REPUBLIC OF LEBANON
MINISTRY OF ENVIRONMENT

GEF

UNEP

Republic of Lebanon
Ministry of Environment

National Implementation plans for the Management of Persistent Organic Pollutants

Final Report

2006

Executive Summary

A. Introduction

The Government of Lebanon (GoL) signed the Stockholm Convention (SC) on May 22, 2001; it came into force on May 17, 2004. With grant funding from the Global Environment Facility (GEF)/UNEP, Lebanon is one of 12 countries participating in a pilot project for the "Development of National Implementation Plans for the Management of POPs." Major milestones during the implementation of this NIP include:

1. Preliminary POPs inventories
    a. Dioxins and Furans
    b.Pesticides
    c. Polychlorinated Biphenyls (PCBs)
2. National Profile (NP) of Chemicals Management in Lebanon
3. Health and Environment Profile of Lebanon
4. National Implementation Plan:
    a. Priority setting: Recommendations from the preliminary inventories were aggregated into nine priority areas and scored using five evaluation criteria.
    b. Validation of tentative priority issues: MoE organized a full day priority-setting workshop in August 2005 with relevant stakeholders to validate the nine priority areas across all three groups of chemicals (pesticides, dioxins and furans, and PCBs).
    c. Draft NIP document review: MoE organized a second workshop in November 2005 to review the draft NIP document with emphasis on the proposed action plan. Participants discussed the actions and tasks specific to each chemical group and those common to all three. To the extent possible, this Final NIP document has incorporated the comments and suggestions of the participants.

B. Country Profile

Lebanon lies between latitudes 33°03'-34°45' and longitudes 35°05'-36°30'. The dominating topographic features of Lebanon are two parallel mountainous ranges with a NNE-SSW direction, Mount Lebanon and Anti Lebanon, separated by the Bekaa plain.

Lebanon's total population was estimated at 3,753,785 persons in 2004 with a total area of 10,452 km^2 of which 222 km^2 are water and 10,230 km^2 are land. The country is bound from the North and East by Syria, from the South by the Palestinian Authority, and from the West by the Mediterranean Sea with a coastal strip of 225 km.

Local economy in Lebanon mainly depends on the trade and services sector. The Lebanese industry and agriculture are of micro and small size. Lebanese legislation sporadically addresses hazardous chemicals in different laws, decrees and ministerial decisions especially the law 64/1988 on hazardous waste, and the decree 8006/2002 and its amendments on the management of health care waste (which includes hazardous and persistent chemicals, Decree 13389/2004). National environmental standards were issued by the Minister of Environment (decision 52/1 1996 and decision 8/1 2001), however POPs were not covered.

A number of ministries play a role in chemical management. The Ministry of Agriculture is practically handling activities concerned with agricultural pesticides, the Ministry of Environment deals with hazardous and industrial chemicals, the Ministry of Public Health is responsible of pesticides destined for domestic use and the Ministry of Energy and Water is responsible for the import of petroleum derivatives. Responsibilities for POPs management in Lebanon are not well delineated.

Legal procedures are existent for the control of agricultural pesticides, industrial chemicals, domestic pesticides, and PCBs. These are regulated under MOE Decision 71/1 (PCBs) and Decree 5039 (Pesticides). While there are several legal texts that cover the management of POPs chemicals in Lebanon, enforcement of available legal instruments remains very weak due to the lack of human, technical and financial resources.

Many laboratories, belonging to ministries, research institutes, universities or the private sector, can be considered for management of chemicals in Lebanon. IRI is the only institute holding an international certification (ISO 17025; General Requirements for the Competence of Testing and Calibration Laboratories) where a few laboratories are working on getting international certifications in order to improve their working practices.

C. Assessment of the POPs Issue in Lebanon

1) Assessment with respect to Annex A, Part I Chemicals (POPs Pesticides)

A survey on agrochemical distributing companies with a complete list of their products revealed that none of the distributed pesticides belonged to the nine POPs compounds, further confirming their probable absence in the Lebanese market. A survey conducted in a recent study at the MoE whereby the amounts of pesticides imported to Lebanon from 1996 to 2000 were recorded, none of the 9 POPs pesticides were identified.

A study has reported sediment samples results within the El Kabir Watershed in North Lebanon as part of the Syria Lebanon Akkar Watershed Project. Sediment samples were analyzed for the presence of two of the POPs pesticides, namely HCB and Mirex. HCB was detected at low levels, while Mirex was not detected in any of the samples.

Prior to 1999, the Lebanese customs database system was under the responsibility of the Central Administration of Statistics (CAS). Since then, the database import/export materials grouping system had changed thrice, where upon the first and second modification to the system, the amounts of POPs pesticides could not be differentiated from the overall amount of imported pesticides. As such, the amount of imported material per each pesticide was not recorded.

Import/export data of 2000 through 2004, shows that 1 kg of DDT (and possibly 2 other organochlorine compounds) was imported in 2002 by order of the Ministry of Public Health for research purposes. The MoPH is the only institution that is allowed to request such import by a special order, whereby DDT was used for testing and analyses.

Farmers in Lebanon are often poorly aware of the nature of the chemicals they use for their crops, and are particularly ignorant of POPs pesticides. It is highly improbable that stocks exist due to the fact that any present chemicals would have been either sold within due expiry date, or repackaged and sold after expiry in another brand name. The demand for agrochemicals on the Lebanese market is high and selling products is a very easy task considering the illiteracy of the majority of farmers. No smuggled POPs pesticides were officially detected or declared until the present day.

Land contamination from extensive usage is highly probable especially in frequently planted agricultural areas. The vastness of agricultural activities and diversity of planted crops render it difficult to pinpoint exact locations of possible POPs pesticides usage. Therefore, large areas with historically intensive agricultural practices can be identified and will be the target of the action plan for initial sampling. Any possibly contaminated agricultural soils used at construction sites for planting purposes could be considered as a potential source of these chemicals. Such non-point sources could be numerous due to the construction boom after the Lebanese civil war in the past two decades.

Detected levels of organochlorine pesticides heptachlor and epoxide, tested in fish species found off the coast of Lebanon did not constitute a hazard to human health. The limited evidence found could mean that the pesticides have not been in the Mediterranean for a very long time, thus the concentrations in fish are due to direct absorption into the fish body from water rather than from the consumption of other pesticide - containing fish. Another likely explanation reported by the researchers is that the experiment had been too small to give accurate concentrations in the species sampled.

An analysis for organochlorinated pesticides in the Kuwaiti diet including food products imported from Lebanon, concluded that the residue levels encountered were relatively low and none of these residues exceeded the FAO/WHO (1993) maximum residue limit (MRL).

2) Assessment with respect to Annex A, Part II Chemicals (PCBs)

Lebanon has no PCB production facility. The country hosts two companies that manufacture and/or supply distribution transformers: Matelec (Lebanese company) and Elprom (Bulgarian company). Both companies have been using PCB-free oil for many years. Two PCB assessments were conducted in 1995 and 2000, respectively. Key findings are summarized below:

>> Out of 34 samples of dielectric oil collected from distribution transformers in 1995, eight contained PCB concentrations greater than 50 ppm.

>> Out of 38 samples collected in 2000, also from distribution transformers, six contained PCB concentrations greater than 50 ppm and two contained concentrations between 40 and 50 ppm.

>> All nine samples collected from oil barrels contained PCB concentrations less than 50 ppm (values ranged from <1 to 21 ppm); the two well samples contained 222 and 229 ppm of PCB, respectively; and the soil sample contained 8 ppm PCB.

Key findings from the inventory conducted in 2004 are summarized below:

- Power Plants: Lebanon's power plants are relatively new (post 1995). Samples from Lebanon's two oldest plants (Zouk and Jieh) revealed significant quantities of PCB oil in both in-use and out-of-service transformers. Total quantities of PCB oil were estimated at 42 tonnes (5 tonnes in Zouk and 37 tonnes in Jieh); commercial oil names include Askarel, Sibanol and Pyralene. PCB oil or PCB-contaminated oil may be present in other power plants and would require more extensive testing.
- Substations: Lebanon's substations appear to be using and to have been using PCB-free oil. The corresponding test results corroborate this finding (27 samples), where the concentration of PCB oil in new as well as old transmission transformers was not detectable. It is however difficult to categorically exclude the presence of PCB in transmission transformers due to the multitude of associated variables.
- Distribution: Lebanon's power authority, Electricité de Liban (EDL), owns and operates more than 16,000 distribution transformers across the country, many of which may contain PCB oil. Old and/or damaged transformers are gradually being phased-out and replaced with new ones that contain PCB-free oil. The EDL repair shop in Bauchrieh is considered the most severe hotspot in Lebanon, where an estimated 1,600 transformers are present. Previously MoE and EDL commissioned an investigation collecting a total of 84 samples between 1995 and 2000 from the site.

A total of 14 samples contained high concentrations of PCB and the samples collected from a well contained PCB.

- Capacitors: EDL uses only dry-type capacitors. Dry-type capacitors do not contain oil and therefore do not represent a potential repository of PCB material.

3) Assessment with Respect to Annex B Chemicals (DDT)

Municipalities in Lebanon do not use DDT for mosquito abatement or insect spraying. The Ministry of Public Health (MoPH) used to distribute DDT to municipalities in the 1970s and 1980s for malaria prevention. However, no records are available detailing for distributed quantities. The most recent logbook records that are kept indicate the usage of alternative pesticides to DDT, which are often synthetic pyrethroids for spray and ambient fogging.

In a recent publication by the American University of Beirut (AUB), on DDT sampling and analysis results in Lebanon, a total of 113 soil samples were collected for analysis from 3 major agricultural regions in the country: Mount Lebanon, the Bekaa Valley, and the Coastal Plain. The majorities of the analyzed samples were free of DDE (a DDT metabolite) or contained negligible amounts of it. Two urban samples with high human activity in the area revealed higher DDT amounts as compared to other POPs pesticides. These two urban sampling locations were situated in the South Caza, particularly in Saida, such that the first was near a gas station, while the second was in a dense residential zone.

These relatively higher levels of DDT found in the two locations were explained by: (1) an old storage site of DDT in the vicinity, (2) small-scale haphazard dumping of DDT material in the vicinity, or (3) an accidentally discarded DDT product. There are no suggested ramifications as to these two locations, since the levels of DDT in all samples were within permissible standards for agricultural use.

Sediment samples results within the El Kabir Watershed in North Lebanon were also analyzed for the presence of DDT. DDT and DDE were found in small amounts in all samples, indicating possible current usage.

A research conducted at the National Council for Marine Sciences (NCMS) showed that levels of DDT, DDD, and DDE in fish were not negligible. The study also stated that the trend between 1984 and 1988 indicates that fish contamination is not likely to decrease.

4) Assessment of Releases from Unintentional Production of Annex C Chemicals (PCDD/PCDF)

The preliminary inventory for Dioxins and Furans, conducted in 2005, indicated that Lebanon releases an estimated 165.8 g TEQ per year of PCDD/PCDF. Uncontrolled combustion was found to be the major contributor to such emissions with a 124.74 g TEQ/a (this is equivalent to 75.24% of total emissions).
In the context of a study on dioxin assessment in soils, sampling and analysis of 6 potential sites was done in Lebanon in 2001. Test results showed levels lower than the maximum value of toxic equivalent concentration.

D. Action Plans, Activities and Strategies

Consistent with UNEP guidelines, this NIP presents activities, strategies and action plans for POPs management in Lebanon. It describes each activity, strategy or action plan in relation to the provisions of the Stockholm Convention and by providing relevant background information and findings, including tentative cost figures and time-frame. The proposed actions and tasks reflect national priorities as expressed and discussed at the priority setting workshop in August 2005. The total number of discrete tasks proposed in the NIP is 96.

1) Institutional and Regulatory Strengthening Measures

Existing laws and policies were evaluated for efficacy of POPs management, and complementary measures were proposed accordingly. The most prominent tasks were related to updating existing legislation based on its gaps and weaknesses regarding POPs.

These included emission and disposal standards, environmental limit values for classified industrial establishments and wastewater treatment plants for POPs as well as banning open dumping and burning of solid waste.

2) Measures to Reduce or Eliminate Releases from Intentional Production and Use

Measures to reduce or eliminate releases from intentional production and use, were proposed for both POPs pesticides and PCBs. They included ensuring zero PCB release from in-use transformers, strengthening measures to prohibit the use of POPs pesticides, sample and analyze dielectric oil in in-service transformers, and investigating the fate of 13 tonnes of PCB oil imported in 2002.

3) Production, Import and Export, Use, Stockpiles and Wastes of Annex A Part I POPs Pesticides

Since the preliminary POPs Pesticides Inventory in Lebanon did not register production, use, import or export of these substances and has established the absence of their stockpiles and waste, no improvement of the current management and treatment practices of Annex A pesticides is deemed necessary. However, it is recommended that additional efforts be made for improvement including systematic monitoring of environmental POPs pesticides levels in order to confirm the findings of the inventory that these chemicals do not represent a true problem in Lebanon to the environment or human health.

4) Production, Import and Export, Use, Identification, Labeling, Removal Storage and Disposal of PCBs and Equipment Containing PCBs

This activity identifies all sources of PCB release and use in the country by developing a comprehensive inventory of PCBs. Additionally, it addresses monitoring, phase-out and disposal of PCB containing products and equipment.

5) Production, Import and Export, Use, Stockpiles and Wastes of DDT if used in the Country

An action plan for DDT has not been developed due to absence of production, use, import or export as well as stockpiles and wastes of DDT in the country, as recorded by the preliminary POPs Pesticides Inventory.

6) Register for Specific Exemptions and the Continuing Need for Exemptions

Lebanon did not register any exemptions to Annex A and Annex B chemicals, and is not likely to do so in the future.

7) Measures to Reduce Releases from Unintentional Production

The aim of this activity is to take action to identify, characterize and address unintentional releases of PCDD/PCDF, HCB and PCBs formed as a by-product of certain industrial processes. One of the most significant actions proposed was the promotion of BAT/BEP techniques at known source II & III establishments, requirement of BAT/BEP at new source II establishments, which include hospitals, secondary copper, aluminum, and lead producers, as well as textile and leather industries. Others actions involved environmentally sound waste management technologies to stop the uncontrolled burning of municipal solid waste.

8) Measures to Reduce Releases from Stockpiles and Wastes

Two major actions are proposed under this activity to identify and manage waste sites potentially contaminated with Annex C chemicals. These sites include seven large and hundreds of small uncontrolled dumpsites in the country. This activity also aims to reduce PCB releases from PCB-containing transformers in Zouk & Bauchrieh through labeling, storage, detection and containment.

9) Identification of Stockpiles, Articles in Use and Wastes

This strategy lays out procedures to facilitate the identification of POPs present in unidentified stockpiles and equipment still in use, including PCB stockpiles and potential Dioxin/Furan contaminated sites. Its detailed actions include inspection surveys of pesticides retailers, investigations of substations at other power

utilities such as the Litani River Authority (LRA) and the Qadisha plant, and exercising containment procedures at identified contaminated sites or stockpiles.

10) Manage Stockpiles and Appropriate Measures for Handling and Disposal of Articles in Use

This activity focuses on identifying appropriate measures to manage, handle and destroy stocks and articles in use, remedy contaminated sites and other hot spots of concern to public health and the environment. Actions include treatment or disposal of PCB oil and irreparable PCB-contaminated transformers in an environmentally sound manner, and improving procedures for handling transformers at the EDL warehouse in Bauchrieh.

Additionally, the activity outline a procedure for implementing a national sampling and analysis program for identification of sites potentially contaminated with POPs pesticides, and develop a remediation plan that assesses remediation options fitting to Lebanese circumstances.

11) Identification of Contaminated Sites (Annex A, B and C Chemicals) and Remediation in an Environmentally Sound Manner

The strategy identifies contaminated sites and proposes alternative treatment methods for reducing and eliminating the release of POPs. Actions include delineating Dioxins/Furans contaminated sites, identifying, assessing and remediation of POPs pesticides contaminated sites, decontaminating the well at the Bauchrieh repair shop, and exploring the feasibility of decommissioning the Bauchrieh repair shop.

12) Facilitating or Undertaking Information Exchange and Stakeholder Involvement

Actions under this activity aim at strengthening links among relevant private and public stakeholders, organizing and disseminating information, and establishing a mechanism involving several stakeholders to gather data on all POPs chemicals. In particular, this activity proposes to setup a central POPs database and measures to facilitate the information exchange on POPs chemicals.

13) Public Awareness, Information and Education

This activity promotes and facilitates POPs awareness in policy and decision-making, and provision of information to the public at the national, sub-regional, and regional levels, via data sheets and reports, mass media, and information centers. Major actions to be taken include national awareness campaigns targeting universities, farmers, municipalities, industries, and EDL, as well as designating the MoE as the central information source for data related to POPs chemicals.

14) Effectiveness Evaluation

This activity requires further deliberations during later stages of NIP implementation. Tentative actions include measures for monitoring progress, consistent with COP guidelines for comparing monitoring data, frequent update of the preliminary inventories, and developing indicators for each proposed action.

15) Reporting

The objectives of this activity are to report to the COP and Secretariat by preparing and submitting national reports to the COP, and developing a data collection system for POPs emissions from individual enterprises.

16) Research, Development and Monitoring

This activity proposes actions focusing on undertaking research, development, monitoring and cooperation related to POPs. The NIP proposes four actions concerning health related research, establishing inspection units and monitoring programs for POPs emissions and self-monitoring.

17) Technical and Financial Assistance

Lebanon, a developing country with a $38 billion national debt, will require technical and financial resources to execute the National Implementation Plan, either wholly or partly, and to fulfill its obligations under the Stockholm Convention.

Assessment of the required funds is based on cost assessment of individual action plans and strategies. Total implementation costs of NIP's key segments are estimated to amount to nearly 13.4 million USD. It is important to note that some tasks have no direct cost.

Table of Contents

List of Acronyms

Al	Aluminum
AAA	Amino Acid Analysis
AAS	Atomic Absorption Spectrophotometer
ACTS	Advanced Construction Technology Services
ALI	Association of Lebanese Industrialists
APC	Air Pollution Control
AUB	American University of Beirut
BAT	Best Available Techniques
BEP	Best Environmental Practices
BOD	Biological Oxygen Demand
BS	Bachelor of Sciences
CAS	Central Administration of Statistics
COP	Conference of the Parties
CDR	Council for Development and Reconstruction
CoM	Council of Ministers
CRSL	Central Research Science Laboratory
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
ECL	Environment Core Laboratory
EDL	Electricité Du Liban
EERC	Environmental Engineering Research Center
EIA	Environmental Impact Assessment
ELARD	Earth Link and Advanced Resources Development
EPA	Environmental Protection Agency
ERM	Environmental Resources Management
EU	European Union
FAO	Food and Agricultural Organization of the United Nations
GBA	Greater Beirut Area
GC-ECD	Gas Chromatograph Electron Capture Detector
GC-NPD	Gas Chromatograph Nitrogen Phosphorus Detector
GC-FID/PID	Gas Chromatograph-Flame Ionization Detector/Photo-Ionization Detector
GC-MS	Gas Chromatograph/Mass Spectrometer
GCLL	General Confederation of Lebanese Labors
GD	General Directorate
GEF	Global Environment Facility
GoL	Government of Lebanon
GDP	Gross Domestic Product
HCB	Hexachlorobenzene
HGU	Hydrogen Generation Unit
HPLC	High Performance Liquid Chromatography
HRGC-HRMS	High Resolution Gas Chromatography/High Resolution Mass. Spectrometry
HS	Harmonized System
ICP-MS	Inductively Coupled Plasma -Mass Spectrometer
IDAL	Investment Development Authority of Lebanon
IDRC	International Development Research Center
ILO	International Labor Organization
IRI	Industrial Research Institution

ISO	International Organization for Standardization
LARI	Lebanese Agricultural Research Institute
LAU	Lebanese American University
LBP	Lebanese Pounds
LC-MS	Liquid Chromatograph/Mass Spectrometer
LCA	Lebanese Customs Authority
LEAC	Lebanese Atomic Energy Commission
LSC	Liquid Scintillation Counters
LT	Long Term
LU	Lebanese University
LWA	Litani Water Authority
METAP	Mediterranean Environmental Technical Assistance Program
MoA	Ministry of Agriculture
MoE	Ministry of Environment
MoEHE	Ministry of Education and Higher Education
MoET	Ministry of Economy and Trade
MoEW	Ministry of Energy and Water
MoPH	Ministry of Public Health
MoI	Ministry of Industry
MoIM	Ministry of Interior and Municipalities
MoL	Ministry of Labor
MoPWT	Ministry of Public Works and Transport
MoSA	Ministry of Social Affairs
MS	Masters of Sciences
MSW	Municipal Solid Waste
MT	Medium Term
NCSR	National Council for Scientific Research
NGO	Non-Governmental Organization
NIP	National Implementation Plan
NEW-SSW	North East West-South South West
P&TGC-MS	Phosphorous and Total Gas Chromatography Mass Spectrophotometer
PAH	Poly-Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PCDD	Polychlorinated Di-benzo-para-Dioxins
PCDF	Polychlorinated Di-benzo-para-Furans
PhD	Doctor of Philosophy
POPs	Persistent Organic Pollutants
PVC	Polyvinylchloride
SC	Stockholm Convention
SES	Sanitary Engineering Service
SoER	State of Environment Report
SoR	Service of the Registry
ST	Short Term
TEQ	Toxic Equivalent
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USAID	United Sates Agency for International Development
USD	United States Dollars
USJ	University Saint-Joseph
UV	Ultra-Violet
UNIDO	United Nations Industrial Development Organization
WWTP	Wastewater Treatment Plants

Units of Measurement

°C	Degrees Celsius
ha	Hectares
km	Kilometers
L	Liters
L/cap/day	Liters per capita per day
m^2	Square meter
m^3	Cubic meter
m^3/day	Cubic meters per day
mm/year	Millimeters per year
Mm^3	Million cubic meters

List of Tables

List of Figures

Introduction

1.1. Background

The Government of Lebanon (GoL) signed the Stockholm Convention (SC) on May 22, 2001; it came into force on May 17, 2004. Recognizing the impact of POPs on human health and the environment, the Stockholm Convention on Persistent Organic Pollutants (POPs) aims to:

(1) Protect human health and the environment through measures which will reduce and/or eliminate emissions and discharges of POPs;
(2) Eliminate and remove from use equipment containing more than 0.005% (50 parts per million) polychlorinated biphenyls and volumes greater than 0.05 liters, by 2025. It also prohibits the production of PCBs as well as their import or export for purposes other than environmentally sound waste management;
(3) Eliminate the production and use of the POPs pesticides with the exception of DDT (Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene, Mirex and Toxaphene), as specified in Part I of Annex A; and restrict the production and use of DDT to acceptable purposes as specified by Part I of Annex B.
(4) Require the use of Best Available Techniques (BAT) for new sources in categories listed under Part II of Annex C of the Convention that shall be phased in as soon as practicable but no later than four years after the entry into force of the Convention (May, 2008). Promote the use of BAT and BEP for existing sources listed under Part II and III of Annex C of the Convention and for new sources under Part III of the Annex.

Pursuant to the Convention, each party shall (i) develop and endeavor to implement a plan for the implementation of its obligations under the Convention; (ii) transmit its implementation plan to the Conference of the Parties within two years of the date on which this Convention enters into force for it; and (iii) review and update, as appropriate, its implementation plan on a periodic basis and in a manner to be specified by the Conference of Parties (COP)[1] .

With grant funding from the Global Environment Facility (GEF)/UNEP, Lebanon is one of 12 countries participating in a pilot project for the "Development of National Implementation Plans for the Management of POPs."[2] Pursuant to the project objectives, the Ministry of Environment (MoE) prepared three preliminary inventories for pesticides[3], dioxins and furans[4], and PCBs[5]. These inventories were prepared and submitted in 2005 and received excellent ratings from the UNEP Secretariat. Building on these inventories, MoE in collaboration with relevant stakeholders prepared the National Implementation Plan (NIP) for POPs management in Lebanon. This plan was prepared during the period ranging from April through November 2005.

In addition to the preliminary Inventories and National Profile, Lebanon prepared a "Health and Environment Profile" to evaluate the intensity of the effects of POPs pollutants. This report was finalized in August 2005[6].

1.2. Objectives

The purpose of this report is to assist the Government of Lebanon define and implement its obligations under the Convention. In particular, the objectives of the NIP are to[7]:

(1) Identify and gather information on possible options for management of POPs to implement the SC with indication of the scope of application, limitations, costs and benefits for each option.

1 Stockholm Convention on Persistent Organic Pollutants, Article 7, pg. 13
2 Project Ref nº GF/2732-02-4458
3 Inventory was prepared in 2005 by ELARD
4 Inventory was prepared in 2005 by ELARD
5 Inventory was prepared in 2005 by ECODIT Liban
6 Health and Environment Profile, ELARD 2005
7 Guidance for Developing a National Implementation Plan for the Stockholm Convention (Chapter 8). UNEP-World Bank.

(2) Evaluate the options available and actions necessary to meet the requirements of the SC and country objectives.
(3) Identify requirements for assistance in the completion of additional assessments and information gathering to complete and implement the NIP.

1.3. Methodology

This National Implementation Plan builds on the findings of the preliminary inventories conducted earlier in 2005. The inventories were compiled using a combination of field investigations, sampling and testing, literature review and interviews.
Major milestones during the implementation of this NIP include:
(1) Three Preliminary Inventories covering:
   a. Dioxins and Furans
   b. POPs Pesticides
   c. PCBs
(2) The National Profile of Chemicals Management in Lebanon
(3) The Health and Environment Profile of Lebanon
(4) Priority setting: Several NIP reports were reviewed (e.g., Croatia, Jamaica, Latvia, Poland) to explore alternative techniques for priority-setting including evaluation criteria and scoring matrices. It was decided to aggregate the recommendations from the preliminary inventories into nine priority areas and to score these areas using five evaluation criteria.
(5) Validation of tentative priority issues: MoE organized a priority-setting workshop in August 2005. This two-day workshop was attended by representatives from 14 private and public agencies and lead to the validation of nine priority areas across all three groups of chemicals (pesticides, dioxins and furans, and PCBs). All the participants received prior to the workshop an information package containing relevant materials including executive summaries of the inventories and scoring matrices.
(6) Draft NIP document review: MoE organized a second workshop for the NIP draft document review in November 2005 hosted at the American University of Beirut (AUB) to present and discuss the draft document with emphasis on the proposed action plans. During this one-day workshop, participants made valuable suggestions for improvement to the draft NIP document as part of the working group session (the participants received prior to the workshop a copy of the draft document for their review). Participants discussed the actions and tasks specific to each chemical group and those common to all three.

1.4. Report Organization

Consistent with the UNEP guidelines on the NIP structure, this report is organized into three chapters and thirteen subchapters, and its subsequent appendices as follows[8]:

Executive Summary
(1) Introduction
   a. Background
   b. Objectives
   c. Methodology
   d. Report Organization
(2) Country Baseline
   a. Country profile
   b. Institutional polity and regulatory framework
   c. Assessment of the POPs issue in the country
(3)Strategy and Action Plan Elements of the National Implementation Plan
   a. Policy statement
   b. Implementation strategy
   c. Activities, strategies and actions plans
   d. Development and capacity-building proposal and priorities
   e. Timetable for plan implementation and measures of success
   f. Resource requirements

8 Guidance for Developing a National Implementation Plan for the Stockholm Convention (Annex 5). UNEP-World Bank.

2.1. Country Profile

This section presents background information on Lebanon, particularly the physical, demographic, geographic, and economic status in the country, with emphasis on the industrial and agricultural sectors.

