MNP and UNIDO</u>** The Guidance for PCB management in the Republic of Armenia shall be submitted for approval. Since enactment of legislations is a	The development of new legal instruments is in line with the project document. Regulation on obsolete pesticides (including POPs-pesticides) handling, including obsolete pesticides	

No	Conclusion - MTE	No	Recommendation - MTE	Conclusion - TE	Recommendation - TE
	transportation, re-packaging, identification, disposal" prepared and enacted on the 17th February 2011. Signed by the prime minister on 10th March 2011 (decision No 195/2011). The Guidance for PCB management in the Republic of Armenia (Drafted) will be submitted for approval May or June 2011.		lengthy process and can sometimes take more than two years, project documents shall in the future be more realistic in this regard.	inventory taking, storage, transportation, re-packaging, identification, disposal" prepared and enacted on the 17th February 2011. Signed by the prime minister on 10th March 2011 (decision No 195/2011). The Guidance for PCB management in the Republic of Armenia (Drafted) was approved by the Government. Guidance for PCB containing waste management» was prepared and approved by Protocol Decree of the Government of the RA on 20 October 2011 (No. 41).	

Outcome 3: Concerned stakeholders involved civil society and apply improved knowledge on the ESM of POPs and disposal activities

No	Conclusiones	No	Recommendations		
7	Awareness raising and providing access to information is one of the largest impacts the project has achieved so far. 14 workshops, 20 scientific publications, one exhibition and contest for children were undertaken. The project has a website where project related information will be accessible. These assure the possible replication of the project.	6	**To WRC and UNIDO** In order to further boost the possibilities for replication of the project, the Evaluation Team recommends WRC and UNIDO to invite representatives from the surrounding countries to the final workshop.	Awareness raising and providing access to information is one of the largest impacts the project has achieved so far. 10 workshops within the project and 14 in the frames of other relevant projects were held. 20 scientific publications, one exhibition and contest for children were undertaken. The project has a website where project related information will be accessible. These assure the possible replication of the project.	

Outcome 4: Improved capacity on POPs management issues, including disposal of PCBs and POPs pesticides in an environmentally sound manner.					
No	**Conclusion**	**No**	**Recommendation**		
8	The inventory is ongoing; inventory is taken on 26 220 power transformers, power transformers, oil switches, measuring devices, current transformers, voltage transformers, arc-suppression coils. The main part of the inventory has been done.	**7**	**To the Central Analytical Laboratory** Information concerning the concentration of PCBs needs to be extracted from the inventory as the cost-efficient management of PCB-containing equipment is based on this information. The pace of the inventory process should be increased as approximately 87% of the potentially equipment is still to be inventoried.	The inventory is ongoing; inventory is taken on 26 220 power transformers, power transformers, oil switches, measuring devices, current transformers, voltage transformers, arc-suppression coils. The main part of the inventory has been done.	The labelling using the adhesive stickers is not stable in time. Some of them was peel off. Much more suitable and stable will be probably labelling using the paints or combination of both possibilities especially from the point of view of the future controls. In the following years, the national inventory in the agreement with the newly adopted POPs of the SC, it is a necessary to oriented the national inventory to the new POPs, their sources, environmental and human levels, new types of wastes specific for these new types of pollutants such are for example e-wastes or car wastes.
Outcome 5: Project management, monitoring and evaluation					
No	**Conclusion**	**No**	**Recommendation**		
9	The project management structure is in place, works at very high quality. Implementation follows the work plan; co-financing to the project is slightly above the expectations.	**8**	**To WRC:** Private sector involvement should be facilitated as planned in the project document, especially in the area of POPs disposal.	The project management structure is in place, works at very high quality. Implementation follows the work plan; co-financing to the project is slightly above the expectations.	Private sector involvement should be increased especially in the area of POPs disposal.

5.2 Summary of Conclusions

The project was very successfully finished. The commitments of the stakeholders were high, the attainment of project objectives were in line with the project document.

