The Hashemite Kingdom of Jordan

Ministry of Environment

National Implementation Plan for Stockholm Convention on Persistent Organic Pollutants

Jordan

Amman – June, 2006

GEF

UNEP

وزارة البيئة

MINISTRY OF ENVIRONMENT

His Majesty King Abdullah II Bin Al Hussein

Acknowledgement to Contributors

A large number of Jordanian scientists and experts were involved in the preparation and the production of the National Implementation Plan for Persistent Organic Pollutants)POPs(under a project implemented with UNEP and funded by GEF.

The project was coordinated by:

- Dr. Ziad Abu Kaddourah - Project Coordinator
- Dr. Mohammed Kashashneh- Ministry of Environment
- Eng. Nizar Hadad- Project Assistant

National Coordinating Committee was consisted of:

- Eng. Faris al Junidi, Secretary General, Ministry of Environment
- Dr. Kamal Khdeir , Ministry of Planning and International Cooperation
- Eng. Maysoun Bseso , Ministry of Health
- Eng. Abeer Al-Zuheer, Ministry of Trade and Industry
- Eng. Mahmmoud Alkhtom, Ministry of Agriculture
- Mr. Firas Karadsheh, General Command of Jordanian Armed Forces
- Mr. Muneeb Awaudah, Civil Defense
- Dr. AbdAlkareem Almagrabe, Custom Department
- Eng. Roz Alsmaade, Amman Industrial Chamber
- Mr. Ibrahem Alkhloof, Amman Trade Chamber
- Eng. Wael Suleman, Royal Scientific Society
- Eng. Seren Alshyab, Jordanian Environment Society

Special task groups were commissioned to conduct different inventories related to POPs, these groups consisted of:

- Eng. Izzat Abu Humra
- Dr. Jamal Jaber
- Eng. Siham El-Heih
- Prof. Tawfiq Al-Antary
- Prof. Mahmoud Elawi
- Prof. Elyas Salamah
- Prof. Manar Alfayath
- Eng. Abdelkarim Shalabi
- Dr. Mohammad Al Dabbas
- Ms. Omamah Al Saeedi
- Eng. Rehab Tarawneh
- Eng. Mohammad Katbeh
- Eng. Ahmad Shawki Khasawneh
- Eng. Khalaf Al-Okhlah
- Dr. Mohamad Obaidat
- Eng. Khaldoon Al-Awamleh
- Eng. Faisal Hamed
- Eng. Mohammad Ziedan
- Mr. Marwan Alrakad
- Dr. Radi Al-Tarawneh
- Dr. Mohannad Sahawneh
- Eng. Afaf Bataynah
- Mr. Ashraf Kharabshah
- Dr. Tariq Al-Haliq
- Eng. Shouroq Hamarneh,
- Eng. Bassem Abu-Sukar,

Table of Contents

Table of Contents

List of Tables

List of Figures

ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
APCs	Air Pollution Control System
ASEZA	Aqaba Special Economic Zone Authority
BAT	Best Available Technology
BET	Best Environmental Practices
BHC	Benzene Hexa Chloride
CDM	Clean development Mechanism
CEGCo	Central Electricity Generation Company
D.M	Dray Matter
DDT	1,1,1 –trichloro –2,2 –bis(4-chlorophenyl)ethane
DOS	Department of Statistic
E.F	Emission Factor
EDCo	Electricity Distribution Company
ESI	Environmental Sustainability Index
ESP	Electrostatic Precipitators
EU	European Union
FF	Fabric Fitter
GAM	Grate Amman Municipality
GATS	General Agreement on Trade and Services
GATT	General Agreement on Tariffs and Trade
GCEP	General Cooperation for Environmental Protection
GDCD	General Department for Civil Defense
GDP	Gross Domestic Product
GIS	Geographical Information Center
GTZ	Gesellschaft Fuer Technische Zusammenarbeit
HCB	Hexachloro Benzene
HFO	Heavy Fuel Oil
HIV	Human Immunodeficiency Virus
HTPS	Al-Husain Thermal Power Station
IARC	International Agency for Research on Cancer
IEDCo	Irbid Electricity Distribution Company
IGRs	Insect Growth Regulars
IMF	International Monetary Fund
ITNs	Insecticide Trade Nets
IVC	Integrated Victor Control
IVM	Integrated Victor Management
JEDCo	Jordan Electricity Distribution Company
LPG	Liquefied Petroleum Gas
MDGs	Millennium Development Goals
MOEnv.	Ministry Of Environment
MRL	Minimal Risk Levels (for Hazardous Substances)
NAFTA	North American Free Trade Agreement
NCART	National Center of Agriculture Research and Technology Transfer
NEPCo	National Electricity power Company
NGOs	Non Governmental Organizations
NIP	National Implementation Plan
NIU	National Implementation Unite
PCBs	Poly Chlorinated Biphenyl's
PCDD	Poly Chlorinated Dibenzo Dioxin
PCDF	Poly Chlorinated Dibenzo Furan
PCP	Pentachlorophenol
PERSGA	The Regional Organization for the Conservation of the Environment of Red Sea and Gulf of Aden
PIC	Prior Informed Consent

ABBREVIATIONS

PMC	POPs Monitoring Committee
POPs	Persistent Organic Pollutants
PVC	Polyvinyl Chloride
RSS	Royal Scientific Society
SPS	Sanitary and Phytosanitary Measures
TEQ	Toxicity Equivalent
TRIPS	Agreement on Trade-Related Aspects of Intellectual Property Rights
UNDP	United Nation Development Program
UNEP	United Nation Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nation Industrial Development Organization
USA	United State of America
WHO	World Health Organization
WTO	World Trade Organization

Executive Summary:

Persistent Organic Pollutants(POPs)are halogen containing carcinogenic, toxic and mutagenic substances that can travel long distances through the air and water and accumulate in land and aquatic ecosystems. POPs include the previously widely used chlorinated organic pesticides and industrial chemicals; however, POPs can also be generated in the form of byproducts as a result of combustion and industrial manufacturing processes.

The aim of the Stockholm Convention is to protect human health and the environment from POPs. Currently the Convention lists twelve POPs chemicals. They have similar physical, chemical, and biological characteristics. They possess toxic properties, resist degradation, bioaccumulate and are transported through air, water and migratory species across international boundaries and deposited far from their place of release, where they accumulate in terrestrial and aquatic ecosystems.

Jordan signed Stockholm Convention on POPs on 18th January 2002, and ratified it on 8th November 2004.

With a fund from the Global Environment Facility (GEF) and assistance of the United Nations Environment Programme (UNEP), the Ministry of Environment prepared the first National Implementation Plan (NIP) on POPs for Jordan.

POPs are not intentionally produced in Jordan. Also they are not imported or exported. Periodical assessment and evaluation of POPs situation may indicate the need for specific exemption, in this case Stockholm Convention secretariat will be informed.

Jordan has taken some actions to ban importing, production and use of pesticides listed as POPs since 1980. Several official agencies has already established programs and/or initiated projects to monitor POPs releases to environment and to take actions aiming at minimizing the releases impacts on human health and environment and to shift to other alternatives, particularly, integrated pest management approaches.

The first chapter of this document gives an introduction about the project; objectives and outcomes and also about Stockholm Convention and Persistent Organic Pollutant; properties, sources of these pollutants. And the second chapter gives a country baselines current status in Jordan with regards to POPs.

The national POPs inventories results indicate that:
Jordan has taken unilateral measures by holding the use and handling of POPs pesticides since the early eighties for purposes of controlling agricultural pests, while allowing their use for control of disease vectors till 1995.

The main source of PCBs in Jordan is form of electrical equipment, such as transformers, capacitors and other special machinery. Leakage, evaporation and/or improper disposal of the broken or used equipment, that contain PCBs based oil, might end up in the environment and then move and concentrate into humans through

the food chain. However, this would need a detailed field survey in order to find out contaminated sites and/or equipment.

The survey, which was mainly oriented for electrical transformers that manufactured and installed before the year 1980, was divided geographically into three main regions:

1- Southern region: 10 substations in Aqaba Special Economic Zone Authority (ASEZA) were inspected using special screening test- kit and the final result of inspection was negative (i.e. no indication of presence of PCBs).

2- Middle region: which include Amman, Zarqa and Salt.
There are 5 old transformers in Al-Husian Thermal Power Station (HTPS), in Alhashemya, near Zarqa, contain about 1
In addition 4 transformers were identified in the National Electricity Power Company (NEPCo) that manufactured before 1980. NEPCo has conducted required tests and found that these transformers are free from PCBs.

3- Northern region: which includes Irbid, Mafraq, Jarash and Ajlun. The working team has identified about 21 transfor

PCDD/PCDF release inventory shows the following:

1. D/PCDF release inventory shows the following: Jarash and Ajlun. The working team has identified about 21 transformers that may contain PCBs, within this region, owned and operated by Irbid Electricity Distribution company. Five transformers on operatio.D/PCDF release inventory s

2. D/PCDF release inventory shows the following: Jarash and Ajlun. The working team has iden

3. D/PCDF release inventory shows the following: Jaras

4. D/PCDF release inventory shows the following: Jarash and Ajlun. The working team has identified about 21 transformers that may contain

5. D/PCDF release inventory shows the following: Jarash and Ajlun. The working team has identified about 21 transformers that may contain PCBs, within this region,

6. D/PCDF release inventory shows the following: Jarash and Ajlun. The working team has identified about 21 transformers that may contain PCBs, within this region, owned and operated by Irbid Electricity Distribution company. Five transformers on operatio.

The detected quantities of stockpiles of POPs pesticides and places of their storage are:

Name of pesticide & its concentration	Stock quantity	Place of storage
DDT 100%	13015kg	Ministry of Health/ stores of the Malaria and Bilharzia Division
DDT 75%	9130kg	
Dieldrin	175 liter	Ministry of Agriculture/ Yajouz storehouse
Agrocide	60kg	Ministry of Agriculture/ Mafraq Directorate

The hot spots identified sites are:

1. Marka old solid waste dumping site
2. Greater Amman Municipality (GAM) landfill / Russeifa
3. Aqaba old landfill site
4. Kufur Awan solid waste dumping site/ Irbid
5. Tayba solid waste dumping site/ Irbid.
6. Sorrow solid waste dumping site/ Irbid.
7. Wadi Kattar liquid waste dumping site/ Zarqa
8. Sludge disposed in As- Samra area.
9. Chlorine factory fire accident / Zarqa.

Government of Jordan has been always encouraged non-governmental organizations and private sector organizations to partnering developmental activities. There are a handful numbers of NGOs are working in the field of environment and ecology. The NGOs are providing both information and services in making a safer environment and also contributes in wastes management of the country. The activities of the majority NGOs in Jordan with regard to environment ranges from promote safe environment, preservation of nature and ecology, protection and improvement of environment and obviously raise awareness of the people.

Only compatibilities for analyses of pesticide is present in the country. Dioxins, Furans and PCBs are not being analyzed. The laboratories that analyze pesticides are present mainly at; Ministry of Agriculture, Ministry of Health, Different universities, and RSS.

Based on inventories, the national related stakeholder – during a national workshop- identified the following major priority areas:
1. Detailed inventory of POPs chemicals
2. Establishment of a National POPs unite
3. Inventory of "hot spots"

4. Preventing uncontrolled waste combustion
5. PCB/OCP containing waste management
6. Preparation of new and amendment of existing legislation
7. Monitoring of POPs
8. Providing necessary equipment for and training on POPs monitoring
9. Public awareness and education
10. Evaluation of adverse effects on human health
11. Measures for the reduction of dioxin and furan emission

To implement and to meet the requirements of the action plan elements, estimation of the needed budget has been made. This estimation has come to the total value of about 101 million dollar. This is not only to eliminate the POPs quantities found in the inventory but also to modernize the industry in order to reduce and /or eliminate their non-intentional releases. Details of these estimations can be seen in Annex 7

The following Activities will be given high priorities to be implemented during the coming few years:

1- Capacity building for implementation of the National Implementation Plan for Stockholm Convention on POPs in Jordan.
2- Store, label and repack for POPs pesticides.
3- Use of Best Available Technologies and Best Environmental Practices (BAT/BEP) in municipal solid waste disposal.
4- Medical waste environmentally sound management.
5- Monitoring of chlorinated hydrocarbon pesticides in suspected contaminated locations in Jordan.
6- Proposed comprehensive field survey for electrical equipment.
7- Appraisal of laboratories and capacity building of laboratory staff in the area of POPs analysis.

1 Introduction

Preparation of the National Implementation Plan (NIP)

The Stockholm Convention (SC) on (POPs) was enacted on May 22, 2001. The "SC" binds its parties to the elimination of the production and use of POPs; limited use of selected substances is exempted under stringent conditions. Jordan signed the "SC" on 18/1/2002 and ratified it on 8/11/2004.

In order to enable the developing countries to live up to their obligations towards the implementation of the Convention, the GEF has allocated certain funds for that purpose. GEF designated the UNEP as the exchange agency, within a tripartite framework (GEF, UNEP and the beneficiary country), to put this fund or financial assistant into effect. The proposed National for implementation the "SC on POPs" in Jordan was prepared in the form of UNEP's Project No. "GF/2732-02-4495LRev.01" that is entitled "Enabling Activities for the Development of a National Plan for Implementation of the Stockholm Convention on POPs"

Project Objectives:

Within the overall objective of the Stockholm Convention, which is to protect human health and the environment for POPs; the project will:

- Prepare the ground for implementation of the convention in Jordan;
- Assist Jordan in meeting its reporting and other obligations under the Convention; and ;
- Strengthen Jordan's national capacity to manage POPs and chemicals generally.

The project has the following out comes:

a- Determination of coordinating mechanism ad organization of Process: this involved the establishment of coordinating mechanism, project organization, managerial structure, and approved work plan.
b- Establishment of a POPs inventory and assessment of infrastructure and capacity: this involved the evaluation of the existing national infrastructure and capacities for the realization of the inventory. The outcomes of this phase were development of the initial national POPs inventory.
c- Priority setting and determination of objectives: this outcomes came as a result of the national priorities workshop.
d- Formulation of the NIP and action plans on specific POPs: this included the preparation of specific action plans dealing with POPs, and their evaluation by experts.
e- Endorsement of the NIP by stakeholders: this involved the discussion and concern by all stakeholders (institutions and groups) through the endorsement workshops.

1.1 Stockholm Convention

The objective of the Stockholm Convention is to protect human health and the environment from POPs. The Convention has identified twelve POPs components. It refers to nine chemicals used only as pesticides (Aldrin, Chlordane, Dieldrin, DDT, Endrin, Heptachlor, Hexachlorobenzene, Mirex and Toxaphane), two industrial chemicals: Polychlorinated biphenyls (PCBs) and Hexachlorobenzene (HCB) and four unintentional by-products(PCDD, PCDF, HCB and PCB).
The convention has entered into force on February 17, 2004. The POPs chemicals referred to in the Convention are listed in Annexes A, B, and C of the Convention Appendix 1.
The commitments under the convention directly relating to the chemicals are stated in Article 3 (refers to the manufactured chemicals), Article 5 (refers to by-products) and Article 6 (refers to stockpiles and wastes of all twelve POPs chemicals). In addition, the parties to the convention are obliged to promote and facilitate awareness, public information and education on POPs (Article 10).

1.2 Persistent Organic Pollutants

The term Persistent Organic Pollutants" (POPs) is used to describe a class of toxic chemical substances that can harm human health and environment. POPs are long-lasting toxic substances that are produced and released into the environment by human activity. Some POPs are produced for use as pesticides; some are for use as industrial chemicals; and some are produced as unwanted by-products of certain chemical and/or combustion processes. For more information about POPs mentioned by the Stockholm Convention see Table 1.1

Properties of POPs
POPs are having the following properties.

- Produced and mobilized into the environment as a result of human activity.
- Potential to cause harm to human health and/or to the environment.
- Long life in the environment and not easily or quickly broken down when they are in air, in water, in soil and in sediments. They are persistent in environment.
- Become concentrated in the environment to levels of concern under circumstances where species accumulate POPs by eating smaller POPs contaminated organisms.
- Travel long distances in the environment through air, water or migratory species, and accumulate at locations that are distant from the sources of release.

Sources of POPs:
Among these twelve POPs, some of those used as pesticides and some of those used as industrial chemicals give rise to unintentional by-products of chemical and/or combustion processes. To some extent these categories overlap. For example, PCBs, produced as industrial chemicals in large quantities, may also be generated as

unintentional by-products. Hexachlorobenzene fits into all three categories; pesticides, industrial chemicals and unintentional by-product.

POPs - Pesticides:
There are nine pesticides. The names and specific uses of these pesticides are given in Table 1.1.

POPs - Polychlorinated Biphenyl:
Polychlorinated biphenyls (PCBs) are a class of chlorinated hydrocarbons that have been widely used as industrial chemicals since 1930. There are 209 varieties of PCBs. The most commercial PCB, applications are in the form of mixtures of varieties. Large quantities of PCBs were produced for use as a cooling and dielectric fluids in electric transformers and in large capacitors. These compounds have also been widely used as hydraulic fluids and as heat exchange fluids. PCB, applications have included use as a sealants, as paint additives, as additives in some plastics, as a component of carbonless copy papers, etc. PCBs can also be formed and released as unwanted by-products in some chemical and combustion processes.

PCBs are linked to reproductive failure and suppression of the immune system in various wild animals, severe human intoxication may occur due to accidental consumption of PCB, containing oils. The International Agency for Research on Cancer (IARC) classified PCBs into Group 2B (possibly carcinogenic to human). International production of PCBs was ended in most countries by 1980. The major exception to this was in the former Soviet Union countries and some Central European countries. No country presently reports intentional PCB, production.

POPs - Dioxins and Furans:
Dioxins and Furans are two classes of chlorinated hydrocarbons. They have never been produced commercially or intentionally except in small quantities for laboratory purposes and/or as reference standards. There are 75 different dioxin congeners and 135 different furan congeners. IARC classifies one congener of dioxin as group 1 carcinogen (human carcinogen). All others are carcinogenic to animals.

Table 1.1: POPs Pesticides and Their Uses.