2.1.1. Country Geography and Demography

Lebanon lies between latitudes 33°03'-34°45' and longitudes 35°05'-36°30'[9]. The dominating topographic features of Lebanon are two parallel mountainous ranges, Mount Lebanon and Anti Lebanon, separated by the Bekaa plain. These topographic features extend in a NNE-SSW direction, and largely influence the climate of the country.

The climate of the Lebanese coast is of Mediterranean subtropical type, with hot and dry summers, and mild and wet winters. The two mountain ranges tend to have a cool and wet climate in contrast to that of the coastal zone, whereby snow covers their mountains for several months per year. Average humidity on the coast ranges from 60's to high 70's. During the summer months of May through September, the average daily temperature in Beirut ranges from 22°C to 30°C. January and February are the coldest months of the year when the average temperature in the capital is 14°C, rarely falling below 8°C.

Lebanon has a total area of 10,452 km^2 of which 222 km2 are water and 10,230 km^2 are land, and total land boundaries of 454 km of which 375 km are with Syria from the North and the East, and 79 km with Palestine from the South. The country is bound from the West by the Mediterranean Sea with a coastal strip of 225 km.

Lebanon's total population was estimated at 3,753,785 persons in 2004[10]. 247,835 out of the total residents in Lebanon are foreigners. A total of 40% of the Lebanese population is concentrated in Mount Lebanon. Population distribution in Lebanon is shown in Figure 2.1. Females cover 50.2% of the total population with 1,885,563 and males reached a percentage of 49.8% with 1,868,222. The rate of unemployment as declared averaged to 3.8%. The rate of illiteracy in the same year was estimated to be 7.5%.The crude death rate of the overall Lebanese population is estimated at around 7.4 deaths per 1000 persons, with mortality rate being higher for men (7.9‰) than for women (6.9‰), while crude birth rate is around 24.6 live births per 1000 people[11].

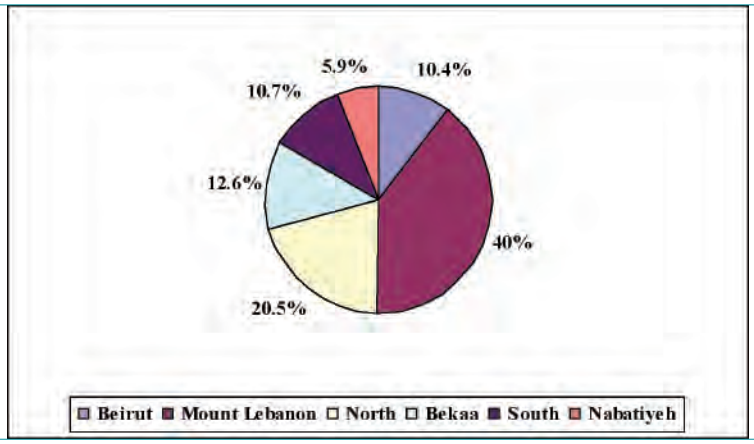

Figure 2.1. Population Distribution in Lebanon[12]

9 FAO, 2002
10 CAS, 2005
11 MoSA/UNDP, 1996
12 CAS, 2005

2.1.2. Political and Economic Profile

Lebanon is a republic, with the official language being Arabic while French and English are the two locally used languages. The country's institutional authorities consist of:

1) The Legislative authority: represented by the General Assembly of the Parliament whose role is to issue and update legislation;
2) The Executive authority: represented by the Council of Ministers (CoM) and its support institutions; and
3) The Judiciary authority: represented by the Higher Council of Justice (whose role is to apply the legislation).

The Secretary General of the Prime Minister, the Ministries and their dependent councils constitute the administrative institutions of the central government.

The Head of the State is the President of the Republic, who is elected by the Parliament and supervises the functions of each of the individual Lebanese authorities. The Prime Minister is appointed by the President after consulting the members of Parliament. The Prime Minister forms a government by appointing cabinet ministers whose appointments are ratified by Parliament.

The central government is supported by a number of public institutions that include the Council for Development and Reconstruction (CDR), Civil Service Board, Central Inspection, Disciplinary Council, Investment Development Authority for Lebanon (IDAL), Electricity of Lebanon, National Council for Scientific Research (NCSR), among others.

Recent developments had led to changes in the administrative regions of the Lebanese Republic. According to Law nº 522 (16-07-2003) and Decree nº 11861 (16-07-2003) 2 Governorates, Akkar and Baalbek EL-Hermel, were added to the 6 administrative regions or Governorates (Mouhafazas) and are summarized in Table 2 1. These are also illustrated in Figure 2 2.

Table 2.1. Administrative Divisions of the Republic of Lebanon

Mouhafaza (Governorate)	Cazas
Beirut	-
North Lebanon	Tripoli, Minieh, Sir Ed-Diniyeh, Zgharta, Bcharrreh, Koura & Batroun
Akkar	Akkar
Baalbek El-Hermel	Baalbek and Hermel
Mount-Lebanon	Baabda, Keserwan, Metn, Jbeil, Aley & Shouf
Bekaa	Zahle, West Bekaa & Rachaiya
South Lebanon	Sidon, Jezzine, Zahrani & Tyre
Nabatiyeh	Nabatiyeh, Hasbaya, Marjayoun & Bint Jbeil

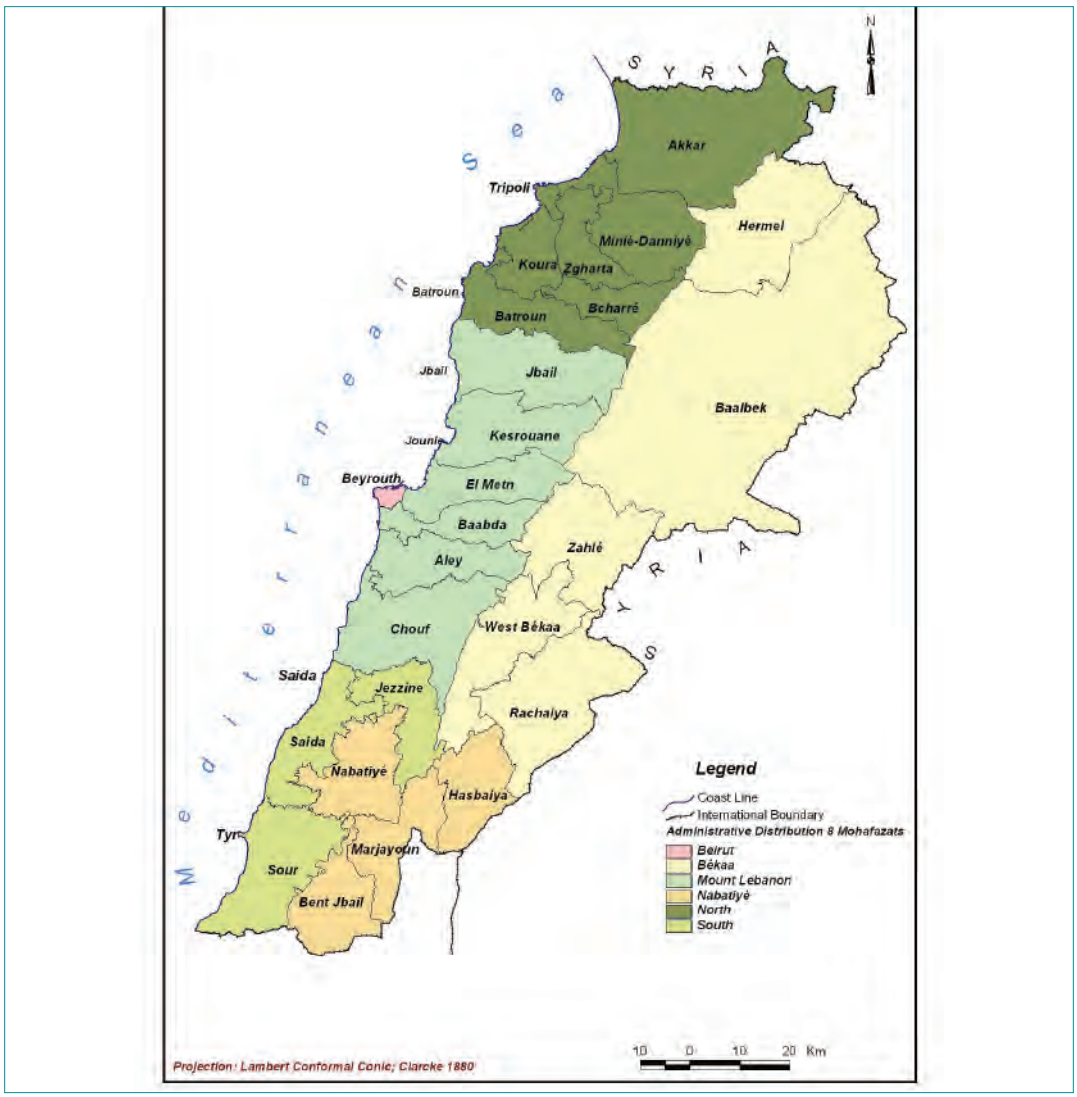

Figure 2.2. Administrative Boundaries of Lebanon[13]

Each Mouhafaza is headed by a Mouhafez - a chief administrator from the Ministry of Interior and Municipalities (MoIM). The Mouhafez represents the National Government administration in the region of his Mouhafaza and is directly responsible to the MoIM. Each Mouhafaza has two advisory councils: the Council of the Mouhafaza and the Health Council whose recommendations are advisory and not binding.

Law enforcement in the Mouhafaza is the responsibility of the Mouhafez who also grants permits to establish, build or operate classified establishments, with the exception of industrial establishments, whereby recent legislation attributes this role to the Ministry of Industry (MoI) and assigned permitting committees.

All Mouhafazas are composed of Cazas except for the Mouhafaza of Beirut, whereby each Caza is headed by a Qaimmacam. The National Government administration in the Caza is therefore represented by the Qaimmacam who reports directly to the Mouhafez.

The Municipalities and Councils of Elders make up the local government in Lebanon. The Mayor heads the municipality enjoying a vast authority over local affairs, while the Moukhtar heads the Council of Elders and undertakes the services related to statements of birth, death, personal identification, property and inheritance. Figure 2 .3 represents the existing institutional arrangements in Lebanon.

13 Courtesy of NCRS

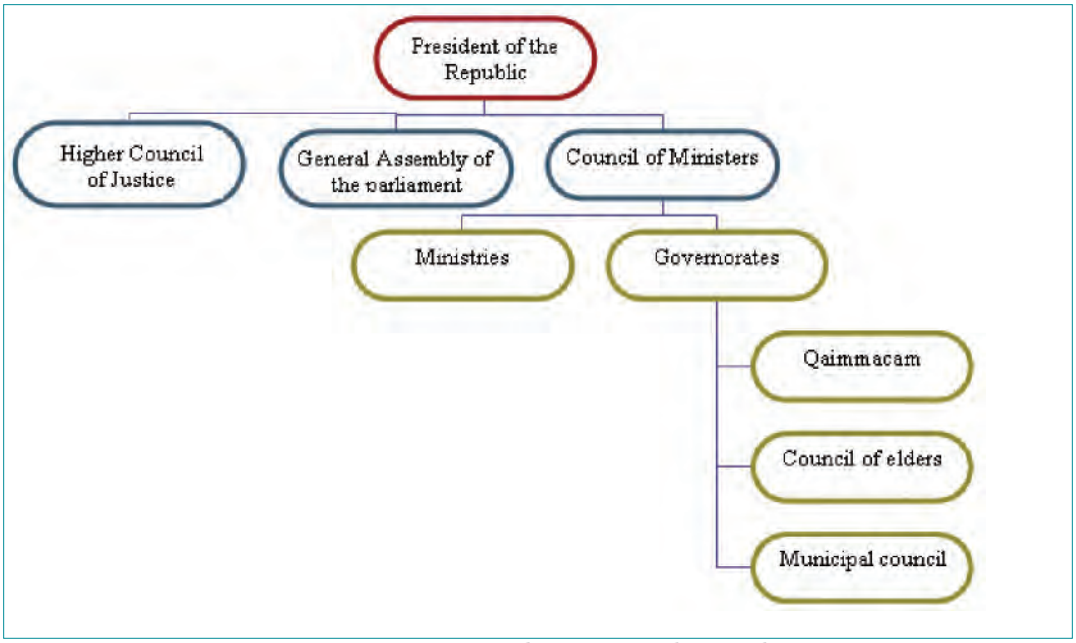

Figure 2.3. Institutional Framework in Lebanon[14]

2.1.3. Profiles of Economic Sectors

Local economy in Lebanon mainly depends on the trade and services sector, which are common in coastal cities with abundant ports such as Tripoli, Sidon and Beirut. Agriculture is dominant in the Bekaa valley, in addition to the North and South Governorates. The main agricultural products include citrus, potatoes, grapes, olives, apples, and tobacco. The bulk of the Lebanese industry is concentrated in Mount Lebanon, the sea front suburbs of Beirut and the coastal area of northern Lebanon. Major products include construction material, food processing, textiles and readymade garments, furniture and jewelry. The distribution of GDP among the three main sectors is shown in Table 2.2.

14 adapted from METAP, 2002

Table 2.2 GDP Breakdown and Growth Rates by Sector[15]

Sector	% contribution		% yearly change rate		
	1997	2002	in value	in price	in volume
Agriculture	6.5	5.8	0.8	-1.2	2.0
Energy & water supply	0.9	1.0	3.7	0.4	3.2
Industry	13.5	11.7	0.1	-1.6	1.7
Construction	9.4	7.7	-1.0	1.9	-2.9
Transport & communication	5.2	6.5	7.5	-0.3	7.8
Services	31.7	32.9	3.8	1.6	2.2
Trade	21.3	21.8	3.5	2.8	0.7
Public administration	11.5	12.6	4.9	-	4.9
Total GDP	**100.0**	**100.0**	**3.0**	**1.0**	**2.0**

2.1.3.1. Agriculture and Livestock Sectors

According to statistics done in 2003 by FAO, the value of agricultural products (Table 2.3) reached 1,900 billion Lebanese Pounds (LBP) divided as follows:

o 72% (1,366 billion LBP) as crop output; and
o 28% (534 billion LBP) as animal output.

Table 2.3. Agricultural Output Values (2001-2003)

Product Type	Production 2001 (Billion LBP)		Production 2002 (Billion LBP)		Production 2003 (Billion LBP)	
	Value	%	Value	%	Value	%
Crop output	1247	70	1408	73	1366	72
Animal output	533	30	521	27	534	28
Total	**1,780**	**100**	**1,929**	**100**	**1,900**	**100**

Agricultural production has shown a regression of 2% in 2003 compared to 2002. Lebanon produces crops in five major categories: (1) cereals, (2) fruits, (3) olives, (4) industrial crops (e.g. sugar beet, tobacco) and (5) vegetables. A recent MoA/FAO survey showed that 267,000 hectares of land were cultivated in Lebanon[16], of which around 49% are irrigated. Table 2.4 indicates total production per crop type.

15 MoET, 2005
16 MoA/FAO, 2003

Table 2.4. Total Production per Crop Type (in Billions of LBP)[17]

Product Types	Production (Billions LBP)
Cereals	28.9
Vegetables	372.7
Industrial Crops	100.8
Fruit Trees & other trees	646.5
Olives	110.3
Other Trees	41.9
Grameninaceae	65.1
Total	**1,366.2**

The majority (53%) of Lebanese farmers work in small sized (less than 0.5 ha) farms, which represent 9% of the total cultivated area in Lebanon. Medium sized farms (0.5-10 ha) provide work for 45.4 % of Lebanese farmers while only 1.6% of farmers work in large farms (>10ha), representing 61 and 30% of total cultivated area respectively.

In regions where soil fertility is relatively low, such as the Baalbek-Hermel area, livestock production constitutes an important activity (Table 2.5).

Table 2.5. Animal Products Values (2001-2003)[18]

Product	Production 2001*	Production 2002*	Production 2003*
Milk	23	24	26
Red Meat	11	13	15
Chicken Meat	41	39	35
Eggs	10	10	10
Honey	4	3	4
Fish	11	11	10
Total	**100**	**100**	**100**
Total Value (in Billion LBP)	**533.1**	**521**	**534.1**

2.1.3.2. Industrial Sector

Excluding water, power and construction activities, Lebanon has 23 industrial branches. The majority of the manufacturing sector is made up of micro facilities (90%), while small facilities and medium facilities represent 9.7 and 0.2% of the sector respectively. Large facilities constitute 0.1% of the sector.

Food products and beverages is the largest industrial sector in the country, followed by fabricated metal products and non-metallic mineral products. Table 2.6 shows the distribution of the 8 largest industrial sectors by region.

17 MoA, 2003
18 MoA/FAO, 2003

Table 2.6 Distribution of the 8 Largest Industrial Sectors by Governorates[19]

Number of Facilities							
Industry \ Mouhafaza	Beirut	Mount Lebanon	North	South	Bekaa	Nabatiyeh	**Total**
Food Products & Beverages	720	1,615	1,020	385	580	160	**4,480**
Leather & Leather Products	143	969	117	15	21	25	**1,290**
Textiles	76	500	115	38	56	19	**804**
Clothes & Dyeing Fur	534	1,302	286	18	95	28	**2,263**
Wood Products	208	1,188	151	309	310	83	**2,249**
Non-metallic Mineral Products	20	1,132	551	238	458	131	**2,530**
Fabricated Metal Products	286	1,946	477	274	371	199	**3,553**
Furniture & Other Manufactured Goods	185	1,018	770	236	104	39	**2,352**

The total number of facilities is in the range of 22 thousand, employing over 78,000 persons. Mount Lebanon holds the majority of the industries with almost half of them located within its administrative boundaries, and thus also holds the largest number of employees (almost 60%).

2.1.4. Environmental Overview[20]

2.1.4.1. Water

Although water is one of Lebanon's most precious resources and while significant investments are made to tap water resources, very little is done to preserve them. Human activities exert strong pressures on both the quantity and quality of water resources. In addition, many activities affect the water cycle thereby altering the conditions for water replenishment.

Lebanon is in a relatively fortunate hydrological situation, where it is estimated that the yearly precipitation gives rise to 40 major streams and rivers and more than 2,000 springs. Approximately 50% of the average yearly precipitation is lost through evapo-transpiration, while additional losses include surface water flows to neighboring countries[21] (8%) and groundwater seepage (12%). Snow cover is a principal source contributing to groundwater recharge, where estimates for the groundwater quantity available for exploitation range from 400 to 1,000 million m^3/year. Thus, 2,600 million m^3 of surface and groundwater remain potentially available and 2,000 million m^3 is deemed exploitable. Lebanon has 17 perennial streams and about 23 seasonal ones; whose combined length is approximately 730 km and total annual flow averages 3,900 million m^3[22].

Agriculture is by far the largest consumer of water, followed by domestic and industrial uses. Auxiliary uses and functions of water include the generation of hydroelectricity (hydroelectric power plants), recreation (water parks and sports), and aquaculture.

Water quality is adversely affected by industrial, agricultural and domestic wastewaters Water bodies receive or are affected by liquid effluents and solid waste from about four million people and 22,000 industrial establishments[24]. The prevalence of fissured limestone formations in Lebanon facilitates the seepage of liquid wastes into groundwater[25].

2.1.4.2. Wastewater

Domestic wastewater management is one of the greatest concerns of Lebanese municipalities and concerned ministries (MoEW, MoIM, CDR). Lebanon generates an estimated 249 million m^3 of wastewater per year, with a total BOD load of 99,960 tons. Industries generate an estimated 43 million m^3 of wastewater per year. Currently, there are about 53 wastewater outfalls along the coast[26], whereby some 2.3 million people live in the coastal zone. They release approximately 950,000 m^3 of wastewater a day, most of it ending up in the sea[27].

19 MoI, 2000
20 This section is based on the State of the Environment Report (SOER) by MoE/ECODIT, 2001
21 Litani Water Authority (LWA)
22 SOER, MoE/ECODIT, 2001
23 CAS Study No. 9, 1998
24 MoI, 2000
25 SOER, MoE/ECODIT, 2001
26 CDR/LACECO, 2000c
27 CDR/ECODIT-IAURIF, 1997

About 38% of all buildings in Lebanon were connected to a sewer network[28]. The remaining buildings (62%) either use cesspools and septic tanks or simply release raw sewage directly into the environment, including rivers and streams, dry river beds, and underground (through dry wells). Since 1997, extensive wastewater works have been achieved, which has presumably improved the wastewater collection capacity[29]. Thirty-five wastewater treatment plants (WWTP) are currently planned or under construction. The GoL initiated the construction of 7 WWTPs in 2001: Saida, Chekka, Batroun, Jbeil, Chouf coastal area, Baalbeck and Nabatiyeh. The only large-scale WWTP that is currently operational is the Ghadir plant, south of Beirut, which provides only preliminary treatment. About 50 small-scale WWTPs have been established in rural areas, mainly via NGOs, the majority of which are non-operational, degraded, or incomplete[30].

2.1.4.3. Solid Waste

Varying degrees of Solid Waste Management is currently practiced in different parts of the country. Solid waste continues to be managed in a manner that is not protective of either human health and/or the environment.

Municipal Solid Waste (MSW) makes up about 90% of the total solid waste stream generated in Lebanon. The main sources of MSW are households, commercial establishments, street markets, street cleaning operations, and public garden pruning. Lebanon generated about 1.44 million tons of MSW in 2001 (~3,940 tons/day), or about 0.92 kg/person/day.

Organic waste is by far the single largest component of the MSW stream, representing over 63% of the total MSW quantity in Greater Beirut Area (GBA) and slightly over 50% at the national level.

In the GBA, MSW has been managed in accordance with the 1997 Emergency Plan. To date, key solid waste management indicators (recycling and composting) remain below target, which have drastically reduced the projected lifetime of the Naameh sanitary landfill.

Outside the GBA, local municipalities are responsible for waste collection and disposal. These often subcontract waste collection to local entrepreneurs and small businesses. Waste is then transported to nearby open dumps, typically located in the outskirts of the village. Due to the absence of an overall long-term strategy, mayors are being approached by small-scale private businesses with their own waste treatment technologies, many of which are poorly founded and unreliable[31].

2.1.4.4. Biodiversity and Natural Heritage

Lebanon's biological wealth has been influenced by successive civilizations, and is closely related to its geomorphology and micro-climates. Roughly three quarters of the total surface area of the country is mountainous, which gives rise to many micro-climates, favorable to the occurrence of many plant and animal species and communities. There are 5 geomorphological regions in Lebanon: (1) the coastal zone, (2) the Mount Lebanon range, (3) Bekaa Plain, (4) The Anti-Lebanon Range, and (5) South Lebanon[32]. The number of known fauna and flora in Lebanon are 4,486 and 4,633 respectively[33].

2.1.4.5. Energy

The Ministry of Energy ad Water (MoEW) is currently responsible for the petroleum and gas sectors, while the executing agency is the General Directorate of Petroleum (GDoP), which is responsible for licensing import activities, importing crude and fuel oil, and setting prices for petroleum products.

Lebanon is entirely dependent on imports of fuel for energy. Excluding limited hydropower, primary energy consumption was about 4.1 Mtoe in 1999, up from 3.5 Mtoe in 1993[34], which is equivalent to about 0.95 toe/person (or 39.9 GJ/person)[35]. Primary energy sources include gasoline, gas oil, fuel oil and diesel oil, in addition to several other minor petroleum products such as aircraft oil, liquid gas and tar.

The combustion of petroleum products, charcoal, and other combustibles releases significant amounts of pollutants into the atmosphere. In addition, leaking underground storage tanks containing petroleum products and accidental oil spills could lead to significant pollution of soil, fresh water resources, and the sea[36].

28 CAS census of Buildings and Establishments, 1996-1997
29 SOER, MoE/ECODIT, 2001
30 MSC/IPP, 2005
31 SOER, MoE/ECODIT, 2001
32 SOER, MoE/ECODIT, 2001
33 Biological Diversity of Lebanon, MoA/UNEP, 1996
34 METAP/ERM, 1995
35 Toe is Tonnes of oil equivalent. 1 Toe is equivalent to 41.8 Giga Joules (GJ)
36 SOER, MoE/ECODIT, 200137 Trabulsi, 1991; Abou Fakhr et al., 1995

2.2. Institutional Policy and Regulatory Framework

2.2.1. Environmental Policy, Sustainable Development Policy and General Legislative Framework

The Lebanese Framework Law on the Protection of the Environment (Law 444/2002) mentioned the necessity to set standards and criteria to control the transport and movement of hazardous chemicals (import, production, extraction, conversion, marketing, purchase, utilization, abatement, transport and disposal). However, the ratification of the Stockholm Convention by Lebanon in 2002 (Law 432) can be considered the first legal step towards the commitment to the need to regulate the production, utilization of persistent organic pollutants in specific.

Other than the legal texts mentioned above, Lebanese legislation sporadically addresses hazardous chemicals in different laws, decrees and ministerial decisions especially the law 64/1988 on hazardous waste, and the decree 8006/2002 and its amendments on the management of health care waste (which includes hazardous and persistent chemicals) (Decree 13389/2004). National environmental standards were issued by the Minister of Environment (decision 52/1 1996 and decision 8/1 2001), however POPs were not covered.

At the level of POPs trade, the laws on customs still lack proper classification to effectively control the imports and exports of material containing POPs. Within the agriculture sector, despite the fact that the SC called for the banning of the utilization of POPs and despite the existence of a list published in 1992 by the Ministry of Agriculture officially banning certain pesticides, the control by the government at the marketing level and the enforcement of the law are believed to be weak. Therefore, even banned products are made available by illegal means (smuggling) and used by the public, in addition to the misuse of several agents, regardless of any health and ecological toxicity risks[37].

A special committee was established at the Ministry of Agriculture in 1998 to control agriculture chemicals; however, there is a conflict in mandates between MoA and MoE which is also assigned the task of specifying the chemicals and agrochemicals that harm human health and the environment. In addition, although there are legal texts setting requirements for labeling and storage of agrochemicals, adequate enforcement is needed to guarantee the effectiveness of such articles.

Disposal of hazardous material is controlled by the law 64/1988 which sets the basis for licensing of facilities specialized in the disposal of hazardous waste, and giving the MoE the authority of licensing and monitoring of these facilities. However, hazardous waste management is still lagging behind due to the delayed application of an integrated solid waste management strategy.

2.2.2. Roles and Responsibilities of Ministries, Agencies and Other Governmental Institutions Involved in POPs Life Cycles

A number of ministries play a role in chemical management. The Ministry of Agriculture is practically handling activities concerned with agricultural pesticides, the Ministry of Environment deals with hazardous and industrial chemicals, the Ministry of Public Health is responsible of pesticides destined for domestic use and the Ministry of Energy and Water is responsible for the import of petroleum derivatives.

Table 2.7 provides a general overview of ministerial responsibilities and activities related to chemicals management through its life-cycle from production/import to final disposal.

37 Trabulsi, 1991; Abou Fakhr et al., 1995

Table 2.7 Responsibilities of Government Ministries, Agencies and Other Institutions

Stages of Life cycle Entity Concerned	Import	Production	Storage	Transport	Distribution/ marketing	Use Handling	Disposal	Chemical Type	Legal Instrument
MoE[1]	✓	✓	✓	✓		✓	✓	Industrial chemicals, Pesticides	Law n°690, 27/08/2005
MoPH[2]	✓	✓	✓			✓	✓	Insecticides	Decree 8377, 30/12/1961
MoA[3]	✓	✓	✓			✓	✓	Pesticides	Decree 5039, 20/06/1994
MoL[4]					✓			Occupational; industrial	Decree 8352, 30/12/1961
MoI[5]	✓	✓	✓	✓				Industrial	Decree 13173, 08/10/1998
MoEW/[6]	✓	✓	✓	✓	✓	✓		Petroleum	Law n° 247 (replaced Law n° 9/37 dated 32-12-1973 & issued on 07-08-2000)
LCA[7]	✓							Imported chemicals	Decree 4461 (issued on 15-11-2000)

1: Ministry of Environment
2: Ministry of Public Health
3: Ministry of Agriculture
4: Ministry of Labor
5: Ministry of Industry
6: Ministry of Energy and Water
7: Lebanese Customs Authority

Responsibilities for POPs management in Lebanon are not well delineated. Governmental institutions potentially involved in the life cycles of POPs include the Ministry of Environment (MoE), the Ministry of Energy and Water (MoEW) and Ministry of Finance (MoF) as described next.