The project implementation experienced some delay due to lengthy procurement of analytical equipment and due to the fact that many project activities were inter-related with other projects and delays in that project had also delayed. But finally, this connection with other projects, was very effective and contributed to the sufficient and successful fulfilment of the project targets.

The inventory exercise is still ongoing, but a lot of work was done until now. Total number of collected samples is 2 416, until 01 July 1 820 were analyzed, the rest of analysis is ongoing. From these 1 820 samples, 390 were positive with PCBs findings. Additional 60 environmental abiotic and biotic samples were collected and analyzed and 1 500 results were obtained.

Institutional capacity at the Governmental level has been created for POPs management. A new Central Analytical Laboratory has been established and it is a fully functioning now. The Government of Armenia provided space. The equipments and infrastructure were supported from different projects (UNIDO, NATO and Brazilian Government).

The development of new legal instruments is in line with the project document. Regulation on obsolete pesticides (including POPs-pesticides) handling, including obsolete pesticides inventory taking, storage, transportation, re-packaging, identification, disposal prepared and enacted on the 17th February 2011 signed by the prime minister on 10th March 2011 (decision No 195/2011).

Guidance for PCB containing waste management» was prepared and approved by Protocol Decree of the Government of the RA on 20 October 2011 (No. 41).

Awareness raising and providing access to information is one of the largest impacts the project has achieved so far. 10 workshops were held within the project and 14 workshops were arranged in the frames of other relevant projects. 20 scientific publications, one exhibition and contest for children were undertaken. The project has a website where project related information will be accessible. These assure the possible replication of the project.

The inventory is ongoing; inventory is taken on 12 441 power transformers, power transformers, oil switches, measuring devices, current transformers, voltage transformers, arc-suppression coils. The main part of the inventory has been done.

The labelling using the adhesive stickers is not stable in time. Some of them were peeled off. Much more suitable and stable will be probably labelling using the paints or combination of both possibilities especially from the point of view of the future controls.

The project management structure is in place, works at very high quality. Implementation follows the work plan; co-financing to the project is slightly above the expectations.

5.3 Recommendations

Concerning to the national POPs inventory:

The inventory is ongoing; inventory is taken on 12 441 power transformers, power transformers, oil switches, measuring devices, current transformers, voltage transformers, arc-suppression coils. The main part of the inventory has been done.

The labelling using the adhesive stickers is not stable in time. Some of them were peeled off. Much more suitable and stable will be probably labelling using the paints or combination of both possibilities especially from the point of view of the future controls.

In the following years, the national inventory in the agreement with the newly adopted POPs of the SC, it is a necessary to oriented the national inventory to the new POPs, their sources, environmental and human levels, new types of wastes specific for these new types of pollutants such are for example e-wastes or car wastes.

Private sector involvement should be increased especially in the area of POPs disposal.

Concerning to the national POPs laboratory:

The established national POPs laboratory unfortunately exists in s small room, which is not sufficient for the laboratory, which will be accredited and which will work with relatively high amounts of samples per year.

National support of the Armenian Government is extremely needed. It is necessary to decide which status laboratory will have – governmental, private. This is very important from the point of view of rules of accreditation – especially with the focus on salary for permanent staff, operational budget – chemicals, standards, columns etc. and also a number of samples connected with the regular monitoring, control measurements etc.

Laboratory is not ready for accreditation and the cross-laboratory inter-comparisons and calibrations which is prerequisite for the accreditation procedure and work of this lab.

6. LESSONS LEARNED

Ensure Objectives and Outcomes/Outputs are realistic and focused on the future effective management of POPs issue in the Republic of Armenia.

Lesson for other countries and regions

The project approaches and results can serve as useful examples of well prepared project proposal realisation for other countries in the subregional territory as well as in the broader context of the SC space. Project was focused on very important aspect of the national inventory of POPs pollution source in the country where the detailed inventory was missing, where sufficient waste management system was missing and where exist lot of hot spots. Prepared project outputs represent from the methodological point of view an example of very effective

approaches to the solution of serious environmental problems. They can also help and be very useful for the development of new approaches for many other countries.