Name of pesticide	Specific uses	Remarks
Aldrin	Used to control soil insects such as termites, corn rootworm, wireworms, rice water weevil, grass hoppers etc. and also to protect wooden structures from termites.	IARC - Group 3 (not classifiable as carcinogenic to humans)
Chlordane	Used as insecticide on agricultural crops including vegetables, small grains, maize, oilseeds, potatoes, sugarcane, sugar beets, fruits, nuts, cotton and jute, and also to control termites	IARC - Group 2B (possibly carcinogenic to human)
Dieldrin	Used for control of soil insects	IARC -Group 3 (not classifiable as to be carcinogenic in human)
Endrin	Used on field crops such as cotton, jute and grains as insecticides. It has also been used as rodenticide to control mice.	IARC -Group 3 (not classifiable as carcinogenic to humans)
Heptachlor	Used against soil insects, cotton insects, grasshoppers, crop pests and against termites.	IARC -Group 2B (possibly carcinogenic to humans)
Mirex	Used against ants and to control leaf cutters, harvester termites, mealy bug etc. It has also been used as a fire retardant in plastics, rubber, paint paper and electrical goods.	IARC -Group 2B (possibly carcinogenic to human)
Toxaphene	Used primarily on cereal grains, fruits, nuts vegetables and cotton. It has also been used to control ticks and mites in livestock,	IARC -Group 2B (possibly carcinogenic to human)
DDT	It is also an insecticide, intensively used for vector control in malaria eradication programme. During the second world war to protect the troops and civilians from the disease. Continues production in many countries for public health purposes.	IARC -Group 2B (possibly carcinogenic to human)
Hexachlorobenzene (HCB)	Used as pesticide. It has been widely used as fungicide for seed treatment. It is also produced as an unintentional by-product in chemical industries and is present as an impurity, and in combustion process too.	IARC -Group 2B (possibly carcinogenic to human)

Dioxins and furans are generated as unwanted by-products in a variety of combustion and chemical process. The major sources include waste incinerators combusting municipal waste, hazardous waste, medical waste, sewage sludge, etc. Incineration of medical wastes in small and poorly controlled incinerators was found to be a major source of dioxin and furans. Kilns firing of cement industries and open burning of wastes may also generate dioxins and furans. Other dioxins and furan sources are: pulp and paper mills using chlorine bleach processes, certain thermal processes in metallurgic industries and chemical production processes.
Dioxins and furans are formed as by-products in a wide range of processes. They are directly dispersed to the environment and may also be present in manufacturing processes such as extracting raw materials or preparing primary products.

Dioxins and furans are persistent in the environment and transfers can occur between media, e.g. from air to water through rain water and by run off from soil to water bodies. This type of transfer may also make an important contribution to human exposure to these organic compounds.

2. Country Baseline (The Hashemite Kingdom of Jordan)

2.1 Country Profile:

2.1.1 Location and Climate Characteristics

The Kingdom lies in the Middle East and the Arab world, extending between the latitudes of 29°11` N and 33°22` N, and the longitudes of 34°59` E and 39°12` E. The area of the country is 92,000 km^2, of which more than three-quarters is desert (Figure 1). There are three main geographic regions:

- Jordan-Valley Region (the Ghor): This has the distinction of including the lowest region on the earth. The Dead Sea surface is ~400 m below normal sea-level. The climate is sub-tropical: hot and dry in summer and warm during winter, with monthly-average temperatures ranging between 16°C in winter and 35°C in summer. However, temperatures up to 50°C have been reached, in the shade, during summer. The Zarqa, Yarmouk and Wadi Shuib valleys and Jordan River are the major sources of water used for irrigation.

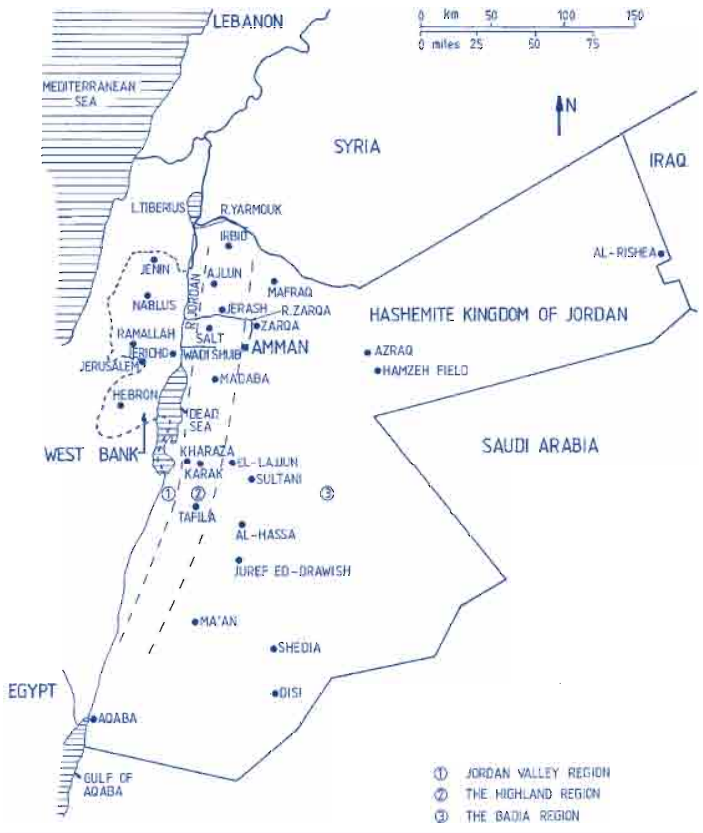

Figure 1 Map of Jordan

- The Highland Region (The mountainous terrain): The elevation of this region varies between 1000 and 1500 m above normal sea-level. During summer, the climate is moderate and dry, whereas the winters are cold and rainy. The monthly-average temperatures are 10°C in winter and 30°C in summer. The region experiences the highest rainfall in the country; its annual average being approximately between 300 and 550 mm with occasional light snowfalls. Most (i.e. 88 %) of the country's population lives in this region; the main cities and towns being located there.

- The Badia Region (The desert): This plateau extends eastwards from the highland region. Its elevation varies between 600 and 900 m above normal sea-level. It comprises most of the country and is linked with the Arabian Desert. The climate prevails there is very hot, dry and dusty in summer and cold and dry in winter, with monthly-average temperatures of 5°C in winter and 37°C in summer. The maximum temperature during the summer months usually exceeds 40°C. The average annual rainfall is less than 50 mm, but the amount may vary significantly from year to year.

2.1.2 Population

Jordan population has grown rapidly during the last four decades. In 1952, it was estimated to be about 0.586 millions. The first comprehensive population census was carried out in 1961, and the latest in 2003-2004. By 2004, the population of Jordan has reached 5.3 millions. The long-term average growth rate, during the period 1961 to 2004 was more than 4 %. This has been due partially to political instability and military conflicts in the region, which fostered several waves of immigration into the country; the last one being in 2003, as a result of the recent Gulf crisis. Approximately 52% of the population at present are students, all with ages of less than 24 years. These are non-wealth-creating, consume significant amounts of resources and require the services of others. If this pattern is allowed to continue, then this ratio could reach as much as 60% by the year 2010.

2.1.2.1 Political and Administrative Structure

The Hashemite kingdom of Jordan is a constitutional monarchy which gained independence in 1946. It is located at the center of a complex and dynamic political, social and economic sub- system between Iraq, Saudi Arabia, Syria, Palestine and Israel. Regional tensions have continuously impinged upon the country decision-making processes.

The Kingdom is an independent sovereign Arab State. Islam is the religion of the State and Arabic is its official language. System of government is parliamentary with a hereditary monarchy. The King is the head of the state, Prime Minister is the Chief of the government run by the cabinet ministers. Legislative power is within the Parliament, which consists of the upper and lower houses. The latter is formed from elected members, where members of the upper house are appointed by the King. The parliament decides on the enactment and amendment of the constitution, passes laws and adopts the state budget. Courts exercises judicial power and the Supreme Court of Jordan is the highest court, which ensures the implementation of laws and the equality of all citizens.

Jordan is divided into twelve administrative divisions, called governerates. On top of each governerate there is a governor. There are 15 main cities and about 600 villages.

2.1.2.2 The Economy

Jordan was primarily an agricultural country, but in recent decades the importance of the agricultural sector has declined both in terms of its contribution to the national income and as the main source of employment. The country has become more dependent on the manufacturing and service sectors, as well as upon tourism and transport activities.

For many years, Jordan enjoyed good relations with the Arab Gulf countries. They provided the kingdom with direct financial-support, expanding export markets, and job opportunities for Jordan's skilled work-force. However, as a result of the sharp drop in oil prices from more than 30 to less than 15 US$ per barrel in 1986, the economy immediately afterwards in the entire region became stagnant. As a result of (i) the associated decline in commercial and industrial activities in the Gulf states, (ii) the Government's central economic policies which concentrated on big infrastructure projects financed by the public sector, (iii) the limited financial-resource base of Jordan together with a large external debt (with a debt/GDP ratio of 160 % in 1989), and (iv) the Gulf crisis of 1990/91 and 2003, the Jordanian economy suffered. The income per capita in 1991, reached its lowest level with a drop of about 37 % compared with the 1982 level in real terms.

In 1989, the Government devised an economic-reform programme in close co-operation with both the IMF and the World Bank. This was intended to reduce the macro-economic imbalance, and restore the nation's financial health. Since then, the Government has implemented several measures, such as: reducing the state's (including those for military purposes) rates of expenditure, decreasing subsidies, and increasing revenues. The most important actions were: (i) the devaluation of the Jordanian dinar to 50% of its previous value; (ii) the adoption of flexible exchange rates for hard currencies; and (iii) decontrolling interest rates in order to encourage private-sector participation in industry and trade. Rescheduling arrangements for the repayment of the national debt were also agreed with the Paris and London Clubs.

The devaluation of the Jordanian Dinar had a major impact on the energy sector, mostly because all of the outstanding national loans were in US dollars at floating interest-rates. The low-income segment of the population was also affected adversely due to the sharp increase in the cost-of-living. Jordan has achieved good social indicators relative to its income level and established a social-security net to deal with poverty. However, in line with the new policy of tightening the control of resources, there is a need to improve the targeting of poverty payments and to expand the involvement of NGOs, in order to ensure that subsidies reach those truly most in need or where they are most desirable for achieving a sustainable economy.

The Gulf crisis, in 1990, damaged the Jordanian economy and led to the complete loss of (i) the Gulf countries' export markets as well as their financial aid, (ii) revenues from transit trades, and (iii) remittances from those working abroad. The population rose rapidly by 10% as a result of such migrant-workers returning, and the

unemployment rate increased to a peak of about 25% in 1991. Despite these adversities, the sharp increase in the Government's received revenue together with the strict control imposed on public expenditure, reduced the national deficit: simultaneously the GDP growth-rate rose and inflation was brought down to 5% in 1991.

In 1992, the Government continued its "adjustment" programme: a new 18-months IMF Stand-By Arrangement was adopted and a second Paris Club debt-rescheduling programme was agreed. The high economic growth-rate witnessed, in 1992, was mainly due to investments by returning migrant-workers.

The corner stone for the adopted economic-reform programme is the need for sustainable growth in the productive sectors. The main objectives are: (i) achieving the long-term development goals of reducing poverty and population growth-rate; (ii) mobilising and securing external finance by encouraging foreign investments; and (iii(protecting the environment. During the period 1992 to 1995, the Government went further in implementing its reform plans. A new general-sales tax was introduced, consumption taxes as well as unit electricity and some petroleum products' prices were increased, water and sewage charges were raised, and subsidies for strategic commodities such as wheat and bread, livestock feed and food items were removed. It is believed that such plans will reduce the national trade-deficit and increase domestic savings as well as help in mobilising domestic resources by improving the investment environment.

The cost-of-living index was relatively stable during the period 1980 to 1988 but increased sharply during the period 1989 to 2004 due to the devaluation of the Jordanian dinar in 1989, and the removal of Government subsidies. It has increased more than two and a half times over the period 1990 to 2000.

Jordan is classified as a lower–middle income country whose economy is constrained by limited arable land, and scarce water, mineral and energy resources. Table 2.1 shows a selection of development indicators for Jordan from the UNDP Human Development Report 2004.

Table 2.1: Selected Development Indicators for Jordan from the UNDP (HDR) 2004.

No.	Item	Indicator
1	Human Development Index	0.750
2	Population (million)	5.3
3	Recent annual population growth rate (%)	2.1
4	Population with sustained access to improved sanitation(%)	99
5	Per capita GDP (US$)	4,220
6	HDI Ranking	90
7	Life expectancy (years)	70.9
8	Infant mortality rate (per 1000)	27.0
9	Health expenditure per capita (US$/annum)	412
10	Gender related development index	0.734
11	Military expenditure (% of GDP)	8.4
12	Public Expenditure on education (% of GDP)	4.6
13	Public Expenditure on health (% of GDP)	4.5
14	Adult literacy rate (%)	90.9
15	Internet users (per 1000)	57.7
16	Cellular subscriber (per 1000)	229
17	Population with less than 2.0 US $/ day (%)	7.4
18	ODA received as % of GDP	5.7

The government has also liberalized the trade regime sufficiently to secure Jordan membership in the WTO (2000), a free trade accord with the US (2000), and an association agreement with the EU (2001). These measures have helped improve economic productivity and have put Jordan on the foreign investment map. On the other hand, The US-led war in Iraq in 2003 dealt an economic blow to Jordan, which was dependent on Iraq for discounted oil (worth $300-$600 million a year). Several Gulf nations have provided temporary aid to compensate for the loss of this oil; when this foreign aid expires, the Jordanian government has pledged to raise retail petroleum product prices and the sales tax base. Jordan's recent economic performance has exceeded expectations, notwithstanding the negative impact of the ongoing Palestinian-Israeli conflict, the aftermath of September 11, 2001, the global war on terrorism and ongoing conflict in Iraq.

Real GDP growth was 3.2% in 2003 led by a strong export performance. It has increased to 3.8% in 2004. GDP compositions by sector is: agriculture (3.7%), Industry (17.9%), Services (78.4%). The budget deficit, after grants is 1.6% of GDP in 2004. Industrial production increased by 12.1% in the year 2004.

- Urbanization:

The population of Jordan is highly urban. In 1952, only 39.6% of Jordan population lived in urban areas. By 2002, the figure had reached 78.7%. This increase is largely a result of internal rural – to- urban migration, combined with the influx of refugees and migrants, mainly from Palestine and Iraq. The urban population within Amman, Irbid and Zarqa governorates now account for 3.378 millions of people, equaling almost two-thirds of the total population of Jordan.

- Unemployment:

The unemployment rate in 2004 was 12.5% decreasing from 14.5% in 2003 and 18.8% in 1993. Percentage of women's participation in the labor force is 11.2% in 2003 (up from 6.7% in 1979, 9% in 1987, and 6.6% in the period 1991-1994). Women account for around 13.8% of total employed persons, and less than 2% in the government, private sector or trade unions.

- Health:

Jordan's total expenditure on health, based on the latest available statistics, is estimated at $325 millions, around 9% of total GDP. $168 millions of this constitute government expenditure on public health. The average per capita spending is around $1,657 per year. Jordan's health care system is regarded as one of the best in the region. Jordan is striving to become a medical hub for the Middle East by offering relatively high-quality care at comparatively inexpensive rates.

- Poverty:

The poverty line was about 392.0 JD during 2002, which included about 733,000 citizens, while the poverty incidence is 14.2% down from 21.3% in 1997.

- Selected International Rankings:

Jordan's ranking improved substantially in the Global Competitiveness Index (from 44/80 In 2002 to 34/102 in 2003), and in the Business Competitive Index (from 53/80 in 2002 to 41/101 in 2003). The main strengths of the Jordanian economy lie in the quality of the educational system(27/102); the availability of scientists and engineers, where Jordan outranks Singapore (12/102); infrastructure quality, (23/102); judicial independence (23/102); efficiency of legal framework (29/102); protection of minority shareholder interests (19/102); and intellectual property protection (22/102).

2.1.3. Millennium Development Goals (MDG) Indicators:

In 2000, a total of 189 political leaders in the world gathered for their countries to collectively sign and endorse the Millennium Development Goals)MDG(. The MDGs consist of 8 time-bound and measurable goals that cover all sustainable development aspects. The 8 goals are further divided into 18 targets and measured by 48 indicators. The MDGs use the 1990 data as baseline for the purpose of attaining the goals by the year 2015.

The MDGs encapsulate people's basic aspirations for a better life. Between 1990 and 2015 countries have agreed to halve extreme poverty and hunger, achieve universal primary education, promote gender equality, reduce under-five mortality by two thirds, cut maternal mortality by three quarters, combat HIV/AIDS, malaria and tuberculosis, ensure environmental sustainability and build a global partnership for development.

The Jordan annual MDG report of 2004 has documented the progress towards meeting the MDGs in Jordan. Table 2.2 illustrates the level of achievement as stated in the Jordan MDGs report.

Table 2.2: Jordan's Progress in Meeting the MDGs (Jordan MDG report 2004)

Goals	Targets	State of Achievement in 2004
1- Eradicate extreme poverty and hunger	1- Halve, between 1990 and 2015 the proportion of people whose income is less than one dollar a day	On Track
	2- Halve, between 1990 and 2015 the proportion of people who suffer from hunger	On Track
2- Achieve universal primary education	3- Ensure that by 2015 children everywhere, boys and girls alike, will be able to complete a full course of primary schooling	On Track
3- Promote gender quality and empowerment of women	4- Eliminate gender disparity in primary and secondary education preferably by 2005 and in all levels of education no later than 2015	On track except for proportion of seats held by women in parliament
4- Eradicate Child mortality	5- Reduce by two-thirds, between 1990 and 2015 the under five mortality rate	On track, except tuberculosis
5- Improve maternal health	6- Reduce by three-quarters, between 1990 and 2015, the maternal mortality ration	On track, except for maternal mortality per 100,000 live births.
6- Combat HIV/ AIDS, malaria and other diseases	7- Have it halted by 2015 and begun to reverse the spread of HIV/ AIDS	Strong
	8- Have it halted by 2015 and begun to reverse the incidence of malaria and other major diseases	Strong
7- Ensure environmental sustainability	9- Integrate the principles of sustainable development into country policies and programs	Potentially
	10- Halve by 2015, the proportion of people without sustainable access to safe drinking water	Achieved
	11- Have achieved by 2020 a significant improvement in the lives of at least 100 million slum dwellers	Potentially

Goals	Targets	State of Achievement in 2004
8- Developing a global partnership for development	Jordan is facing the challenge of Goal 8 by working both on external relations and in internal policies. Government's commitment is strong on the modernization of the economic and legal frameworks and the tax system. Yet, more efforts have to be made in order to achieve more effective roles and functions of all the stakeholders within the development process.	

Progress in Meeting Target 7 on Environmental Sustainability:
The Jordan annual MDG report of 2004 has documented the progress towards environmental sustainability in Jordan by the indicators developed for the MDG monitoring purposes.

Goal 7 of the MDGs is "ensuring environmental sustainability" and it has three specific targets (targets 9-11 of the MDGs).

Cost of Environmental Degradation:
In a recent study (2004) conducted by the World Bank the cost of environmental degradation in Jordan was estimated to be 3.1% of GDP annually with a total of 205 million JDs estimated for five environmental sectors.

The most significant negative impacts on health and quality of life was caused by water pollution at an estimated cost of 0.71 – 1.24 percent of GDP. Diarrhoeal illness and mortality which damage cost is estimated at JD 31 million per year, are caused by a lack of access to safe potable water and sanitation, and inadequate domestic, personal and food hygiene. Most of those impacted are children.

The damage cost of air pollution associated with mortality and morbidity is estimated at around 0.69% of GDP, while the cost of land degradation comes predominantly from rangeland degradation (0.46% of GDP) and soil salinity (0.14% of GDP). The damage cost from inadequate waste collection, associated with reduction in land prices is estimated at 0.11% of GDP. Finally, the coastal degradation in Aqaba is assessed at around 0.09% of GDP.

2.1.4. Jordan in the Environmental Sustainability Index 2005:

The Environmental Sustainability Index (ESI), developed by the World economic Forum and Yale University benchmarks the ability of nations to protect the environment over the next several decades. It does so by integrating 76 data sets – tracking natural resource endowments, past and present pollution levels, environmental management efforts, and the capacity of a society to improve its environmental performance – into 21 indicators of environmental sustainability.