- MoE has lead responsibility on all matters related to the Convention (e.g., reporting, awareness). The focal point for the Convention is the Service of Environmental Technology. The ministry hosted and executed the Lebanese component of the regional UNEP project for the management of POPs.
- MoEW has lead responsibility in the management of PCBs in the energy sector. Lebanon's national electricity company, Electricité du Liban (EDL), handles hundreds of potential PCB-containing equipment including and transformers. EDL falls under the tutelage of MoEW.
- MoF also has a significant role in controlling the flow of PCB-containing equipment to Lebanon; this is the direct responsibility of the customs authority which falls under the tutelage of the MoF.
- MoA has a lead responsibility in the control of pesticides. It is important to note that POPs pesticides have been banned from being imported, used, or circulated in the Lebanese territories since the year 1998 through Decision 94/1 that was issued by the Minister of Agriculture.
- Dioxins and Furans are under the shared responsibility of four main ministries: MoE, MoI, MoIM, and MoPH. A number of controlled and uncontrolled sources are behind the release of these POPs. MoE is mainly concerned with the monitoring of emissions released at the different sources. The promotion of BAT/BEP practices is mainly the duty of the MoI in addition to MoE.

2.2.3. Relevant International Commitments and Obligations

Lebanon is involved in a number of international organizations through regional and international agreements and conventions. Table 2.8 provides an overview of Lebanon's membership at international organizations and the responsible local contact.

Table 2.8 Membership in International Organizations and Bodies

International Organization Body/Activity	National Focal Point (Ministry /Agency & Primary Contact Point)	Related National Activities
Intergovernmental Forum on Chemical Safety (IFCS)	MoE	None
FAO	MoA	Integrated Pest Management
UNIDO	MoE	Alternatives to Methyl Bromide (Strawberry)
ILO	ILO Regional Office, Beirut	Employment policies that promote workplace safety
World Bank		Agriculture infrastructure development, solid waste management, health sector rehabilitation
OECD	IDAL	Promote Lebanon as a viable investment destination and foster, facilitate and retain investments in the country.

Lebanon has signed a number of conventions and agreements where some have been ratified. Among these conventions, the Government of Lebanon (GoL) signed and ratified the Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal in 1994 (Law 387/94). As such, any future export of PCB-containing waste to designated destruction facilities abroad must comply with the provisions of the Basel Convention. Table 2.9 presents agreements that are effective.

Table 2.9 Participation in International Agreements

International Agreements	Primary Responsible Agency Implementation Activities	Relevant National
Agenda 21 - Commission for Sustainable Development	MoE	Previous activities promoting application of agenda 21 principles
FAO Code of Conduct (voluntary procedure)	MoA	Yearly statistics on agricultural sector growth
Basel Convention	MoE	Application based on ratification Law 387
Stockholm Convention	MoE	Inventories on PCDD/PCDF, pesticides, PCBs, National Profile on Chemicals Management, health profile
Vienna Convention and Montreal Protocol and its amendments	MoE	Adequate implementation and compliance to the protocol requirements
Barcelona Convention	MoE	Wastewater treatment plants at the coast; 2 completed, 4 under construction, and 6 on-going

2.2.4. Key Approaches and Procedures for POPs Chemical and Pesticide Management including Enforcement and Monitoring Requirements

2.2.4.1. Pesticides Chemicals

In order to receive a permit of import, production, formulation, use, packaging or marketing of pesticides, the facility should submit documents required by Decree 5039 (26/3/1982) to the Department of Pharmacy at the Ministry of Agriculture which refers the file to the Committee of Pesticides which in its turn reviews the case and gives the final decision. Each facility holding a permit should register any pesticide imported, produced or formulated, and submits a request to the Department of Pharmacy at MoA. The file is assigned a number and checked for the completion of all required documents. When all documents are supplied, the pesticides committee studies the file and decides to whether or not grant its approval. This procedure is shown in detail in Figure 2.4.

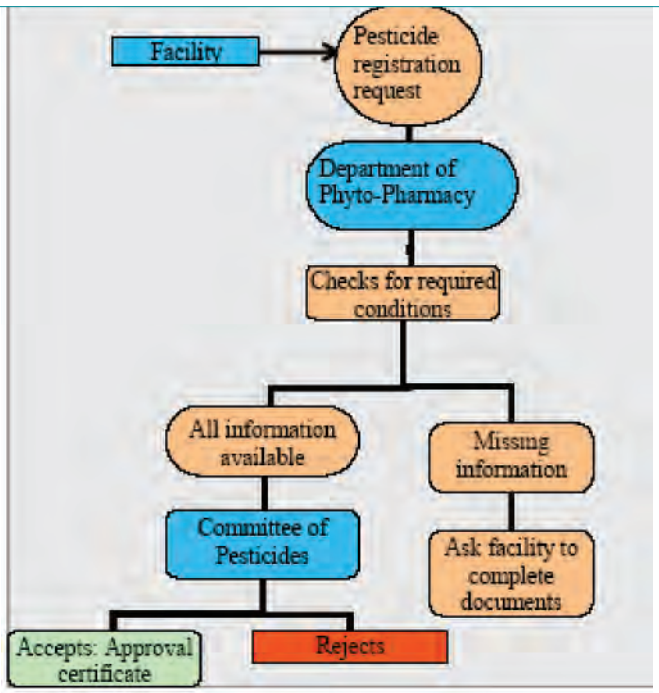

Figure 2.4. Registration Procedure of Pesticide that will be Imported, Produced or Formulated

In order to import pesticides for any purpose, the importer should hold a permit allowing the company to import pesticides and fertilizers. The companies can only import pesticides that are registered at the Ministry of Agriculture. Once the pesticides reach the Lebanese customs, the importer submits an import request at the MoA. The department of Pharmacy then checks for the pesticide registry, whereby if the pesticide is not registered, the request is denied. If the pesticide is registered, the department checks if the importer has a permit for import thus keeping request in process or otherwise it stops.

At Customs, inspectors check if the importer has a permit of import to allow the processing of the importation. Sampling is done by inspectors at the Quarantine and sent to one of Ministry of Agriculture's laboratories to identify the active ingredient and its percentage composition. Laboratory results are then compared with the information submitted by the importer; if the test results show a difference of 10% for pesticides whose active ingredients constitute 10%, or 5% for pesticides with 10-20% active ingredients, or 3% for pesticides with over 20% active ingredients, compared to the submitted information by the importer, the request is stopped (Figure 2.5).

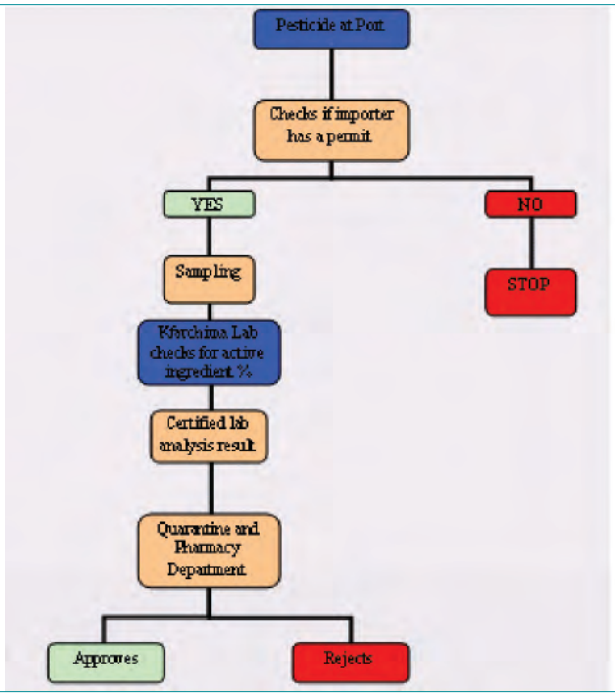

Figure 2.5. Lebanese Customs Procedure for Import of Pesticides

2.2.4.2. Industrial Chemicals

Industrial chemicals do not undergo an official procedure at MoE. Industries that deal with chemicals request a permit from the MoI where environmental conditions are part of the conditions set by the MoI.

Only chemicals restricted by MoE based on the Basel Convention are given codes at customs for identification and checking. The importer requesting such restricted chemicals asks for clearance from the MoE, which controls the import of these products. Upon product entry, the code is identified and reported to MoE, whereby environmental conditions and specifications are verified by the Service of Prevention of Impacts from Technological and Natural Hazards and approval is subsequently granted for the product entry. The procedures for these chemicals to enter the country are depicted in Figure 2.6.

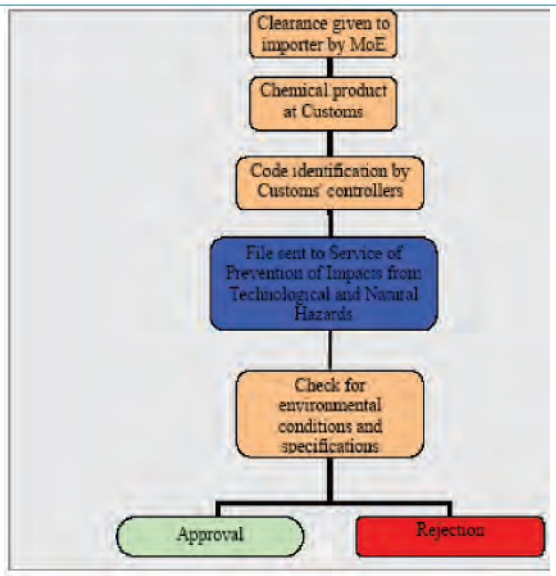

Figure 2.6. Procedures for Import of Substances restricted by Basel Convention in Lebanon

2.2.4.3. Chemicals for Domestic Use

Facilities that deal with the import of pesticides for domestic use submit necessary documents to the Sanitary Engineering Service (SES) at the MoPH in order to receive an import permit. After receiving the permit, the importer can request a clearance for the import of the target chemicals.

When the requested products reach customs, the file is transferred to SES. The file is methodically reviewed for compliance with MoPH conditions and specifications. Random sampling occurs under the request of SES. Final approval is granted based on the file review and test results. Figure 2.7 shows the complete procedure in detail. There is no available information on non-regulatory mechanisms for managing chemicals.

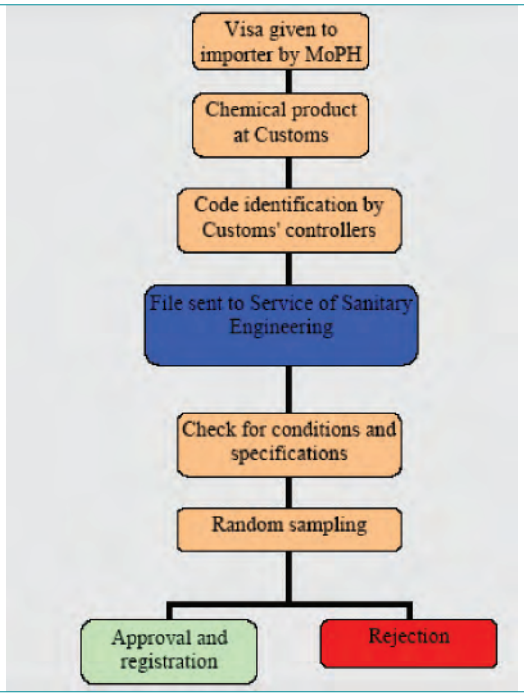

Figure 2.7. Permitting Procedures for the Import of Pesticides for Domestic Use

The Ministry of Finance issued in a declaration to inform customs officials of Decision 71/1 (Ministry of Environment, 1997) on banning the entry of PCBs products into the country. The extent to which these procedures have been implemented or enforced remains uncertain.

MoE has prepared an Environmental Framework Law as well as a draft Environmental Impact Assessment (EIA) decree, both of which await approval by parliament and the Council of Ministers, respectively. Despite extensive delays in endorsing the EIA decree, MoE has been requiring project investors to conduct and submit EIA studies as part of the permitting application. While EAs cannot help with the already imported materials, it can help prevent the entry of new PCB products in the country.

There are no explicit government procedures in place regarding the handling of PCB-contaminated equipment. MoE has however employed Basel Convention procedures to assist the American University of Beirut in exporting hazardous waste for destruction abroad (PCB-containing materials) - see Box 1.

Box 1. Export and Destruction of Chemical Wastes from Lebanon

Lebanon has at least one formal experience in exporting hazardous waste to a destruction facility abroad; a two-tonne shipment of hazardous waste (including chemicals and containers) from the American University of Beirut. The university contracted a UK-based waste management firm in 2002 to pack, export and destroy the waste in the UK. The firm handled the shipment in accordance with the Basel Convention by drafting a waste protocol according to two mandatory phases:

1. Preparatory Phase (about 3 to 4 months) from the time the contract is concluded with the exporting company till that company completes all so called "movement documents."
2. Duly Motivated Request (a maximum of one year) from the time the movement documents are approved till the time the waste has been shipped and destroyed, and the export country/entity has been informed in writing that the waste has been destroyed. The Duly Motivated Request is prepared by the ministry of environment (or equivalent agency) in the exporting country and addressed to the ministry of environment (or equivalent agency) in the importing country.

2.3. Assessment of the POPs Issue in the Country

2.3.1. Assessment with respect to Annex A, part I chemicals (POPs pesticides): historical, current and projected future production, use, import and export; existing policy and regulatory framework; summary of available monitoring data (environment, food, humans) and health impacts

2.3.1.1. Historical, Current and Projected Future Production, Use, Import and Export

Surveyed agrochemical dealers, distributors, or manufacturers denied having, selling, packaging, distributing, or having done those activities in the past for any of the nine POPs pesticides. None of these industries claimed to have any stocks of pesticides. This is most likely true since all stocks would have been already re-packaged and sold on the market years ago. Although contacts were often made through individuals known or friendly to these industries, no useful information was received.

Municipalities claimed to be using alternative pesticides to DDT for mosquito abatement or insect spraying. The Ministry of Public Health (MoPH) used to distribute DDT to municipalities, around 15 to 20 years ago (as stated during interviews), for the purpose of mosquito spraying and malaria prevention. However, the quantities were usually sufficient for one to three spraying events, and no records are available detailing for such quantities distributed.

The periodic change in municipality authorities and representatives usually hinders the keeping of steady records in these public institutions. Related records are not kept in a consistent manner, properly filed or maintained, such that data on pesticide usage is often incomplete, irregular or simply absent. The most recent logbook records that are kept indicate the usage of alternative pesticides to DDT, which are often synthetic pyrethroids for spray and ambient fogging[38] .

A survey on agrochemical distributing companies with a complete list of their products revealed that none of the distributed pesticides belonged to the nine POPs compounds, further confirming their probable absence in the Lebanese market. A survey conducted in a recent study at the MoE whereby the amounts of pesticides imported to Lebanon from 1996 to 2000 were recorded, none of the 9 POPs pesticides were identified[39] .

38 Kawar, 2005
39 MSC-IPP, 2003

The most relevant piece of information obtained was a recent publication by AUB professors[40]. This article contains information on DDT sampling and analysis results in Lebanon. During this study, a total of 113 soil samples were collected for analysis from three major agricultural regions in the country: Mount Lebanon, the Bekaa Valley, and the Coastal Plain. The majorities of the analyzed samples were free of DDE (a DDT metabolite) or contained negligible amounts of it. Two urban samples with high human activity in the area revealed higher DDT amounts as compared to other POPs pesticides.

These two urban sampling locations were situated in the South Caza, particularly in Saida, such that the first was near a gas station, while the second was in a dense residential zone. These relatively higher levels of DDT found in the two locations were explained by: (1) an old storage site of DDT in the vicinity, (2) small-scale haphazard dumping of DDT material in the vicinity, or (3) an accidentally discarded DDT product. There are no suggested ramifications as to these two locations, since the levels of DDT in all samples were within permissible standards for agricultural use. A convincing statement would be that there was no major DDT dumpsite in any of the sampled locations as reflected by the sampling results and data analysis.

Another study has reported sediment samples results within the El Kabir Watershed in North Lebanon as part of the Syria Lebanon Akkar Watershed Project[41]. Sediment samples were analyzed for the presence of, among other substances, three of the POPs pesticides, namely DDT, HCB and Mirex. HCB was detected at low levels, while DDT and DDE were found in measurable amounts in all samples, indicating current use of DDT parent compounds in the watershed despite it being a banned substance. Mirex was not detected in any of the samples.

Regarding the Lebanese customs database system, prior to 1999 it was under the responsibility of the Central Administration of Statistics (CAS). The database import/export materials grouping system had changed thrice. The first categorization grouped all geochemical compounds into one category, which made it impossible to differentiate even between fertilizers and pesticides. Upon the second modification to the system, the amount of POPs pesticides still could not be differentiated from the overall amount of imported pesticides.

The amounts of POPs pesticides could not be known from the total due to the grouping of several pesticides and pesticide classes under one category of imports. As such, the amount of imported material per each pesticide was not recorded. For instance, even to date, with the most advanced and detailed customs import database, DDT is grouped with two other compounds under one category. As a result, assumptions are inevitable as to the percentage of importations that are actually DDT.

From the import/export data of 2000 through 2004, which are categorized into 6,000 different groups, it was obtained that 1 kg of DDT (and possibly 2 other organochlorine compounds) was imported in 2002 by order of the Ministry of Public Health. Since the import of such material is illegal, special permissions are granted for import for research purposes. The MoPH is the only institution that is allowed to request such import by a special order. This one kilogram of DDT was used by the MoPH laboratories for testing and analyses. Upon request, the MoPH refused to submit written evidence of such usage in their laboratories. It must be noted that the imported quantity is insufficient for agricultural use.

Information from farmers was hard to obtain since they are often poorly aware of the nature of the chemicals they use for their crops. Many of the farmers are illiterate and unaware of the existence of active ingredients, and tended to remember commercial names of pesticides instead. Commercial names are prone to change especially if packed by local distributors, which makes the task of getting any useful information neither promising nor accurate.

40 Bashour et al., 2004
41 IDRC, 2003

Given the rather homogeneity of the farmers community in Lebanon with respect to their agriculture practices and knowledge[42], the number of farmers interviewed provides a fairly representative overview of their possible use (or previous use) of the POPs pesticides. Regarding the coverage of agricultural areas, it should be noted that although the Bekaa plain has the most intensive agricultural activities, those farmers in Bekaa plain own the largest amount of land per farmer, while those in the South have the least farming area per individual. Thus, considering population density in each Mouhafaza[43], and the relative population density in percent, the area covered per each category is very well distributed with respect to land coverage per farmer (reflected by population density in each Mouhafaza).

No smuggled POPs pesticides were officially detected or declared until the present day.

Concerning the possibilities for the presence of stocks, it is highly improbable that they exist. This is due to the fact that any present chemicals would have been either sold within due expiry date, or repackaged and sold after expiry in another brand name. The demand for agrochemicals on the Lebanese market is high and selling products is a very easy task considering the illiteracy of the majority of farmers.

The remaining issue of concern is the contamination of land and agricultural soils in the country. Land contamination from extensive usage is highly probable especially in frequently planted agricultural areas. Lebanon's mild climate, versatile landscape, and fertile soils render it suitable for agricultural activities. The vastness of agricultural activities and diversity of planted crops render it difficult to pinpoint exact locations of possible POPs pesticides usage. However, large areas with historically intensive agricultural practices can be identified and will be the target of the action plan for initial sampling. It is highly suspected that the majority of previously imported or currently smuggled POPs pesticides would eventually wind up in the agricultural soils. Any possibly contaminated agricultural soils used at construction sites for planting purposes could be considered as a potential source of these chemicals. Such non-point sources could be numerous due to the construction boom after the Lebanese civil war in the past two decades.

2.3.1.2. Existing Policy and Regulatory Framework

Table 2.10, Table 2.11, and Table 2.12 present a description of existing legislation and regulations addressing POPs in Lebanon. The mentioned section describes relevant environmental laws, decrees amendments, regarding protection of the environment, transport and movement of hazardous chemicals, ratification of the Stockholm Convention, hazardous chemicals, management of health care waste, and POPs chemicals trade.

42 MSC-IPP, 2003
43 MoE/ECODIT, 2001

Table 2.10 References to Existing Legal Instruments Regarding Agro-Chemicals

Legal Instrument	Responsible ministries or bodies	Chemical use categories covered	Objective of legislation	Relevant articles/Provisions
Law n°6/68 (Issued in 08-01-1968)	MoA	All fertilizers, pesticides and provender (production, manufacturing, importing, distribution and use)	Organization of the trade of fertilizers, pesticides and provender	2
Decision of the Minister of Agriculture n°336 (Issued in 16-11-1973)	MoA	All provender containing arsenic and antimonies (both importing and producing)	Interdiction of producing, importing, and using provender that contain arsenic and antimonies	1&2
Decree n°5039 (Issued in 26-03-1982)	MoA	Pesticides	Organizing the import, trade, packaging, formulation, production and use of pesticides	1&2
Decision of the Minister of Agriculture n°65 (Issued in 22-06-1983)	MoA	List shown in article 1	Prohibition of importing some pesticides	1
Decision of the Minister of Agriculture n°19/1 (Issued in 1991)	MoA	All commercial agricultural fertilizers as listed in the decree n°15659 21-09-1970	Organizing the importation operations of agricultural fertilizers and the verification of the rightness of their composition for their use in the Lebanese agriculture	1
Decision of the Minister of Agriculture n°254/1 (Issued in 30-05-1997)	MoA	Pesticides registered in M.O.A (only)	Necessity of an advance authorization for the importation of agricultural pesticides	2
Decision of the Minister of Agriculture n°92/1 (Issued in 20-05-1998)	MoA	Pesticides	Prevents the import, trade, and use of pesticides without specifications for labeling of agrochemicals bottles and information required to be provided	3
Decision of the Minister of Agriculture n°94/1 (Issued in 20-05-1998) Decision of the Minister of Agriculture n°262/1 (Issued in 2001)	MoA	Some pesticides	Bans the use, import and trade of 109 pesticides	1
Decision of the Minister of Agriculture n°90/1 (Issued on 05-04-2000)	MoA	All types of pesticide chemicals pesticides	Conditions for importation of pesticides	1
		Organic, solid and liquid pesticides		4
Decision of the Minister of Agriculture n°262/1 (Issued in 26-09-2001)	MoA	Some pesticides	Ban certification for Monocrotophos, methyl parathion, lindane, fenamiphos	1
Decision of the Minister of Agriculture n°316/1 (Issue on 31-10-2001)	MoA	Some pesticides	Allow certification of import of some pesticides: Fenamiophos	1

Legal Instrument	Responsible ministries or bodies	Chemical use categories covered	Objective of legislation	Relevant articles/Provisions
Decree n°456/1 (Issued on 26-01-2004	MoA	Pesticides	Formation of the Current Committee of Pesticides according to Decree 5039	1, 2
Decision of the Minister of Agriculture n°59/1 (Issued on 26-02-2005)	MoA	Pesticides	Organizing the import, registration, and use of pesticides in Lebanon. Description of documents and information required from the importer.	1

Table 2.11 References to Existing Legal Instruments regarding Consumer Chemicals

Legal Instrument	Responsible ministries or bodies	Chemical use categories covered	Objective of legislation	Relevant articles/Provisions
Decision of the Minister of Public Health n°148 (Issued in 08-04-1972)	MoPH	Cyclamic acid	Prohibition of importing, manufacturing and exporting of cyclamic acid	1
		Saccharin	Special visa given for importing, manufacturing, packing and exporting saccharin	2
Law n°11/78 (Issued in 24-04-1978)	MoPH	Insecticides	Organization of importing, selling, filling, packing, preparing, manufacturing and spraying insecticides	1
Decree n°5100 (Issued in 12-04-1982)	MoPH	Insecticides	Specification of the technical and special conditions for the importing, selling, filling, storing, preparation, manufacturing and spraying of domestic insecticides	1,2,3,4

Table 2.12 References to Existing Legal Instruments Addressing Industrial Chemicals

Legal Instrument	Responsible ministries or bodies	Chemical use categories covered	Objective of legislation	Relevant articles/Provisions
Law n°64/88 (Issued in 12-08-1988)	MoE	List in annex 1	The preservation of environment agains tpollution from hazardous wastes and hazardous materials	2 2
Law n° 387 (Issued in 04-11-1994)	MoE	Annexes n°1,2,3,4 and 5	Authorization to the government for the ratification of " Basel Treaty" concerning the control of the movement of hazardous wastes across the borders and the disposing of them	3/1
Decision of the Minister of Environment n°9/1 (Issued in 18-09-1995 and amended the Decision n°5/1	MoE	Petrocoke	Certifications required by the importer to be submitted to MOE ahead of the order arrival to Lebanon	1
Decision 174/1, dated 2/11/1998	MoE	Crocidolite	Prohibition and allowance of import, transport, trade, and use of varieties of crocidolite	
Decision of the Minister of Environment n°52/1 (Issued in 29-07-1996)	MoE	Lists n°1,2,3,4,5,6,7,8,9,11, 12,13,14	Determination of the specifications and specific concentrations to limit the air, water and soil pollution	1
Decision 174/1, dated 2/11/1998	MoE	Asbestos	Requirement of the Asbestos product to a previous import allowance from MoE	
Decision of the Minister of Environment n° 71/1 (Issued in 19-05-1997)	MoE	List number 1 (with permission from MoE)	Regulation of importing wastes replaced decision 91/1, 24-10-1996 and decision 22/1, 17-12-1996	1
		List number 2 (total prohibition of importation)		4
Decision of the Minister of Environment n°1/22 (Issued in 05-09-2000)	MoE	Industrial liquid wastes (water that might contain chrome, chloride, nitrogen, sulfide, pesticides, etc.)	Environmental conditions for the authorizations of creating/exploitation tanning factories	2/1
		Solid wastes (leather residues, greases, etc.)		2/2
		Air polluters		2/3
Decision of the Minister of Environment n°5/1 (Issued in 30-11-2000)	MoE	Industrial liquid wastes	Environmental conditions for the authorizations of creating/exploitation of conservation firms of fruits and vegetables	2/2
		Solid wastes		2/3
		Air polluters		2/4
Decision of the Minister of Environment n°4/1 (Issued in 12-01-2001)	MoE	Liquid and solid industrial wastes	Environmental conditions for the authorizations of creating/exploitation slaughterhouses	2

Legal Instrument	Responsible ministries or bodies	Chemical use categories covered	Objective of legislation	Relevant articles/Provisions
Decision of the Minister of Environment n° 8/1 (Issued in 30-01-2001)	MoE	Air polluters, liquid wastes generated by classified firms, water treatment station and hospitals in addition to those generated by sectors, industries and other sources of pollution	Standards & specification concerning air polluters, wastes generated from classed firms and everyday water treatment station	2, annex 1 & 2, annex 2
Decision of the Minister of Environment n°61/1 (Issued in 10-09-2001)	MoE	Industrial liquid waste (bis (II-ethylhexyl) phthalate), Di-n-butyl,bis (II-diethylhexyl), dim ethyl phthalate	Environmental conditions for the authorizations of creating/exploitation the factories for plastic	2/1
		Solid waste		2/2
		Air polluters		2/3
Decision of the Minister of Environment n°15/1 (Issued in 04-03-2002)	MoE	Industrial liquid waste (pH)	Environmental conditions for the authorizations of creating/exploitation for glass factories	2/1
		Solid wastes (residues of melted glass).		2/2
		Air polluters		2/3
Decree n°8018 (Issued in 12-06-2002)	MoI		Determination of the procedures and the conditions for the authorizations of creation industrial firms	3
Law n°444 (Issued in 29-12-2002)	MoE	List of hazardous chemicals in Bullet 1 of article 44, Chapter 6	Protection of the environment.	Chapter 6, article 44
Decree n°8006 (Issued in 11-06-2002 and amended by Decree n0 13389 issued in 30-09-2004)	MoE	Wastes similar to municipal wastes (annex 1) Hazardous & infectious waste (annex 1)	Specification of the types of the health institution wastes and the ways of their draining Organization of the management of the health institution aiming the protection of the environment and the general interest	4/1 4/2
		Hazardous and non-infectious wastes (annex 2)		4/2
		Special wastes (annex 3)		4/3
		Radioactive wastes(annex 3)		4/4
Decree 11802 (issued on 31-01-2004)	MoL	Health and Safety	Health and safety measures at the industrial occupation	Chapter1: Prevention and safety Chapter 2: Health Chapter 3: Occupational safety at chemical use Chapter 4: Prevention from occupational hazards from benzene

While there are several legal texts that cover the management of POPs chemicals in Lebanon, enforcement of available legal instruments remains very weak. In the case of pesticides, monitoring is performed at the customs according to specifications imposed by MoA on imported pesticides. The pesticides committee at MoA informs the customs about banned pesticides, which are subsequently rejected to enter the country. The Ministry of Agriculture has a specialized inspection team and laboratory for monitoring, analysis and control of products entering the country. Testing is limited to active ingredient.