Lesson for other international global activities

The project results can have a potential to also catalyze a lot of other international global activities. For example, to create mechanisms to integrate regional administrations and local communities with global environmental networks implemented through UN agencies and international banks. Hopefully it can be very a very sufficient and effective basis for broader cooperation in the Caucasian region which is missing permanently from the political and historical reasons.

Lessons for UNEP/UNIDO/GEF

UN bodies and GEF can use it as a good example of effective use of various financial supports and as an example of suitable methodological approaches.

Lesson for Armenian environmental policy

The project inventory of the Armenian POPs sources is a suitable tool for the development of whole Armenian inventory of pollution sources, legal and illegal waste disposal sites and contaminated sites. It can be used also for the development of institutional and financial mechanism to address past environmental damage using the USA Superfund as a model.

Lesson for political commitment at governmental levels

The overall lesson that can be drawn from the project is to underline the importance of fully testing government commitment and the prospects of it being sustained over the life of the project. The project largely met the overall objectives and expectations at the national level, because what appeared to be significant government policy commitment to functional improvement of environmental management in the Armenia was sustainable.

Lesson for stakeholders from governmental institutions at federal and regional levels

The success of this type of complex environmental project depends on degree of involvement of top-level stakeholders from governmental institutions, the implementation of the activities at the regional level as well as on proper channelling contributions from donors and from the Armenian stakeholders for the project needs.

Broader stakeholder support at the high level is required for introduction of environmental policy changes and ensuring their sustainability. This is strongly connected with the follow-up activities of the top-level stakeholders from governmental institutions level. The reflection of project results in the strategic and conceptual documents of the Government and responsible ministries will be the best project.

7. FINAL STATEMENT

All Project tasks and proposed goals were successfully achieved; the Project outcomes set up solid grounds for global implementation of the Stockholm Convention. It will favour the improvement of the environmental and human health protection in the Republic of Armenia. The main critical problems of the POPs, POPs waste occurrence, inventory and future disposal in the country were identified; environmental risks at all levels were assessed. The project prepared proposals to the Armenian Government to improve nature protection legislation and management. Final evaluation of the project goals realisation is **satisfactory**.

ANNEX I

TERMS OF REFERENCE

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Technical assistance for environmentally sustainable management of PCBs and other POPs waste in the Republic of Armenia

JOB DESCRIPTION

Post title	International consultant – team leader for assessment and evaluation of project´s results/achievements
Duration	21 days (14 days home base, 7 days Yerevan)
Date required	8 May 2012
Duty station	Home base and Yerevan
Counterpart	Department of Hazardous Chemicals and Waste Management, Ministry of Nature Protection of the Republic of Armenia
Duties	Final assessment of the results/achievements. The consultant will be the team leader of the mission, he should coordinate the mission activities with the other members of team, the National project Coordinator and other project stakeholders and with the national consultant selected as member of the mission. The consultants should present the draft report to the Project Manager in UNIDO, outlining the results achieved by the project, including conclusions and recommendations. The report should be a looking forward assessment basing conclusions and recommendations on the results obtained by the project during its activities and the possibilities of future sustainability, once the project is completed. The final version of the report, after having discussed the draft with the UNIDO Project Manager, shall be submitted to UNIDO. Details on the specific duties are indicated below. For the smooth development of the activities, the consultant will receive the necessary support from the Project Manager, the project staff in the field and the National Counterparts of the project.