These indicators permit comparison across a range of issues that fall into the following five broad categories:

- Environmental systems
- Reducing environmental stresses
- Reducing human vulnerability to environmental stresses
- Societal and institutional capacity to respond to environmental challenges
- Global stewardship.

In the 2005 ESI ranking, Jordan was ranked 84th in a list of 184 countries, with significant retreat from its position of 53rd in 2002.

2.2 Institutional, Political and Legislative Framework

2.2.1 Environmental / Sustainable Development Policy and General Legislative Framework:

Jordan possesses very limited natural resources: water is scarce; arable land is limited; and energy sources are few, but the population increasing rapidly. This is creating a burden on the limited available natural resources. During the past three decades, the country has experienced crucial changes in its infrastructure, i.e. with respect to the housing, commercial, agriculture and industrial sectors. In the absence of environmental legislation, such developments led to adverse impacts on the local environment.

Historically, one of the main objectives of the development plans has been to increase the quantity and value of Jordanian exports, and to sustain the economic growth, but insufficient attention has been paid to protecting the environment. Increasing industrialization in order to create an economic base, which will contribute to the growth and prosperity of the country and the urban development, has resulted in several environmental problems with respect to water, land and air-pollution. Moreover, the lack of proper planning, the absence of comprehensive environmental regulations, monitoring and management systems. The poor coordination among concerned institutions, have led to increasing pollution problems in Jordan. As a result and in order to combat the deteriorating environmental conditions in the country, the government introduced, in 1995, the Environment Protection Law and the General Corporation for Environmental Protection (GCEP) was created, to achieve better environmental management. Recently, early 2003, the Ministry of Environment was introduced to replace the GCEP.

During the second half of 1990s, the concerned governmental authorities and NGOs became aware of the environmental consequences of increasing dependence on fossil fuels combustion to supply needed energy in different sectors of the economy and insufficiency of existing regulations and standards. Thus, new rules, by-laws and standards, such as clean air act, emissions from stationary and mobile sources, industrial- and waste-water treatment, and hazardous waste, were introduced and enacted. For example, water quality regulations made it compulsory to both new and working firms, including energy facilities, to install a proper wastewater treatment plant, which should meet the specified limits of criteria pollutants.

Most of existing power plants and industrial complexes, in Jordan, were constructed during 1970s and 1980s. At that time, there were no effective environmental regulations. In general, power plants and most of factories are operating without any environmental control, except new industries and modern power stations, such as Aqaba Thermal Power Plant. The latter is properly designed in order to keep ground-level pollutant concentrations within limits of some international codes. This is achieved by constructing stacks with height of about 120 m to keep the site free from pollution. While other power stations and large industrial plants have chimneys with an average height of between 45 and 55 m. Wastewater discharges from all working power stations are considered to be zero emission, since wastewater is collected in adequate evaporation ponds.

Heavy fuel oil (HFO), with high sulphur content of about 4% by weight, is the main fuel used to supply power plants and industrial activities in Jordan. In 2001, HFO consumption was more than 40% of the total national demand, and about 88% of the total electricity generated was produced using HFO, as shown in Fig. 1. Diesel fuel, with average sulphur content of 1% by weight, supplies gas turbines, which are operated only to satisfy electricity demands during peak-load periods and emergencies: its share was less than 0.02% for electricity generated in 2001. High costs prevented the old and new power plants firing fuel oil from being equipped with flue gas desulphurisation systems. But recently the concerned authorities became aware of environmental consequences of fossil fuels, especially HFO, consumption and the inadequacy of local standards. Thus, natural gas will be imported from Egypt to substitute for HFO used in power plants and large industries. The conversion of Aqaba power plant to be dual firing, i.e. HFO to natural gas, is under way and most probably it will be ready next year. But there are still a number of actions and policy issues that should be implemented in the future in order to enhance the efficiency and reduce current rate of pollutant emissions.

To summarise, more sustainable developments could be achieved in Jordan, if the population growth is stabilised in the long run. Moreover, the following points should be taken seriously:

- Harnessing renewable sources when their economics are attractive and increasing efficiency of resource use.
- Adopting more efficient energy-thrift and environmental-protection policies by integrating environmental, social, and economic goals in the development, planning and implementation stages of all state and private projects.
- Implementing economic-energy-pricing methodology in order to enhance energy efficiency in the country through eliminating energy subsidies. Equally important is that the government should make sure that subsidies reach those truly most in need, or where they are most desirable, for achieving a sustainable economy.

Development Of Environmental Regulations:
For actions to preserve the environment the government had until 1995, to rely on laws, which were designed to regulate other sectors, regions, services and activities. There were articles in at least 18 laws and 8 regulations dealing with preservation of environmental resources in Jordan.

Those laws were pertaining to specific sectors: water, agriculture, antiquities, quarries …etc. as well as to regions: Aqaba, Jordan Valley Authority, and also some specific activities: Traffic Law, Crafts and Industries Law, Municipalities Law, etc. Most of these laws date back to the fifties and the sixties when environmental awareness was still limited, and environmental stress less noticeable.

As result, there was duplication and over-lapping between the laws, as well as many gaps, when environmental issues are considered. The National Environment Strategy for Jordan, developed in 1991, pointed out all these legal difficulties and strongly recommended the introduction of a special environmental legislation.

In 1995 a new comprehensive environmental law was enacted by the Government which was intended to regulate various activities in the country in an environmentally safe way and which includes monitoring & compliance provisions. The law specifically provides for the creation of a central authority to manage Jordan's environment and implement the new environmental legislation.This law has been repealed by the Environmental Protection Law 1/2003 in 2003.

Environment Protection Law No. 1 for 2003:

The main law governing environmental management in Jordan is the Environment Protection Law No. 1 for 2003, which has established for the first time the Ministry of Environment (MoEnv.) in Jordan. The law considers the Ministry of Environment to be the competent authority for the protection of environment in the Kingdom, and the official and national authorities shall be bound to implement the regulations and instructions issued under the provisions of this law which gives the Ministry all the juridical powers it requires for implementing the law.

A number of regulations have been adopted since 2003.

Environmental Regulations:

- Regulation of Nature Protection
- Regulation of Environment Protection from Pollution in Emergency Case
- Regulation of Water Protection.
- Regulation of Air Protection.
- Regulation of Natural Reserves and National Parks.
- Regulation of Management, Transport and Handling of Harmful and
- Hazardous Substances.
- Regulation of Solid Wastes Management.
- Regulation of Environment Impact Assessment.
- Regulation of Soil Protection.

The Air Protection regulation number 28 for 2005 was issued to provide the legal powers for the Ministry of Environment in conducting and enforcing air monitoring programmes. The regulation is based on the "Polluter Pays Principle" that commits the polluting facility to pay for any remediation and mitigation measures, whether technical or financial to curb pollution sources.

Economic and Free Trade Regulations and Legislations:

Jordan's negotiations with the WTO did not include any environmental provisions, as the WTO agreements do not contain a specific agreement dealing with the environment. However, environmental implications of Jordan's entry into the WTO are cross-sectoral with various aspects and agreements signed with the WTO, mainly SPS, TRIPS, GATS, GATT and dispute settlement mechanisms.
As for the Jordan-USA Free Trade agreement, the circumstances are different. The Jordan US free trade Agreement has a set of unique features pertaining to environment.

It is only the second free trade agreement signed by the US and has environmental provisions in its body (the first was NAFTA).
The inclusion of environmental provisions and principles in the text of the agreement is consistent with a global trend in integrating trade and environment issues to safeguard the option of sustainable development. It is expected that future trade agreements must have environmental provisions, or will be subjected to skeptical public scrutiny upon negotiation and implementation.

The language in Article 5 of the Agreement was written in a general and flexible way to ensure smooth and effective implementation by both parties and maximizing opportunities presented by the agreement for the Jordanian economy as well.
The four key principles that energize this agreement are as follows:

- Ensuring sustainable development;
- Maintaining high level of environmental protection,
- Not lowering environmental standards to promote trade; and
- Effective enforcement of environmental laws and regulations.

The most important points that can be derived out of the text of Article 5 are the following:

- Domestic environmental standards and regulations should not be lowered or relaxed in order to attract investors or encourage trade. This will require continuous monitoring and effective enforcement of environment laws.

- A party should not fail to effectively enforce its environmental laws through a sustained. The text were defines the incidents that can be challenged as a failure in effective enforcement as "sustained and recurring". Which means that rapid and effective monitoring should be applied to developmental facilities and activities and where remediation action should be taken to prevent individual incidents from turning into a continuous failure.

2.2.2. Roles and Responsibilities of Ministries, Agencies and other Governmental Institutions Involved in POPs Life Cycle

Jordan has more than a single agency that look after all environmental issues. Many ministries and institutions are involved, directly or indirectly, with their respective capacity and duties assigned to them.

However, the main organ of the government with respect to environmental protection and conservation is the Ministry of Environment (MoEnv), which was established in 2003. MoEnv was given the ultimate power of controlling air pollution, protecting habitats and conservation of soil, water and other natural resources and setting environmental standards.
The Ministry of Environment is responsible for the management of hazard substances and waste in the country, formulates the framework of policies and action plans pertinent to chemicals and waste management in corporation with the other related agencies and authorities. The MOEnv is the focal point for the main international agreements related to chemicals and waste management.

Other relevant agencies that will participate in the chemicals and waste management include:

- Ministry of Health regulates the import and handling of chemicals for their impacts on health, thus, enforcing chapter 9 "Chemicals" of Public Health Law No 54/2002. This gives the MOH more mandates in controlling and managing chemicals in a manner that does not pose any harm to human health.
- Ministry of Agriculture is concerned with the use of pesticides, fertilizers and other agricultural chemicals. The Ministry also regulates the manufacturing, import, export and the use of these chemicals at the national level. The MOA, moreover, issues import, export and local production permits for agricultural chemicals.
- Ministry of Finance / Custom Department one of it is responsibility to enforce the national regulations implementation on controlling import and export of chemicals and make. The Custom Department should lay down the ground for a proper infrastructure to facilitate the implementation and enforcement of national legislations.
- Ministry of Interior:
  - The public security Directorate (Police Department): responsible in charge of licensing transport vehicles of chemicals.
  - Civil Defense Directorate: One of its major responsibilities is to cope with chemical accidents and emergencies. Their approval is required prior to construction of a new chemical industry regarding its location, chemical safety, fire prevention and fire fighting.
- Ministry of Industry and Trade responsible for regulating the import and export of trade permits.
- Ministry of Finance has a central role in financial resource allocations for chemicals-related activities;
- Ministry of Foreign Affairs usually coordinate all international aspects of chemicals and waste management,
  Government printing/publications offices are generally concerned with the publication and distribution of laws, regulations and other government documents
- Ministry of Justice or Legal Affairs is generally concerned with the development and enforcement of laws and regulations,
- Ministry of Planning and international cooperation primarily deals with economic planning (and land use/regional development). This ministry can also often deal with the donation or receipt of development assistance, which could include chemicals for agricultural use, technical or financial assistance for the

development of chemical industries, or technical assistance for the management of chemicals;
Ministry of Transport is concerned with the safe transportation of chemicals.

Besides, many Non Governmental Organizations (NGOs) have been engaged in the process of environmental protection. Some are active on environmental issues. Among all NGOs working in Jordan which are exceeding 600 societies, only 9 are concerned with environmental improvement and protection. The most active NGOs in environmental protection are:

- Friends of Environment Society.
- Jordan Environment Society
- Jordan Engineers Association
- Jordan Society for Desertification Control and Badia Development.
- Royal Society for Conservation of Nature.
- Jordan Society for Conservation of Marine Environment.
- The National Society of Environment and Wild Life.
- Fertile Crescent Society.
- Friends of Earth.

2.2.3 Relevant International Commitments and Obligations

The Hashemite Kingdom of Jordan is part to several international agreements concerned with the hazardous chemicals and their management and disposal, and identifying environmentally-safe alternatives. These agreements are as follows:

- Basel Convention on The Control of Transboundary Movements of Hazardous Wastes And Their Disposal

Jordan signed the agreement and it has entered into force in 1992. Subsequently, the Hazardous Chemicals Management and Handling By-law No. 44 for 1999 was issued. And based thereon, a technical committee for the management of harmful and hazardous materials was formed and tasked with, inter alia:

Classification of the harmful, hazardous, prohibited and restricted materials and their wastes, specification of the basis and rules necessary for transport of harmful materials.

- Montreal Protocol on Substances That Deplete The Ozone Layer:

For purposes of full implementation of the agreement and its amendments, Jordan started implementation of the Methyl Bromide Phase-out Project in 1999, with the Ministry of the Environment being the Supervising Agency, the Ministry of Agriculture and the National Center for Agricultural Research & Technology Transfer being the Implementing Agencies, and the United Nations Industrial Development Organization (UNIDO) and the GTZ being the Funding Agencies.

- Rotterdam Convention on Prior Informed Consent (PIC):

Jordan ratified the Convention on 22/7/2002. Consequently, the former Public Corporation for Environment Protection (presently, the Ministry of Environment) was assigned as the Designated National Focal Point for Chemicals, and the Ministry of Health as the Designated National Authority for Pesticides, for purposes of implementing the Convention.

- Stockholm Convention for Persistent Organic Pollutants (POPs):

This agreement was signed in 2001, and Jordan ratified it in November 2004. A national plan was set for implementation of the agreement. The Persistent Organic Pollutants National Plan Project is implemented as a response to the International cooperation concerning the hazards of organic pollutants to human health and the environment.

Following Jordan's accession to the World Trade Organization (WTO), the national legislation has been adjusted and up-dated to coincide with the pertinent international agreements. This process included, among other, the newly issued Agriculture Law No. (44) for 2002; and thereafter, the pesticide registration, handling, import, manufacture and trade directives were developed to suit the requirements of the International Code of Conduct for Handling of Pesticides (directive No, 22/Z/2003).

2.2.4 Description of Existing Legislations and Regulations Addressing POPs

Jordan was one of the first countries to in the region take effective measures to protect human health and environment. Regarding POPs, several legislative tools were introduced to ban and restrict its use and handling.
Annex 1 shows a list of legislations related to persistent organic pollutants, their aim, responsible authorities to implement them and the persistent organic pollutants caused by these legislations, and Annex 2 shows banned and usage redistricted POPs according to PIC Lists

General regulations related to the management of POPs:

1. The temporary law of Environment Protection No. 1 year 2003.
2. The temporary law of Ministry of Health No. 54 year 2002.
3. The temporary law of Ministry of Agriculture No. 44 year 2002.
   - Agricultural fertilizers controlled by the resolution issued in accordance of article 52-57.
   - Compacting agricultural pets controlled by the resolution issued in accordance with article 53-63 of the law of Agriculture.
   - Pesticides regulated by resolutions issued in accordance with articles 70-75 of the law of Agriculture.
   - Animal disease by resolutions issued in accordance with article 168 paragraph (Y) of the law of Agriculture
   - All these resolutions are issued according to the old law (law of Agriculture, year 1973).
4. Medical Wastes Management Instructions No. (1) year 2001.
5. The Management and Handling of Hazardous and Harmful Substance by law No (24) year 2005.
6. Crafts and Industry Law No. 16 year 1953.

7. Export and Import Law No. 21 year 2001.
8. Export and Import Bylaw No. 74 year 1993.
9. Export and Import Instructions No. 1 year 1999.
10. Jordanian Labor Law No. 60 year 2002.
11. Labor Protection Instructions of Environmental Risk Issued in Accordance with Resolution of the article 79 of the work law.
12. Special Resolution in Dangerous, Exhausting or Health Harming Work for Teenagers.
13. Special Resolution to Restricted Works to Hire Women year 2001
14. Civil Defense Law No. 18 year 1999 and the Modified Temporary Law No. 57 year 2002
15. Customs Department By the new customs pricing regulation which eliminated the chemical materials through definite chapters of the law of custom
16. Customs Laboratories Regulation No. 59 year 1969
17. Bylaw of the Ports Institution No. 5 year 1961
18. The Transfer of Hazardous or Explodable Materials Issued According to the Resolution of section 2, paragraph A article 46 of the temporary Traffic law No. 47 year 2001
19. Organizing Law of Electricity No. 49 year 2002
20. Free Zones Law No. 32, year 1984
21. Investment in the Free Zone Bylaw No. 32 year 1984
22. Regulations of the Storage and Investments in the Free Zone No. 32 year 2000
23. Aqaba Special Economic Zone Authority Law No. 32 year 2000
24. Law of Organizations and Development of the Investment Environment to the ASEZE No. 11 year 2000
25. Bylaw of Recording and Licensing Establishments in ASEZE No. 13 year 2000
26. Bylaw of Environment Protection in ASEZA No. 21 year 2000
27. Customs Bylaw in the ASEZA No. 9 year 2000
28. Regulations of the Storage and Handle
29. Hazardous Goods and Ships Regulation No. 51 year 1961
30. Law of Standards and Metrology No. 22 year 2002
31. Temporary Law of Traffic No. 47 year 2001 and No. 23 year 2002
32. Jordan Valley Authority Law No. 19 year 1988, which has been modified by the modified law No. 30 year 2001
33. Air Protection By-law No.28/2005
34. Soil Protection By-law No. 25/2005
35. Environmental Protection from Pollution in Emergencies By-law No. 26/2005
36. Environment Impact Assessment By-law No. 37/2005
37. Management and Handling of Hazardous Waste Regulation of 2003

Although there are various pieces of legislation that are linked or related to chemical materials. This legislation relates chemical material in general and without specifying. In addition these pieces of legislation do not cover all the stages of the handling of chemical materials, according to the persistent organic materials which ban the handling of most of persistent organic materials mentioned according to Stockholm convention.

Lack of the existing legislations could be attributed to many reasons, of which are:

1. Lack of having a unique legislation which cover chemical materials generally the inexistence of a bylaw special to persistent organic material.
2. Shortage of professional staff to conduct tasks given to them which has relation to persistent organic compounds.
3. Variety of parties which do the monitoring without coordination which resulted to disseminate efforts without achieving the purpose of the targeted aim.
4. Not having concerned parties working on monitor and execute legislations even effective.
5. Following the script without the analysis and not giving it the required flexibility.

2.2.5 Key Approaches and Procedures for POPs Chemical and Pesticide Management Including Enforcement and Monitoring Requirement

Undesirable effects for POPs have become increasingly apparent in recent years in Jordan. Pesticides are by nature toxic to one or more forms of life. Chlorinated hydrocarbon pesticides are persistent and biological active chemicals, causing harmful side effects on the long run to man and to the local as well as the global environment.

2.2.5.1 Pesticides:

At present, there are about 300 imported and locally formulated pesticides referring to about 200 pesticides common names in Jordan. These are registered through the registration committee in the ministry of Agriculture. None of these pesticides belong to chlorinated hydrocarbon pesticides. At present, there is no manufacturing, formulation, import and legal use for any chlorinated hydrocarbon pesticides in Jordan.

In pesticides rules and Acts of 2002 and 2003, general rules and instructions are shown. Accordingly, precise regulations have to be addressed and developed in the future on many aspects and uses of pesticides. Many properties and effects of pesticides should be known before farmers use them, several other properties of pesticides are little explored and poorly understood at the present time including their mechanism of action, toxicity to human, toxicity to pests, side effects on non targets, pathways of transportation, metabolism, degradation and contamination of food, soil, water, air, wild life and natural enemies to pests and long term effects on human and environment. Pesticides should pass several tests before being used by the farmers such as chemical, physical, analytical, toxicological, physiological and economic quality tests. The proposed label for a pesticide with all supporting data and waiting period should be clear and precise when submitted for pesticide registration in Jordan. Technical material and different formulations of pesticides should be registered. The pesticide containers are an important element of the product which is the responsibility of the manufacturer. All pesticide products should be packed in suitable, clean and strong enough containers.