Concerning the monitoring of implementation, inspection on-site is done by the staff of the responsible ministry. Theoretically, inspection units work should monitor the implementation of regulations at all facilities, but it is limited due to lack of personnel.

MoE Decision 71/1 (issued on 19/5/1997) bans the import of PCB products[44]. The Decision however is not PCB specific (about 100 other chemical groups and waste products are also listed) and lack enforcement measures. Lebanon has no laws banning the production, use and/or disposal of PCB containing equipment and byproducts.

Emissions of Dioxins and Furans are not regulated for their concentration. The promotion of BAT/BEP is included under some legislation. Enforcement is a main component that is lacking due to the lack of personnel, equipments and funding.

2.3.1.3. Environmental Contamination and Monitoring Data

Levels in air, water, sediment, soil, and biotic sinks (part of the food chain) vary over several orders of magnitude, often depending on the proximity to the source of release into the environment[45].

Because much of the drinking water supplies in Lebanon originates from groundwater reserves, it is not considered at high risk of POPs pollution, because the hydrophobic properties of POPs (e.g. Aldrin and Dieldrin) make them resistant to leaching into ground water[46].

Low levels of HCB were detected in a study conducted by IDRC in 2003; whereas, measurable amounts of DDT and its metabolite (DDE) were detected in all samples. On the other hand, Mirex was not detected in any of the samples.

Organochlorine pesticides, including heptachlor and epoxide, were tested in fish species found off the coast of Lebanon[47]. This study tested for biomagnification of organochlorines in fish species belonging to several trophic levels; however the hypothesis was not proved, and the detected levels did not constitute a hazard to human health from fish consumption. The researchers further discussed that the limited evidence they found could mean that the pesticides have not been in the Mediterranean for a very long time, thus the concentrations in fish are due to direct absorption into the fish body from water rather than from the consumption of other pesticide -containing fish. Another likely explanation reported by the researchers is that the experiment had been too small to give accurate concentrations in the species sampled.

A Kuwaiti study published in 2001 analyzed for organochlorinated pesticides in the Kuwaiti diet which includes food products imported from Lebanon[48]. This study concluded that the residue levels encountered were relatively low and none of these residues exceeded the FAO/WHO (1993) maximum residue limit (MRL).

44 Annex 2, under the generic heading "halogenated wastes," (ID# 2903.69.10)
45 EPA, 1996
46 UNEP, 1998
47 Riss and Gulbrandson, 1970
48 Saeed et al., 2001

At the national level, breast cancer was reported as the most common cancer among women in Lebanon accounting for almost one third of all cancers in women, whereas, in the mid-sixties, it represented 18%, of all cancers in women[49]. In addition, the cancer registry results for the year 2002 reported breast cancer as the top ranking among cancer cases in females; however, these numbers should be handled with extreme care and caution as there are no prevalence or incidence rates based on which scientific analysis can be made. These findings might indicate an increase in incidence, similar to the experience of countries with reliable data, or an increase in diagnosis and reporting. In-depth investigation and epidemiological studies are needed to examine the association between these high rates and exposure to POPs.

As for pesticides, low level exposure was reported to be correlated with increased risk of cancer. One study reported that the growing incidence of cancer cases among children in Lebanon (average cancer cases 786 cases/year) can be attributed to contaminated breast milk[50].

2.3.2. Assessment with respect to Annex A, part II chemicals (PCBs) (PCB)

2.3.2.1. Production of PCB

Lebanon has no PCB production facility. The country hosts two companies that manufacture and/or supply distribution transformers: Matelec (Lebanese company) and Elprom (Bulgarian company). Both companies have been using PCB-free oil for many years. For example, Matelec uses known PCB-free oil called Nynas.

2.3.2.2. National PCB Preliminary Inventory

Estimating PCBs quantities in Lebanon is difficult; PCB containing equipment is seldom labeled, and archives and statistics are not readily available (or too recent). Under contract with MoE, a local consulting firm produced in 1995 the first partial assessment of PCBs in Lebanon[51]. This assessment investigated PCB quantities in out-of-service distribution transformers stockpiled in a warehouse and repair shop located near Beirut, owned and managed by EDL[52]. The same firm then conducted a follow-up sampling and analysis campaign in 2000 from the same warehouse during which they collected 50 samples as follows: 38 samples from out-of-service transformers, nine samples from storage barrels, two samples from a contaminated well and one soil sample.

Key findings from both assessments are summarized below[53]:

- Out of the 34 samples collected in 1995, eight contained PCB concentrations greater than 50 ppm.
- Out of the 38 samples collected in 2000, six contained PCB concentrations greater than 50 ppm and two contained concentrations between 40 and 50 ppm.
- The firm could not establish a statistical correlation between manufacturers and PCB concentrations.
- All nine samples collected from the oil barrels contained PCB concentrations less than 50 ppm (values ranged from <1 to 21 ppm); the two well samples contained 222 and 229 ppm of PCB, respectively; and the soil sample contained 8 ppm PCB.

In 2004, MoE contracted a Lebanese firm to prepare a preliminary national inventory of PCBs in the country[54]. The inventory recognized the overwhelming importance of the energy sector as a potential source of PCBs found in dielectric fluids/oil and PCB-contaminated transformers (i.e., closed applications). Such transformers are located in (i) power plants (thermal and hydroelectric), (ii) substations and, (iii) distribution stations, as illustrated in Figure 2.8. The inventory categorized dielectric fluid/oil into three groups; PCB containing oil, non-PCB oil that has been contaminated and PCB-free oil.

49 Nuwayhid and Sibai, 2002
50 El-Saghir et al., 1998
51 COGIC Consultants, with technical assistance from TREDI, a PCB destruction facility in Switzerland
52 The repair shop is located in Bauchrieh, in the northern suburbs of Beirut.
53 Rapport d'Evaluation des PCB Site EDL de Baouchrieh, COGIC Consultants, 2000
54 ECODIT Liban, www.ecodit.com

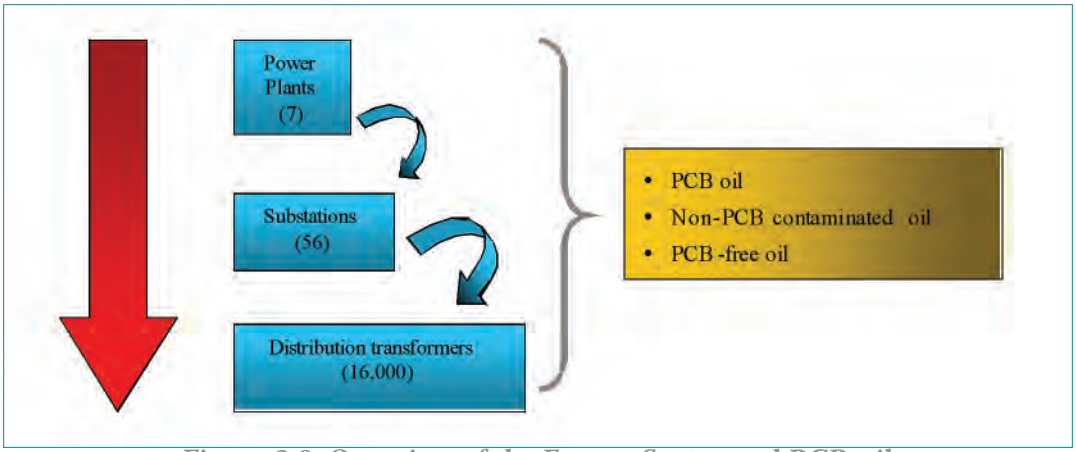

Figure 2.8. Overview of the Energy Sector and PCB-oil

- The inventory could not investigate PCBs in other types of closed applications such as those found in the tourism sector (in hotels and large resorts), in domestic facilities and large public complexes. Key findings from the inventory are summarized below: With the exception of two plants in Zouk and Jieh, Lebanon's power plants are relatively new (post 1995). Samples from each of Lebanon's seven power plants indicate that only the Zouk and Jieh power plants have significant quantities of PCB oil equivalent to about 42 tonnes. PCB oil or PCB-contaminated oil (a direct result of oil filtration and/or oil refilling) may nevertheless be present in other power plants and would require more extensive testing.
- Lebanon's substations appear to use (and have been using for many years) by and large PCB-free oil. The corresponding test results[55] corroborate this finding (27 samples); the concentration of PCB oil in new as well as old transmission transformers was not detectable. It is however difficult to categorically exclude the presence of PCB in transmission transformers because there are many variables (e.g., different manufacturing companies, different ratings and years of manufacturing).
- EDL owns and operates more than 16,000 distribution transformers distributed across the territory. Many of these transformers may contain PCB oil. Naturally, old and/or damaged transformers are gradually being phased-out and replaced with new transformers that contain PCB-free oil. However, hundreds of PCB transformers are still in use and will remain so for many years to come.
- EDL uses only dry-type capacitors, i.e., they do not contain oil and therefore do not represent a potential repository of PCB material.
- Some level of cross contamination between transformers may be occurring during routine filtration of dielectric fluids.

2.3.2.3. Import/Export

Lebanon has a poor track record in data management and national statistics. In recent years, MoF developed and launched a public database on all imports to the country (www.customs.gov.lb). While useful, the database brings little value to the assessment of PCBs because (1) the oldest records are from the year 2000 and, (2) the data are aggregated under general subheadings. The website uses the Harmonized Commodity Description and Coding Systems (or Harmonized System, HS) which came into effect in 50 countries on January 1, 1989[56]. The Harmonization Code System (HS-Code) is a system of progressively more specific identifiers for a commodity. PCB oil falls under "oil from petrol and bitumen mineral" - the general code is 2710. HS271091 contains PCB oil as well as other oil products. According to the database, total import of HS271091 between 2000 and 2004 was 13 tonnes (net weight).

55 17 samples were analyzed at the environmental core lab at the American University of Beirut
56 http: //www.tradeinfo.net/itc.html

2.3.2.4. Treatment of PCB- containing waste

There are no incineration plants for municipal waste or landfills for chemical waste in Lebanon. PCB-contaminated equipment are usually handled and disposed off haphazardly, or sold to third parties as scrap, without prior knowledge or verification of the potential presence of PCBs. EDL sends damaged distribution transformers to its designated warehouse and repair shop in Bauchrieh. In the past, EDL used to store waste oil (low-quality dielectric fluids) in barrels to be sold as fuel, or discharged the oil in an open well. Open dumping has reportedly ceased and the oil is entirely stored in barrels for resale.

The inventory identified six alternative disposal methods:

1. Incineration
2. Chemical Dechlorination
3. Transformer retrofilling
4. Landfilling
5. Plasma Arc Technology
6. Storage

Based on a preliminary comparative analysis of these disposal methods, the most feasible alternatives for the treatment and/or disposal of PCB waste are (a) incineration in cement kilns in Lebanon and (b) export to destruction facilities. The results of a comparative analysis of the two options indicated that export was more feasible than in-country incineration. Evaluation criteria included proximity of the facility to the source, the type of waste, destruction efficiency, ease of management and administrative requirements, health and safety, public acceptability and costs. Among several destruction facilities in the Gulf region and Europe, a follow-up analysis indicated that export to Europe (e.g., France, UK) was the best and most reliable option overall.

2.3.2.5. Available monitoring and health impact data

So far, there is no official program to monitor PCB effects on public health and the environment. Leading research institutions may be sponsoring small-scale and point studies on PCBs but such research has so far not contributed to formal PCB discussions at the national level. Only one study has so far examined the incidence of several disease symptoms (e.g., ocular, dermal, cardio and cancer) among PCB-exposed personnel, and reported those findings (see section 2.3.11).

2.3.3. Assessment with Respect to Annex B Chemicals (DDT)

As previously mentioned (Section _2.3.1.1), research studies conducted by the AUB and IDRC revealed that DDT was used in the past in two areas in the South. This was explained by: (1) the possible presence of an old storage site of DDT in the area, (2) the presence of a small-scale haphazard dumping of DDT material in the vicinity, or (3) the accidental discard of the DDT product. Yet, ramification strategies were not set since the levels of DDT in all samples were within permissible standards for agricultural use[57] .

A study conducted by IDRC in year 2003 analyzed for DDT and its metabolite DDE in the sediments of El-Kabir watershed. Measurable amounts of DDT and its metabolite (DDE) were detected in all samples. The detected DDE and DDT levels are presented in Table 2.13.

Table 2.13. DDE and DDT Sediment Levels in El Kabir Watershed (in ppb)[58]

SAMPLING LOCATION	PP'-DDE	PP'-DDT
L1	0.08	2.70
L6B	ND	0.17
L8	9.96	12.17
L13	2.36	4.33
S3	0.34	0.74
S12	0.51	2.95
Mean	**2.21**	**3.84**
Standard Deviation	**3.90**	**4.35**

ND not determined

57 Bashour et al, 2004
58 IDRC (2003)

In Lebanon, research conducted at the National Council for Marine Sciences[59] showed that levels of PCB and organochlorine pesticides (DDT, DDD, DDE) in fish were not negligible (Table 2.14). The study also stated that the trend between 1984 and 1988 indicates that fish contamination is not likely to decrease.

Table 2.14. PCB and Pesticide Presence in Fish Species (mg/kg wet weight)

Local Fish Species	Pesticide	Year			
		1984-85	1986	1987	1988
	DDT	0.014	0.010	0.010	0.014
	DDD	0.005	0.007	0.012	0.0125
	DDE	0.046	0.040	0.057	0.1000
	DDT	0.007	0.005	0.065	0.0090
	DDE	0.012	0.027	0.015	NA

NA not available

Organochlorine pesticides, including DDE, DDD, and DDT, were tested in fish species found off the coast of Lebanon (Section 2.3.1.3)[60].
A Kuwaiti study published in 2001 analyzed for organochlorinated pesticides in the Kuwaiti diet which includes food products imported from Lebanon[61]. Concerning pesticides in general, low level exposure was reported to be correlated with increased risk of cancer[62](Section 2.3.1.3).

2.3.4. Assessment of Releases from Unintentional Production of Annex C Chemicals (PCDD/PCDF, HCB and PCBs)

The United Nations Environment Program (UNEP) Toolkit 2003 defined ten common sources of emissions of Dioxins and Furans. These sources are: a) waste incineration, b) ferrous and non-ferrous production, c) power generation, d) production of mineral products, e) transport, f) uncontrolled combustion, g) production and use of chemicals and consumer goods, h) disposal and landfilling of wastes, and i) miscellaneous sources. The preliminary inventory for Dioxins and Furans, developed in the year 2005, indicated that an estimated total of PCDD/PCDF of 165.8 g TEQ/a were released annually from these sources. Detailed information about the emissions by category is presented in Table 2.15.
Uncontrolled combustion was found to be the major contributor to such emissions with a 124.74 g TEQ/a (this is equivalent to 75.24% of all emissions). The inventory showed an increased level of emissions after the utilization of the edited UNEP 2003 Toolkit, when compared to the previous national inventory for the year 1999, where the estimated total annual amount of Dioxins and Furans releases was 77.465 g TEQ/a. The 1999 inventory also indicated the highest emissions by uncontrolled combustion, which was estimated at 54.035 g TEQ/a (equivalent to 69.754% of the total emissions). However, caution should be exerted in explaining this rise as it might indicate higher emission levels (thus more uncontrolled combustion), or it could just be a translation of improved accuracy in data collection. Note that since numerous assumptions are used in the calculations, it is difficult to provide the exact reason for the increase in emission levels.

59 Kouyoumjian and Safa, 1993
60 Riss and Gulbrandson, 1970
61 Saeed et al., 2001
62 El-Saghir et al., 1998

It is important to note that high concentration levels are due to assumptions done at some categories. In the case of medical waste incineration, only 85 hospitals were surveyed by the Syndicate of Hospitals from 160 hospitals. An extrapolation was done for the left number of hospitals resulting in an estimated total emission of 32.09 gTEQ/a of PCDD/PCDF in the air. Another major rise in the estimated releases of PCDD/PCDF is due to the open burning of solid waste. It was estimated that 10% of generated waste is open burned. The estimation resulted in a release of 39.24 gTEQ/a in the air and 78.48 gTEQ/a.

Table 2.15. PCDD/PCDF Annual Emission Levels per Category [63]

Category	PCDD/PCDF Annual Release (g TEQ/a)					
	Air	Water	Land	Product	Residue	**Total**
1. Waste Incineration	32.09	-	-	-	0.161	**32.251**
2. Ferrous and Non-ferrous Production	0.488	-	-	-	0.4056	**0.8936**
3. Power Generation	0.8921	-	-	-	0.037	**0.9291**
4. Production of Mineral Products	0.41	-	-	-	1.107	**1.517**
5. Transport	0.1493	-	-	-	-	**0.1493**
6. Uncontrolled Combustion	44.98	-	0.0173	-	79.748	**124.74**
7. Production and use of chemicals and consumer goods	-	-	-	3.052	-	**3.052**
8. Miscellaneous	0.000517	-	-	-	-	**0.000517**
9.Disposal/Landfill	-	1.203	-	-	1.079	**2.282**
10. Hot Spots	-	-	-	-	-	-
Total	**79**	**1.203**	**0.0173**	**3.052**	**82.53**	**165.8**

Several industries have the potential for relatively high formation and unintentional release of PCBs as a result of thermal processes involving organic matter and chlorine[64]. Some of these sources may be present in Lebanon:

1. There are currently two or three licensed medical waste incinerators in Lebanon, but there are many more unlicensed and poorly monitored. Soil samples taken from one incinerator site revealed high concentrations of Dioxins and Furans [65].
2. Cement kilns: There are five cement factories in Lebanon. MoE began to monitor stack emissions from these factories intermittently. There is no public information on the source and origin of the type of fuel burnt at the cement kilns before that.
3. Production of pulp using elemental chlorine for bleaching: There are three paper factories in Lebanon (Sipco, Sicomo and Solicar) that recycle paper. It appears that they do not use bleaching but coloring to enhance paper whiteness. They use very small quantities of pulp to strengthen the paper, which is producing using recycled paper. There is no pulp production in Lebanon.
4. Thermal process in the metallurgical industry PCBs may also be unintentionally formed and released from the following source categories:
   1. Open burning of waste from landfill sites,
   2. Fossil fuel-fired utility and industrial boilers,

63 Dioxins-Furans Inventory, MoE/ELARD, 2005
64 Stockholm Convention, Annex C
65 Greenpeace Soil Sampling, Hotel Dieu Hospital, 2001

3. Motor vehicles (burning leaded gasoline): Lebanon introduced unleaded gasoline in 1993. The Government of Lebanon phased out leaded gasoline completely in 2001. This has significantly reduced (though not eliminated) vehicle lead emissions as well as the unintentional release of PCBs.
4. Textile and leather dyeing: The tanning sector in Lebanon has been facing mounting problems including fierce competition from neighboring countries, and effluent discharge standards. In recent years, several tanning industries have shut down or relocated (less than 20 tanning units remain). The tanneries may be using chlorine-containing chemicals (chloranil) throughout the dyeing process.

2.3.5. Information on the State of Knowledge on Stockpiles, Contaminated Sites and Wastes, Identification, Likely Numbers, Relevant Regulations, Guidance, Remediation Measures and Data on Releases from Sites

2.3.5.1. Dioxins and Furans

The disposal of products or residues containing PCDD/PCDF poses a threat of repeated release into the environment. A landfill or open dump can become a reservoir for the release of these compounds. Such is the concern of these potential contaminated sites. It is important to note that the dump or landfill in this case must be contaminated with PCDD/PCDF containing wastes described in categories 1 through 9 of the UNEP Toolkit.

The three main sanitary landfills in Lebanon: Tripoli, Naameh, and Zahleh are potential contaminated waste sites. These landfills receive all kinds of waste from batteries, health care waste, bleached products and other. No specific data on PCDD/PCDF releases were found thus as an estimation of PCDD/PCDF releases resulted in 0.00005 gTEQ/a in the leachate and 0.4046 gTEQ/a in the flared gas.

Open dumping and burning of solid waste spread out in a fast and random way within the Lebanese territory in the absence of legal enforcement.

In addition, accidents which often result from accidental fires of PCB transformers, storage rooms, and houses rich in plastics, carpets, treated wood or brominated flame retardants should be considered for PCDD/PCDF release. The Israeli bombarded electric distribution stations at Jamhour and Bsalim which contained PCB containing equipment (transformers and capacitors, also refer to the previous 1999 Inventory) and that has not been de-contaminated, are still a probable site for PCDD/PCDF. In the context of a study on dioxin assessment in soils, sampling and analysis of 6 potential sites was done in Lebanon in 2001. Sampling was done at Jamhour and Bsalim distribution stations, Amrousieh old site of a municipal waste incinerator, Quarantina a domestic waste dump and two cement kilns' surroundings in Chekka and Feih-Koura. The results of the analysis are presented in Table 2.16.

Table 2.16. Results of Dioxin Soil Sampling and Analysis in Two Power Stations: Jamhour and Bsalim (Kaskas and Kodeih, MoE, 2001)

Sampling sites	Detected value of Toxic Equivalent Concentration (I-TEQ) pg NATO-TEQ/g	Maximum value of Toxic Equivalent Concentration (I-TEQ) pg NATO-TEQ/g
Amrousieh	0.6	< 0.9
Jamhour	0.6	< 0.9
Quarantina	0.9	< 1.1
Bsalim	0.1	< 0.4
Chekka	1.7	< 2.2
Feih-Koura	0.1	< 0.5

According to the sampling done, one can notice that tested concentration levels are lower than the maximum value of toxic equivalent concentration.

Regarding relevant fire accidents, according to the Lebanese Civil Defense firefighting forces, no large scale incidents where PCB containing equipment were burned were known to occur. On average, 20 to 70 large house/apartment fires are encountered per year, where wood and more particularly plastics and carpets are common household elements. However, it should be noted that the occurrence of these events is sporadic and does not result in the accumulation of PCDD/PCDF in a certain area. Thus, it can be concluded that household fires during 2004 did not constitute a contributing factor to the inventory emissions and do not qualify as PCDD/PCDF hotspots.

2.3.5.2. PCBs

Out of 10 oil samples collected from Lebanon's seven thermal power plants, only one sample contained PCB - a staggering 500,000 ppm[66]. This finding subsequently revealed the presence of up to 5 tonnes of PCB oil stored in 10 out-of-service transformers located in the Zouk power plant and about 37 tonnes stored in in-service transformers in the Jieh power plant (see Table 2.17). The commercial oil names were Askarel, Sibanol and Pyralene.

Table 2.17. Total Quantity of PCB-Oil Present at Zouk and Jieh Power Plants

PCB-Oil Type	Zouk (kg)*	Jieh (kg)**
Askarel	4,740	-
Sibanol	-	5,840
Pyralene	-	31,275
Subtotal	**4,740**	**37,115**

Source: PCB Inventory, 2005

Potentially Contaminated Hotspots

The inventory identified seven potential PCB hotspots in Lebanon. These sites were considered potential hotspots either because they sustained aerial bombing (e.g., Israeli air raids) or because significant leakages are known to have occurred and/or still occur. These hotspots are (dates of shelling are indicated in parenthesis):

Power plants:

- Deir Aamar and (2000)
- Baalbeck (2000)

Substations:

- Bsalim (1993, 1996,1999 and 2000),
- Jamhour (1993, 1996, 1999 and 2000),
- Deir Nbouh (2000),
- Hazmieh (1975 - 1990) and
- Bauchrieh

The Jamhour and Bsalim substations sustained the highest number of raids. In Jamhour, several transformers were hit during the civil war (1975-1990); information on the extent of damage sustained during that period is lacking. The substation was then damaged again during three successive air raids, in 1996, 1999 and 2000. Following the 1999 raid, several transformers were either repaired or replaced (nine new ABB, 57-40MVA, transformers). The 2000 raid resulted in the complete destruction of all 17 transformers, containing on average 20 tonnes of oil each (340 tonnes in total). The extent of oil percolation into soil and groundwater is uncertain and would require targeted sampling and analysis. Naturally, if these transformers contained PCB-free oil before the raids, then the resulting contamination would not include PCBs.

The EDL repair shop located in Bauchrieh (one of Beirut's northern and highly urbanized suburbs) is considered the most severe hotspot in Lebanon.

66 Name of manufacturing company, ACEC

An estimated 1,600 transformers, of different marks, epochs and capacities are scattered around the site. Previously MoE and EDL commissioned the investigation of PCB by collecting a total of 84 samples between 1995 and 2000, 38 from out-of-service transformers, nine from storage barrels and two from the contaminated well and one soil sample[67]. A total of 14 samples contained high concentrations of PCB and the samples collected from the well contained PCB.

2.3.5.3. Pesticides

Intensive agricultural practices reflect on the frequency of chemicals usage, and therefore the most agriculturally active areas will be identified for future reference purposes. POPs pesticides were mostly used in Lebanon on fruit trees, especially commercial fruit orchards, citrus trees, and on greenhouses vegetables. They were not used on olive trees which are the most commonly cultivated tree species. A hypothetical zone, which is strongly suggested for sampling, is represented by Lake Qaraoun, which lies in the Bekaa plain. The sediments of this lake can contain accumulated evidence of prolonged usage of the target chemicals. Sampling from the bottom of the lake is suggested.

Despite the concentrations of plantations and agricultural practices in certain areas of Lebanon, the domestic usage of the POPs pesticides on insects has implications on their more random distribution. This is also supported by the common presence of fertile soils in many regions and scattered agricultural practices in Lebanon.

2.3.6. Summary of future production, use and releases of POPs - requirements for Exemptions

There is no production of DDT in Lebanon, and no likely future production, no known use or future use, and no clearly detected releases of this pesticide. Lebanon did not file for any exemptions under the Stockholm Convention for DDT, and is not likely to do so in the future. The national inventories highlighted some hotspots for POPs releases and potential exposure and these are summarized in Table 2.18 below.