Main duties	Expected duration	Location	Expected result(s)
1) Study project documentation, including progress reports, work plans, relevant notes of meetings, specific project components plan etc. The project staff in the field, a s well as the UNIDO project manager, will facilitate to the consultant and to the team the available information. Review the mission plan and suggest eventual adjustments, if needed. Discuss the mission strategy with the members of the team. Consider the technical elements of the UNIDO evaluating procedures that should be observed during the exercise and brief the members of the team accordingly.	During the assignment	Home-based and Yerevan	Expert briefed and fully provided with the project documentation and familiar with the UNIDO evaluating procedures. Mission in the field started.
2) Hold meetings with the counterparts, project staff and selected on the relevant	During the assignment		Assessment completed and findings discussed among the members

issues related to the project: vision, validity in local context, development, ownership, relevance for the future development and sustainability of the activities. Elaborate technical criteria for the analysis of the project impact and its relevance. Draft the technical analysis and elements of the report to be discussed with the members of the team			
3) Visit the demonstration sites of the different project components, specially the areas dedicated to the management system for safe and environmentally sound phase-out and disposal of PCBs. Meet local counterpart authorities at various levels. Assess technically the results, achievements and further needs for possible improvement. Analyze UNIDO documents and reports prepared on the impact of the performed project activities.	During the assignment		Assessment done. Achievements and shortcomings, if any, documented.
4) Prepare the first draft of the report in cooperation with the national consultant, and in documenting the findings and recommendations. Prepare jointly with Team leader the draft report to be submitted for final comments before the final assessment report.	During the assignment		Draft document including findings, conclusions and recommendations presented to the Project Manager.
5) Prepare the final report including technical findings, conclusions and recommendation and submit it to UNIDO, both in hard and electronic version.	During the assignment	Home based.	Mission completed. Final report presented.

Qualifications: Qualified expert experienced in project results assessment, monitoring and evaluation, with knowledge of waste management, environmental problems and familiar with the UNIDO project activities. The consultant should be also familiar in assessing achievements, success and shortcomings of technical cooperation projects. The consultant should be capable of leading monitoring/evaluation teams, to perform objective evaluation and presenting objective recommendations. Minimum 10 years of experience.

Language English

ANNEX II

Participants of the Evaluation Workshop, Yerevan, Armenia, 26 May, 2012

1) Professor Ivan Holoubek, Project Co-Director, NPD, Masaryk University, Brno, Czech Republic
2) Ms. Anahit Aleksandryan, Project Coordinator, PPD, Ministry of Nature Protection of the Republic of Armenia
3) Mr. Mkrtich Danielyan, Ministry of Agriculture of the Republic of Armenia
4) Mr. Khachatur Khachatryan, Ministry of Nature Protection of the Republic of Armenia
5) Mr. Alik Abrahamyan, Direction of Construction Hrazdan – 5, Enterprise (TPP), "HayRusGazArd" CJSC
6) Mr. Vardges Frangulyan, Malatya – Sebastya Medical Center
7) Mr. Yurik Bunyatyan, Waste Research Centre SNCO
8) Mr. Artak Khachatryan, Waste Research Centre SNCO
9) Mr. Feliks Petrosyan, NAIRIT Plant
10) Mr. Bardukh Gabrielyan, Scientific Center of Zoology and Hydroecology, National Academy of Science, Republic of Armenia
11) Mr. Vladimir Kogan, Scientific Research Institute of Hygiene and Occupational Diseases of Kanaker – Zeytun Medical Centre CJSC at Yerevan City Administration
12) Ms. Renik Hovhannisyan, Scientific Research Institute of Hygiene and Occupational Diseases of Kanaker – Zeytun Medical Centre CJSC at Yerevan City Administration
13) Ms. Evelina Ghukasyan, Institute of Hydroecology and Ichthyology of the National Academy of Armenia
14) Ms. Zhenya Harutyunyan, Narek Research Centre CJSC
15) Mr. Aleksandr Yengoyan, State Agrarian University of Armenia
16) Mr. Aram Knyazyan, Russian-Armenian (Slavonic) University
17) Ms. Zhanna Sukiasyan, State Engineering University of Armenia
18) Ms. Astghik Badalyan, Environment and Health "EcoTox" NGO
19) Ms. Alla Ivchenko, Translator
20) Ms. Irina Kulajyan, Assistant