The transportation and storage of pesticides must be subject to laws. A complete inventory of all pesticides in the storage area is essential. All pesticide stocks must be examined periodically for leaks, spills, or any sign of deterioration.

The proper handling and disposal of empty pesticide containers is the responsibility of the person, company or other organization that used and emptied the full containers. Improperly empty container may become a serious safety hazard to man, livestock, pets, wildlife, fish and birds. Empty containers may contaminate water, soil, air and food.

Pesticide application equipment may play an important role in the success of pesticide control to the pest. Proper pesticide calibration is another factor for pesticide success to control pests.

Preventing exposure of by standers at all stages of pesticide use is important, in addition to protect pesticide applicators and field workers.

Pesticide residues in food commodities and feed should be regulated and monitored for many years. Pesticide residues in soil, air, water should also be taken into consideration for its significant importance.

Existing regulations for controlling the smuggling of banned pesticides are not sufficient. Some of the above mentioned gaps in the existing law must be addressed ad amended in the future. In addition, environmentally sound disposal of POPs pesticides wastes has to be tackled in the relevant legislation taking into consideration BAT and PEP and induce 'pollute pays concept '.

Priority Set Up:

The following actions should be taken to comply with the Stockholm convention.

1. Define stockpiles of existing banned POPs pesticides and their quantities in various suspected places in Jordan
2. Label and repack of POPs pesticides properly
3. Store and /or dispose of pesticides stockpiles in an environmentally sound manner
4. Trans-boundary movement of POPs pesticides should be clearly and precisely regulated and must comply with international conventions.
5. Train members of custom department and enforce monitor illegal POPs pesticides at points of entry to the country
6. The custom act should contain all POPs pesticides to impose banning their entry to the country
7. Residues of POPs pesticides in commodities should be clarified in the exiting law impose ban on contaminated comities within certain criteria. Residues of POPs pesticides in soil, water and air should have certain maximum residual levels

2.2.5.2. PCBs:

There is no specific legislation controlling handling and disposal of equipment contaminated with PCBs, yet this is covered in by law no. 24/2005, management of hazardous and harmful substances, its transport and handling and regulation on handling of hazardous waste of 2003.

However, a ban on importing and using PCBs and preparations containing more than 0.005% PCBs by weight was imposed by a decree issued by the Ministry of Health in the official gazette No. 4717 dated 16/8/2005.

During the survey is was found that obtaining detailed or sufficient information about the present status of PCBs from electric sector and large industrial companies in Jordan is extremely difficult due to the absence of accurate documentation for used and damaged or broken electric equipment, particularly electric generators prior to 1980.

The authorized workers in the power sub-sector do not test for oil quality before oil change or make-up of electrical transformers. Most workers in operating and maintaining electric equipment and devices containing oils with PCBs are not aware of the hazardous effects of such compounds. During maintenance of these tools, worker sometimes mix different oils which might probably become contaminated with PCBs. Used oils are sometimes sold to some merchants to sell it for different uses. Tenders for purchasing new electric tools do not add a condition concerning these tools to be free of any contamination with PCBs.

A survey conducted in Jordan by the Royal Scientific Society in 1991 aiming to check the presence of PCBs in oils in electrical transformers, revealed no significant concentration of PCBs. The concentrations ranged between 0.11-22.36 ppm which is internationally acceptable.

As mentioned above PCBs residues in Jordan are not well regulated to match the Stockholm Convention which aims to get rid of these pollutants. The present regulations must emphasis on local laws including ban of uses, production, import and export. Implementation of laws should be activated by penalties, to have good documentation of PCBs, making regular tests on oil quality in electric tools, not mixing oils together, and not selling used oil. The existing law should force workers dealing with electric equipment to have sufficient training on PCBs contamination and its hazards to mankind and the environment. Furthermore, the existing laws should be modified to contain items for regulating safe ways of handling, labeling, storage, transport and disposal of PCBs.

Priority Set Up:

The most feasible actions, concerning electrical equipment that contain PCBs and suspected polluted sites, are discussed in detail later on. It is anticipated that the GOJ, represented by the Ministry of Environment, will take necessary actions in accordance with requirements of the Stockholm Convention, but upon availability of needed funds.

2.2.5.3. Unintentional By-products

There are several laws concerning chemicals management and emissions in general, but there are no rules or regulations particularly concerning unintentional by-products, except for regulation no. 1/2001 on the Management of Healthcare Waste, which tackles the issue of dioxin and furan emissions from medical waste incineration process and specifies, based on international criteria, limits for the emissions. There are no laboratories in Jordan specialised in monitoring these unintentional by-products. Some other legislation includes articles to reduce emissions in the context of environment protection. These articles are found, for instance, in the following legislations:

- The Waste Management By-law prevents the open burning of wastes;
- Regulations for Management and Handling the Hazardous Waste specifies that hazardous wastes and their emissions should be controlled;
- The Air Protection By-law controls the emissions from different sources;
- Controls are also found in the regulations for the use and handling of waste oils.

The laws concerning chemicals and emissions are not well enforced up to the present time. However, it is difficult to obtain accurate estimations for unintentional by-product emissions.

Most unintentional by-product emissions come out from the public, governmental sector which makes it easy to enforce the existing legislation and to issue and enforce new legislation. For some reasons, the most convenient solution, and the best available practice in Jordan to dispose house hold waste is land filling instead of burning. Other alternatives, supported by legislation, applying best available technologies and best available practices, can be adopted. Examples of such alternatives are:

- Separation and recycling waste is a good policy to minimize the waste quantities and to make use of such wastes.
- Better management of medical waste, including separate collection, storage, transportation, and treatment.
- Using of unleaded automobile fuel.
- Encouraging the use of natural gas as a source of energy, as well as, methane produced from waste.

Environmental education on the unintentional by-products is needed for public and private workers. Training on monitoring of unintentional by-products is essential in Jordan.

Priority Set Up:

1. Effective enforcement of the legislation concerning unintentional by-products and associated emissions needs new legislation.
2. Improved focus is required to control open burning of solid waste, such as in landfill fires, and authorities need to consider technical alternatives so as to comply with best environmental practices;

3. Manage and incinerate the medical wastes according to the scientific basis and sound technologies.
4. Processes for handling of sludge from wastewater treatment plants needs to be evaluated
5. Statutory authorities should ensure safe storage of the PCBs and adopt safe elimination measures of the PCB stockpiles and wastes;
6. POPs information exchange needs to be extended to include all stakeholders, interested parties and individuals as a means of strengthening the cooperation with the international community with regard to POPs information exchange.
7. There is a need to strengthen the involvement of different sectors in POPs management areas. This involvement should include private, academic and research sectors.
8. Sectoral and public awareness regarding POPs hazards, needs to be reevaluated and POPs handlers need to be trained on safe handling procedures and introduce POPs issues should be addresses through education process.

2.3 Assessment of POPs Issue in Jordan

2.3.1 Assessment with respect to annex A, Part 1 Chemicals (POPs Pesticides)

Introduction

Jordan was one of the first countries in the Middle East to take prompt and appropriate decisions to protect human health and environment against the hazards caused from using chlorinated organic (POP) pesticides, as classified in the Stockholm Agreement (Annex A, Part I, Chemicals: POP pesticides include: Dieldrin, Aldrin, Endrin Heptachlor, Hexachlorobenzene, Toxaphene, Chlordane, Mirex), and Annex B, Part I, Chemicals: DDT). This is due to the fact that POP pesticides tend to accumulate in human and animal fat tissues and are of slow degradation in the various environmental elements.

Jordan, therefore, has taken unilateral measures by holding the use and handling of such pesticides since the early eighties for purposes of controlling agricultural pests, while allowing their use for control of disease vectors till 1995.

2.3.1.1 Historical background

The term "Ministry of Agriculture" was first used in the government establishment records in 1939. The records available at the Ministry of Agriculture, indicated that the pesticides used in Jordan during the period 1952-1957 were agricultural pesticides (fungicides, insecticides and rodent toxins), and mainly were Mercury compounds, phosphorus, as well as chlorinated pesticides. Records indicated also that import of organophophate pesticides has started in 1958. Records of the Ministry of Health indicated that import and use of the DDT pesticide started in 1959 for purpose of controlling disease vectors, particularly the Anopheles mosquitoes which cause Malaria.

The Ministry of Agriculture has actually started performing its role in controlling the import of pesticides at the beginning of 1966, when it adopted classification based on the chemical group. The POPs pesticides represented the largest quantity consumed (I.e. 83,000 kg in 1966).

It should be noted that the majority of the POP pesticides were imported, not manufactured locally, except those designated as veterinary drugs. Local preparation of these has started when the first pesticide factory was established to produce veterinary drugs in 1976.

The Agriculture law was issued in 1973, and Article 65 thereof provided information of the Agricultural Pesticides Committee, which was entrusted with the duty of selecting or specifying the kinds of agricultural pesticides that are permitted for circulation, and specifying their prices, specifications, registration conditions, as well as conditions of their trade. A technical committee, composed of representatives of the various specialized governmental and academic agencies was formed in 1975 for purposes of registration of the pesticides entering the Kingdom, studying their

potential risks and recommending prohibition of their entry if it was proven that they are harmful to human health and/or environment. Pursuant to the Pesticide Registration Committee's resolution in its meeting No. 68 dated 29/10/1980, a decision prohibiting the POP pesticides was taken based upon studies carried out by the United States Agency for Environment Protection.

The Ministry of Health acted strictly and promptly and stopped using the DDT in 1993, and a decision prohibiting it completely was issued in 1995.

The Ministry of Agriculture plays an important role in the field of controlling pesticides. The first laboratory for pesticide residue analysis in agricultural products was established in 1982 with funds provided by the German Technical Cooperation Agency (GTZ). This lab participates in implementing the regional projects for the safe use of pesticides, and contributes to studies conducted on residue analysis of imported, as well as locally-produced, products. In addition, the pesticide analysis laboratory was established in 1986 and carries out quality control tests on pesticides on the basis of the FAO international standards.

2.3.1.2 Assessment of the Pesticides' Impact on Agricultural Pest Control

a. Target POPs pesticides:
Table 2.3 shows the target POP pesticides which were used for control of agricultural pests, date of prohibition, kind of pesticide, mode of action and their trade names.

Table 2.3: Annex A, Part I, Chemicals (POPs):

Common Name	Trade Name	Pesticide Group	Mode of Action	CAS. No	Date of Prohibition	Reason for Prohibition
Aldrin	Aldrex' * 'Octalene' *	Insecticide	Non-systemic insecticide with contact, stomach, and respiratory action.	309-00-2	29/10/1980	According to PIC
Dieldrin	Dieldrin ULV	Insecticide	Contact and ingested insecticide.	60-57-74-9	29/10/1980	According to PIC
Endrin	Endrex' * 'Mendrin' * 'Nendrin' *	Insecticide	Contact insecticide.	72-20-8	29/10/1980	Very toxic & according to PIC
Heptachlor	Drinox	Insecticide	Non-systemic insecticide with contact, stomach, and some respiratory action	76-44-8`	29/10/1980	According to PIC

Common Name	Trade Name	Pesticide Group	Mode of Action	CAS. No	Date of Prohibition	Reason for Prohibition
Hexachloro-benzene		Fungicidal seed treatment	Selective fungicide. Acts by fumigant action on fungal spores.	118-74-1		According to PIC
Toxaphene)camphechlor(	Toxaphin 40 EC, chompechor, strobane-T, Toxakil Magnum- 44 ltox' *(; 'Agronex Hepta' * 'Attac' *	Insecticide	Non-systemic, contact and ingested insecticide with some acaricidal action	8001-35-2	29/10/1980	According to PIC
Chlordane	Compound K	Insecticide	Non-systemic insecticide with contact, stomach, and respiratory action.	57-74-9	29/10/1980	According to PIC
Mirex	Dechlorane' * 'Mirex' *	Insecticide	Ingested insecticide	2385-85-5		Not used in Jordan

b. Imported and Used Quantities of Annex A, Part I, Chemicals (POPs):

Table 2.4: shows the quantities of POP pesticides imported during the period 1966-1985.

It can be concluded that Dieldrin was the greatest in use due to its control of desert locust, during the period 1966-72. It was followed by BHC pesticide which was used for control of pests in stores and food stuff storehouses, as well as for control of household insects during the period 1966-85. Endrin was used from 1967-79 for control of Aphids, rodents, worms, leaf hoppers, and thrips, and Toxaphene was used during the period 1968-76 for control of rodents worms, thrips, aphids and leaf hoppers. Heptachlor, on the other hand, was used for control of cut worms, termite, and beetles on some crops such as barley, broad beans, cauliflowers, citrus, maize and tomatoes, as well as some ornamental plants, during the period 1967-77. It should be noted here that records show that no quantities of Mirex pesticide had been imported or used in Jordan.

Table 2.4: Quantities of POPs pesticides imported during the period 1966-1985.

Year	Common Name	Quantity Kg/year
1966	DIALDRIN	700
	BHC	79500
	DDT	3000
	Total	83200
1967	BHC	30000
	LINDANE	200
	ALDRIN	200
	DIALDRIN	500
	HEPTACHLOR	4000
	ENDRIN	450
	DICOFOL	750
	Total	36100
1968	BHC	30500
	TOXAPHENE	300
	ENDRIN	800
	Total	31600
1969	BHC	48000
	ENDRIN	400
	CHLORDANE	400
	Total	48800
1970	BHC	25000
	ENDRIN	500
	Total	25500
1971	LINDANE	52900
	DDT	400
	DIALDRIN	200
	HEPTACHLOR	1550
	ENDRIN	1300
	CHLORDANE	300
	Total	56650
1972	BHC	28500
	DIALDRIN	500
	ALDRIN	500
	HEPTACHLOR	1000
	DICOFOL	250
	Total	30750
1973	BHC	46000
	CHLORDAN	6000
	DICOFOL	1435
	ENDRIN	3000
	Total	56435

Year	Common Name	Quantity Kg/year
	BHC	10030
1974	TOXAPHENE	5000
	HEPTACHLOR	2000
	DICOFOL	2000
	Total	19030
1975	ENDRIN	1500
	Total	2864
1976	ALDRIN	250
	TOXAPHENE	1875
	BHC	500
	Total	2625
1977	BHC	25000
	HEPTACHLOR	400
	ENDRIN	30
	DICOFOL	880
	Total	26310
1978	Chlorinated Hydrocarbon	4995
	ENDRIN	4940
1979	BHC	1000
	Total	5940
1980	Chlorinated Hydrocarbon	5312
	BHC	35613
1981	LINDANE	72
	Total	35685
1982	BHC	30000
	DICOFOL	500
	Total	30500
1983	BHC	14000
	DICOFOL	2500
	Total	16500
1984	BHC	30000
	DICOFOL	1508
	Total	31508
1985	BHC	30000
	DICOFOL	1500
	Total	31500
	Total	581804

c. Categories of Alternate Pesticides Currently Used and Available in the Jordanian Markets:

There are about one thousand pesticides acting as alternatives for POPs pesticides belonging to the following groups :

1- Pyrethriods,
2- Organophosphates,
3- Carbamates,
4- Dithiocarbamates,
5- Avermectins,
6- Insect growth regulator and neunicotonoieds

Table 2.5 shows the results obtained from data contained in the questionnaires that were completed by farmers. It can be concluded that the farmers are committed to the use of the alternative pesticides that are available in local markets, which are of lower impact and lower persistence, and are permitted by the Ministry of Agriculture for import and use.

Table 2.5: Results Obtained From Data Contained in the Questionnaires That Were Completed By Farmers in 2004

Agriculture Directorate	Area	No. of Questioner's	Occurrence of POPs pesticide	Alternative pesticides
Amman	Qwaysma/Yaduda	3	Not found	Lannate, Decis, Vacomil, Afugan, Rubigan
	Naur	3	Not found	Dimethoate, Canvil, karate, Dursban Cuprocide
	Muwager	3	Not found	Propargate, Ground up, Tachagareen, Vertemic, Dimethoate
	Wadi Seir	3	Not found	Supracide, sun winter oils &
	Al-Jeezah	3	Not found	Lannate, Match, Evasect, Aciphate
Madaba		10	Not found	Dimthoate, Rubigan, Lannate,benomyl, Decis, Cypermethrin
Mafraq	Hayan	1	Not found	Vapcocidin, Canvil, Byfidan Commanador, Cypermethrin
	Khaldiyah	2	Not found	Byfidan, Cypermethrin, Dithane, Cyperkill, Trydimefon
	Al-Badya Assamalya Al-gharbyiah Jaber	1	Not found	Best, Avant, Comodor, Deltamethrin, Byfidan
	Al-badya Ashamaliyah	9	Not found	Dimethoate, Lannate, Byfidan,Hostathion, Trimiltox, Kumolus
	Moghayer Asarhan	2	Not found	Vertemic, Commando, Sandofan, Tachagreen, Vapcothion
	Azzubaydiyah	1	Not found	Confodor, Pygasis, Carbendit, Karate, Cypermethrin
	Annahdhah	1	Not found	Marshal, Dimthoate, Lannate, Vapcomil, Cypermethrin
	Ashwaymah	2	Not found	Confidor, Dimethoate, Fastac, Aliet, Dursban
Agriculture Directorate	Area	No. of Question'res	Result	Alternative pesticides
Ajloun		10	Not found	Lannate, Anvil, Dursban, Rubigan, Trimiltox, Sulphur

Agriculture Directorate	Area	No. of Questioner's	Occurrence of POPs pesticide	Alternative pesticides
Ma'an	Shoubak	10	Not found	Supracide, Neoron, Decis, Cynthiene, Cuprosan, Gusathion
Jordan Valley	Ashuna Al-Janoubiyah	10	Not found	Confodor, Supracide, Zineb, Vertemic, Omite, Ridomil, Stroby, Rovral, Antracol, Match
Al-Aghwar Ashamaliyah		11	Not found	Metasystox, Dimethoate, Benlate, Supracide, Decis
Deir Alla		10	Not found	Cymezal, Spathien, Ridomil, Lannate, Zineb, Alliet

2.3.2 Assessment with Respect to Annex A, Part II Chemicals (PCBs)

Annex A, Part II Chemicals, is concerned with Polychorinated Biphenyls (PCBs). In Jordan, PCBs have never been produced or re-exported. Some of the previously imported special electrical transformers and capacitors, may be contaminated with PCBs. The most common brands of PCBs which were used in transformers, as cooling fluid, are Askarel and Sovtol, in which the used oil is a mixture of tetrachlorobenzen with PCBs content.

The main source of PCBs in Jordan is form of electrical equipment, such as transformers, capacitors and other special machinery. Leakage, evaporation and/or improper disposal of the broken or used equipment, that contain PCBs based oil, might end up in the environment and then move and concentrate into humans through the food chain. However, this would need a detailed field survey in order to find out contaminated sites and/or equipment.