Table 2.18. Possible Hotspots for POPs Releases and Potential Exposure

PCB Category	Hotspots
Dioxins and Furans	• Areas around incinerators (hospitals equipped with incineration facilities) • Areas around uncontrolled combustion (open dumps)
PCBs	There are at least seven sites in Lebanon potentially contaminated with PCB oil: • Three power plants (Deir Aamar, Deir Nbouh and Baalbeck) • Three substations (Bsalim, Jamhour and Hazmeih) • EDL repair shop in Bauchrieh: The most critical PCB hotspot; about 1600 transformers are stored on site destined for repair or disposal. • The disposal of burnt oil continues to pose grave environmental concerns.
Pesticides	Areas of commercial fruit orchards, citrus trees, and on greenhouses vegetables: • Coastal plain • Bekaa plain

67 COGIC Consultants, with technical assistance from TREDI, a PCB destruction facility in Switzerland

2.3.7. Existing programmes for monitoring releases and environmental and human health impacts, including findings

In order to be able to manage chemicals and take the proper decision in various situations, it is necessary to have accurate and complete data basis on chemical substances, their properties, impact on humans and environment, the exact quantities of chemicals produced, used, imported or exported and the types and quantities of the accumulated waste in the country. It is expected that each ministry has a database that covers such information on chemicals where some of them are required under existing legal instruments. Table 2.19 shows the availability of data for different types of chemicals.

Table 2.19. Quality and Quantity of Available Information

Data Needed for/to	Pesticides (agricultural public health and consumer use)	Industrial Chemicals	Consumer Chemical products	Chemical Waste
Priority Setting	Yes	Yes	No	No
Assess Chemicals impact under local conditions	Yes	Yes	No	Limited
Risk Assessment (Environment/Health)	No	No	No	No
Classification/Labeling	Yes	No	No	No
Registration	Yes	Yes	Yes	No
Licensing/Permitting	Yes	Yes	Yes	No
Risk Reduction Decision	No	No	No	No
Accidental preparedness/Response	No	Limited	No	No
Poisoning	No	No	No	No
Emission Inventories	Limited	Limited	Limited	Limited
Inspection and Audit (Environment/Health)	Limited	Limited	Limited	Limited
Information to workers	Yes	Limited	Limited	No
Information to the Public	Limited	Limited	Limited	Limited

Information on chemicals is available in the form of reports, literature (national and international databases). The information however is still considered very limited and disorganized; information sources being scattered in different institutions. A networking among the information sources would be very beneficial to chemical management and would go a long way in facilitating information dissemination.

There is no single data reporting system in Lebanon. The main institution which accumulates and provides information on all type of activities, including production and trade data is the Central Administration of Statistics. However, data is not provided to all public and is not detailed, i.e. do not specify which chemicals and hence in real terms the data is far from usable in assessing chemical management. However, for detailed import and export of chemicals, the Ministry of Economy and Trade Customs division provides accurate data, which is available to all public via their internet site.

Information on the use of pesticides and fertilizers is the responsibility of the Ministry of Agriculture. Data on hazardous waste, on environment monitoring, on pollutant emission should be collected by the Ministry of Environment. Note that different types of data are located in different organization and agencies at the national level that can be used for chemical management as shown in Table 2.20. This data is stored in different formats. It is unfortunate that the scope of data collected on a nationwide basis is not adequate (it is accurate and detailed only in respect to chemical import/export broken down according to product - raw material, complete with value and mass figures).

Table 2.20. Location of National Data

Type of Data	Location(s)	Data Source	Who has Access	Format
Production Statistics	Ministry of Industry Ministry of Agriculture	UNIDO www.industry.gov.lb FAO (www.agriculture.gov.lb)	Open	Computerized database, files of documents, Internet
Import Statistics	Customs	Customs www.customs.gov.lb	Open	Computerized database, Internet
Export Statistics	Customs	Customs	Open	Computerized database, Internet
Chemical Use Statistics	ASPLANTE	MoA	Open	Upon request
Industrial Accident Report	None	None	None	None
Occupational Health Data (Agricultural)	None	None	None	None
Occupational Health Data (Industrial)	None	None	None	None
Poisoning Statistics	None	None	None	None
Pollutant Release and hazardous waste data	Ministry of Environment	ECODIT/MoE 2001 www.moe.gov.lb METAP 2002, ERM 2002	Open	CD-ROM, Internet Publications
Register of Pesticides	MoA	Customs	Upon request	Upon request
Register of Toxic Chemicals	None	None	None	None
Inventory of Existing Chemicals Register of Producers	MoA Ministry of Agriculture	Customs MoA	Upon request Open	Upon request Upon request

Different organizations employ their own different formats and criteria for undertaking data collection. For example, the Ministry of Agriculture, as the responsible body for the registration of pesticides in the country, has developed its own registration criteria for pesticides that are being used at the national level. The Customs registers import/export of all chemicals. In general, the procedures for the collection and dissemination of chemical data in the country depend mainly on the internal policies or purposes of the different organizations and agencies.

The Ministry of Environment has data on chemical waste that are imported. Unfortunately these information need to be entered within a database. Reports on emissions productions are part of obligations of facilities that receive their permits from the Ministry. These information need to be collected and disseminated.

The Ministry of Public Health has the capacity for health surveillance for chemical diseases. However, health assessment analysis related to chemicals does not exist at the national level.

Data on issues such as chemical accidents, levels of production, imports etc. are not available. However, The Ministry of Interior and Municipalities has the responsibility of dealing with any incident that may put the general public in danger, and therefore might have information dealing with chemical incidents. However, the ministry does not have a special data repository for chemical accidents.

There is no national exchange system between ministries and institutions. An official request of information is sent from the Director General at the requesting ministry to the Director General at the ministry expected to have the information. Information request is mainly addressed to the Director General of the concerned ministry.
Specific information from international organizations to concerned parties is supplied through international projects, and agreements. Relevant information is mainly sent by mail to concerned parties. International information can be directly accessed through internet communication.

2.3.8. Current Level of Information, Awareness and Education among Existing Target Groups

In terms of education, Lebanon has a large number of universities relative to its size. Only one university (AUB) has a department on risk management and chemical safety. Nevertheless, a number of universities provide programs in the environmental sector (water, air, science, health, biodiversity, technology, chemistry) and the agricultural sector. In addition, some environmental courses are offered for non-environmental majors.
At the level of schools, topics on POPs chemicals are not integrated within the offered disciplines of the Lebanese curriculum. POPs chemicals are known at the level of experts in scientific institutions, laboratories, organizations and companies.
Public awareness on POPs does not still have its own national campaign in Lebanon. A campaign targeting different groups is needed to raise the level of knowledge especially at groups that are directly related to POPs; farmers, customs, industries, electric stations, and municipalities. Media is an important component that can be exploited for the education and awareness on POPs related issues.
A number of environmental NGOs undergo awareness campaigns. The focus on POPs is limited within activities undertaken by these NGOs. Some NGOs aim at organic farming and at farmers' awareness on the best management techniques for agriculture and pest management. Awareness regarding Dioxins and Furans is very limited.

There is no national exchange system between ministries and institutions. In order to receive information, one should submit a request that is mainly addressed to the General Manager of the concerned institution.

2.3.9. Relevant Activities of Non-Governmental Stakeholders

In Lebanon, several associations representing the interests of various industrial sectors in general and within the field of chemicals do exist. These organizations' major objective is to bring together the industries belonging to their sector or region and promote material output and export, with limited or no concerns in relation to health, safety and the environment. Some institutions and groups that involve chemical management in their activities or support such initiatives are further described in the subsequent paragraphs.

2.3.9.1. Industrial, Commercial and Agricultural Associations

ASPLANTE

ASPLANTE is a non profit association of importers and distributors of agricultural products, established in 1965. Its major activities deal with forwarding services and looking after the interests of its members, besides, enhancing agricultural production practices and methods for the welfare of the Lebanese Farmer and Lebanese agricultural economy.
ASPLANTE indulges in ministerial actions through the Committee of Pesticides. It is an active member of Croplife International, the global Agro-Industry Federation and does work under its emblem in issues related to industry. It is an active participant in regional and international conferences related to pesticides formulation and manipulation. The association takes stake endeavor for the implementation of environmentally safe use of pesticides including import, registration, safe use, and disposal of obsolete stock and empty containers.
The Association does practice technical activities related to agrochemicals licensing and development of regulatory issues concerning the importation, registration, use, labeling and awareness of pesticides manipulation and disposal.

Federation of Chamber of Commerce, Industry and Agriculture of Lebanon

The federation has its juridical personality as well as financial and administrative autonomy. The Federation coordinates between the different chambers of commerce and industry in Lebanon and has the following main activities:

- Holds economic conferences, local and international exhibition.
- Represents the chambers in common interests with official authorities, economic talks with Arab, foreign and international delegations.
- Cooperates with official authorities in order to organize, develop and promote the national economy, collect and coordinate economic and commercial information and statistics, issue newsletters and prepare studies and researches in this purpose.
- Exchanges opinions, information and reports with international and foreign organizations and institutions interested by economic and commercial matters, while giving opinion to competent authorities before approving the establishment of new chambers and giving new permits to establish mixed chambers between Lebanese and foreigners.

The regional chambers have the following activities:

- Approval of bills and the issuance of the necessary certificates of the authenticity of exports' prices as well as certificates that prove the commercial or industrial or agricultural nature of a product.
- Approves the authenticity of signatures of traders, industrialists and agriculture producers registered in the Chamber and issues certificates of origin for exports since the chamber has been entrusted by the government with the task of attesting invoices and issuing certificates of origin and submitting of commercial documents relating to the export of goods from Lebanon.
- Provides solution to problems and hindrances impeding commerce, industry and agriculture, and work on solving them as well as helping within its capacity.

Association of Lebanese Industrialists

The association of Lebanese Industrialists is a Lebanese economic organization grouping industrialists from all Lebanese regions in a concerted and balanced effort at promoting and developing industry in Lebanon. The association seeks to create and maintain an atmosphere which is favorable to industrial growth and development.

The Association boasts a membership of 1,100 which represents about 75% of the total capital invested in manufacturing. It lobbies for certain policies, negotiates with labor unions, fosters cooperation between industrialists and organizes seminars and activities to help modernize industrial firms.

The association has a wide range of activities on the national and international level:

- Vocational training development
- Technical education program
- Sales promotion of Lebanese manufactured products in the local markets
- Rehabilitation of infrastructures, transport, etc...
- Participation in meetings and discussions related to industrial activities

There are 12 Specialized Committees that play a significant role in policy formulation. Each committee is headed by a member of the Board of Directors and membership is open to members of the Association. In addition, there are 4 Special Committees. The environmental committee is part of the ALI's committees and follows-up issues concerned with the environment. This committee meets once per month and has the following activities:

- Follow-up of issues concerned with the environment
- Participation in environmental workshops
- Organize awareness programs concerned with cleaner production

Another committee is formed jointly with the MoE where a partnership was established between both parties. The main objective of this committee is to form a strategy for compliance of industrial to environmental requirements. It is headed by the General Director at MoE and members are represented by MoE staff and the ALI representative.

Industrial Syndicates

Lebanon has a wide range of business associations that are mainly concerned with promoting their business interests and maintaining good working relations with policy makers.

With regard to the organization of labor, there are approximately 400 labor syndicates in Lebanon. The pyramid of labor organization is topped by the General Confederation of Lebanese Laborers (GCLL).

2.3.9.2. Environmental Non-Governmental Organizations

National and international NGOs such as Rene Moawad Foundation, Makhzoumi Foundation, and Greenpeace are active and participate in bringing up the issue of chemicals management and hazardous waste through daily follow-up and public awareness campaigns.

MoE has provided small grants to environmental NGOs since 1994 as part of its own budget. In 1992, eight NGOs combined to establish the Lebanese Environment Forum (1999 membership reached 33 NGOs) while other five organizations formed the Green Forum. However, more than fifty organizations do not belong to these forums.

So far, Lebanese environmental NGOs have been weak at the national and international levels in terms of effectively lobbying for policy changes. Activities are focused primarily on urgent local issues and can be summarized as follows:

- Raising environmental awareness
- Organizing conferences, seminars, workshops, etc.
- Organizing topical activities
- Exposing environmental threats
- Protecting nature (mainly forests and wildlife reserves)
- Undertaking research and training

Table 2.21 gives an idea of active NGOs in the field of environment and agriculture.

Table 2.21..Relevant Environmental NGOs

Organization	Activities	Contact
Makhzoumi Foundation	Agriculture, community development	www.makhzoumifoundation.org
Rene Moawad Foundation	Agriculture, health, environment, rural development	www.rmf.org.lb
Association for Forest Development and Conservation	Community development, rural development, environment	www.afdc.org.lb
Green Line Association	Agriculture, environment	www.greenline.org.lb
Society for the Protection of Nature in Lebanon	Environment, education	www.spnl.org.lb
Arc En Ciel	Community development, handicaps, health	www.arcenciel.org
Greenpeace	environment	www.greenpeace.org.lb
Association Libanaise pour le Maîtrise de L'Energie	environment	www.almee.org.lb
Mercy Corps International	Income generation, rural development	www.mercycorps.org
Pontifical Mission	Rural development, refugees/displaced	www.pontifical.org
Young Men's Christian Association	Agriculture, health, community development	www.ymca-leb.org.lb

The Greenpeace office in Lebanon has been running an aggressive campaign against POPs. In 1997, they launched a campaign to protest against waste incineration in Lebanon, stressing on the fact that incineration is the primary source of POPs in Lebanon. Greenpeace demanded and maintains that Lebanon should ban incineration. The campaign contributed to the closure of two municipal waste incinerators in the Beirut suburbs (Karantina, Aamrousieh). In 2002, Greenpeace began pressuring hospitals to stop medical waste incineration. They collected and analyzed soil samples from the vicinity of the incinerator at Hotel Dieu, one of the largest hospitals in Beirut. The results showed high levels of Dioxins, Furans and heavy metals. Following sustained public pressure, the American University Hospital and Hotel Dieu are considering alternative waste treatment technologies including autoclaving. Their incinerators have reportedly been decommissioned.

2.3.9.2.1 Universities

Environmental clubs at universities work on awareness programs where faculties (Science, Agriculture) work more on funded projects by the Ministries of Agriculture and Environment or International funding agents (USAID, EU).

2.3.9.2.2 Private Consulting Companies

There are over 20 Lebanese engineering and consulting firms with experience and qualifications in different environmental planning and management aspects[68]. However, most of these consulting firms are small in size, although with most of them venturing with European or American counterparts.

2.3.9.2.3 Summary

Table 2.22 shows the strengths of different institutions and the capability of integrating them in governmental programs to raise their responsibilities in the management of chemicals.

Table 2. 22. Summary of Expertise Available Outside the Government

Field of Expertise	Research Institutes	Universities	Industry	Environmental/ Consumer Groups	Labour Unions	Professional Orgs.	Other (specify)
Data Collection	√	√	x	√	x	√	Yes consulting firms
Testing of Chemicals	√	√	√	x	x	x	Yes Laboratories
Risk Assessment		√	x	x	x	√	Yes consulting firms
Risk Reduction	√	√	√	x	x	x	-
Policy Analysis	√	√	x	x	x	√	Yes consulting firms
Training and Education	√	√	x	√	x	√	Yes Consulting firms
Research on Alternatives	√	√	x	√	x	√	-
Monitoring	√	√	x	√	x	x	-
Enforcement	x	x	x	√	√	x	-
Information to Workers	x	√	√	√	√	√	Yes (Farmers org)
Information to Public	√	√	x	√	√	√	

2.3.10. Overview of technical infrastructure for POPs assessment, measurement, analysis, alternatives and prevention measures, management, research and development - linkage to international programmes and projects

2.3.10.1. Overview of Laboratory Infrastructure

This section provides an overview of laboratories with analytical chemistry capabilities which can help to ensure the quality of chemicals, conduct residue analysis, identify unknown substances, and monitor for possible adverse effects.

A questionnaire was prepared based on the "UNEP Global Monitoring Program on POPs" questionnaire with some modifications. This questionnaire has been sent to laboratories at universities and government institutions. Fourteen (14) laboratories from responding ones were relevant to the study.

Many laboratories, belonging to ministries, research institutes, universities or the private sector, can be considered for management of chemicals in Lebanon. The most important ones, from the perspective of enforcing chemicals' management policies, are mentioned in the Table 2.23.

68 MoE/ECODIT, 2001

Table 2.23. Overview of Laboratory Infrastructure for Regulatory Chemical Analysis

Name/Description of Laboratory	Location	Equipment/ Analytical capabilities available	Accreditation (if yes, by whom?)	Certified GLP[69] (yes/no)	Purpose
Advanced Construction Technology Services (ACTS)	George Assy St., Sanayeh P.O. Box 14-5918 Beirut, Lebanon	-UV Spectro-photometer	None	ISO9001 ISO/IEC 17025 (in process)	Physical, and chemical testing of material construction and soil
Environmental Core Laboratory (ECL)	Basic Medical bldg, 3rd floor, room:3-27,3-28, 3-42,3-44, AUB	-GC-ECD/ NPD/FID -GC-MS -ICP-MS -HPLC -PandTGC-MS -HRGC-HRMS -Colorimetric method	EPA Certification Manual for Environmental Laboratory Approval Program and American Association for Laboratory Accreditation (A2 LA)	ISO/IEC 17025,.(in process)	PCB, organochlorine pesticides, drugs/ pharmaceuticals, petrochemicals, heavy metals, PAHs, Alcohols, toxins, food additives, poisons. Water, waste water, solid waste, food compost stones, alloys, rocks, biological tissues
Central Research Science Laboratory (CRSL)	AUB, Faculty of Arts and Sciences	- HPLC - Flame AAS - Colorimetric method - Immunoassay screening	None	-	--
Environmental Engineering Research Center (EERC)	AUB, Faculty of Engineering	- Flame AAS - Electrothermal AAs -Hydride/vapor generation AAS	None	-	Heavy metals (wastewater, leachate, municipal solid waste, sediments, sludge, soil, water)
Soil Chemistry Laboratory	AUB, Faculty of Agriculture and Food Sciences	- Colorimetric - Flame AAs	None	-	Heavy metals
Pesticide Research Laboratory	AUB, Faculty of Agriculture and Food Sciences	- GC-MS		-	Organochlorine pesticides, organophosphorous pesticides, pharmaceutical drugs, alcohols/glycols
Centre régional de L'eau et de l'environnement GREEN Université Saint Joseph, Faculté D'ingénierie, ESIB	CST - Mar Roukos BP 11-0514 Riad El Solh Beyrouth Liban 1107 2050	- Spectrophotometer - AAA	None	-	-
IRI: Industrial research institution	Paris Avenue Père Lebret Street, Ras Beirut, Beirut, Lebanon	-Spectro-photometer: UV/VIS -HPLC: UVdetector/ fluorescence -ICP-MS -AAA: MVU/HGU - GC-ECD/NPD/ FID - GC-MS	German Accreditation Body, Germany 2005	ISO/IEC 17025	Pesticide residue, heavy metals, water, soil, air, food, wetchemistry Industrialand commercial product, petroleum products

69 Good Laboratory Practices

Name/Description of Laboratory	Location	Equipment/ Analytical capabilities available	Accreditation (if yes, by whom?)	Certified GLP[69] (yes/no)	Purpose
LU (Faculty of Sciences)	Hadath	-AA spectrophotometer -Gas chromatography - Flame photometer -Total carbon analyzer - HPLC, UV spectrophotometer	None	-	Chemical pollutants (MoE/ECODIT, 2001)
LAU: Lebanese American University Environmental laboratory and the pharmacy	Byblos	-UV spectro-photometer -Fluorescence Specto. -HPLC -LC-MS -AAS -GC-MS/FID/UV/ fluor. Detectors. -ICP	None	-	Water, sediments and ambient air
LARI: Lebanese Agricultural Research Institute	Tel Amara Station in the Bekaa Valley	-Inductively Coupled Plasma-AE - HPLC -AAS -UV-VIS Spectrophotometer -Kjeldhal distillation and digestion -Flame Photometer -Ion Chrom. -Amino Acid Analyzer -Elemental Analyzer -Saccharimeter -Infratec Analyzer -pH and electrodes -Sample preparation	None	-	Soil, plant tissues analysis, drinking and irrigation water, animal waste analysis Feedingand forage analysis.
LARI: Lebanese Agricultural Research Institute	Fanar	-GC-ECD -GC-FID/PID -HPLC -Flame AAS -Hydride/vapor generation AAS -Colorimetric	None	None	Organochlorine pesticides, heavy metals, alcohols, natural toxins, other poisons
Public Health Laboratory: central laboratory	Nsouli Street, Beirut	-GC with several detection systems. -HPLC -ICP -UV spectro	None	None	Clinical chemistry, water, food.
NCSR- Lebanese Atomic Energy Commission. (LEAC)	Highway Beirut, Lebanon P.O. Box 11-8281 Riad el Soleh	-Alpha Spectrometry -GC-MS -LSC	None	None	Water, food, clinical, waste.

Name/Description of Laboratory	Location	Equipment/ Analytical capabilities available	Accreditation (if yes, by whom?)	Certified GLP[69] (yes/no)	Purpose
NCSR- National Centre for Marine Sciences (NCMS).	Batroun - North Lebanon P.O.Box 534, Batroun,	-Electrothermal AAS -Hydride/vapor generation AAS -Colorimetric	None	None	Heavy metals
Beirut Arab University	Beirut	-HPLC -Flame AAS -Hydride/vapor generation AAS -Colorimetric -Electrothermal AAS -Anodic stripping voltametry	None	None	Drugs/pharmaceuticals heavy metals, poisons, industrial/municipal wastewater, sediments, soil, water

AAA = Amino Acid Analysis AAS = Atomic Absorption Spectrophotometer; GC-MS = Gas Chromatography-Mass Spectrophotometer; NPD = Nitrogen-Phosphorous Detector; FID = Flame Ionization Detector; ICP-MS = Inductively Coupled Plasma-Mass Spectrophotometer; HPLC = High Performance Liquid Chromatograph; P&TGC-MS = Phosphorous and Total Gas Chromatography Mass Spectrophotometer; HRGC-HRMS = High Resolution Gas Chromatography-High Resolution Mass Spectrophotometer

IRI is the only institute holding an international certification (ISO 17025; General Requirements for the Competence of Testing and Calibration Laboratories) where few laboratories are working on getting international certifications (AUB) in order to improve their working practices. The poison centre at USJ works on analyzing poisoning related to food, alcohol, and medicine use. The centre is getting equipped and trained to work on pesticide poisoning as a future step.

Personnel working at surveyed laboratories are highly skilled (holding Ph.D., M.S. and B.S. degrees). Generally, the laboratories affiliated to academic institutions are followed-up and improved in accordance to the institution's regulations, objectives, and budget allowances and if accredited, supposedly jointly by the accreditation body. As for governmental laboratories, improvement is dictated by the authorities to whom the laboratory is affiliated.

The Ministry of Finance is working on a project funded by the EU on quality units where 5.8 Million Dollars will be dedicated among others, to improve lab infrastructure.

Cooperation among countries to share laboratory facilities is very limited and informal. Share of test results with an another country occurs upon a common agreement especially at connected water bodies or other resources

Measurement capacities

Workers potentially exposed to PCBs have received no training on how to conduct rapid qualitative tests to detect PCBs. At least two laboratories in Lebanon (Industrial Research Institute and AUB Core Lab) have in-house PCB testing capabilities.

Research and Development

The inventory was not able to obtain information regarding the possibility of research studies currently in preparation or on-going at universities and research institutes.

2.3.10.2. Overview of Government Information Systems/Computer Capabilities

Lately, computers facilities have increased in governmental institutions, ministries and industries; some ministries developed their own Internet sites, which further facilitate internal and external information flow. On the other hand, almost all the research laboratories or staffs use the Internet and the Email system to provide information about their activities and qualification, to communicate, to collect data and to get access to international magazines.

2.3.10.3. Overview of Technical Training and Education Programs

Lately, some universities and institutes in Lebanon developed higher educational programs (MS., PhD) related to chemicals' management in chemistry, biochemistry, agronomy, food science and technology, public health, environmental sciences and engineering.

In addition to universities, there are some important research centers in Lebanon, namely the National Council for Scientific Research, the Industrial Research Institute, and the Lebanese Agricultural Research Institute for the sake of illustration

Although their facilities and financial resources are limited, the universities and research institutes try to provide the best trainings to their employees to keep them up-dated with the latest available information and technologies, by collaborating with external research institutes and universities, by investing in libraries and equipments, by financing theses and by participating in national and international seminars, hold in and outside Lebanon such as AUB laboratories and IRI.

The research areas are many and involve basic and applied research in their multiple aspects such organic, inorganic and analytical chemistry, etc.

On the technical level, there are no educational institutes providing technical studies in chemicals' management in Lebanon and important investments are still needed in this field

POPs awareness in Lebanon is fairly limited to educated people or individuals who are professionally or academically interested in POPs issues. Perhaps the most limited awareness is that of farmers' to POPs pesticides. PCB awareness in the country is limited to very few people mostly the members of the PCB committee, the project team and a few chemical specialists. There is a need to publicize the affects of PCB use on human health and the environment. Training workshops are necessary for the EDL staff. The training workshop must focus on developing the skills and know-how on handling, storing and monitoring of PCB products and equipment.

The customs website is the only existing system that provides computerized records that date back to 2000. The database is online and information on the amount of PCB import has been aggregated under mineral oil (i.e., 13 tonnes imported since 2000).

Previous records of transformers that have undergone oil filtration and record keeping of distribution transformers is poor. EDL archives all documents (including purchasing requests) for about 10-15 years then destroys those records. The records have never been computerized and put for public access. Consequently, historic records of oil imports (pre 1990) some of which may have contained PCB are no longer available. The public does not have access to any records or information related to PCBs in Lebanon.

2.3.11. Identification of impacted populations or environments, estimated scale and magnitude of threats to public health and environmental quality and social implications for workers and local communities

At the national level, breast cancer was reported as the most common cancer among women in Lebanon accounting for almost one third of all cancers in women, whereas, in the mid-sixties, it represented 18%, of all cancers in women[70]. In-depth investigation and epidemiological studies are needed to examine the association between these high rates and exposure to POPs.

As a case study, analysis of health history of workers within Jieh Power plant and Bauchrieh station showed cancer incidence among workers exposed to PCB[71]. However, this case study was mainly based on questionnaires, filled by 145 workers, 62 of whom reported health problems, and 11 of whom reported cancer. However, these findings need to be addressed cautiously due to methodology limitations (particularly the questionnaire and the small sample size).

70 Nuwayhid and Sibai, 2002
71 COGIC, 2004

Concerning pesticides, low level exposure was reported to be correlated with increased risk of cancer.

Within the Lebanese context, cardiovascular diseases were the main underlying cause of death in Beirut in 1992-93 (49% of deaths among males and 36% among females)[72]. The World Bank Human Development Group of Middle East and North Africa (January 2000) reported that the major causes of morbidity among elderly in Lebanon are cardiovascular diseases and diabetes and which requires further research and investigation to analyze for its relationship with exposure to POPs.

Neurotoxicity research has been facing many challenges in Lebanon, but it is worth noting that some attempts were made to examine the prevalence of neurobehavioral effects among working children, and detected a correlation between lower neurobehavioral performance and exposure to solvents in some occupations[74]. Similar research might be needed to test for similar correlations with POPs.

There are no clear indicators or estimates for endocrine symptoms at the national level. However, hormonal disturbances are reflected in reproductive (fertility), metabolic (diabetes) and other health outcomes. Local studies report that reproductive impairments and diabetes are common in Lebanon, and increase with age[75]. Yet in-depth analysis and research is needed to analyze for cause effect relationships with environmental exposures.

Technicians that work at the hotspots and who transfer old and damaged transformers as well as emptying the oil from irreparable transformers are at high risk from PCB exposure, especially since most do not wear protective clothing.

An earlier study in 2004[76] assessed the impact of PCBs on the health workers at the Bauchrieh repair shop using a questionnaire. A total of 145 workers participated, 62 (43%) of which were seen to be directly exposed to PCB. The questionnaire investigated the affect of PCB exposure on the occurrence of health symptoms encountered by the workers (i.e. Ocular, Dermal, Cardio and Cancer symptoms). Out of the workers exposed to PCB 34.7% showed ocular symptoms versus 15.1 of the workers that were not exposed. As such 20.8% versus 4.1 % showed dermal symptoms, 26.4% versus 38.4% showed Cardio symptoms and 22.2% versus 4.1% showed Cancer symptoms. In general the workers exposed to PCBs were more susceptible to the health symptoms in comparison to workers who were not.

2.3.12. Details of any relevant system for the assessment and listing of new chemicals

No well-defined procedure is available for the assessment and listing of new chemicals. Despite this, new banned chemicals were being introduced quickly and efficiently through coordination between relevant ministries and the Lebanese Customs Authority. As such, a system remains to be defined and well-described, in order to decrease dependence on simple one-to-one communication among institutions.

2.3.13. Details of any relevant system for the assessment and regulation of chemicals already in the market

There were limited relevant systems or mechanisms identified in Lebanon that regulate the marketing of chemicals (agricultural, industrial).

Pesticide retailers and outlets typically submit logbook records of their sales, by product active ingredient, brand name, and quantity.

Statistics have been gathered by the MoI on industrial sales and production, and are to be frequently updated and published.

72 Nuwayhid et al., 1997
73 Nuwayhid and Sibai, 2002
74 Saddik et al., 2003
75 Nuwayhid & Sibai, 2002
76 Preliminary Inventory for PCBs and Chlorinated Pesticides prepared by COGIC consultants, 2004

Strategy and Action Plan Elements of the National Implementation Plan

3.1. Policy Statement

Being aware of the toxic properties of the Persistent Organic Pollutants, their resistant properties to environmental degradation, their capacity to bioaccumulate, and their mobility in the environment, as well as the risk they present to human health,

In line with Lebanon's long standing efforts to combat POPs pollution, reflected through the decision by the Minister of Environment nº 71/1 on 19/5/1997 (Banning the import of PCBs or any material containing or contaminated with PCBs), and the decision by the Minister of Agriculture nº 94/1 on 20/5/1998 (banning, among others, the POPs pesticides subsequently mentioned in the Stockholm Convention),

Convinced of the importance of undertaking gradual reduction, and where feasible elimination, of emissions and discharges of POPs on the Lebanese territories,

Determined to safeguard its environment and population by controlling all sources of adverse impacts induced by POPs at all stages of their life cycle,

The Ministry of Environment's decision closes the consultation process and is regarded as a political declaration for undertaking actions directed at reducing the impacts of Persistent Organic Pollutants on the environment and human health, and endorses the National Implementation Plan (NIP) for the Stockholm Convention, prepared under the UNEP/DGEF 12 Countries Pilot Project for the Development of National Implementation Plans for the Management of Persistent Organic Pollutants Lebanon Sub-project (GF/2723-02-4458). The Ministry of Environment commits itself to undertake adequate activities in order to implement the tasks included in the NIP action plans and meet its obligations under the Stockholm Convention within its existing national circumstances and capabilities.

3.2. Implementation Strategy

3.2.1. Introduction

The diagnosis of the existing situation in Lebanon on the basis of available data is an essential element for taking proper measures aiming at successful implementation of the provisions of the Stockholm Convention.

In that respect, the results of the three preliminary inventory reports and the National Profile on Chemical Management were first evaluated. This proved to be a valuable exercise, as major gaps were identified. The major obstacles ahead are:

- Lack of databases and monitoring infrastructure;
- Lack of precise emissions data;
- Insufficient or lack thereof on the level of environmental and food contamination by persistent organic compounds;
- Low public awareness related to threats caused by POPs
- Lack of sufficient financial resources to eliminate, control or reduce the emissions of POPs.

Quantitative data on chemical pollution is very limited. Published figures regarding chemical pollution within different media are limited to studies and projects within a restricted period and selected area. Continuous monitoring is almost absent often due to insufficient financial resources, technical infrastructure and skilled human resources.

There is a lack of information on the chemical composition for most of imported chemicals, raw materials and products. The lack of database on imported and used chemicals in the country makes it unfeasible to determine the location of handling and storage of certain hazardous chemicals.

In general, there is no systematic tracking system of hazardous products transport in Lebanon. No emergency response system is set in place to address emergency situations related to transport or industrial accidents.

In addition to the lack of database information, no national health assessment studies are available rendering it more difficult to set national health priorities.

The capacity to comprehensively monitor industrial sources is limited in Lebanon. There is a clear need to promote source monitoring programs in coordination with the private sector. From existing publications, a general or qualitative idea of chemicals-related problems can be inferred, but not quantitative or region-specific information showing which regions are more affected than others since studies do not cover long monitoring periods, affecting factors and impacts.

The absence of data pertaining to: a) environmental levels (air, water, land, and sediments), b) human concentrations, and c) sources of POPs pesticides presents a major limitation for conducting risk assessment representative of the real situation in the country. Risk Assessment of such pollutants is recommended after the identification of hotspots, the detection of the levels of suspected chemicals, and the identification of the exposed population.

Lack of adequate sources of data was the major limitation for the assessment of the status of POPs in Lebanon. This limitation was a common reported factor across the three inventories.

Monitoring data was a major shortcoming facing health and environment assessment of POPs as Lebanon lacks a specialized monitoring program for the detection of environmental Dioxin and Furans concentrations. This can be attributed to the lack of financial and human resources. The developed National Profile for the year 2005 identifies and assesses the capacity of the national laboratories in chemical analysis, and the hindering factors behind the continuous monitoring of such chemicals.

3.2.2. Criteria and Priority areas

With respect to the current situation with POPs based on the inventories (Dioxins/Furans, PCBs, and Pesticides) and the National Profile for Chemical Management in Lebanon and developed criteria, priority areas were recognized during the National Priority Validation Workshop. For each priority area a set of objectives was formulated to better define the proposed activities under each priority area, each objective generating a number of actions.

The priority actions were set as follows:

1. Strengthening the Legal Framework

- Take effective legislative measures to regulate POPs management in the country, including obligation for introduction of new technologies, techniques and practices, inventory, monitoring and control programmes of POPs in environment and humans
- Update existing legislation based on gaps and weaknesses of existing legal framework; this includes reviewing the mandates of key institutions.
- Propose new legislation to complement the existing ones and lead to full compliance with Stockholm convention's requirements.
- Develop mechanisms for enforcement of legal framework such as the creation of inspection units for the control of chemicals at their different stages (import, export, formulation/production, emission, storage, packaging, use, marketing and disposal).

2. Institutional Strengthening and Capacity Building

- Identify and assess the needs of key ministries and institutions involved in chemical management to fulfill its mandates (human resources, equipment, financial resources, IT, etc.).
- Identify and propose mechanisms to improve the communication among key ministries and stakeholders such as through the creation of a National Committee for Chemicals Management.
- Provide training for relevant parties; decision-makers, industrialists, farmers, laboratories, customs, traders and community as needed.
- Control of smuggling activities

3. Improving Data Management

- Update and strengthen existing databases.
- Strengthen information exchange linkages.
- Create a database for record keeping on POPs emissions.
- Update inventories on regular basis.
- Conduct a comprehensive POPs inventory and update it regularly.

4. Raising Awareness

- Develop awareness programs to decision-makers, industrialists, farmers, laboratories, customs, traders and community.

5. Mobilizing Financial Resources for NIP Implementation

- Develop a resource mobilization plan for chemicals management in Lebanon (Insufficient national financial resources at the moment).
- Allocate new funds based on NIP findings and recommendations.

6. Promoting Improved Technologies and Practices

- Promote Best Available Technology (BAT)/ Best Environmental Practices (BEP) techniques.
- Establish emergency plans, health and safety measures to reduce risks occurring during the import, production, transport, use, and emission of chemicals.

7. Promoting Research in Chemicals Management

- Identify key areas that need further research and development.
- Identify key research institutes to form an R&D holster.
- Support the holster in developing R&D in the key areas identified.
- Systematic research programmes for more efficient control and monitoring of each group of POPs chemicals in the environment and humans (during the inventory assessment phase, it has been confirmed that the current levels of research programmes in POPs areas were not sufficient).

8. Improving National Infrastructure

- Increase laboratories' capabilities of testing POPs and chemicals' composition and residue.
- Increase the number of qualified laboratory personnel, trained for the different analysis methods.
- Increase the number of accredited and certified laboratories.
- Assess the need for new laboratories in different geographical areas of Lebanon.

9. Managing Hot-Spots and Stockpiles

- Promote the safe disposal of existing stocks
- Identify and de-contaminate polluted sites with POPs chemicals.
- Sample and monitor environmental matrices (air, water, soil, sediments) and biota (food, occupation).

As part of the priority-setting process, proposed five evaluation criteria to screen and prioritize the issues and actions related to the management of Dioxins and Furans, PCBs, and pesticides were proposed. The five criteria are:

1. **Technical feasibility**
2. **Financial requirements**
3. **Relevance to the provisions of the Stockholm Convention**
4. **Ability to generate socio-economic benefits**
5. **Urgency**

The fifth criterion was later slightly modified from "Urgency" to "Urgency/Occurrence" (the change was solely made to the term used and not to its definition or degree of urgency).

Each evaluation criterion can obtain 1pt, 2pts or 3pts. Assuming no weights are assigned to the criteria, the highest obtainable score would then be 15 points (5 criteria, 3 pts each), whereas the lowest would be 5. To differentiate high priorities from medium and low priorities, the following grading levels are proposed:

1. **High Priority** are issues that have received a score between 12-15 points
2. **Medium Priority** are issues that have received a score between 10-12 points
3. **Low Priority** are issues that have received a score below 10 points

The evaluation criteria are listed Table 3.1 below and described in more details to facilitate the priority-setting exercise.

Table 3.1. Evaluation Criteria and Scoring System for Priority Setting

Criteria	Weight*	Score		
		3	2	1
1. Technical feasibility (incl. skills and know-how)		Highly Feasible	Moderately Feasible	Poorly Feasible
2. Financial requirements (incl. capital and O&M costs)		Low	Moderate	High
3. Relevance to provisions of the Stockholm Convention		Highly Relevant	Moderately Relevant	Poorly Relevant
4.Ability to generate socio-economic benefits (incl., BEP and BAT)		High	Moderate	Low
5. Urgency/Occurrence		Very Urgent	Moderately Urgent	Poorly Urgent
Maximum Scores		**15**	**10**	**5**

* The priority-setting workshop discussed the merits of assigning weights to the evaluation criteria.

1. Technical feasibility - This criterion is about how feasible it is to implement the priority area. A priority area would score 3 (highly feasible) if the human (skills and know-how) and technical (technology) resources are widely available for implementation of the priority area. Additionally, the selected technology should be adapted to local conditions (physical, chemical, geographic). The priority area would score 1 point if neither human or technical resources are readily available.

2. Financial requirements - This criterion examines the financial requirements of the priority area including capital as well as Operational and Management (O&M) costs. The priority area would score 3 points if it requires low financial resources (capital and O&M) and 1 point if it requires unreasonably high resources.

3. Relevance to the provisions of the Stockholm Convention - This criterion is designed to differentiate priority actions that are directly related to the Convention (i.e., the priority area is clearly embedded in one of its Articles) from those that are not (i.e., the priority area is not a stand-alone Article in the Convention).

4. Ability to generate socio-economic benefits - This criterion reflects the ability of each priority area to generate socio-economic benefits. For example, if the priority area will generate significant socio-economic benefits, such as improving the occupational environment of workers exposed to POPs, then it would score 3 points. If however the priority area will potentially generate significant opposition (e.g., imposing heavy emission charges on industries, introducing waste incineration to treat POPs), then the priority area will score 1 point. The socio-economic impacts of introducing Best Environmental Practices (BEPs) and Best Available Techniques (BATs) should also be considered here.

5. Urgency/Occurrence - This criterion reflects the urgency of the priority area within the Stockholm Convention timeframe (i.e., up to 2025). If the priority area must be immediately implemented, then it would score 3 points. If the priority area "can wait," then it would score 1 or 2 points depending on how relaxed the urgency.

During the priority setting workshop, an open debate was initiated in order to discuss the effectiveness of adding a weighing factor to the matrix. It was proposed to vote on picking a weighting system of: no weights, weights 1 to 3, or weights 1 to 5. After voting on the three proposed options, the stakeholders agreed on using a weight range of 1 to 5. In addition, the participants agreed on not including the 'Zero' to the scoring.

This was followed by a 'ranking exercise' where the participants agreed to add a weighing factor by filling a ranking sheet of criteria. The results are shown Table 3.2.

Table 3.2 Results of Ranking Exercise

N°	Criterion	Ranking	Weights
1	Technical Feasibility	2	4
2	Financial Requirements	1	5
3	Relevance to Provisions of the Stockholm Convention	5*	1
4	Socio-economic Benefits	3	3
5	Urgency	4	2

* Relevance to Provisions of the Stockholm Convention being undoubtedly one major criterion, it was ranked as least important (Number 5) in order to better level the other factors.

The given priorities (defined as "Criterion" in Table 3.2) set for prioritization were based on the following developed criteria:

- Complying with the provisions of the Stockholm Convention
- Impact on the environment and on human health
- National, regional and global requirements
- Financial resources
- Availability and existence of technical solutions
- Time consideration
- Impact on unemployment and economical development

All aspects of the above proposed priorities were reviewed and adjusted to the specific requirements and conditions of each inventory. Each technical report focused on the infrastructure, the available capacity gaps and the existing barriers in the current legislation which in turn, slowed down the adoption of the Stockholm Convention. During prioritization, the identified capacity gaps were analyzed and leveled. Based on these gaps and group of barriers, the main priorities were identified within each inventory assessment.
During the prioritization session, several points of discussion and bottleneck issues were raised among the groups and an overview of the project was given to the participants to clarify and simplify issues. Moreover, a presentation was given to show the methodology followed in the inventories of each categories.

3.2.3. Priority Setting

With respect to the prevailing situation of POPs in Lebanon, and following discussions, the participants grouped ranked the priority areas as shown in Table 3.3.

Table 3.3. Priority Areas

Priority Area	Dioxins & Furans		PCBs		Pesticides		**Total**
	Score	Rank	Score	Rank	Score	Rank	
Raising Awareness	35	2	43	2	35	3	**113**
Institutional Strengthening & Capacity Building	30	4	38	3	37	2	**105**
Strengthening the Legal Framework	41	1	45	1	19	8	**105**
Mobilizing Financial Resources	35	2	30	4	28	5	**93**
Promoting Research in Chemical Management	35	2	30	4	25	7	**90**
Promoting Improved Technologies	31	3	26	6	26	6	**83**
Improving Data Management & Monitoring Programs	24	5	23	8	34	4	**81**
Improving National Infrastructure	15	6	24	7	39	1	**78**
Managing Hot Spots & Stockpiles	31	3	27	5	17	9	**75**
Total	**277**		**286**		**260**		

In general, PCB related issues ranked the highest followed by PCDD/PCDF. Pesticides ranked the last, and thus are judged to be the least important of all POPs sectors (the sectors being PCBs, PCDD/PCDF, and pesticides).
Overall, the highest ranked priority area was 'raising awareness' followed by 'strengthening the legal framework' and finally 'institutional strengthening and capacity building'. However, results per sector show a different picture; under the PCDD/PCDF, the highest priority area ranked was 'strengthening the legal framework' followed by 'raising awareness', 'mobilizing financial resources', and 'promoting research in chemical management'; 'managing hot spots and stockpiles' and 'promoting improved technologies' ranked third. As for PCBs, the highest ranking priority area was 'strengthening the legal framework' followed by 'raising awareness' and 'institutional strengthening and capacity building'.
The pesticides priority ranking did not differ that much from the above mentioned two, except that the first ranking priority area was 'improving the national infrastructure' followed by 'institutional strengthening and capacity building' and 'raising awareness'.

3.3. Activities, Strategies and Action Plans

Sections 3.3.1 through 3.3.17 present specific activities, strategies and action plans for POPs management consistent with the UNEP guidelines on how to present National Implementation Plans. Each section explains how the given activity, strategy or action plan is related to the Stockholm Convention and provides a summary of background information and findings. For clarity, each activity, strategy and action plan is then presented in a separate, stand-alone, table. The tables provide a description of each action (Description), the tasks under each action (Tasks), the responsible implementing partners (Responsibility), the estimated cost and the time-frame for each task. The timeframe is provided in ranges by task[77].

Calculating the cost of executing the National Implementation Plans for the Management of Persistent Organic Pollutants is based on many assumptions and subject to much uncertainty. However, providing such an approximation or estimate would deliver a better and more realistic idea to decision-makers of the costs involved, and thereby mobilize the funding needed to implement the action plans. This report outlines the assumptions undertaken for each respective action plan in order to breakdown the costs of implementation and gives an indication of the total costs of implementation of all action plans, giving them in terms of net present value of costs (discounted at 0% and at 3%).

Many of the costs incurred would occur in the future, as the project timeline spans from the several years up to the year 2025. Therefore, discounting the costs to be incurred in the future to the present in order to attain the Net Present Value (NPV) would be necessary. The implicit weighting of the present over the future is known as discounting and the rate at which the weight changes is the discount rate. Discounting is used due to two main reasons, that of time preference and that of the productivity of capital. Time preference refers to the concept of uncertainty and impatience when considering a future cost or benefit and to the concept of opportunity costs in that there may be opportunities for generating further benefits from having a good now rather than later (productivity of capital). Therefore, any cost(s) to be incurred in the future would be discounted, and the rate of discount would be taken to be 3%, a standard rate used in many countries. Therefore, the NPV of costs would be:

$NPV = X / (1+r)t$
Where X is the total cost to be incurred over all years in consideration, 'r' is the discount rate (3%) and 't' is the time frame, or the number of years, where the costs would be incurred.

Discounting would occur to Action Plans considered medium term (2010-2015) or long term (2016-2025) and not to Plans considered short term (2006-2010) in implementation time.

77 ST: short-term (1-5 years), MD: medium-term (6- 10), LD: long-term (10-20 years)

In Lebanon, studies, audits, sampling, projects (e.g. Environmental Impact Assessments) and wage rates have, more or less, a standard known market rate. After conferring with several local environmental and financial consultancies, the following rates of projects, audits, sampling, wages and studies were inferred;

Environmental Impact Assessment Studies for small projects (e.g. industrial facility) amounts to about 5,000 USD and for larger ones around 15,000 USD.
20 thousand USD for small projects to environmental consultancies
20-30 thousand USD for medium projects to environmental consultancies
100-200 thousand USD for large projects to environmental consultancies
Audits of small industries or establishments amounts to about 5,000 USD
Audits of medium-large industries would cost between about 10,000 USD - 150,000 USD
Sampling (of substances or other to test in labs) amount to about 2,500 USD per facility
Fees for Junior Expert consultants amounts to about 150 USD/day
Fees for Senior Expert consultants amounts to about 350 USD/day
Fees for government employee (on-site visit) 40 USD/day
Transportation cost 20 USD/day/vehicle
Workshop is about 30 USD/head (which includes logistics and brunch/lunch), 150 USD/junior expert training hired, 350 USD/senior expert hired for training, and equipment at USD 250/day.
Other rates and assumptions would be taken on a base to base basis

3.3.1. Activity 1: Institutional and Regulatory Strengthening Measures

3.3.1.1. Compliance and Objectives under SC
This activity falls under the requirements of Article 5, a, ii of the Stockholm Convention: an evaluation of the efficacy of the laws and policies of the Party relating to the management of such releases. Objectives include:

- Update existing legislation based on gaps and weaknesses of existing legal framework; this includes reviewing the mandates of key institutions; and
- Develop mechanisms for enforcement of legal framework such as the creation of inspection units for the control of chemicals at their different stages (import, export, formulation/production, emission, storage, packaging, use, marketing and disposal).

3.3.1.2. Background information and Findings
The current legislation in Lebanon does not adequately address the management of POPs. Emission and disposal standards regarding POPs do not exist and control is very limited. In particular:

- Decision 52/1 (dated 29/07/1996) provides emission release standards based on three environmental receptors (air, water, soil) but does not include emission values for POPs.
- Decision 8/1 (dated 30/01/2001) revised Decision 52/1 by providing detailed environmental limit values for classified industrial establishments as well as wastewater treatment plants. The values cover emissions into air and water matrices but do not mention POPs.
- Decision 71/1 (dated 19/05 /1997) lists hundreds of imported waste material contaminated with chemicals that are restricted and/or banned from entering the country. Dioxins and Furans congeners are listed without any specifications and concentrations.
- Law 8735 (dated 23/08/1974) addresses in vague terms public cleanness and sanitation. It does not however ban open dumping and burning of solid waste.

Table 3.4 Activity 1: Institutional and Regulatory Strengthening Measures

Description	Tasks	Responsability	Estimated Cost	Time-Frame
Action 1.1: Adapt Existing and On-going Legislation Addressing Health Risk Issues from POPs Chemicals				
Review and update existing legislative instruments to reduce and eliminate POPs emissions pursuant to the SC	1. Update Decree No. 11802 to develop occupational standards and conditions specific for POPs chemicals	MoL, MoPH	14,000 USD (2 man-month)	ST
	2. Update Law No. 659 (MoET, 10/08/2005) "Consumer Protection Law" to develop consumer protection standards and monitoring for POPs in food processing industries and food sold on the market	MoET, MoPH	14,000 USD	ST
	3. Update Decision No. 52/1 (29/07/1996): Specifications and concentrations to limit air, water, and soil pollution. Introduce ambient standards for POPs releases in different environmental media	MoET, MoE	14,000 USD	ST
	4. Update Decision No. 8/1 (30/01/2001): Environmental limit values for emissions and discharges from classified establishments and wastewater treatment plants. Introduce standards for Dioxins/Furans at sources mentioned in the decision. Add new standards for sources under sources II in Annex C of Article 5 of the Convention.	MoE	14,000 USD	ST
	5. Update Decree-Law No. 8735 (23/08/1974): Preservation of the public cleanness: Ban open dumping and burning of solid waste.	MoPH	14,000 USD	ST
Action 1.2: Improve Enforcement Mechanisms & Measures for POPs Chemicals Control				
Develop mechanisms to strengthen the enforcement of POPs legislation	6. Review the sampling & analysis inspection program at customs to include inert materials in addition to the active ingredients of pesticides • Identify harmful or banned inert materials in pesticides that need to be tested, based on international standards and local requirements • Assess the technical and human resources of inspection teams under the MoA at Customs to sample for and analyze new inert materials; and propose future recommendations. • Implement the updated inspection program with the collaboration and knowledge of all relevant stakeholder	LCA	16,000 USD	ST
	7. Enhance control of smuggling and illegal entry and exit of POPs pesticides and chemicals • Identify weaknesses, strengths and gaps in the smuggling control mechanisms of the country. Make sure to involve relevant stakeholders in this exercise • Develop a plan to enhance smuggling control with due consideration to enforcement mechanisms. Again, make sure to involve relevant stakeholders in the plan development. • Enforce or implement the plan to strengthen smuggling control.	MoA, LCA	37,000 USD	Continuous up to 2025

Description	Tasks	Responsability	Estimated Cost	Time-Frame
	8. Enhance inspection of pesticides outlets & distribution retailers with respect to product expiry dates, labeling requirements, hygiene & other standards: • Identify weaknesses, strengths and gaps in the inspection of pesticides outlets and distribution retailers • Develop a plan for more effective inspection • Enforce or implement the plan for more effective inspection and performance self-evaluation	MoA	32,000 USD	ST-LT
Action 1.3: Strengthen the Institutional Framework				
Strengthen the existing institutional framework and assess the need to create a POPs follow-up institution	9. Conduct an institutional study to determine most appropriate mechanism for POPs management, enforcement, and compliance to standards (Committee & commissions or institution or focal point)	MoE	25,000 USD	ST
	10. Review and update mandates of key institutions (MoE, MoI, MoPH, MoA); where required, human resource with specified expertise levels is to be given positions at the ministry.	MoE	20,000 USD	ST
Action 1.4: Develop and Enforce Regulations to Prohibit the Manufacture or Use of PCBs and PCB-Containing Equipment				
Although decision 71/1 bans the import of PCBs, other decisions and laws are required to prohibit the manufacture or use of PCBs and PCB containing equipment	11. MoE in collaboration with the Ministry of Industry and the Ministry of Energy and Water should issue a joint decree that: • Prohibits the manufacture and use of PCBs and PCB equipment • Defines a phase-out plan for PCB containing transformers • Delineates roles and responsibilities for the disposal of PCB oil and equipment	MoE	USD 14,000	ST 2006-2008
Action 1.5: Enforce the Import Ban on All Compounds Listed in Decision 71/1 (Annex 2, 1997) Including PCBs				
To enforce the ban on the compounds listed in Decision 71/1, MoE would need to work more closely with Customs (MOF)	12. To enforce the ban, MoE should send a memo (bayan taarifih) to Lebanese Customs indicating which products and equipment may contain PCBs (products and chemical standards used by testing laboratories should be exempted)	MoE & LCA (& other institutions)	No direct cost	ST 2006-2007
Action 1.6: Establish a Chemicals Management Unit at EDL				
EDL has expressed interest in establishing one central unit for chemicals management.	13. Establish a chemicals management unit at EDL with simple PCB testing capabilities (density, flaring, etc.). Routine EDL operations include oil filtration, testing, replacement, etc. These operations are currently implemented by various departments and therefore would benefit from being centralized	EDL	USD 10,000	MT

3.3.2. Activity 2: Measures to Reduce or Eliminate Releases from Intentional Production and Use

3.3.2.1. Compliance and Objectives under SC

This activity is consistent with Article 3 of the Stockholm Convention according to which Lebanon shall:

- Prohibit or eliminate the production and use, import and export of Annex A chemicals, and production and use of Annex B chemicals;
- Guarantee that Annex A and B chemicals are imported only for the purpose of environmentally sound disposal; and
- Protect human and environmental health via measures to minimize or prevent releases.

3.3.2.2. Background Information and Findings

Lebanon does not intentionally produce PCBs. Twenty seven samples from EDL transformers and substations were collected and analyzed to support the PCB inventory. The results included the identification of (a) seven in-service transformers at the Jieh power plant containing 37,115 kg of PCB oil, and (b) records showing 13 tonnes of PCB oil imported in 2002; these findings represent the only known cases of intentional PCB use. This activity seeks to conduct a comprehensive inspection of EDL transformers to identify other transformers that may be using PCB oil. The proposed action plan will also locate and phase-out the 13 tonnes of PCBs imported that were imported in 2002.

There are no real measures in place to enforce legislation prohibiting the use, production or formulation of POPs pesticides. Such measures control only entry and exit of these chemicals through banning of import and export (Decision 94/1), thus rendering smuggled and locally formulated or produced POPs pesticides practically 'legal'. However, due to the absence of such activities in the country, as found by the preliminary POPs Pesticides Inventory, no obligations are necessary on this account. It is also recommended that amendments be made to Decision 94/1 to include the prohibition of use, production and formulation of POPs pesticides.