2.3.2.1 Legal Regulations Concerning PCBs

In Jordan, there is no regulation controlling handling of equipment contaminated with PCBs, or disposal of such equipment, and banning of PCBs. However, recently, a ban on importing and using oil containing more than 0.005% PCBs by weight was imposed by a decree issued by the Ministry of Health in the official gazette No. 4717 dated 16/8/2005.

In 1989, Jordan signed and approved the "Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal". In this convention "waste materials and objects containing or contaminated with PCBs (labelled Y10) are classified as waste requiring control", i.e. hazardous waste (Annex I). In compliance with the Basel Convention, hazardous waste can be exported to countries having no ban on the import of hazardous waste and at written approval of the competent institution of the importing country. Moreover, transboundary movement of hazardous waste and of other types of waste must be reduced to the least possible extent, in compliance with environmentally harmless and efficient waste disposal practices, and in the manner that prevents harmful impact of such movement to human health and environment.

2.3.2.2 Past, Current and Future Production And Use Of PCBs Containing Equipment

PCBs and/or PCBs mixtures have never been manufactured in Jordan. Electrical transformers and capacitors imported during 1960s-1980s from different countries may contain PCBs based oils, as dielectrics. However, PCBs compounds are still in use in some closed systems.

As Jordan has signed the Stockholm Convention, future use of equipment containing PCBs will be limited to those in operation at present. It is worth noting that the Ministry of Environment, which is the focal point for implementing this convention, is intended to form a technical team, from all concerned stakeholders, in order to carry

out a field survey and recommend the best way to replace such equipment according to the Stockholm Convention. Moreover, all new transformers and capacitors will be free from PCBs based oils in accordance with the recent decree of the Ministry of Health.

2.3.2.3 Inventory of PCBs Containing Transformers and Capacitors

A working group was formed from relevant institutions to conduct a field survey and prepare a list of transformers which were manufactured and introduced into service before 1980. The team adapted a reasonable approach in order to achieve this objective. The first step was defining the parties and companies that own and operate old electrical transformers before that date, i.e. 1980. Then previous studies were reviewed. Followed by distributing a questionnaire to all concerned entities, such as power stations, transmission and distribution companies as well as large industrial establishments. The questionnaire included detailed information, such as the owner, location, capacity, country of origin and oil content (if known) etc., of potentially PCB containing equipment. Moreover, in certain locations, a field test was carried out for electrical transformers only, using a simple test-kit provided by an international specialized company, i.e. DEXSIL, in order to check whether the employed oil is contaminated or free from PCBs compounds.

The survey focused on electrical transforms only due to time limitation. Circuit breakers and capacitors were not included. In 1991, a study carried out by the Royal Scientific Society (RSS) aimed to analyze and detect the presence of PCBs in large transformers owned and operated by Jordan Electricity Distribution Company (JEDCo.), within the central region, i.e. Amman, Zarqa, Salat and Madaba. The results of about 119 samples of oil showed that there was no sign of PCBs in all the tested samples within concentration given in the Convention, as shown in Annex 4.

The data collected from power stations and electricity entities (i.e. power stations, main high voltage sub-stations and distribution sub-stations) about employed transformers is presented in Annex 5 and Annex 6.

The working team carried out a preliminary survey, with the main aim of establishing a data base for entities and large industrial enterprises that might have some equipment require or dealing with oils based on PCBs. The results of this survey showed that only two entities at present do have transformers containing cooling oils with PCBs. These entities are CEGCo and Irbid Electricity Distribution Company (IEDCo). The survey, which was mainly oriented for electrical transformers that manufactured and installed before the year 1980, was divided geographically into three main regions:

1- Southern region: 10 substations in Aqaba Special Economic Zone Authority (ASEZA) were inspected using special screening test- kit and the final result of inspection was negative
(i.e. no indication of presence of PCBs).

2- Middle region: which include Amman, Zarqa and Salt.
There are 5 old transformers in Al-Husian Thermal Power Station (HTPS), in Alhashemya, near Zarqa, contain about 11,000 kg of cooling oil; with PCBs base, including the standby quantity that kept in stores. The latter is estimated to be around 1500 kg.

Regarding Greater Amman area, a previous study, which was conducted by RSS, in early 1990s was reviewed and its finding and conclusions were included in this study. The most important result is that all transformers within this region owned and operated by Jordan Electricity Distribution Company were free from PCBs.

In addition 4 transformers were identified in the National Electricity Power Company (NEPCo) that manufactured before 1980. NEPCo has conducted required tests and found that these transformers are free from PCBs.

3- Northern region: which includes Irbid, Mafraq, Jarash and Ajlun. The working team has identified about 21 transformers that may contain PCBs, within this region, owned and operated by Irbid Electricity Distribution company, as follows:

- Five transformers on operation, where oil changed after installation.
- Sixteen transformers are not working and kept in main stores of IEDCo.

Twenty samples using special PCBs test-kit were taken and it was found that only 4 samples showed positive signs (i.e. transformers having identification Nos.13901/74001/12401/21701) that may contain oils with PCBs base. But it is worth noting that a comprehensive field study should be conducted as soon as possible in order to check old transformers in IEDCo. and elsewhere. Because there are no official records and designated maintenance staff that can show if IEDCo. add or mix different types of cooling oil, it is estimated that about 1,500 kg of oil containing PCBs might be available in the company. This brings the total estimated PCBs in electrical transformers in Jordan to about 12,500 kg. But there was no information available about the quantity of wastes or how it is stored, if there is any. It is important to note that working electricity entities, in the energy sector in Jordan, do not have facilities for identification of PCB content and more important, is that the content of PCBs did not come into their consideration, yet. Again Jordan does not manufacture either electrical transformers, or dielectric fluids and all are imported from abroad.

Regarding ink and carbonated paper, used by the local printing industry, and other materials and equipment, that considered as a potential for PCBs, are almost totally imported from the international market. Thus, the working team decided that there is no point to spend more time and effort in investigating such issues. However, it is wise that MoEnv would star keeping records about imported materials, and equipment that might contain PCBs when started implementation of the NIP.

PCB Content in Ship Industry
On the sea-side, Jordan's total Gulf coastline is about 26 km; the Port of Aqaba, being the only shipping outlet to the sea, is of crucial importance to the Jordanian economy. The increase in the conveyance activities via Aqaba has made it the busiest port in the

Red Sea basin after Suez in Egypt. The transport sector in Jordan is a single-mode system, relying principally on road transport. There are no water-ways or railways, with the exception of the Aqaba railway, which is used solely for conveying phosphate from mines in the southern part of Jordan to Aqaba. There is no ship breaking industry or even maintenance yards in Aqaba, with the exception of activities related to light boats, mainly used for tourists and fishing. An official letter and special questionnaire for ground and marine supporting equipment and vessels were sent to the Aqaba Ports Corporation and the reply confirmed that no PCBs based oils are used at present. It is difficult to estimate the quantity of PCBs, if there is any, from ship industry in Jordan at this stage. Thus, it is recommended that MoEnv should carry out a field study to address the PCBs problem in Aqaba.

PCBs in Semi-closed and Open Systems

The present inventory does not include the use of PCBs in hydraulic fluids, adhesives, plastics and lubricating oils, etc. Such applications need more attention in the future activities in order to estimate PCBs content in semi-closed and open systems.

Prevention of PCBs Production and Use

PCBs, at present, are legally permitted only in the closed systems. According to the Stockholm Convention all equipment with PCBs must be removed from use by the year 2025 and the following preventative measures should be taken:

1. limitation of import of equipment (mainly transformers and capacitors) containing PCBs based oils.
2. monitoring and control of imported equipment and machinery in order to make sure that all are free from PCBs.
3. introducing new regulations which should include compulsory deadlines for replacement of all equipment with PCBs, and reporting system about damages and leakage from old transformers and other equipment.

Current Stockpiles, PCBs waste and Disposal Sites

Stockpiles of PCBs comprises usable equipment, which contaminated with PCBs, that is not working or taken out of service for major maintenance and the reserves of used and/or fresh fluids stored as stand-by in some of power stations and electricity entities. PCB waste comprises of old transformers and capacitors with PCBs that are not in use and will not be used in the future, waste liquid and solids (i.e. metal and non-metal as well as soil) that are generated due to leaks, and damaged equipment as well as cleaning facilities contaminated with PCBs.

In Jordan there is no identified site for the disposal of PCB waste, yet. Thus, a proper collection and disposal of PCBs waste is needed and should be adapted and enacted soon.

National Capacity for PCBs Monitoring

In Jordan, there is no specialized analytical laboratory to identify and measure POPs and/or PCBs. Currently, there are some activities in the Ministry of Agriculture regarding pesticides and other chemicals that are used in this sector. The working

team discussed this issue with all concerned parties and concluded that the analytical capability of existing laboratories is not sufficient enough to meet the standards set by the UNEP Global POPs Monitoring Network. It is recommended to up-grade and strengthen the Transformers Oil Laboratory in NEPCOP in order to be able to carry out required tests in the future.

Review of Probable PCBs Contaminated Locations

Transformers and capacitors are repaired, overhauled and retro-filled in different central workshops. These workshops may be considered as probable PCB contaminated sites, but a detailed field study is highly recommended to identify the contaminated site and the required remedial measures. However, the most important site is the Al-Husian Thermal Power Station, where about 90% of the total reported PCBs exists. Other locations to be checked in the future include free zones, coastal-line at Aqaba, sites at old transformers that may contain PCBs in Irbid district.

2.3.3 Assessment of Annex B/ Part II Chemicals (DDT):

Jordan has banned the production, import and usage of DDT in year 1995 according to PIC.

Use of DDT Pesticides In Public Health.

Before 1970, Malaria was endemic with epidemic porne pockets (lowlands) in Jordan. Table 2.6 shows the disease occurrence according to statistics available at the Ministry of Health.

Table 2.6: Average Spleenomegaly Cases Due To Malaria Among Patients Who Visited The Clinics In Jordan During The Period 1926- 1949

Year	% of spleenomegaly among school children	positive slides among fever cases attending
1926	25.3	11
1930	6.6	8.4
1935	15	11.3
1940	3.8	1.9
1945	4.2	2.4
1949	2.7	3.8

A Malaria Control Program (MCP) had been setup in Jordan since 1959, with the aim of eradicating the disease from the country. It had succeeded in achieving its objective in 1970. Since then, no local transmission cases were registered, despite the detection and treatment of 150- 250 imported Malaria cases nationals and expatriates annually

and the occurrence of 33 introduced Malaria cases caused by means of an expatriate in Ghour Al-Safi/ Kerak Governorate in 1990.

Reintroduction of Malaria is still threatening the area due to the favorable epidemiological and climatic factors in lowlands (lowest point in the world) and the intense population movement to and from Malaria endemic countries specially the presence of migrant workers working in lowlands in agricultural, industry and tourism.

The actual objectives of the (MCP) is to prevent Malaria reintroduction. The program had depended on the use of DDT during the period 1959- 1970. It was sprayed twice a year indoors in the wetland areas of Jordan, the first in March/ April and the second in September/ October Indoor residual spraying (IRS).

During the period 1970- 1991, the MCP continued as a maintenance phase and depended on indoor residual spraying with DDT. In addition, Temephos, with a concentration of half part per million, was used for control of larvae on water surface by spraying the breeding sites of mosquitoes "Malaria vectors" once a week from March to November.

The last recorded usage of DDT in Jordan was in 1991, before the issuance of a resolution prohibiting its use for Malaria control in the year 1995.

Table 2.7 shows the quantities of DDT and Abate used under the Malaria Control Program during the period 1959-1991, and Figure 2 Shows quantity of DDT used in Malaria Control Program during 1959-1991

Table 2.7: Imported quantities of Annex B, Part I, Chemicals (POPs) and their Alternatives

Year	DDT (kgs)		Abate (500 E) (liter) a.i Temephos 50%	
	Quantities used in Al- Ghour	Total quantities used in Jordan	Quantities used in Al- Ghour	Total quantities used In Jordan
1959	-	26000	-	-
1960	-	30600	-	-
1961	-	28560	-	-
1962	-	25148	-	-
1963	-	11937	-	-
1964	-	35800	-	-
1965	-	7917	-	-
1966	-	50500	-	-
1967	-	46014	-	-
1968	-	28560	-	-
1969	-	28562	-	547
1970	-	17665	-	2050
1971	15519	24110	-	2056
1972	16279	30548	-	2017
1973	16108	29449	-	2140
1974	17183	23093	-	2164
1975	18805	27291	1148	2326
1976	15843	19946	1240	2583
1977	15147	19860	1296	2587
1978	12710	18989	1490	2861
1979	12467	15960	1548	2980
1980	10382	13049	1480	3013
1981	9684	12532	1529	3235
1982	8024	10377	1554	3169
1983	4021	5519	1480	3221
1984	8141	11604	1327	2743
1985	1390	10997	1260	2970
1986	7861	9147	1006	2807
1987	8799	9783	1217	2109
1988	1300	1300	1192	3131
1989	5631	6310	1167	3088
1990	2063	2463	1274	2971
1991	6690	6690	1085	2432
1992	-	-	1239	2748
1993	-	-	1109	2379
Total	214047	646271	24641	64327

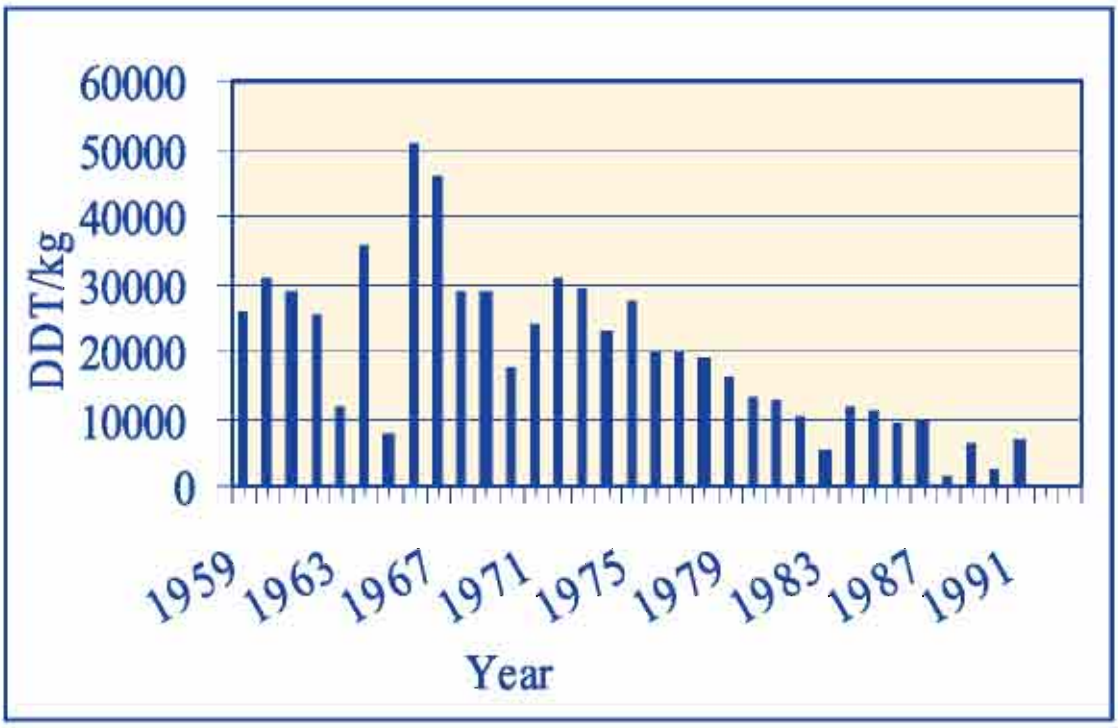

Figure 2 Quantity of DDT used in Malaria Control Program during 1959-1991

The stockpiles of DDT stored at the Ministry of Health/ Malaria Division are:

1- DDT 75%: 9130 kg.
2- DDT 100%: 13015 kg.

The pesticide is kept in a separate store with restricted entry. The pesticide is raised on a wooden platform. One portion is packaged and kept in cardboard boxes, whereas the other portion is packed in plastic sacs which provide inadequate security during transport.

Numerous efforts have been made to donate these quantities, through the World Health Organization, to other countries which still use this pesticide in Malaria Control Programs. But these efforts have failed. Furthermore, the Ministry of Health has contacted the Ministry of Environment for the purposes of disposing the DDT stockpile in an environmentally- sound manner. This issue is of high priority due to the likelihood of harm resulting from exposure to these pesticide quantities in stock.

Therefore, the Government of Jordan is trying to attract the attention of international organizations, in order to obtain their assistance in repackaging, transport, secure storage, final transport and disposal.

Currently, the Malaria Control Program depends on the following:

1- Early detection and treatment of imported cases (nationals and expatriates) with the passive case detection, which is done in all the parts of the kingdom, in contrast with the active case detection, which is done only in the aquatic areas.

2- Control of the "Malaria vector" Anopheles mosquitoes: 13 species recorded in Jordan 3 Proven victors : A.Sergenti, A.superpictus and A.Sacharovi

The mosquitoe control process includes environmental management which includes:

1- Physical treatment by recommending drip irrigation methods, intermittent irrigation, drying marshy lands and stagnated water, drain away the wastewater of agricultural canals and water courses and maintenance of these canals and water courses, use of cemented canals or pipes, and flushing system for dams.

2- Chemical treatment by spraying water surfaces once a week with a larvicide's. Temephos is used in this case, with a concentration of half part per million from March to November.

Control measures against adult mosquitoes are carried out occasionally, by using the Pyrethroids insecticide, esp. Deltamethrin (vacuum spraying) around the wetlands, where the cases of Malaria among expatriates had been detected.

It should be emphasized that the necessary entomological studies must be carried out before spraying.

Also, annual experiments should be carried out on Anopheles (Malaria vector Mosquitoes) susceptibility to the used insecticides: Temephos for the control of mosquito larvae and Deltamethrin for control of adult mosquitoes.

It should be noted that these experiments should be carried out in the laboratories and the field to assure resistance monitoring.

3.3.3.1 Cutaneous Leishmaniasis Control in Jordan

Cutaneous leishmaniasis is endemic in Jordan. It is zoonotic leishmaniasis, the host reservoir of the disease is a rodent (Psamomys obesus) which feeds on chenopods, small grazing shrubs that grow in Al- Ghour and desert areas to the east of the railway, which cover two thirds of Jordan area. This rodent lives in colonies in sandy lands, and the burrow of this animal is recognized by the existence of several openings.

The vector of the disease is a sand fly of the species (Phlebotomus papatasi). It breeds on the organic decaying residues in the humid places especially on the faeces of the host reservoir in rodent burrows. 13 species of phlebotomus were recorded in Jordan but only P.Papatasi was incriminated as vector of ZCL.

DDT was used to control the sand fly in the areas of cutaneous leishmaniasis. But as was mentioned before, use of this compound has been prohibited. Currently, pyrethroid pesticides are being used to control sand flies and mosquitoes.

But, to control the disease of cutaneous leishmaniasis, it is necessary to ameliorate the environmental situation in general by removing the desolated buildings and the heaps of soils and stones and the stables, and to control rodents inside human dwellings. It is also necessary to control the host reservoir and sand flies as well.

2.3.3.2 Other Diseases Transmitted by Biological Vectors:

There are other diseases which are transmitted by different species of mosquitoes such as Anopheles, Culex, and Aiedes. Infections of some of the following non- endemic diseases may occur in Jordan:
"Rift Valley Fever, West Nile Fever, as well as other arthropod- borne viruses and viruses are transmitted by sand flies and other insects".
These infections are due to the development of transportation, travel, bird migration, herd movement and international trade.
If case of spread of these diseases, then it would be necessary to control the different species of mosquitoes and sand flies altogether, by using the recommended insecticides. Table 2.8 shows a summary on disease vector control programs in Jordan.

Table 2.8: Summary on Disease Vector Control Programs in Jordan.

Alternate Pesticide	Control Method	Site	Vector	Disease
1. TEMEPHOS 2. DELTAMETHRIN ULV if epidemics	1. Drip irrigation and Intermittent pumping of irrigation water. 2. Drying of stagnant water collections and wetlands. 3. Chemical control.	Wetlands in Ghour areas, Wadi Araba, JordanValley, Karak ghours and Yarmouk Valley	Anopheles mosquitoes	Malaria
PYRETHRIOD GROUP	1. Removal of abandoned buildings, debris heaps and animal barns. 2. Control of rodents inside housing compounds. 3. Control of the host reservoir (Psamomys Obesus) and sandflies.	Ghour areas and desert regions located to the east of the railway	Sand flies	Cutaneous Leishmania sis Papatasi fever (or sand Fly Fever)
Use of the various general hygiene pesticides, insect growth regulators and the Pyrithroid group pesticides for control of various vectors	Control of the different mosquito and sand fly species, which requires use of various insecticides	Not endemic in Jordan (Travel, international trade, transport of livestocks and birds)	Anopheles, Culex, Aiedes	Rift Valley Fever, West Nile Fever dengue fever. ARBO viruses

Different studies show that the use of the POPs pesticides under consideration has been stopped since 1980 with respect to agricultural fields, since 1993 for veterinary uses and since 1995 for the public health. However, the Malaria Division at the Ministry of Health stopped the use of DDT in 1991 due to availability of alternative pesticides that are safer to the environment and human health.

Table 2.9 shows the detected quantities of stockpiles of POPs pesticides and places of their storage.

Table 2.9: Detected Quantities of POPs Pesticides and Places of Their Storage.

Name of pesticide & its concentration	Stock quantity	Place of storage
DDT 100%	13015kg	Ministry of Health/ stores of the Malaria and Bilharzia Division
DDT 75%	9130kg	
Dieldrin	175 liter	Ministry of Agriculture/ Yajouz storehouse
Agrocide	60kg	Ministry of Agriculture/ Mafraq Directorate

2.3.3.3 Management of POPs

a. Ministry of Health:

1. All the DDT quantity available now (about 22,000kg) is more than 13 years old, and is not designated for use inside Jordan as a resolution has been issued by the government prohibiting use, import, circulation or transport of DDT.

2. The Ministry of Health has endeavored to donate, through the World Health Organization (WHO), the quantities in its possession to countries that still use DDT for control of disease vectors.

3. The Jordanian government intends to dispose the quantities in its possession in safe methods, but it has neither the capabilities nor the technical equipment/supplies required for this work.

Therefore, the government requests assistance from the specialized international agencies as required for proper disposal. The assistance needed includes:

1. Re-pack the whole amount of DDT.
2. Identify a secure store in Jordan
3. Transport whole amount of DDT to secure store
4. Identify the country of disposal,

5. Provide appropriate means of transportation to move the pesticide to the disposal site outside Jordan,
6. Dispose of the pesticide, outside Jordan, using appropriate methods at the sites specially designated for this purpose.

b. Ministry of Agriculture:

1. The 175 liters of Dieldrin and 60kg of (a-HCH) pesticides that are poorly stored in the Ministry storehouses on wooden platforms bases need to be re-packed.

2. The Ministry has repeatedly contacted the concerned agencies for the purpose of environmentally safe disposal of these quantities at the hazardous waste management project, in accordance with Basel Agreement

2.3.3.4 Recommendations

a. General Recommendations:

- Continue retaining the target pesticides that are stored at both ministries (Ministry of Health and Ministry of Agriculture) until such time that they disposed off properly with the assistance of the international institutions in accordance with Basel Agreement.
- Re-pack the whole amount of DDT (22 tons) pesticide which is presently stored at the Ministry of Health.
- Develop a national program for control of vectors of human diseases that are borne by biological vectors, using the Integrated Vector Management (IVM) technique, including provision of support to such programs as the alternative pesticides are costly.
- Establish a National Toxicological Center in Jordan.
- Enhance the efficiency and capabilities of the residue analysis laboratories in order to enable them to carry out impurities and additives analysis tests.
- Provide support to comprehensive programs on awareness on use of the alternate pesticides for all concerned parties at the national level.
- Train the concerned national staff in the field of alternative pesticides' use.
- Establish a regional referral laboratory for pesticide quality control and assurance in the east Mediterranean region, with its headquarters in Jordan.
- Emphasize the need to develop a database at border crossing points and plant quarantine centers, and adoption of the scientific name and CAS NO for chemicals.
- Develop a mechanism for cooperation between scientific research centers and other institutions concerned with pesticides; and develop a database on the available expertise and capabilities in field of persistent organic pollutants.
- Provide support to such programs, especially the Malaria Control Program, in order to eliminate the need to resort to DDT or other insecticides from the POPs list. The cost of Pyrethroids modern pesticides is ten-folds that of DDT, so that it is crucial to substantially increase the Malaria Control Program funds.

- Provide the necessary support to develop a national plan within the national implementation program in order to adopt a control that is evidence- based and supported by operational research.
- Adopt the Integrated Vector Control (IVC) technique, which requires:
- Training of entomologists and entomology technicians of the Malaria Control Program and other vectors,
- Provide the equipment/ supplies necessary for carrying out tests to establish mosquito susceptibility to insecticides,
- Providing a Geographical Information System (GIS) to monitor the disease vectors.
- Secure cooperation by all parties concerned with the environmental management, which includes, inter alia, engineering control by using intermittent pumping of irrigation water, use of drop irrigation, cleaning of wadi beds, canals and water escapes, drying of stagnant collections of water, as well as improving transport and storage of the water used for agricultural purposes in general.
- Apply the biological control technique (s) in certain wetland areas, including fish that feed on the larvae and the bacterial insecticides.
- Use the Insect Growth Regulators (IGRs).
- Study the feasibility and suitability of using the Insecticide Treated Nets (ITNs) in case of spread of diseases.
- Involve the farmers in the mosquito larvae control process during their farming works, through special programs such as the farmers' schools.
- Adopted IVM (Integrated Vector Management).

2.3.3.5 Legislation and Directives Relevant to the Management of Organic Pollutants and Hazardous Substances

1. The Agriculture Temporary law No. (44) of 2002: where Article (21) regulates issues related to distribution of pesticides, and provides for the penalties and fines to be applied in case of circulation of prohibited pesticides.

   Pursuant to this Article, Directive No. (22/Z/2003) on pesticides' registration, manufacture, preparation, import, circulation and trade requirements has been issued.

2. Environment Protection law No. (12) for 1995: the Harmful and Hazardous Substances Management and Circulation Regulation No. (43) for 1999.

2.3.3.6 Regulation on Pesticide Circulation Inside the Hashemite Kingdom of Jordan

Jordan is committed to abide by the international agreements pertaining to handling of pesticides and hazardous chemicals. Therefore, Jordanian legislation and directives on pesticide handling have been developed and up-dated to coincide with the International Code of Conduct on Pesticides. An example is the Agriculture law No. (44) for 2002, with its Article 21 which regulates the following items:

1. It shall be prohibited to produce, prepare, circulate, or trade with pesticides for purposes of using them in the Kingdom without licensing and registering by the Ministry.
2. It shall be prohibited to enter pesticides into the Kingdom for commercial purposes or for private use. It shall not be permitted to clear the same and they must be re-exported during the period defined by the Minister in any of the following cases:
    1) If not registered according to the regulations.
    2) If not registered in the Kingdom and it has been found out that they cannot be used in their country of origin or if any health or environmental reason emerges and prevents admitting or using the same in the country.
    3) If registered and the tests show that they do not comply with the relevant technical rules unless their attributes are superior from the scientific point of view to the attributes set in the approved technical rules.
    4) If the data provided on packages and labels violate the data approved at registration.

3. Samples that the regulations admit for experimentation purposes and scientific research or for registration purposes shall be excluded from provisions of Paragraph (b) of this Article.
4. While observing provisions of Articles (6) and (8) of this Law, the Minister shall issue regulations related to:
    1) Requirements of registering pesticides and procedures related thereto.
    2) Requirements of licensing production of pesticides; their preparation, storage, circulation, trading therewith and announcing them.
    3) Requirements of importing pesticides.
    4) Methods of analyzing, testing and examining pesticides.

5. 1) Pesticides shall be registered through a committee formed by the Minister for this purpose. The Committee will study the registration, applications and advise the Minister in relation therewith to make his decision.

2.3.3.7 Mechanism of Regulating Pesticides' for Import and Control

- Registration of the pesticide, provided that it is not among the pesticides prohibited under PIC list, or listed among the prohibited pesticides in Jordan for health or environmental reasons.
- Preparation of an Import License for the quantity of the pesticide to be imported, whether in the form of raw material for local processing or ready-made and imported for use inside the Kingdom. This license contains, among others, the following data:
    - Name of the importing agent or factory,
    - Name of the active ingredient in the pesticide
    - Trade name of the pesticide
    - Quantity to be imported, and
    - Registration No. of the pesticide in Jordan.

- Preparation of a Hand-over Permit for the pesticide, and attaching an Analysis Certificate from the Country of Origin to the Original Invoice. This Hand-over Permit contains the following data:
  - Name of the importing agent or factory,
  - Trade name of the pesticide
  - Number and date of the invoice
  - Quantity to be imported, and
  - Registration No. of the pesticide in Jordan

- Samples of the imported pesticides are referred by the Plant Quarantine staff of the Ministry of Agriculture to Ministry laboratories for analysis to verify whether the pesticide is within the internationally acceptable technical standards/ specifications.
- In case of non-conformity of the pesticide to the required technical standards/ specifications, the penalties provided for in Article (21) of the Agriculture law (44)/ 2002 are applied.

2.3.4 Assessment of Release From Unintentional Production of Annex C Chemicals (PCDD/PCDF, HCB And PCBs)

2.3.4.1. Dioxin and Furans

Jordan prepared its second dioxin and furan (PCDD/PCDF) releases inventory report in 2005. The first report was issued in the year 2003 in the context of the Asian Project, in which the first draft of the "Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases" issued by UNEP Chemicals of 2001 was used. The base year for the first inventory was 2000. The second inventory report was issued in early 2005 and the base year was 2003. The first edition of the Toolkit of May 2003 was used in the second inventory.

The toolkit is used as a general form for estimating the quantities of dioxin and furan releases emitted from different probable sources. The main contents of the toolkit are:

1. Identification of the main categories of possible emitting sources as well as subcategories.
2. Quantification of these categories' contribution to the emission quantities. This contribution is based on an adversely proportional relationship between the source strength and the extent of control systems development. The relationship is expressed by the emission factors (E.F) developed in several developed countries by carrying out extensive research for different sources.
3. Identification of the environmental media (vectors) receiving such releases. These vectors could be air, water, land, products or residues. The release quantity that the vector receives depends on the strength and the nature of the emitting source. The following screening matrix. Table 2.10 shows the PCDD/PCDF main emission source categories and the possible receiving vectors.
4. Setting mathematical formula to calculate the annual releases from sources as follows:

Source strength (dioxin emissions / year) = (emission factor × activity rate)
Source strength is given in (µg TEQ/a),
Emission factor is given in (µg TEQ/t).
Activity rate is given in (t/a)

Where:
TEQ = Toxicity Equivalent.
µg = Microgram.
t = ton (weight of products, waste, fuel etc)
a = Annum (year).

Table 2.10: Screening Matrix – Main Source Categories

No.	Main Source Categories	Air	Water	Land	Product	Residue
1	Waste Incineration	X	X			
2	Ferrous & Non-Ferrous Metal Production	X		X		
3	Power generation & heating	X		X		X
4	Production of Mineral Product	X				X
5	Transportation	X				
6	Uncontrolled Combustion Processes	X	X	X		X
7	Production of Chemicals & Consumer Goods	X	X	X	X	
8	Miscellaneous	X	X	X	X	X
9	Disposal	X	X	X	X	
10	Identification of Potential Hot-Spots					

X: Significant potential route

The methodology followed in this inventory was based on the UNEP Chemicals Toolkit. The inventory was carried out with the following steps:

A) Forming the task force team representing the national POPs project (NIP), Ministry of Environment, Ministry of Energy and Mineral resources, and specialized academics from some universities.
B) Reviewing the tasks that would be carried out by the team as stated in the project document associated with the Stockholm Convention.
C) Setting the work plan and discussing it with the project coordinator and with other task force team leaders working in this project.
D) Reviewing some similar project related reports to get benefit of other countries' experience.
E) Identification of source categories and subcategories that will be dealt with when being applicable to Jordan.
F) Gathering, revising and categorizing the information and data as per illustrated in the UNEP Chemicals Toolkit and using the emission factors corresponding to the level of control technology existing in the various source activities.
G) Carrying out the final calculations using spread sheets provided in the Excel program which was provide with the Toolkit.

h) Preparing the draft report and discussing its contents with the project coordinator and the task force team leaders.
I) Issuing the final report.

Data and information were collected from different sources and by using different approaches including: questionnaires, field visits, interviews, formal and informal communications, scientific references, previous studies and statistics.

Main Source Category 1: Waste Incineration

Considering the differences between incineration and burning, this category is broken down into two sub categories that are available in Jordan; medical waste incineration and animal carcass destruction. Other sub categories are not usually practiced in the country. Emission factors (E.F) used in calculations are 40,000µg TEQ/t and 3,000µg TEQ/t for air emission, and 200µg TEQ/t and 20µg TEQ/t for residues in medical wastes and 500µg TEQ/t for air emissions in animal carcasses destruction. Table 2.11 shows the estimated PCDD/PCDF releases from waste incineration category.

Table 2.11: Estimated PCDD/PCDF Releases from Waste Incineration

No	Sub – Categories	Annual Release) g TEQ/a(					
		Air	Water	Land	Product	Residue	Total
A	Municipal solid waste incineration	0	0	0	0	0	0
B	Hazardous waste incineration	0	0	0	0	0	0
C	Medical solid waste incineration	8.772	0	0	0	0.052	8.824
D	Light fraction shredder waste incineration	0	0	0	0	0	0
E	Sewage sludge waste incineration	0	0	0	0	0	0
F	Waste wood & waste biomass incineration	0	0	0	0	0	0
G	Animal carcasses burning	0.593	0	0	0	0	0.593
Total		9.365	0	0	0	0.052	9.417

Main Source Category 2: Ferrous and Non-Ferrous Metals Production

Jordan is lacking of metallic resources, especially ferrous metals, therefore, heavy metal industries such as iron ore sintering, copper, zinc or aluminum industries do not exist. Some industries based on metal reformation under high temperatures are available.

Activities such as metal smelting and wire reclamation are practiced in the country. In iron and steel production emission factors used for air emissions are 3µg TEQ/t and 10 µg TEQ/t and for residues it is 15 µg TEQ/t. In foundries, emission factor used for air emission is 10 µg TEQ/t. In aluminum production emission factor used for air emission is 35µg TEQ/t and for residue it is 400µg TEQ/t. In thermal wire reclamation emission factor used for air emission is 5,000 µg TEQ/t. Table 2.12 shows the estimated PCDD/PCDF releases from category of ferrous and non- ferrous metals production.

Table 2.12: Estimated PCDD/PCDF Releases from Ferrous and Non-Ferrous Metal Production

No	Sub - Categories	Annual Release (g TEQ/a)					
		Air	Water	Land	Product	Residue	Total
A	Iron ore sintering	0	0	0	0	0	0
B	Coke production	0	0	0	0	0	0
C	Iron & steel production and foundries	0.501	0	0	0	1.11	1.612
D	Copper production	0	0	0	0	0	0
E	Aluminum production	0.091	0	0	0	1.040	1.130
F	Lead production	0	0	0	0	0	0
G	Zinc production	0	0	0	0	0	0
H	Brass & bronzeProduction	0	0	0	0	0	0
I	Magnesium production	0	0	0	0	0	0
J	Other non-ferrous metal production	0	0	0	0	0	0
K	Shredders	0	0	0	0	0	0
L	Thermal wire reclamation	0.115	0	0	0	0	0.115
Total		0.707	0	0	0	2.150	2.857

Main Source Category 3: Power Generation and Heating

Jordan has witnessed a considerable increase in electricity consumption since the year 2002. The annual growth rate is about 8.2%. About 99.9% of population have access to electricity service. Fossil fuels, mainly heavy fuel oil, are the main source for power generation and heating. The contribution of renewable sources (e.g. Biogas) to electricity generation is very limited. At present, Jordan is utilizing natural gas reserves, only to generate electricity.

Utilization of landfill gas and biogas is still in its early stages. Biogas has recently been generated in Greater Municipality Amman (GAM) landfill site by the Biogas Company. The biogas quantity generated in the year 2002 has been estimated to be 3,182,204 m^3 with an average high heating value of abut 20 MJ/kg.

Most of the Jordanians rely on LPG and kerosene in heating and cooking. A central heating system, where diesel oil is used, is common in wealthy districts in the capital city Amman.

Emission factor used for air emission is 2.5 µg TEQ/TJ for heavy fuel oil and 0.5 µg TEQ/TJ for Diesel fuel and natural gas. While it is 8 µg TEQ/TJ for biogas and 10µg TEQ/TJ for fossil fuel fired stoves. Table 2.13 shows the estimated PCDD/PCDF releases from category of power generation and heating.

Table 2.13: Estimated PCDD/PCDF Releases from Power Generation and Heating/ Cooking

No	Sub – Categories	Annual Release (g TEQ/a)					
		Air	Water	Land	Product	Residue	Total
A	Fossil fuel power plants	0.173	0	0	0	0	0.173
B	Biomass power plants	0	0	0	0	0	0
C	Landfill, biogas combustion	0	0	0	0	0	0
D	Household heating and cooking (biomass)	0	0	0	0	0	0
E	Domestic heating (fossilfuel)	0.177	0	0	0	0	0.177
Total		0.350	0	0	0	0	0.350

Main Source Category 4: Mineral Products
This category deals with manufacturing of cement, lime, bricks, ceramics and asphalt mixing which are all practiced in Jordan.

There are three factories for cement production in the country. With a total capacity of about 4.2 Mt/a. Heavy fuel oil (HFO) is the main fuel being used in the three plants. The production process is classified as dry kilns with APCs, where electrostatic precipitators (ESP) and fabric fitters (FF) are employed as air pollution control devices. The factories are classified as class 3 with emission factor to air of 0.05µg TEQ/t and to residue of 0.003 µg TEQ/t.
Only one factory produces lime, and it has no APC systems. Emission factor used to air is 10 µg TEQ/t.
Heat-treated brick is produced in two plants in the country. Emission factor used to air is 0.2 µg TEQ/t as neither of the factories has APC system. The estimated PCDD/PCDF releases are very small to appear in the related table.
A total of 5 major ceramic factories exist in the country. Emission factor used to air is 0.2 µg TEQ/t
There are about 20 asphalt-mixing plants spread in the country. The plants can be classified into two classes according to availability of APC systems. Class 1 represents 8 plants that have no APC systems, where emission factor used to air is 0.07 µg TEQ/t, and class 2 represents the other 12 plants that have filters as APC system, where emission factor used to air is 0.007 µg TEQ/t and to residue it is 0.06 µg TEQ/t.