Table 3.5 Activity 2: Measures to Reduce or Eliminate Releases from Intentional Production and Use

Description	Tasks	Responsability	Estimated Cost	Time-Frame
Action 2.1: Conduct a Comprehensive Inspection of Transformers to Identify Potential Releases of PCBs				
Not all substations were visited for the inventory and not all transformers were tested for PCBs. The comprehensive inspection will entail visiting all the substations in Lebanon to investigate possible releases of PCBs from in-use transformers. The inspection should cover EDL as well as other private power utilities. It will identify and recommend the most suitable mitigation measures for leaking transformers.	14. Sample and analyze dielectric oil in in-service (a) power, (b) transmission and (c) distribution transformers using: • Density tests (easy tool kit) • Chromatography analysis	MoE in coordination with EDL and other private power utilities	USD 1,800,000	ST (by 2010)
	15. Ensure zero PCB release from in-use transformers: follow UNEP procedures for possible PCB leaks	MoE/EDL	USD 20,000	ST (by 2010)
	16. Identify and implement mitigation measures for leaking in-service PCB containing transformers	MoE	USD 20,000	ST (by 2010)
Action 2.2: Monitor past and current oil imports				
Official records from Lebanese customs authorities show that 13 tonnes of PCB oil entered the country in 2002. The oil was imported by a private buyer (possibly in the form of lubrication oil) in the north.	17. Instruct Customs to be more vigilant in relation to oil imports (source and origin, properties, quantities, etc).	MoE and other ministries (Industry, Interior, Economy &Trade)	USD 6,000	ST
	18. Investigate the fate of 13 tonnes of PCB oil imported in 2002 (north Lebanon)		USD 3,600	ST

3.3.3. Activity 3: Production, Import and Export, Use, Stockpiles and Wastes of Annex A POPs Pesticides (Annex A, Part 1 Chemicals)

Since the preliminary POPs Pesticides Inventory in Lebanon did not register production, use, import or export of these substances and has established the absence of their stockpiles and waste, no improvement of the current management and treatment practices of Annex A pesticides is deemed necessary. However, it is recommended that future actions be taken, within the country's financial and technical capacity, to strengthen the existing system for tracking POPs chemicals from entry to final use through inspection of pesticides outlets and distribution retailers, improvement of the customs categorization system to identify individual pesticides, and enforcement of reporting of POPs pesticides if identified.
Additional efforts for improvement could include systematic monitoring of environmental POPs pesticides levels in order to confirm the findings of the inventory that these chemicals do not represent a true problem in Lebanon to the environment or human health. A national monitoring plan, including sampling and analysis requirements, has been developed and proposed in the preliminary Inventory, and is described in detail in section 3.3.16, Activity 3.3.16: Research, Development and Monitoring.

3.3.4. Activity 4: Production, Import and Export, Use, Identification, Labeling, Removal Storage and Disposal of PCBs and Equipment Containing PCBs (Annex A, part II chemicals)

3.3.4.1. Compliance and Objectives under SC
Activity 3.3.4 seeks to formulate and implement a management plan for PCB containing equipment and waste products in a manner that is environmentally friendly and that will not harm public health. According to Article 6 of the Stockholm Convention, Lebanon must develop appropriate strategies for identifying products and articles in use. The article also recommends parties to handle, collect, transport and store the waste in an environmentally sound manner. Disposal must destroy or irreversibly transform the Persistent Organic Pollutant.

3.3.4.2. Background Information and Findings
Building on Activity 3.3.2, this activity aims to identify all the sources of PCB release and use in Lebanon by developing a comprehensive inventory of PCBs. Appropriate removal, storage and disposal methods should then be implemented.

Table 3.6 Activity 4: Production, Import and Export, Use, Identification, Labeling, Removal Storage and Disposal of PCBs and Equipment Containing PCBs (Annex A, part II chemicals)

Description	Tasks	Responsability	Estimated Cost	Time-Frame
Action 4.1: Prepare a Comprehensive Inventory of PCBs in Lebanon				
The inventory should assess and investigate PCB products and equipment in several sectors including energy. The Central Administration of Statistics can provide support in case surveys are needed (see Action 2.1).	19. Secure funds to implement a complete inventory (building on the preliminary inventory)	MoE, UNDP	USD 3,000	ST (2006- 08)
	20. Collect and analyze samples from: - Closed applications - Open applications - Partially closed applications	MoE, CAS	USD 150,000	ST (2006- 08)
	21. Determine the actual number of transformers that would require phase-out and decommissioning	MoE, EDL, other power utilities	No direct cost	ST (2006- 08)
Action 4.2: Develop a Plan for Phasing out PCB Transformers				
EDL and other power utilities own and operate many transformers that contain (or have contained) PCB oil. The action will develop and implement a phase-out plan for PCB containing transformers and other PCB equipment identified during the inventory.	22. Discuss with EDL and other power utilities alternative options for phasing-out PCB containing transformers (e.g., retro-filling, decommissioning and replacement, end-of-service) to come up with a phase-out plan	MoE, EDL (Technical Assistance)	USD 50,000	ST
	23. Secure funds for the gradual phase-out and replacement of in-service transformers by 2025	MoE, GEF	USD 3,000	MT
Action 4.3: Develop and Implement a Plan for the Disposal of PCB Oil and Equipment				
A plan for the disposal of PCB oil and equipment should take into consideration the social and economic conditions of the government and private establishments. The plan will investigate the most cost-effective disposal options and identify the most suitable destruction and disposal site.	24. Identify PCB destruction facilities for the transport and disposal of PCBs and PCB-contaminated equipment	MoE	See Task 22	ST
	25. Seek endorsement for disposal plan	MoE	USD 3,000	MT
	26. Secure funds for the disposal of PCB oil and equipment	MoE, GEF	USD 3,000	MT
	27. Implement & monitor the disposal plan	Per decree (Task 11)	USD 1,500,000	LT (by 2025)

3.3.5 Activity 5: Production, Import and Export, Use, Stockpiles and Wastes of DDT (Annex B chemicals) if used in the Country

An action plan for DDT has not been developed due to no production, use, import or export and absence of stockpiles and wastes of DDT in the country, as recorded by the preliminary POPs Pesticides Inventory.
Similarly to Annex A pesticides (section 3.3.3), DDT can be included in the strengthening of the existing tracking system for POPs chemicals, if this activity is undertaken.

3.3.6. Activity 6: Register for Specific Exemptions and the Continuing Need for Exemptions

Lebanon did not register any exemptions to Annex A and Annex B chemicals, and is not likely to do so in the future. Therefore, no action plan has been developed to address this issue under Article 4 of the SC. This Activity will be elaborated in the future in the event that Lebanon files for exemption.

3.3.7. Action Plan 7: Measures to Reduce Releases from Unintentional Production

3.3.7.1. Compliance and Objectives under SC
The aim of this activity is to take action pursuant to Article 5 of the convention to reduce unintentional releases of PCDD/PCDF, HCB and PCBs formed as a by-product of certain industrial processes. According to Article 5 of the Convention, Lebanon shall:

- Develop and implement an action plan designed to identify, characterize and address the release of these chemicals
- Promote the application of available, feasible and practical measures
- Require the use of substitute or modified materials, products and processes

3.3.7.2. Background Information and Findings
There are few industrial establishments in Lebanon that could unintentionally produce POPs. Foremost among them are medical waste incinerators which typically lack quenchers; some surveyed industries lack Air Pollution Control (APC) systems such as brick and glass. Emission releases occur mainly from uncontrolled processes such as open dumps and open fires of solid waste, so widespread in the country. PCDD/PCDF has minute releases at some facilities such as secondary copper and secondary aluminum production that respectively have a yearly production of 85 tons and an annual release of PCDD/PCDF of 0.0252 g TEQ/annum in residue for copper and a yearly production of 955 tons aluminum with a release of 0.138 g TEQ/annum of PCDD/PCDF in the air and 0.38 g TEQ/annum in the residue. This action plan ensures the investigation of several industrial source categories and the introduction of BAT/BEP for all sources.

Table 3.7 Action Plan 7: Measures to Reduce Releases from Unintentional Production

Description	Tasks	Responsability	Estimated Cost	Time-Frame
Action 7.1: Promote BAT/BEP Techniques at known establishments under Sources II and III and oblige them at future Sources II				
Possible unintentional emission and contamination of PCBs and Dioxins can occur from at least eight activities in Lebanon: 1)Medical waste incineration 2)Secondary copper production 3)Secondary aluminum production 4)Paper bleaching 5)Lead production 6)Textile dyeing with chloranil 7)Leather dyeing with chloranil 8)Open burning of waste 9)Transportation	28. Medical Waste incineration (source II) • Identify the location and status (waste incinerated, quantity, APCs, etc.) of existing medical waste incinerators in Lebanon (based on MoPH study) • Promote good waste management practices in hospitals (e.g., waste minimization, segregation at the source by waste type, wastes recycling). • Promote appropriate treatment of bottom ashes and residues from flue gas to reduce PCDD/PCDF releases into the environment during incineration • Consider best available techniques in incinerators to reduce emissions; remove chlorinated products and heavy metals, ensure good combustion conditions (turbulence, temperature, residence time) • Ban incineration of PVC made materials and promote its replacement when possible by other non-chlorinated plastics • Provide alternatives to incineration: sterilization (steam, advanced steam, dry heat), microwave treatment, alkaline hydrolysis, or biological treatment, each followed by landfilling.	MoE, MoPH (CAS: Survey)	USD 750,000	MT
	29. Secondary copper production (source II) • Explore available methods for emission reduction • Conduct audits at existing plants in Lebanon and evaluate recommended solutions such as: presorting, cleaning feed materials, maintaining temperatures above 850° C, utilizing afterburners with rapid quenching, activated carbon adsorption and fabric filter de-dusting.	MoE	USD 10,000	ST
	30. Secondary aluminum production (source II) • Explore available methods for emission reduction • Conduct audits at existing plants in Lebanon and evaluate recommended solutions such as: high-temperature advanced furnaces, oil- and chlorine-free feeds (if alternatives are available), afterburners with rapid quench, activated carbon adsorption and de-dusting fabric filters.	MoE	USD 14,000	ST

Description	Tasks	Responsability	Estimated Cost	Time-Frame
Action 7.1: Promote BAT/BEP Techniques at known establishments under Sources II and III and oblige them at future Sources II				
	31. Secondary lead production (source III) • Explore available methods for emission reduction • Conduct audits at existing plants in Lebanon and evaluate recommended solutions such as: the use of plastic-free and oil-free feed material, high furnace temperatures above 850° C, effective gas collection, afterburners and rapid quench, activated carbon adsorption, and de-dusting fabric filters.	MoE	17,500 USD	ST
	32. Textile and leather dyeing and finishing (source III) • Conduct a survey to identify sites of production of textile and leather using chlorinated dyes in Lebanon • Conduct a study to assess possible alternative methods of emissions reduction • Conduct audits at existing plants in Lebanon and evaluate recommended solutions at identified industries such as: Reduce the use of dioxin-contaminated biocides and dyestuffs in the production chains for leather and textile production. • Promote alternative chemicals or low concentrations of chemicals used such as pentachlorophenol and chloronitrofen (for example, distilled or otherwise purified chemicals).	MoE	100,000 USD	ST
	33. Open burning of solid waste (source III): See Task 35	-	-	-
	34. Transportation (Source III) • Promote the use of the catalyst at new imported cars	Customs, MoIM	20,000 USD	ST
Action 7.2: Introduce Environmentally Sound Waste Management Technologies to Stop the Unintentional Release of PCBs from Uncontrolled Burning of Municipal Solid Waste and from Medical Waste Incinerators				
Action 7.1: Promote BAT/BEP Techniques at known establishments under Sources II and III and oblige them at future Sources II				
Many communities continue to practice open burning of MSW; the GoL should ban open-burning of MSW and provide viable alternative solutions in all six Governorates. The disposal of hospital waste in the MSW stream must also be banned.	35. Endorse and implement solid waste management law: • Prepare an inventory of open dumping sites • Identify needs for dump closure and measures to deter open burning • Identify most cost effective measures for dumpsite rehabilitation • See action 13.2 (Task 68) on awareness raising	Ministry of Interior / MoE	$100,000 for technical study. Implementation costs depends on proposed solutions	MT By 2010 (conditional on finding alternative solutions)
	36. Ban the co-disposal of medical waste with the municipal waste stream by encouraging hospitals to adopt cleaner technologies for the treatment and disposal of medical waste (e.g., autoclaving)	Syndicate of Hospitals / MoE / Private Sector / NGOs	See 28	ST By 2010

3.3.8. Activity 8: Measures to Reduce Releases from Stockpiles and Wastes

3.3.8.1. Compliance and Objectives under SC

According to Article 6 of the Stockholm Convention, Lebanon shall:

- Identify wastes sites contaminated with chemicals listed in Annex C; and
- Manage wastes sites contaminated with chemicals listed in Annex C.

3.3.8.2. Background Information and Findings

There are many uncontrolled dumpsites in the country including at least seven large ones and hundreds of small scale village-level dumpsites. Lebanon's two sanitary landfills (Naameh and Zahle) lack effective leachate treatment facilities. Random and routine burning of solid waste results in major Dioxins/Furans releases.

Table 3.8. Activity 8: Measures to Reduce Releases from Stockpiles and Wastes

Description	Tasks	Responsability	Estimated Cost	Time-Frame
Action 8.1.: Reduce Releases from burning of Wastes at Open Dumps (Activity 3.3.7)				
See Task 29	See Task 29	MoE	No direct cost	See Task 29
Action 8.2.: Actions for Identifying Stockpiles & Wastes have been Addressed in Section 3.3.11 Task 1.48 and 1.49				
No stockpile or waste identification was possible during the process of the Preliminary Pesticides Inventory. Comprehensive surveys are needed for the confirmation of the absence or presence of waste and stockpiles.	Refer to Tasks 52 and 53 ; If stockpiles or wastes of POPs pesticides are ever found, then proper activities will be developed for reducing releases from these stockpiles or wastes	MoA, MoE	See tasks 52 and 53	Conditional
Action 8.3.: Reduce Releases from PCB-containing Transformers in Zouk & Bauchrieh as well as & Other Potential Sites and Substations				
Under Article 6 of the SC, parties are required to implement measures to reduce or eliminate releases from stockpiles and wastes. The strategy proposed to reduce releases from PCBs includes four steps	37. Sample and analyze dielectric fluids in Zouk and Bauchrieh to determine size of stockpile	MoE, EDL	See Task 20	ST
	38. Segregate PCB transformers from PCB-free transformers (Bauchrieh only)	EDL	No direct costs	ST
	39. Label and store safely out-of-service PCB-containing transformers in Zouk and Bauchrieh until an appropriate disposal method is decided	EDL	USD 15,000	ST
	40. Detect and contain potential oil spills from leaking out-of-service PCB-containing transformers	EDL	USD 20,000	ST

3.3.9. Strategy: Identification of Stockpiles, Articles in Use and Wastes

3.3.9.1. Compliance and Objectives under SC

Pursuant to Article 6, the goal of this strategy is to develop procedures that will facilitate the identification of POPs present in unidentified stockpiles and equipment still in use.

3.3.9.2. Background Information and Findings

The national inventory determined several PCB stockpiles. The inventories did not find stockpiles of dioxins or pesticides. PCB oil in out-of-service transformers in Zouk was confirmed based on the information provided on the plates and through testing. Articles in use (such as the Jieh power plant transformers) and irreparable transformers containing and contaminated with PCB at the Bauchrieh repair shop were identified using the density test and laboratory analysis. There have been no attempts to identify other PCB applications outside the energy sector.

Potential Dioxin contaminated sites are mainly at sites where open dumping of waste and open dumping of wastewater are occurring randomly and illegally. In addition, potentially contaminated sites include landfills such as Naameh, Tripoli, Zahleh where leachate is not treated and sites at preliminary wastewater treatment plants or plants with operation and maintenance problems such as the wastewater treatment plants at the Caza of Hasbaya.

Table 3.9 Strategy: Identification of Stockpiles, Articles in Use and Wastes

Description	Tasks	Responsability	Estimated Cost	Time-Frame
Action 9.1: Use Surveys to Identify Articles in Use (if any)				
Thorough inspection surveys of pesticides retailers and outlets can be used to identify any remaining articles in use in the country	41. Use findings from inspection surveys of pesticides outlets and distribution retailers to identify articles in use if any	MoA	5,000 USD	ST
Action 9.2: Update Inventory Findings Related to Stockpiles				
So far stockpiles have been found only in Zouk power plant and Bauchrieh repair shop (see Section 2.3.5). This action will involve further investigation of substations at other power utilities such as the Litani River Authority and the Qadisha plant.	42. Inventory should also investigate stockpiles, i.e., PCB oil not in use (see Task 20 and Task 37)	EDL and other power utilities	See Task 20	ST
	43. Label new stockpiles that may be discovered	A technical committee will be formed with MoE as Focal Point for data consolidation	No direct cost	ST
Action 9.3: Inspect Industries where PCB Products & PCB containing Equipment may be Used				
Several industries could have old PCB oil stockpiles and/or contaminated equipment not in use on their premises. This action seeks to uncover new (industrial) stockpiles, if any. The inspection team will need to be trained to identify the different sources, products and equipment contaminated with PCBs	44. Train inspectors on how to detect potentially contaminated equipment	MoE	USD 20,000	ST
	45. Label stockpiles identified at industries and exercise containment procedures	MoE and specialized firm	$50,000 for testing and labeling	ST Stockpile assessment should be completed by 2008

3.3.10. Activity: Manage Stockpiles and Appropriate Measures for Handling and Disposal of Articles in Use

After deciding on the tools needed to identify stockpiles and contaminated sites in Lebanon (Activity 3.3.9), this activity focuses on identifying appropriate measures to manage, handle and destroy stocks and articles in use, remedy contaminated sites and other hot spots of concern to public health and the environment. The objectives of this activity are to:

- Promote the safe elimination of existing stocks
- Identify and de-contaminate sites that are polluted with POPs chemicals
- Sample and monitor environmental matrices (air, water, soil, sediments) and biota (food, occupation).

3.3.10.1. Background Information and Findings

As explained earlier in Section 3.3.9, PCB stockpiles were found in the Zouk power plant (out-of-service transformers) and Jieh power plant (in-use transformers), as well as the Bauchrieh repair shop. The stockpiles are not stored in an environmentally safe manner and are usually kept on site. Contaminated in-use transformers have not been labeled. Contaminated sites were never sampled, nor remedied. Contaminated sites will need to be sampled, and all contaminated oil on site will need to be disposed of in an environmentally sound manner. According to the preliminary PCB inventory, treatment and disposal of contaminated articles and equipment should occur abroad (most probably in Europe). The following activity will attempt to achieve compliance with Article 6 of the Stockholm Convention. Because the findings related to POPs pesticides were insignificant, the following actions are recommendations (not obligations) and should also be addressed:

- Implement a national sampling and analysis program for identification of sites contaminates with POPs pesticides;
- Develop or use proposed plan (Preliminary POPs Pesticides Inventory) to conduct screening and detection of contaminated sites;
- If contaminated sites are identified, then develop a remediation plan that assesses remediation options fitting to Lebanese circumstances, and develop legislation on POPs pesticides/chemicals polluted sites;
- Perform an assessment of potential POPs pesticides/chemicals contaminated media to avoid its re-use (especially soil).

Table 3.10 Activity 10: Manage Stockpiles and Appropriate Measures for Handling and Disposal of Articles in Use

Description	Tasks	Responsability	Estimated Cost	Time-Frame
Action 10.1: Treat/Dispose PCB Oil as well as Irreparable PCB contaminated Transformers in an Environmentally Sound Manner				
All PCB stockpiles and articles in use that were listed in the inventory will have to be treated and disposed pursuant to UNEP guidelines	46. Identify the most suitable disposal option (see Task 24 - 27)	MoE / MoEW	Consolidate with Task 25	ST by 2008
	47. Dispose of PCB oil and contaminated equipment according to the feasibility study findings	MoE / MoEW	See Task 27	MT By 2012
Action 10.2: Improve Procedures for Handling Transformers at EDL Warehouse in Bauchrieh				
All EDL damaged transformers converge to Bauchrieh for repair. Transformers may tend to leak during transport to and from the repair shop. Irreparable transformers are sold as scrap metal. There are no records of the fate of the scrap metal	48. Organize the existing repair & maintenance registry and review old transactions.	EDL	USD 1,500	ST Starting in 2006
	49. Test oil & scrap metal before auctioning (see Task 48)	EDL	USD 1,500	ST Starting in 2006

3.3.11. Strategy: Identification of Contaminated Sites (Annex A, B and C Chemicals) and Remediation in an Environmentally Sound Manner

3.3.11.1. Objective and Compliance under SC

This activity falls under the requirements of Article 6 of the Stockholm Convention. Its main objectives are to:

- Identify contaminated sites; and
- Propose alternative treatment methods that aim at reducing and eliminating the release of Dioxins/Furans.

3.3.11.2. Background Information and Findings

Since the three preliminary inventories could only identify sites that were potentially contaminated with POPs, it is important to investigate these potential sites to ascertain the presence or not of a stockpile. Such an action plan has been developed for POPs pesticides in the preliminary inventory, along with suggested remediation options for contaminated media.

Table 3.11 Strategy: Identification of Contaminated Sites (Annex A, B and C Chemicals) and Remediation in an Environmentally Sound Manner

Description	Tasks	Responsability	Estimated Cost	Time-Frame
Action 11.1: Delineate Dioxins/Furans Contaminated Sites				
Identification and specification of sites contaminated with Dioxins/Furans	50. Conduct a preliminary pilot investigation to identify hot spots	MoE (CAS: survey)	USD 20,000	ST
	51. Sampling and analysis at contaminated sites (soils with dioxins)	MoE	USD 100,000	ST
Action 11.2: Identify, Assess and Remediate POPs Pesticides Contaminated Sites				
Implementation of a national sampling, analysis and remediation plan for the detection and management of POPs pesticides contaminates sites	52. Perform an assessment of potential POPs pesticides contaminated sites to avoid re-use of contaminated media (particularly soil) by making use of the proposed plan (in the Preliminary POPs Pesticides Inventory) to conduct screening and detection of contaminated sites	MoE	USD 200,000	MT
	53. If contaminated sites are identified, then develop and implement am appropriate remediation plan for Lebanon, and develop legislation that addresses POPs pesticides' polluted sites	MoE	USD 350,000	LT
Action 11.3: Collect and Analyze Soil and Groundwater Samples from each Potentially Contaminated Power Plant & Substation to Determine Extent of Contamination, if any				
This action aims to investigate PCB contamination in water bodies and soil near hotspots (e.g. substations hit by air strikes)	54. Collect & assess soil samples from each potentially contaminated power plant and substation	MoE, EDL	USD 20,000	ST 2006-2007
	55. Collect & assess water samples from each potentially contaminated sites near power plant and substation using quality assurance and quality control measures (QA/QC)	Specialized laboratories in collaboration with MoE and EDL	USD 20,000	ST 2006-2007
Action 11.4: Decontaminate the Well at the Bauchrieh Repair Shop and the Surrounding Perimeter if well is found to Contain PCBs (>50 ppm)				
Tests conducted in 1995 and 2000 showed PCB in disposal well in Bauchrieh repair shop. EDL has since closed the well. The site however remains a potential hotspot and should be remedied to prevent groundwater contamination.	56. Conduct a complete environmental assessment of the well and determine whether or not the well constitutes a stockpile	MoE	USD 15,000	ST 2006
	57. Develop and implement a remediation plan if found to contain PCBs in appreciable amounts	MoE, MoEW	USD 4,500,000	ST 2007
Action 11.5: Explore the feasibility of decommissioning the Bauchrieh Repair Shop (H&S Impacts too High)				
The Bauchrieh repair shop is located in a highly urbanized residential area (several houses are adjacent to the site). Public health and safety issues are very alarming (inhalation of oil fumes may contain PCBs)	58. Assess the feasibility of relocating and decentralizing the repair shop/warehouse	EDL, MoE	USD $20,000	ST 2008
	59. Secure funds to: • Implement relocation plan OR • Upgrade existing warehouse to meet basic environmental and H&S standards	EDL	USD 100,000	MT

3.3.12. Activity 12: Facilitating or Undertaking Information Exchange and Stakeholder Involvement

3.3.12.1. Objective and Compliance under SC

According to the Article 9 of the Convention, each party shall facilitate or undertake the exchange of information relevant to the 1) reduction or elimination of the production, use and release of POPs and 2) alternatives to POPs including information relating to their risks as well as to their economic and social cost. This activity aims to:

- Strengthen the link among relevant private and public stakeholders;
- Organize and disseminate information among institutions; and
- Establish a mechanism involving several stakeholders to gather data on all POPs chemicals.

3.3.12.2. Background Information and Findings

Statistics on industrial production, emissions and waste stream is limited; similar data for informal industries is even more scant.

Table3.12 Activity 12: Facilitating or Undertaking Information Exchange and Stakeholder Involvement

Description	Tasks	Responsability	Estimated Cost	Time-Frame
Action 12.1: Information exchange on POPs with Convention Secretariat (CS)				
Currently available POPs-related information is kept centralized at the UNDP/MoE POPs Office, including the 3 Preliminary Inventories, National Profile, and the Health and Environment Profile	60. Compile information on POPs and submit it to the Convention Secretariat and the indicated EC Coordinating Centre	MoE	USD 1,500	ST
	61. Receive information from the Convention Secretariat and the EC Coordinating Centre and coordinate the activities with involved and concerned parties	MoE	No direct cost	ST
Action 12.2: Form a Centralized Database for POPs				
Centralize information regarding facilities emitting dioxins/furans	62. Develop an on-line database that provides protected access to different stakeholders and to the public	MoE CAS	USD 50,000	ST
Action 12.3: Exchange Information on POPs Chemicals				
Develop a system of data collection and exchange among different stakeholders	63. Identify all information sources (institutions, industries, laboratories, organizations, ministries, pesticide retailers)	MoE, MoA, MoI	USD 7,500	ST
Action 12.4: Promote Involvement of Producers and Retailers in Data Logging				
Involvement of pesticides retailers in database logging and information exchange would improve the overall pesticides management on a national scale	64. Identify and involve all pesticides' producers and distributors in data logging	MoA, MoE	USD 2,000	ST
Action 12.5: Computerize EDL Archives				
EDL files and records are stored for up to 15 years after which they are usually destroyed. Archive system at EDL is primitive. Oil specs are usually not recorded when tendering.	65. EDL needs to improve data management and availability. For example, it may consider applying for ISO9001:2000 (quality management system) and computerizing its archives.	EDL	USD 50,000	MT
Action 12.6: Promote the MoE library to Serve as a National Information Center for POPs Chemicals				
Currently the library at MoE is open to the public during official working hours. To ensure the sustainability and information exchange with the public it is recommended to promote the MoE library as a national information center for POPs since the Project office is located at the MoE	66. Obtain the approval of the minister and DG to designate the MoE library as the National Information Center on POPs in Lebanon	MoE	No Direct Cost	ST
	67. Make copies of all POPs-related material to be stored in MOE Library for unrestricted disclosure	MoE	USD 1,000	ST

3.3.13. Activity 13: Public Awareness, Information and Education

3.3.13.1. Objective and Compliance under SC

This activity falls under the requirements of Article 10 of the Stockholm Convention and aims at the:

1) Promotion and facilitation of POPs awareness in policy and decision-making, provision of information to the public, development and implementation of awareness and education to specialized and especially minority target groups, public participation in addressing these issues, providing public access to information, training of specialized individuals, as well as Development and implementation of education and training programs at the national and international levels; and
2) Facilitation of POPs information provision at the national, sub-regional, and regional levels, via data sheets and reports, mass media, and information centers.