Table 2.14 shows the estimated PCDD/PCDF releases from category of mineral products.

Table 2.14: Estimated PCDD/PCDF Releases from Production of Mineral Products

No	Sub – Categories	Annual Release (g TEQ/a)					
		Air	Water	Land	Product	Residue	Total
A	Cement production	0.206	0	0	0	0.012	0.218
B	Lime production	0.060	0	0	0	0	0.060
C	Brick production	0.000	0	0	0	0	0
D	Glass production	0.000	0	0	0	0	0
E	Ceramics production	0.012	0	0	0	0	0.012
F	Asphalt Mixing	0.062	0	0	0	0.064	0.126
Total		0.340	0	0	0	0.076	0.416

Main Source Category 5: Transportation

More than 570,000 registered vehicles run on leaded gasoline and diesel fuel in the country. Unleaded gasoline is used for modern and light class cars. For the sack of calculating the total fuel consumption, the annual traveled distance per (km), vehicle size and category, license and the type of fuel has been considered.

Heavy oil fired engines are not used in the country.

Emission factor used for air emissions to air is 2.2 µg TEQ/t for 4 stroke leaded fuel engine (gasoline), 0.1 µg TEQ/t for unleaded fuel without catalyst (gasoline), 3.5 µg TEQ/t for 2 Stroke leaded fuel engine (gasoline) and 0.1µg TEQ/t for diesel engines.

Table 2.15 shows the estimated PCDD/PCDF releases from road transport in Jordan.

Table 2.15: Estimated PCDD/PCDF Releases from Transportation

No	Sub – Categories	Annual Release (g TEQ/a)					
		Air	Water	Land	Product	Residue	Total
A	4- Stroke engines	2.165	0	0	0	0	2.165
B	2- Stroke engines	0.003	0	0	0	0	0.003
C	Diesel engines	0.185	0	0	0	0	0.185
D	Heavy oil fired engines	0	0	0	0	0	0
Total		**2.353**	**0**	**0**	**0**	**0**	**2.353**

Main Source Category 6: Uncontrolled Combustion Process

This category includes combustion processes whether they are practiced on purpose or not. Sub categories of this category include:

- Biomass burning such as forest, grassland and agricultural residues fires.
- Waste burning either inside or outside landfill sites.
- Accidental fires in house, factories and vehicles.
- Open burning of wood residues.

This category is the major PCDD/PCDF releasing source in Jordan as it includes waste landfill fires.

Biomass originated from plants such as leaves is dumped into waste dumping sites, while animal waste generated from cattle farms and poultry farms is usually used in agricultural lands. Biomass quantities being burned are limited.

Jordan is located in a semi arid region, which is characterized of limited precipitation rate and limited vegetation cover. Forests cover less than 1% of the country area. In order to estimate the contribution of forest fires to PCDD/PCDF releases, the forest area exposed to fires is expressed in weight of the material burned.

Landfill fire is the main single source of PCDD/PCDF releases in the country. The process is illegally practiced and takes place for the following reasons:

- Lack of control and supervision in the landfill sites.
- Improper and slow landfill performance.
- Existence of scavengers who delay the landfill operations by collecting the reusable and recyclable materials in the fill land sites.
- On purpose burning to reduce waste volume in case that the site area is limited.
- Landfill fires can be originated from self-combustion or by waste residues burned outside the site and transported to landfill sites before being completely extinguished.

Accidental fires in houses and factories are usually dealt with by extinguishing facilities belonging to General Department for Civil Defense)GDCD(. The total registered fire accidents in houses, factories, and stores were 2,306 in the year 2003. GDCD records show that the total number of accidental fires in vehicles was 731 accidents in 2003.

Emission factors used in this category varies according to the source sub-category with highest value of 1,000µg TEQ/t released to air from landfill fires.
Table 2.16 shows the estimated PCDD/PCDF releases from category of uncontrolled combustion processes.

Table 2.16: Estimated PCDD/PCDF Releases from Uncontrolled Combustion Processes

No	Sub – Categories	Annual Release (g TEQ/a)					
		Air	Water	Land	Product	Residue	Total
a	Biomass burning	0.182	0	0.074	0	0	0.256
b	Waste burning and accidental fires	51.022	0		0	1.880	52.902
Total		51.204	0	0.074	0	1.880	53.158

Main Source Category 7: Production and Use of Chemicals and Consumer Goods

Jordan does not produce paper from raw material such as raw pulp. The country imports its needs of paper from the international market. The only significant activity practiced is paper recycling. This activity is practiced by three factories producing card board and cartons from used paper collected by individuals and/or collecting centers. Emission factor of 10 µg TEQ/t is used for PCDD/PCDF releases to residues. Most of chemical production in Jordan relies on the intermediate chemical industries. The number of industries releasing PCDD/PCDF is limited. An example of such industries is plastic factories, which are shaping and reforming the imported PVC granules in order to produce various plastic products. EDC, PCP and PCB production does not exist in Jordan. Emission factor of 0.1µg TEQ/t is used for PCDD/PCDF releases the product.

Textile production in Jordan is based on using imported cotton, wool and polyester threads. In calculating the PCDD/PCDF releases from textile industry, the lower limit emission factor of 0.1 µg TEQ/t is used for PCDD/PCDF releases to product, in the five existing factories since production of textile raw materials does not exist in the country. The estimated PCDD/PCDF releases is very small to appear in the related table.

Leather is produced in Jordan by one factory only. Different types of leather are produced there, and the lower limit emission factor of 10 µg TEQ/t is used for PCDD/PCDF releases to product

Table 2.17 shows the estimated PCDD/PCDF releases from category of Production of Chemicals & Consumer Goods

Table 2.17: Estimated PCDD/PCDF Releases from Production of Chemicals and Consumer Goods

No	Sub – Categories	Annual Release (g TEQ/a)					
		Air	Water	Land	Product	Residue	Total
A	Pulp & paper production	0	0	0	0.325	0	0.325
B	Chemical industry	0	0.001	0	0.004	0.004	0.008
C	Petroleum industry	0	0	0	0	0	0
D	Textile production	0	0	0	0	0	0
E	Leather refining	0	0	0	00.016	0	0.016
Total		0	0.001	0	0.345	0.004	0.350

Main Source Category 8: Miscellaneous

Most activities under this category such as drying of biomass, crematoria, and smoke houses are not applicable to Jordan. Only dry cleaning and tobacco smoking are applicable.

Dry cleaning process includes cleaning textiles with solvents such as perchloroethylene, petrol fluorocarbons. The used solvent is distilled for recovery and reuse; therefore, PCDD/PCDF is concentrated in the distillation residues. The solvent recovery portion can reach more than 90%. According to Department of Statistics (DOS), the total quantity of dry cleaning solvents imported in the year 2003 is 192.39 tons. Emission factor of 3,000 µg TEQ/t is used for PCDD/PCDF releases to residues from heavy textiles and 50 µg TEQ/t is used in normal textiles. In tobacco smoking, the emission factors used are 0.3 and 0.1 pg TEQ/item for cigars and cigarettes, respectively.

Table 2.18 shows the estimated PCDD/PCDF releases from category of Miscellaneous

Table 2.18: Estimated PCDD/PCDF Releases from the Category of Miscellaneous

No	Sub - Categories	Annual Release (g TEQ/a)					
		Air	Water	Land	Product	Residue	Total
A	Drying of biomass	0	0	0	0	0	0
B	Crematoria	0	0	0	0	0	0
C	Smoke houses	0	0	0	0	0	0
D	Dry cleaning	0	0	0	0	0.044	0.044
E	Tobacco smoking	0.002	0	0	0	0	0.002
Total		0.002	0	0	0	0.044	0.046

Main Source Category 9: Landfill and Waste Dumps

Most of waste landfill sites are located in areas with limited precipitation rates and with high temperatures and high evaporation rates. Therefore, quantities of leachate produced are not large. With the consideration of very small emission factor (30 ng TEQ/m^3)the releases of PCDD/PCDF from this source can be neglected.

Public sewage system serves about 70% of the population in Jordan. Different types of wastewater treatment are applied in the treatment plants existing in the country. The rest of wastewater is either collected in septic tanks or in cesspits.

The PCDD/PCDF releases from wastewater depend on the wastewater quantities, while the releases in sludge depend on the sludge dry matter (D.M). The estimated dry matter ratio is 150 kg/1000 m^3 of wastewater.

Not all pumped wastewater from septic tanks and cesspits is received by or treated in treatment plants. The unaccepted wastewater is transported and dumped in open pools located within solid waste landfill areas. There are eleven authorized sites receiving the pumped wastewater from septic tanks ad cesspits of houses, commercial and industrial areas that are not served by the public sewer system.

Compost production is not common in Jordan. Some experiments were carried out to produce compost from domestic solid waste. The quantities of compost produced are not a considerable source of PCDD/PCDF releases and can be neglected.

Waste oil refers to the used oil generated in kitchens, the mineral oil used in vehicles and other machines and the oil used in electrical transformers (PCBs). UNEP Chemicals Toolkit does not mention an emission factor to calculate the PCDD/PCDF releases from this source.

Different emission factors were used in calculating the PCDD/PCDF releases in this category depending on classes of wastewater. They ranges between 0.5-5 pg TEQ/l in water and 100-1,000µg TEQ/t in product.

This category is the second large source in PCDD/PCDF releases.

Table 2.19 shows the estimated PCDD/PCDF releases from category of Disposal/ Landfill

Table 2.19 Estimated PCDD/PCDF Releases from Disposal/ Landfill

No	Sub – Categories	Annual Release (g TEQ/a)					
		Air	Water	Land	Product	Residue	Total
A	Landfills & waste dumps	0	0	0	0	0	0
B	Sewage/sewage treatment	0	0.390	0	0	12.253	12.643
C	Open water dumping	0	0.029	0	0	0	0.029
D	Composting	0	0	0	0	0	0
E	Waste oil treatment (non-Thermal)	0	0	0	0	0	0
Total		0	0.419	0	0	12.253	12.672

Main Source Category 10: Hot Spots

This category includes the sites that have probably been contaminated with PCDD/PCDF as a result of activities that have been practiced in these sites. Other sites considered as hot spots are those in which some accidents took place. This category does not have numerical estimations of PCDD/PCDF releases. Such estimation requires a detailed and historical study for each site.

Waste dumping was being carried out in the past without any control. By the progress achieved in all sectors of the economy including services, the situation of waste disposal has been improved. Many old dumping sites were closed without taking measures to mitigate the environmental impacts of such sites. The following sites are examples of hot spots:

Marka old solid waste dumping site.
Greater Amman Municipality (GAM) landfill / Russeifa.
Aqaba old landfill site.
Kufur Awan solid waste dumping site/ Irbid.
Tayba solid waste dumping site/ Irbid.
Sorrow solid waste dumping site/ Irbid.
Wadi Kattar liquid waste dumping site/ Zarqa.
Sludge disposed in As- Samra area.
Chlorine factory fire accident / Zarqa.

Table 2.20: Summary of the Results of PCDD/PCDF Releases

Cat.	Source Categories	Annual Releases (g TEQ/a)					Total	%
		Air	Water	Land	Products	Residue		
1	Waste Incineration	9.365	0.000	0.000	0.000	0.1	9.417	11.5
2	Ferrous and Non-Ferrous Metal Production	0.707	0.000	0.000	0.000	2.2	2.857	3.5
3	Power Generation and Heating	0.350	0.000	0.000	0.000	0.0	0.350	0.43
4	Production of Mineral Products	0.341	0.000	0.000	0.000	0.1	0.417	0.51
5	Transportation	2.353	0.000	0.000	0.000	0.0	2.353	2.88
6	Uncontrolled Combustion Processes	51.204	0.000	0.074	0.000	1.9	53.140	65.1
7	Production of Chemicals and Consumer Goods	0.000	0.001	0.000	0.345	0.0	0.350	0.43
8	Miscellaneous	0.002	0.000	0.000	0.000	0.0	0.046	0.06
9	Disposal/ Land filling	0.000	0.419	0.000	0.000	12.3	12.672	15.5
10	Identification of Potential Hot-Spots							
1-9	**Total**	**64.32**	**0.42**	**0.07**	**0.34**	**16.44**	**81.60**	**100**
	%	**78.84**	**0.51**	**0.09**	**0.42**	**20.15**	**100**	

2.3.4.2. PCBs and HCB

Polychlorinated Biphenyls (PCBs)

The task on PCBs containing equipment includes a review of previous related studies and finding out equipment containing such materials and approximate quantity.

The working team of experts and Ministry of Environment (MOEnv) staff had carried a preliminary survey, mainly for electrical transformers that manufactured and installed before the year 1980. The current status was mentioned earlier.

Regarding ink and carbonated paper, used by the local printing industry, and other materials and equipment, that considered as a potential for PCBs, are almost totally imported from the international market. Thus, the working team decided that there is no point to spend more time and effort in investigating such issues. However, it is wise that MOEnv. would keep records about imported materials, and equipment that might contain PCBs.

The details of the study is presented in the final report of PCBs Inventory issued by Ministry of Environment, 2005.

Hexachlorobenzene (HCB)

HCB is not manufactured in Jordan. Moreover it is banned as it is listed in PIC.

Conclusions:

PCDD/PCDF release inventory shows the following:

- The major source category of PCDD/PCDF releases is the Uncontrolled Combustion Processes Category. It is responsible for more than 65% of total release. Category of Disposal/Land filling ranked the second and the Waste Incineration ranked the third of 15.5 % and 11.5 % respectively.
- The major receiving vector is air with about 79 % and followed by residues of more than 20 %.
- There is still more work to be done on hot spots, PCBs.
- The sources responsible of larger PCDD/PCDF releases, such as uncontrolled waste burning and wastewater treatment, belong to public sector.
- The absence of clear waste management policy decreases the application of the waste minimization related activities such as waste segregation and recycling centers.
- Lack of sophisticated medical waste incinerators. Most of incinerators have no APC systems. Medical waste management is weak, either in waste separation, collection, transportation or disposal. Some medical waste is dumped with domestic waste or open burned.

Recommendations:

Recommendations have been made in different fields: legislation, awareness, studies and researches and projects, the recommendation is as follows:

1. Enforce the available legislations, will result in mitigating the negative impacts of some practices like open burning and consequently, will minimize the PCDD/PCDF releases.

2. Issue the PCDD/PCDF related legislations and setting the proper mechanisms to enforce them.

3. Introduce of PCDD/PCDF allowable upper limits within the current Air Quality Standards and other related standards and emission criteria.

4. Enforce and enhance implementation of healthcare waste management regulation and expand inspection coverage to include all healthcare establishments.

5. Focus on the programs prepared for the employees who practice activities known as major contributors to PCDD/PCDF releases. Waste management employees should receive proper awareness and training.

6. Link the releases with the public health issues in all awareness programs.

7. Set a long-term awareness plan to include POPs subjects in the programs of different educational stages.

8. Form an expert committee to identify the country needs of laboratories and related technical facilities. These facilities should be procured in earlier stages of the NIP project in the context of Stockholm Convention on POPs.

9. Build the capacity of the local specialists in PCDD/PCDF subjects through appropriate training programs. Such programs can be implemented in coordination with donors and Stockholm Convention secretariat.

10. Encourage postgraduate students to do their researches in different subjects related to PCDD/PCDF releases.

11. Review and consider the previous PCDD/PCDF initiatives and projects when preparing future POPs related proposals. This will result in avoiding the duplication or overlapping in work and decrease the cost of project implementation.

12. Develop the landfill sites and improve disposal operations by adopting sanitary land filling of waste.

13. Construct central healthcare waste incinerators, where feasible, equipped with flue gas cleaning systems. It is also recommended to investigate the feasibility of alternative treatment and disposal technologies.

14. Secure the needed financial and technical support for hazardous waste management project in Suwaqa.

15. Enhance and support renewable energy projects, rationalizing the energy use and encouraging the production and the use of clean fuel.

2.3.5 Information on The State of Knowledge on Stockpiles, Contaminated Sites, and Wastes: Identification, Probable Amounts, Relevant Regulations, Guidance, Remediation Measures, and Data on Releases From Sites.

Sites considered as probable sources of Dioxin and Furan releases are the hot spots. However, no attempts have been made to investigate or to evaluate the contribution of such sites in the releases. Lack of experience and technical instruments is one constrain of performing such work. The identified sites are:

Marka old solid waste dumping site
Greater Amman Municipality (GAM) landfill / Russeifa
Aqaba old landfill site
Kufur Awan solid waste dumping site/ Irbid
Tayba solid waste dumping site/ Irbid.
Sorrow solid waste dumping site/ Irbid.
Wadi Kattar liquid waste dumping site/ Zarqa
Sludge disposed in As- Samra area.
Chlorine factory fire accident / Zarqa.

2.3.6. Summary of Future Production , Use Releases of POPs Requirement For Exemption

POPs are not produced In Jordan. Also it is not imported or exported. Periodical assessment and evaluation of the POPs situation may indicate the need for specific exemption, in such case the Convention secretariat will be informed

2.3.7 Existing Programs for Monitoring POPs Releases and Environmental And Human Health Impacts, Including Findings

Jordan took actions to ban the import, production and use of pesticides listed as POPs since 1980. Several official agencies has already established programs or projects for monitoring POPs releases in environment to take action to minimize their impacts on human health and environment and to shift to other alternatives particularly integrated pest management approaches. The existing programs related to POPs monitoring in Jordan are listed below with summarized findings.

2.3.7.1 Pesticides:

1. National Monitoring of Pesticide Residues in Jordan Environment

This project is proposed, supervised and supported financially by the Ministry of Environment. The various elements of the project has been carried out by several governmental agencies according to their ability and specialty as follows.

a. Monitoring of Pesticides in Agricultural Crops:

It is an on-going compound of the project that started in 1993 and is carried out by the Center of Analysis of Pesticides and Their Residues in the Ministry of Agriculture. Table 2.21 shows comparison between pesticide residues in the imported agricultural commodities during 1993 up to 2005. Results of the study in 1993/1994 showed that 4.3 % of the samples contained pesticide residues. 3.4 % of the total samples contained chlorinated hydrocarbon pesticide residues but less than the MRL. In 1999/2000 study, 0.5 % of the imported samples contained pesticide residues more than the MRL and all the residues were from non persistent organic pesticides. In 2001/2002 study, none of the imported samples contained pesticide residues more than the MRL, but the found residues were from non persistent organic pesticides. In 2002/2003 study, non of the imported samples contained residues more than the MRL. 1 % of the total imported samples contained chlorinated hydrocarbon pesticide residues less than MRL. These were two samples containing Endosulfan. In 2004/2005 study, 16.7 % of the total samples contained residues but less than the MRL. As a conclusion, none of the polluted samples contained chlorinated hydrocarbon pesticides.