Table 3.13 Activity 13: Public Awareness, Information and Education

Description	Tasks	Responsability	Estimated Cost	Time-Frame
Action 13.1: Conduct Awareness & Training Activities by Preparing Informative Material or Use Ready Material for Information Dissemination & Training at Different Levels				
Awareness activities should include preparation, & distribution of training & awareness materials according to identified target groups, training & follow-up based on prepared materials, media coverage for the organized events, and other complementary informative awareness activities	68. Target universities: specifically 20% of Lebanese university level students and 70% of Lebanese universities/higher academic institutions that are geographically well-distributed	MoEHL, MoA MoE, MoI, MoPH	USD 160,000 [2]	Every 3 years Duration: 20 working days Start: 2006
	69. Target farmers: at least 1000 farmers (direct training) & a minimum of 50% of agricultural associations (by coverage of farmer number & geographical distribution), that are geographically well-distributed among Cazas and agricultural areas. Main focus: Open burning of agricultural waste.	MoA, MoE	USD 260,000 [2]	Every 3 years Duration: 35 working days Start: 2006
	70. Target municipalities & the general public: Cover 70% of Lebanese municipalities with even geographical distribution. Main focus: Solid waste management, Car maintenance.	MoIM,MoE	USD 790,000 [2]	Every 3 years Duration: 25 working days Start: 2006
	71. Target industries: 100% of all unintentional dioxin producing industries under categories II & III	MoI, MoE	USD 228,000 [3]	Every 3 years Duration: 20 working days Start: 2006
	72. Provide EDL technicians with awareness material on health and safety guidelines for PCB handling	MoE/UNDP, EDL	USD 10,000	ST (3-4 days)
Action 13.2: Announce the Ministry of Environment (MoE) Public Library to be the Central Information Source for POPs-Related Data				
There current centralization of reporting at the MoE would facilitate the establishment of the MoE library as a national POPs information source	73. Ensure the public availability of this information, & make sure that the availability of this information source is well-known to the stakeholders & general public (66, 67)	MoE	USD 10,000	Start: Oct-2005 End: Dec-2005

[1] Cost is indicated per library update in USD currency; and includes printing documents and reports for record-keeping at the library as well as e- /mailing stakeholders on information updates

[2] Costs are indicated as total costs of awareness campaigns in USD currency; and was calculated based on the following local cost estimations: (1) 10,000 USD for preparation of new training materials, (2) junior expert cost per day of training is 150 USD; (3) senior expert cost per day of training is 350 USD; (4) training expert costs include all food and transportation expenses, counseling and advising, training and awareness activities, and other miscellaneous expenses; (5) each project requires one junior and one senior expert unless otherwise indicated, and (6) estimated costs do not include media coverage and training/awareness material printing; (7) There would be 7 total campaigns spanning up to 2025, and therefore discount rate of 3% was taken.

[3] Same specifications as above (*), but with two junior and one senior expert per project

3.3.14. Activity 14: Effectiveness Evaluation

3.3.14.1. Objective and Compliance under SC

The objectives, of this activity which falls under the requirements of Article 16 of the Stockholm Convention, are:

1) Evaluation of the SC effectiveness 4 years after its entry into force and then periodically at intervals to be decided by the COP; and
2) Facilitation of effectiveness evaluation via provision of comparable monitoring data for Annex A, B and C chemicals, based on available scientific, environmental, technical and economic information.

Table 3.14 Activity 14: Effectiveness Evaluation

Description	Tasks	Responsability	Estimated Cost	Time-Frame
Action 14.1: Develop a Monitoring Program for Assessment of Due Progress & Effectiveness of Proposed & Adopted Actions, i.e. Implement the Measures Defined by the COP for Comparative Monitoring Data				
This effectiveness monitoring is to be done internally for self-evaluation as well as for the assessment of future activities/ approaches to be undertaken, & shall include quantitative and qualitative means of assessment related to time efficiency, quality of work, work methodology, cost efficiency among others	74. Prepare guidelines for the verification and updating for the NIP with due regard to the documents of the conference to the SC	MoE	5,000 USD	ST
	75. Frequently update the three preliminary inventories and assess progress in estimated emissions' reduction	MoE, Private Sector (In collaboration with: MoI, MoPH & MoA)	184,000 USD	LT (every 3 years)[1]
	76. Develop measurable indicators for each proposed action (such as the percentage coverage of awareness programs) reflective of each task achievements and methodically evaluate each task upon completion	MoE, Private Sector (In collaboration with: MoI, MoPH & MoA)	$47,000[2]	Frequency: Every 6 years LT
	77. Evaluate each activity and task based on time and budget: estimated versus actual	MoE, Private Sector (In collaboration with: MoI, MoPH & MoA)	5,000 USD	5,000 USD ST
	78. Acquire monitoring data required by the COP using existing monitoring programs and methods	MoE	5,000 USD	ST
	79. Include monitoring results in the current report to the COP	MoE	No direct costs	-
	80. Perform Audits by analyzing monitoring reports submitted to MoE and random monitoring	MoE, Private Sector	25,000 USD	MT

[1] Cost is Total cost of inventories (up until 2025 - every three years) in USD currency; and was estimated based on the level of work required in local cost estimations for each POPs category as follows: (1) The Dioxins and Furans inventory includes a full screening of all relevant registered and (if possible) non-registered industries; (2) the PCBs inventory includes sampling and analysis efforts in PCB contaminated oils and materials, (3) the POPs Pesticides inventory involves limited field work in addition to reporting, data gathering, etc.

[2] Cost is indicated as total monitoring tasks in USD currency; and was calculated based on the following local cost estimations: (1) junior expert cost per day of consulting is 75 USD; (2) senior expert cost per day of consulting is 150 USD; (3) training expert costs include counseling and advising; and (4) the project requires one junior and one senior expert unless otherwise indicated

3.3.15. Activity 15: Reporting

3.3.15.1. Objective and Compliance under SC

Pursuant to the requirements under Article 15, the objectives of this activity are to report to the COP and Secretariat on:

1) Measures that were undertaken to implement the provisions of the SC and their effectiveness in meeting the obligations of this convention (Section 0); and
2) Data or data estimates on the quantities of production, import and export, as well as countries of origin, and destination, of the Annex A and B chemicals.

Table 3.15 Activity 15: Reporting

Description	Tasks	Responsability	Estimated Cost	Time-Frame
Action 15.1: Compile Information on the Types (active ingredient) and Quantities of Pesticides being Produced, Imported and Exported, and the Types (active ingredient), Quantities, Locations of POPs Pesticides being Distributed, Used, and Stockpiled in Lebanon				
Full updated statistical data on the presence and location of POPs pesticides will be compiled and submitted to the COP	81. Request and collect information from customs, outlets/ retailers and end-users (mainly farmers)		6,000 USD	ST
	82. Use the gathered information to prepare a database and 'material balance' to be used in future updates of the POPs pesticides inventory		3,000 USD	
Action 15.2: Prepare and Submit National Reports to the Conference of the Parties (COP)				
Reports will be submitted to update the COP on progress with respect to implementation of SC requirements	83. Compile information on relevant efforts and activities		750 USD	ST
	84. Develop and submit a report reflecting on the effectiveness of the adopted measures and recommendations/ suggestions for improvement		5,000 USD	MT
Action 15.3: Develop a Data Collection System for POPs Emission from Individual Enterprises				
Category sources II will submit reports to evaluate the efficiency of the introduced BAT/BEP with respect to PCDD/PCDF emissions	85. submit yearly reports concerning BAT/BEP practices; its introduction, implementation, and difficulties faced		95,000 USD	ST-MT-LT

3.3.16. Activity 16: Research, Development and Monitoring

3.3.16.1. Objective and Compliance under SC

This activity falls under the requirements of Article 11 of the Stockholm Convention. This activity mainly focuses on:

1) Undertaking research, development, monitoring and cooperation related to POPs and, where relevant, to their alternatives and to candidate POPs, including sources, levels, trends, environmental releases and transport, effects on human health and the environment, reduction and elimination of releases, among other; and
2) Taking action, within the country's capabilities, to support and develop activities pertaining to POPs research, to strengthen POPs research capabilities, to promote access to and exchange of POPs data, among others.

Table 3.16 Activity 16: Research, Development and Monitoring

Description	Tasks	Responsability	Estimated Cost	Time-Frame
Action 16.1: Promote and Conduct Health Related Research and Strengthen POPs Research Projects in Lebanon				
The Heath and Environment Profile report exposed the numerous data gaps in POPs health issues in Lebanon	86. Perform analysis of samples taken from the local population and local food samples for POPs chemicals	MoE, NCSR	200,000 USD	MT
	87. Assess environmental and occupational exposure and health risks associated with these chemicals. Identify priority research areas for funding and provide financial resources.	MoE, NCSR	200,000 USD	MT
	88. Encourage MoE, MoA and MoI to invest more resources to promote scientific and technical research in Lebanon	MoE, NCSR	5,000 USD	ST
	89. Encourage local research institutions and universities to conduct research on the effects of POPs on reproductive health	MoE, NCSR	5,000 USD	ST
Action 16.2: Formulate Inspection Units to Monitor Dioxins/Furans Concentrations at Identified Source				
Inspectors units are required to control potential sources of PCDD/PCDF	90. Mobilize resources inspection units that aim at monitoring PCDD/PCDF emissions at identified sources especially those under sources II and III of the convention	MoE	190,000 USD	LT
Action 16.3: Require Monitoring Programs at the Source and Results Submittal to MoE for Record Keeping and Analysis				
Monitoring programs should be done by the sources to evaluate the efficiency of the introduced BAT/BEP practices	91. Require identified sources to perform self-monitoring and send reports to MoE	MoE	5,000 USD	MT
Action 16.4: Establish a Monitoring Program to Validate the Sent Results by Stakeholders' Self-monitoring and to Check the Efficiency of the Strategy of Eliminating Dioxins By-products				
Validation of monitoring reports via inspectors regarding source and emission data	92. A monitoring program should be established by the inspection unit to validate the result of the self-monitoring reports	MoE	5,000 USD	MT

3.3.17. Activity 17: Technical and Financial Assistance

Lebanon, a developing country with a $38 billion national debt, will require technical and financial resources to execute the National Implementation Plan, either wholly or partly, and to fulfill its obligations under the Stockholm Convention. Lebanon therefore should articulate specific requests for international funding from donor agencies based on arrangements established by the COP. As explained in the following activity, Lebanon should if possible share its technical expertise with neighboring countries.

3.3.17.1. Objective and Compliance under SC

This Activity falls under the requirements of Articles 12 and 13 of the Convention. Its main objectives are to:

1) Recognize the importance of cooperation and provision of timely and appropriate technical assistance to developing country Parties;
2) Consider the particular needs and limitations of developing countries and Parties with economies in transition to strengthen their SC implementation capacity; and
3) Promote regional and sub-regional centers for capacity building and transfer of technology.

Table 3.17 Activity 17: Technical and Financial Assistance

Description	Tasks	Responsability	Estimated Cost	Time-Frame
Action 17.1: Provide Technical Support to Other State Members				
Although Lebanon is a developing country, it can technically support neighboring countries in the MENA region	93. Develop or participate in regional and international training and/or capacity building programs	Open: MoE, MoA, MoI, NGOs, NCSR, Universities (AUB, LAU, Balamand)	$280,000[1]	Frequency: Annually Duration: 45 days
	94. Exchange information and technical expertise with pertinent regional and/or international technology centers	MoE, MoA, MoI, NGOs, NCSR, Universities (AUB, LAU, Balamand)	$140,000[2]	Continuous Frequency: Annually Duration: 36 days
Action 17.2: Provide Financial Resources for Realization of the Action Plan				
In accordance with Lebanon's limited financial resources, the county will mobilize whatever means and resources it has available to implement the NIP	95. Mobilize local funding (if any) for NIP implementation (or chemicals management in general)	CoM, UNDP, MoE	77,000 USD	Conditional Start: 2006 Duration: 2 years
	96. Develop cost-recovery and cost-saving mechanisms that complement or enhance the NIP implementation	MoE, MoA, MoI, NGOs	20,000 USD	ST

[1] Cost is indicated in USD currency; and was estimated based on local cost estimations as follows: (1) only 9 local experts will undergo training for 5 working days each; (2) each local expert will require 500 USD as travel and visa costs and 100 USD per day as expense cost, and (3) each regional expert will cost about 200 USD per working day of training; (4) Stated amount equals total cost of annually held programs up to 2025 discounted at 3%.

[2] Cost is indicated in USD currency; and was estimated based on local cost estimations as follows: (1) exchange of human resources will occur with 12 local experts for 3 days each; (2) expense cost per day per local expert is 40 USD; (3) travel and visa cost per local expert per trip if 500 USD; (4) the estimated costs do not include correspondence and other non-mentioned expenses related to this activity; and (5) Amount stated equals exchange of information and expertise annually, up to 2025 at discount rate of 3%.

3.4. Development and Capacity-Building Proposals and Priorities

Priority activities for implementation of the provisions of the Stockholm Convention have revealed areas that would require capacity building. In particular, national capacities for the assessment of emissions and releases are in dire need of support. Other areas of capacity building are described below:

1. Proposing mechanisms to improve inter-ministerial communication

Lebanon needs to identify and propose mechanisms to improve communication among line ministries (MoA, MoE, MoPH, MoF, MoET and MoEW) and other stakeholders (EDL, industries, solid waste operators) such as creating a National Committee for POPs Chemical Management. Lebanon does not have a national committee to monitor and manage chemicals. This committee will assume responsibility for ensuring national inspection of POPs sources and ministerial enforcement of all POPs legislations.

2. Improving data collection and monitoring of POPs emissions and releases

Lebanon will need to develop a data collection system. The National Committee for POPs Chemical Management, if enacted, or otherwise MoE, should decide where this system should be built. This will require some organizational, financial and technical support. Efforts must be made by all the relevant stakeholders to take responsibility for continuous monitoring and data collection of emissions and releases of the POPs chemicals. A system for self-monitoring of polluting industries as well as reporting and auditing mechanisms should be developed.

To improve data collection, relevant government officials will need to be trained to collect samples and conduct qualitative tests. Training will be required to ensure the development of sufficient technical and professional capacities to implement the tasks required. Credible government agencies should be able to collect samples from any matrix that could contain POPs (soil, water and food).

3. Improving sampling and analysis for POPs in laboratories

Field inspectors and laboratory technicians should be trained to perform proper sampling and analysis for POPs under specific POPs monitoring programs. Laboratories in return should be well-equipped for analysis, both technically in equipment and technology as well as professionally in qualified and experienced staff. Personnel from relevant institutions should be trained on the best available technologies/equipment and safety measures to ensure the appropriate collection and analysis of samples. Government institutions often do not have the necessary instrumentation and personal protective equipments for sampling procedures, or the required technology for analysis. Coordination with the Industrial Research Institute (IRI) is important. Government officials and private institutions staff will need to be trained to identify potential POPs sources. Obtained data from monitoring should be added to the centralized POPs information system to keep it regularly updated.

4. Updating the inventory of POPs-containing or POPs-contaminated waste stocks and equipment

Additional technical and financial support is required to conduct full scale inventories for each of the POPs chemicals. This task will require human resources and will be easier to implement once data collection capabilities are improved. Efforts must be made to investigate all potential sources of POPs including contaminated sites and equipment.

5. Storing and disposing POPs containing material and equipment

A particularly difficult situation is observed in the handling of POPs containing material, equipment. Lebanon does not host sufficient technical expertise and the know-how in storing and disposing POPs containing material and equipment. Lebanon also lacks the necessary storing and handling equipment and will require financial support to obtain them.

6. Strengthening inspection and identification procedures at customs

Efforts must be made to strengthen the inspection and identification procedures at customs to properly identify POPs products possibly entering Lebanon. It is not certain that the Lebanese customs are enforcing and implementing Decision 71/1, banning the import of POPs chemicals from entering Lebanon. It is not known whether customs is actually enforcing the decision. It is also not clear whether custom officials are aware which products entering Lebanon contain and are composed of POPs chemicals. The MoF will need to ensure all the customs officials are trained to identify POPs containing products and material.

7. Training different stakeholders

Training should be undertaken for institutions categorized under sources II and III of the SC, where BAT/BEP will be introduced. The main focus of the training should be on incineration infrastructure as well as appropriate site selection and techniques for solid waste management.

3.5. Timetable for Plan Implementation and Measures of Success

The implementation schedule of the National Implementation Plan related to the Stockholm Convention was divided into three periods; Short-term (years 1 to 5), Medium-term (years 6 to 10) and Long-term (years 11 to 20). To the extent possible, each task has its own implementation time. Table 3.18 provides a summary of the timeframe allocated per action and task where tasks are presented as numbers under the corresponding year.

It is important to note that during the consultations conducted in the priority setting workshop in August 2005, it was determined that awareness raising is one of the most critical areas of intervention and therefore should be addressed from day 1. Increased awareness will generate public pressure and strong demand for improved institutional management and legislation.

Table 3.18 Timetable for Action Plan Implementation and Measures of Success

Action	Implementation Year																		
	Short-term					Medium-term					Long-term								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Activity 1: Institutional & Regulatory Strengthening Measures																			
Action 1.1	1,2,3, 4,5	1,2,3, 4,5	1,2,3, 4,5	1,2,3, 4,5	1,2,3, 4,5														
Action 1.2	6,7,8	6,7,8	6,7,8	6,7,8	6,7,8														
Action 1.3	9,10	9,10	9,10	9,10	9,10														
Action 1.4	11	11	11	11	11														
Action 1. 5	12	12	12	12	12														
Action 1.6	13	13	13	13	13	13	13	13	13	13									
Activity 2: Measures to Reduce or Eliminate Releases from International Production and Use																			
Action 2.1	14,15, 16	14,15 16	14,15 16	14,15 16	14,15 16														
Action 2.2	17,18	17,18	17,18	17,18	17,18														
Activity 4: Production, Import and Export, Use, Identification, Labeling, Removal Storage and Disposal of PCBs and Equipment containing PCBs																			
Action 4.1	19,20, 21	19,20 21	19,20 21	19,20 21	19,20 21														
Action 4.2	22,23	22,23	22,23	22,23	22,23	23	23	23	23	23									
Action 4.3	24,25 26,27	24,25 26,27	24,25 26,27	24,25 26,27	24,25 26,27	25,26 27	25,26 27	25,26 27	25,26 27	25,26 27	27	27	27	27	27	27	27	27	27
Activity 7: Measures to reduce releases from unintentional production																			
Action 7.1	28,29, 30,31, 32,33, 34	28,29, 30,31, 32,33, 34	28,29, 30,31, 32,33, 34	28,29, 30,31, 32,33, 34	28,29, 30,31, 32,33, 34	29,30 31,32 33,34	29,30 31,32 33,34	29,30 31,32 33,34	29,30 31,32 33,34	29,30 31,32 33,34									
Action 7.2	35,36	35,36	35,36	35,36	35,36	35	35	35	35	35									
Activity 8: Measures to Reduce Releases from Stockpiles and Wastes																			
Action 8.1	37	37	37	37	37														
Action 8.2	38	38	38	38	38														
Action 8.3	39,40	39,40	39,40	39,40	39,40														
Activity 9: Identification of stockpiles, articles in use and wastes																			
Action 9.1	41	41	41	41	41														
Action 9.2	42,43	42,43	42,43	42,43	42,43														
Action 9.3	44,45	44,45	44,45	44,45	44,45														

Action	Implementation Year																		
	Short-term					Medium-term					Long-term								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Activity 10: Manage stockpiles and appropriate measures for handling & disposal of articles in use																			
Action 10.1	46,47	46,47	46,47	46,47	46,47														
Action 10.2	48,49	48,49	48,49	48,49	48,49														
Activity 11: Identification of contaminated sites and remediation in an environmentally sound manner																			
Action 11.1	50,51	50,51	50,51	50,51	50,51														
Action 11..2	52,53	52,53	52,53	52,53	52,53	52,53	52,53	52,53	52,53	52,53									
Action 11.3	54,55	54,55	54,55	54,55	54,55														
Action 11.4	56,57	56,57	56,57	56,57	56,57														
Action 11.5	58,59	58,59	58,59	58,59	58,59	59	59	59	59	59									
Activity 12: Facilitating or undertaking information exchange and stakeholder involvement																			
Action 12.1	60,61	60,61	60,61	60,61	60,61														
Action 12.2	62	62	62	62	62														
Action 12.3	63	63	63	63	63														
Action 12.4	64	64	64	64	64														
Action 12.5	65	65	65	65	65	65	65	65	65	65									
Action 12.6	66,67	66,67	66,67	66,67	66,67														
Activity 13: Public awareness, information and education																			
Action 13.1	68,69 70,71 72	68,69 70,71 72	68,69 70,71 72	68,69 70,71 72	68,69 70,71 72	68,69 70,71 72	68,69 70,71 72	68,69 70,71 72	68,69 70,71 72	68,69 70,71 72	68,69 70,71 72	68,69 70,71 72	68,69 70,71 72	68,69 70,71 72	68,69 70,71 72	68,69 70,71 72	68,69 70,71 72	68,69 70,71 72	68,69 70,71 72
Action 13.2	73	73	73	73	73														
Activity 14: Effectiveness Evaluation																			
Action 14.1	74,75 76,77 78	74,75 76,77 78	74,75 76,77 78	74,75 76,77 78	74,75 76,77 78	74,75 76,77 78	74,75 76,77 78	74,75 76,77 78	74,75 76,77 78	74,75 76,77 78	74,75 76,77 78	74,75 76,77 78	74,75 76,77 78	74,75 76,77 78	74,75 76,77 78	74,75 76,77 78	74,75 76,77 78	74,75 76,77 78	74,75 76,77 78
Activity 15: Reporting																			
Action 15.1	81,82	81,82	81,82	81,82	81,82	81,82	81,82	81,82	81,82	81,82	81,82	81,82	81,82	81,82	81,82	81,82	81,82	81,82	81,82
Action 15.2	83,84	83,84	83,84	83,84	83,84	83,84	83,84	83,84	83,84	83,84	83,84	83,84	83,84	83,84	83,84	83,84	83,84	83,84	83,84
Action 15.3	85	85	85	85	85														

Action	Implementation Year																		
	Short-term					Medium-term					Long-term								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Activity 16: Research, Development and monitoring																			
Action 16.1	86,87 88,89	86,87 88,89	86,87 88,89	86,87 88,89	86,87 88,89	86,87	86,87	86,87	86,87	86,87									
Action 16.2	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
Action 16.3	91	91	91	91	91	91	91	91	91	91									
Action 16.4	92	92	92	92	92	92	92	92	92	92									
Activity 17: Technical and Financial Assistance																			
Action 17.1	93,94	93,94	93,94	93,94	93,94	93,94	93,94	93,94	93,94	93,94	93,94	93,94	93,94	93,94	93,94	93,94	93,94	93,94	93,94
Action 17.2	95,96	95,96	95,96	95,96	95,96	95,96	95,96	95,96	95,96	95,96	95,96	95,96	95,96	95,96	95,96	95,96	95,96	95,96	95,96

3.6. Resource Requirements

Assessment of the funds is based on cost assessment of individual action plans and strategies. The total cost of the NIP as presented in Table 3 19 amounted to a net present value of about 13.4 USD million when not subject to a discount rate of any sort. When a three percent discount is used however, the net present value of the costs amounts to 11.5 USD million. It is important to note that not all tasks were given estimated costs where cost will have to be determined at some of them and others have no direct cost.

In conclusion, Lebanon does not have sufficient financial resources to implement the foreseen activities. Financial support from international organizations and bodies of the Stockholm Convention is expected once Lebanon has endorsed the NIP.

Table 3.19. Implementation Costs of Activities Covered by the NIP with their Sources of Funding

Activity/Action	Total Budget Required (US$)	Total Budget Required (US$) discounted at 3%
Activity 1: Institutional & Regulatory Strengthening Measures		
Action 1.1	$70,000	$70,000
Action 1.2	$85,000	$73,000
Action 1.3	$45,000	$45,000
Action 1.4	$14,000	$14,000
Action 1.5	No Direct Cost	No Direct Cost
Action 1.6	$10,000	$9,000
Activity 2: Measures to Reduce or Eliminate Releases from Intentional Production		
Action 2.1	$1,840,000	$1,840,000
Action 2.2	$9,600	$9,600
Activity 4: Production, Import and Export, Use, Identification, Labeling, Removal Storage and Disposal of PCBs and Equipment Containing PCBs		
Action 4.1	$153,000	$153,000
Action 4.2	$53,000	$53,000
Action 4.2	$1,506,000	$866,000
Activity 7: Measures to Reduce Releases from Unintentional Releases		
Action 7.1	$911,500	$793,000
Action 7.2	$100,000	$86,000
Activity 8: Measures to Reduce Releases from Stockpiles and Wastes		
Action 8.3	$35,000	$35,000
Activity 9: Identification of Stockpiles, Articles in Use and Wastes		
Action 9.1	$5,000	$5,000
Action 9.2	No Direct Cost	No Direct Cost
Action 9.3	$70,000	$70,000
Activity 10: Manage Stockpiles and Appropriate Measures for Handling and Disposal of Articles in use		
Action 10.1	No Direct Cost	No Direct Cost
Action 10.2	$3,000	$3,000
Activity 11: Identification of Contaminated Sites and Remediation in an Environmentally Sound Manner		
Action 11.1	$120,000	$120,000
Action 11.2	$550,000	$523,000
Action 11.3	$40,000	$40,000
Action 11.4	$4,515,000	$4,515,000
Action 11.5	$120,000	$106,000
Activity 12: Facilitating or Undertaking Information Exchange and Stakeholder Involvement		
Action 12.1	$1,500	$1,500
Action 12.2	$50,000	$50,000
Action 12.3	$7,500	$7,500
Action 12.4	$2,000	$2,000
Action 12.5	$50,000	$43,000
Action 12.6	$1,000	$1,000
Activity 13: Public Awareness, Information and Education		
Action 13.1	$1,448,000	$830,000
Action 13.2	$10,000	$10,000
Activity 14: Effectiveness Evaluation		
Action 14.1	$460,000	$169,000
Activity 15: Reporting		
Action 15.1	$9,000	$9,000
Action 15.2	$5,750	$5,750
Action 15.3	$95,000	$55,000
Activity 16: Research, Development and Monitoring		
Action 16.1	$410,000	$356,000
Action 16.2	$190,000	$110,000
Action 16.3	$5,000	$5,000
Action 16.4	$5,000	$5,000
Activity 17: Technical and Financial Assistance		
Action 17.1	$420,000	$240,000
Action 17.2	$97,000	$97,000

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UNEP Chemicals, Survey of Currently Available Non-Incineration PCB Destruction Technologies, August 2000.

World Business Council for Sustainable Development - Cement Sustainability Initiative, DRAFT Formation and Release of POPs in the Cement Industry, March 2004.

Helpful Websites

CCIA: http://www.ccib.org.lb/profile.html

ALIL: http://www.ali.org.lb

Industrial Syndicates: http://www.industry.gov.lb

Environmental NGOs: http://www.moe.gov.lb

AUB: http://www.aub.edu.lb

LU: http://www.ul.edu.lb

USJ: http://www.usj.edu.lb

UoB: http://www.balamand.edu.lb

BAU: http://www.bau.edu.lb

LAU: http://www.lau.edu.lb

NDU: http://www.ndu.edu.lb

ACTS: http://www.acts-int.com

Centre de Chimie: http://www.fs.usj.edu.lb/cdchimie.htm

Creen: http://www.fi.usj.edu.lb/esib/rech/centre.jsp?code=CREEN

ECL: http://wwwlb.aub.edu.lb/~webcrsl/

IRI: http://www.iri.org.lb/

Lari: http://www.lari.gov.lb/link4.asp

LAU: http://www.lau.edu.lb and http://www.lau.edu.lb/centers-institutes/iwret.html.

Lebanese Atomic Energy Commission: http://www.cnrs.edu.lb/energycommission.html.

Remote Sensing Center: http://www.cnrs.edu.lb/remotesensing.html.

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http://exim.indiamart.com/product-classification

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http://www.ec.gc.ca/pcb/destruction/eng/c42_e.htm

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