Table 2.22 shows comparison between pesticide residues in the local agricultural commodities during 1993 up to 2005. Results of the study in 1993/1994 showed that 20 % of the total samples contained pesticide residues but less than the MRL. 4 % of the total samples contained residues more than the MRL. 5.2 % of the total samples contained chlorinated hydrocarbon pesticide residues. In 1999/2000 study, 0.1 % of the total samples contained pesticide residues more than the MRL and all of the residues from non-persistent organic pesticides. 6 % of the total samples contained pesticide residues from chlorinated hydrocarbon compounds. In 2002/2003 study, none of the samples contained residues more than the MRL. 23.5 % of the total samples contained residues but less than MRL. 5 % of the total samples contained chlorinated hydrocarbon pesticide residues but less than the MRL. These samples contained residues of Dicofol and Procymidon. In 2004/2005 study, 2.5 % of the total samples contained residues but less than the MRL. As a conclusion, none of the samples contained residues more than the MRL. 0.5 % of the total samples contained residues of chlorinated hydrocarbon pesticides but less than the MRL.

Table 2.21: Comparison Between Pesticide Residues in The Agricultural Commodities in The Study Of 2004-2005 and Studies Conducted in 1993-1994, 1999-2000, 2000-2001, 2002-2003 For Imported Samples.

	Study in 1993-1994	Percentage %	Study in 1999-2000	Percentage %	Study in 2000-2001	Percentage %	Study in 2002-2003	Percentage %	Study in 2004-2005	Percentage %
Samples number	989	---	250	---	200	---	200	---	195	---
Number of samples that contain pesticides below MRL.	43	4.35	38	15.2	29	14.5	26	13	12	6.2
Number of samples that don't contain pesticides	946	95.65	212	84.8	170	85	174	87	183	93.8
Number of samples that contain pesticides higher than MRL.	---	---	---	---	1	0.5	---	---	---	---
Number of samples that contain pyrethroid compounds	3	0.3	17	6.8	10	5	6	3	4	2.1
Number of samples that contain organophosphorus compounds	10	10.01	26	10.4	21	10.5	12	6	9	4.6

	Study in 1993-1994	Percentage %	Study in 1999-2000	Percentage %	Study in 2000-2001	Percentage %	Study in 2002-2003	Percentage %	Study in 2004-2005	Percentage %
Number of samples that contain organochlorine compounds	34	3.44	5	2	6	3	2	1	---	---
Number of samples that contain banzelite compounds	2	0.2	2	0.8	2	1	4	2	2	1
Number of samples that contain phthalamid compounds	---	---	3	1.2	---	---	---	---	---	---
Number of samples that contain conzawl compounds	---	---	---	---	3	0.5	---	---	---	---
Number of samples that contain other pesticides group	---	---	---	---	1	0.5	4	2	1	0.5

Note: Samples may have more than one pesticide.

Table 2.22: Comparison Between 2004/2005 Study and Studies Conducted in 1993-1994, 1999-2000, 2000-2001, 2002-2003 For Local Agricultural Commodities .

	Study in 1993-1994	Percentage %	Study in 1999-2000	Percentage %	Study in 2000-2001	Percentage %	Study in 2002-2003	Percentage %	Study in 2004-2005	Percentage %
Samples number	1125	---	250	---	200	---	200	---	195	---
Number of samples that contain pesticides below MRL.	225	20	28	11.2	47	23.5	45	22.5	16	8.2
Number of samples that contain pesticides which don't have MRL.	---	---	5	2	2	1	---	---	---	---
Number of samples that contain pesticides higher than MRL.	45	4	---	---	---	---	---	---	---	---
Number of samples that don't contain pesticides	855	76	217	86.8	151	75.5	155	77.5	179	91.8
Number of samples that contain pyrethroids	49	4.36	7	2.8	6	3	3	1.5	2	1
Number of samples that contain organophosphates	53	4.71	9	3.6	9	4.5	14	7	3	1.5

	Study in 1993-1994	Percentage %	Study in 1999-2000	Percentage %	Study in 2000-2001	Percentage %	Study in 2002-2003	Percentage %	Study in 2004-2005	Percentage %
Number of samples that contain chlorinated hydrocarbons	59	5.24	15	6	10	5	7	3.5	1	0.5
Number of samples that contain banzelites	7	0.62	---	---	5	2.5	5	2.5	2	1
Number of samples that contain phthalamids	1	0.09	1	0.4	---	---	---	---	---	---
Number of samples that contain dithiocarbamates	123	10.93	---	---	18	9	16	8	2	1
Number of samples that contain oxazoledeniles	16	1.42	1	0.4	---	---	---	---	---	---
Number of samples that contain bridzenones	---	---	1	0.4	1	0.5	---	---	---	---
Number of samples that contain conzawls	---	---	---	---	5	2.5	3	1.5	6	3
Number of samples that contain other pesticides	3	0.27	1	0.4	5	2.5	4	2	2	1

b. Monitoring of Organochlorine Pesticide Residues in Mothers Milk:

There were studies on pesticide residues in mothers' milk conducted by University of Jordan, and Royal Scientific Society (RSS) between 1993 and 2005 and still on going. Based on these studies, the following can be concluded:

- An increase of HCHs in 2003 samples compared with 1995 samples.
- A decrease of DDTs residues in 2003 samples compared with 1995 samples.
- A decrease of Cyclodiens in 2003 compared with 1995 samples.

In a study conducted by RSS in 2002 in four governorates in the northern part of Jordan mothers' milk samples were found contaminated with residues of chlorinated hydrocarbon pesticides.

When comparing the results of a study done by University of Jordan in 2000 with that done by the RSS in 2005 in four governorates located in the center of Jordan (Table 2.23).

It was concluded that pesticide residues for cyclodiens, DDTs and HCHs decreased significantly.

Table 2.23: Comparison Between RSS Study of 2004-2005 and University of Jordan Study in 2000 for Determination of Chlorinated Hydrocarbons in Mothers' Milk.

A study of 16/2/2004-16/2/2005 Royal Scientific Society					A study of 2000 University of Jordan				
Total average concentration in (mg/kg milk fat)					Total average concentration in (Mg/kg milk fat)				
Cyclodiens	DDTs	HCHs	Samlpes number	City	Cyclodiens	DDTs	HCHs	Samlpes number	City
0.005	0.16	0.15	30	Amman	0.18	1.02	0.43	45	Amman
0.02	0.20	0.20	20	Zarqa	0.25	1.9	0.63	25	Zarqa
---	0.05	0.20	10	Alsalt	0.15	1.6	0.18	30	Alghwr alawsat
0.04	0.9	0.18	10	Alshone Aljanobeiaa					
---	1.18	0.09	10	Deir ala					
0.01	0.38	0.17	---	Average	0.19	1.41	0.41	---	average

- (---): Mean under the detection limit.
- HCHs: (α,β,γ) Hexachlorocyclohexane, HCB.
- DDTs: (o,p′-DDT, p,p′-DDT, o,p′-DDE, p,p′-DDE, o,p′-DDD, p,p′-DDD).
- Cyclodienes: (Aldrin, Dieldrin, Endrin, Heptachlor, Heptachlorepoxide).

c. Monitoring of Chlorinated Hydrocarbons Residues in Animal Product.

A study conducted by the RSS between June 2002 and June 2003 showed that 37 % of animal product samples were contaminated with pesticide residues but less than the MRL, although 3 % of the samples contained residues more than the MRL. In 1995, 2000, 2001, and 2005 studies conducted by RSS indicated that 26 %, 20 %, 43 %, and 35% of the samples, respectively, were contaminated with pesticides residues but less than the MRL, whereas 5%, 2.5 %, 3 % and 4 % of the samples contained residues more than the MRL (Figure 3).

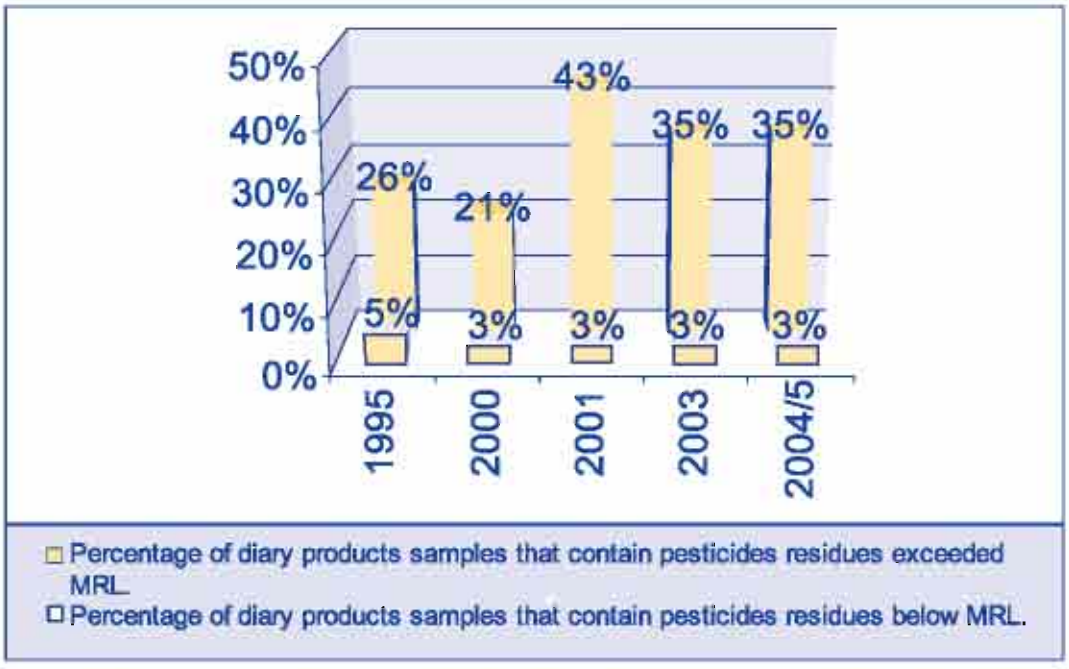

Figure 3 Comparison Between Study Results of 2004/2005 with Similar Studies Results in 1995, 2000, 2001 and 2003 for Dairy Product Samples

d. Monitoring of Chlorinated Hydrocarbons Residues in Water:

University of Jordan, RSS and Jordan University for Science and Technology have conducted monitoring separately or in cooperation with other governmental sectors between 1993 and 2005. The conducted studies from the different sectors always indicated that there was no contamination or residue of chlorinated hydrocarbon pesticides in any drinking water sample except in 1995 study done by the University of Jordan when finding α- HCH and γ-HCH and p, p′- DDT in five samples collected in Deir-Alla (Figure 4) and HCH compound in two samples from Zai (Figure 5), but all of them were less than the MRL.

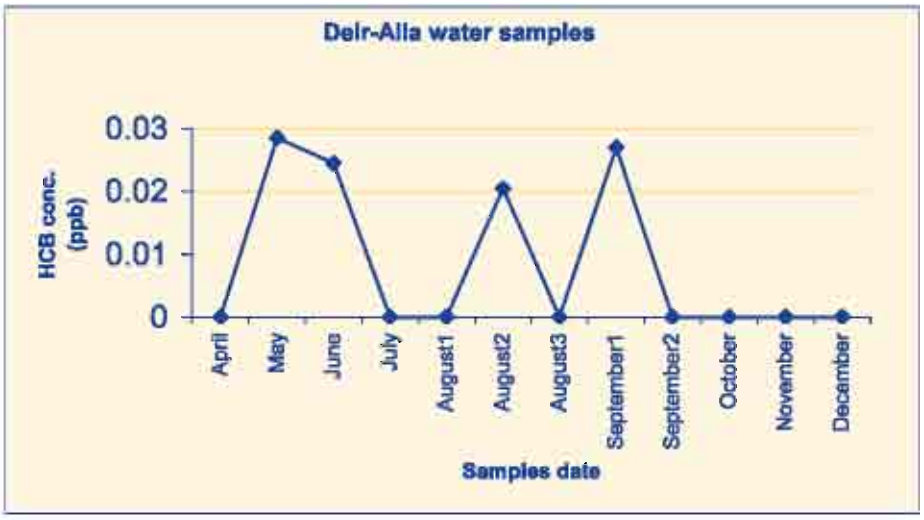

Figure 4 Concentration of HCB in Deir-Alla Water Samples in the Period Between April and December 2004

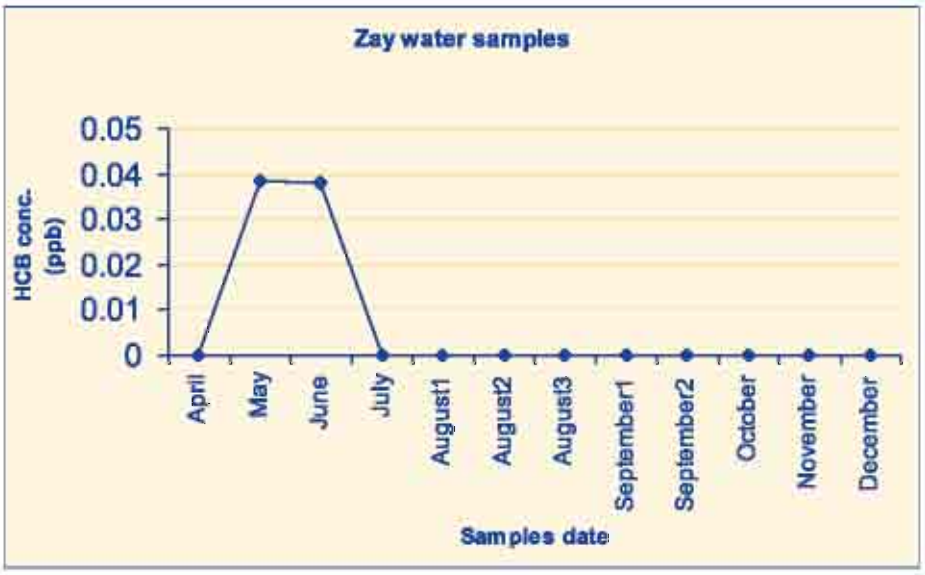

Figure 5 Concentration of HCB in Zai Water Samples in the Period Between April and December 2004

e. Monitoring of Chlorinated Hydrocarbons Residues in Soil and Sediments.

- In Soil

A study conducted by RSS in 1994 showed that most samples taken from the Jordan Valley and other agricultural regions contained chlorinated hydrocarbon pesticide particularly DDTs, Lindane and Cyclodens. In a study done by the University of Jordan in 2002/2003 and 2004/2005, the soil samples taken from southern, central and northern Jordan Valley were contaminated with chlorinated hydrocarbon pesticides particularly Heptachlor epoxide, and DDT.

- In Sediments
  A study conducted by RSS in 1994 showed that there were residues of DDT and DDD in sediment samples. Another study done by University of Jordan in 2004/2005 showed that there were chlorinated hydrocarbon compounds particularly DDT and Heptachlor epoxide in sediment samples.

- Safe Use of Pesticides in Jordan
  There is a national project carried out by Ministry of Agriculture since 2004 and financed by Ministry of Planning of Jordan. The project is aimed to train agriculture engineers, farmers and workers in agriculture sector on the proper use of pesticides to minimize its usage, its hazardous effect on man and environment and to apply the safety period.

- Development the Export of Agriculture Crops
  There is a national project carried out by the National Center of Agriculture Research and Technology Transfer (NCART) at the Ministry of Agriculture in Jordan. It is financed by the International Bank to increase the export of agricultural crops, particularly to the European Union according to EUREP- GAP. In addition, it is aimed to have crops free of pesticide residues or to minimize the residues to less than the MRL, by using alternatives to pesticides such as integrated pest management.

2.3.7.2 PCBs and Unintentional By-Products:

Monitoring of PCBs and unintentional by-products in various fields does not exist. Jordan up to the present time is not able to determine residues of PCBs and Dioxins and Furans. None of the existing laboratories is equipped well to perform this monitoring. In addition, main labs for residue analysis are lacking qualified and skilled manpower. Establishing new labs or providing some laboratories with major equipment for PCBs and unintentional by-product analysis is needed. Moreover, training of qualified people to work on this advanced equipment is also needed to overcome this important point.

2.3.8 Current Level of Information, Awareness and Education Among Target Groups; Existing Systems to Communicate Such Information to the Various Groups; Mechanism for Information Exchange with other Parties to the Convention

2.3.8.1 Current Level of Information:

The level of available information on POPs differs according to the following considerations:

- POPs groups
- The nature of information on the same POPs group, and
- The recipient target groups

- Pesticides:

The availability of information on pesticides in Jordan is much more satisfactory compared to that of PCBs and PCDD/PCDF. There are different national sources of information on pesticides describing their quantities, import, handling, storage, use, risks, registration and banning. In fact, the Government of Jordan has banned many types of pesticides prior to the Stockholm Convention. For example the use of DDT was banned in 1980 by the Ministry of Agriculture for agricultural uses, and in 1992 it was banned by the Ministry of Health for combating Malaria. Toxaphine was banned by the Ministry of Environment. The existing quantities of pesticides, as well as, the locations of stockpiles of DDT, Dieldrin, and Agrocide are defined and documented.
Few studies on pesticide residues in soil, water, mothers' milk animal products and food stuff were conducted by Jordanian experts. However, further studies are needed, particularly on the suspected contaminated sites.
Several national institutions are working on pesticides management within the over all chemical management context. The Ministry of Agriculture, Ministry of Health, Ministry of Environment, Ministry of Labor, Customs Department, Civil Defense Directorate are the main governmental institutions concerned with chemical compounds management. Other agencies such as Chamber of Industry and Farmers Union have a role in this regard.

- PCBs:

The level of information about PCBs is less than that of pesticides. Information on PCBs related issues is exclusively interesting to parties and individuals considered as stakeholders. Environmental concerned agencies, power generation sector, and some specialists are the main interested parties. As PCBs containing transformers and capacitors have not been imported since 1985, the concern about the use of PCBs is getting less. A study on PCBs was conducted by the Environmental Research Center of the Jordanian Royal Scientific Society)RSS(in 1991. The study covering Greater Amman area, revealed very low concentrations of PCBs in a total of 119 collected samples from transformer's oils. A wider inventory for the existence of PCBs has been carried out by the PCBs task force within Jordanian NIP project. The inventory results are presented in other sections of this report. However, further studies are needed for the completion of the inventory on the suspected PCBs containing equipment, probable PCBs contaminated sites, and the method to be followed so as to phase out and to mitigate the PCBs impacts.

- PCDD/PCDF:

Information collection on PCDD/PCDF was initiated in 1996 through conducting three studies conducted by University of Jordan for PCDD/PCDF regarding releases from Jordanian environment. The first study was concerned with the open combustion of municipal waste at Amman landfill site. The second study focused on the existence of PCDD/PCDF in human milk samples. The third study, which was a Ph. D. thesis, dealt with PCDD/PCDF in soil and biological samples from an old municipal landfill site and surroundings at Marka area.
The Ministry of Environment carried out the first national inventory on PCDD/PCDF releases from different sources as specified in UNEP Chemicals Toolkit. The inventory report was issued within the Asian Project in 2003. The inventory has been updated as a requirement of the national NIP project. A total release of 81.6 g TEQ/a

of PCDD/PCDF from all categories was estimated in 2003, compared to 71.1 g TEQ/a of PCDD/PCDF release in 2000.

2.3.8.2 Awareness and Education among Target Groups

Most of Jordanians have a general thought saying that using chemicals is not healthy. Many people attribute occurrence of diseases, especially cancer, to foodstuff products for using chemicals (hormones, fertilizers and pesticides), and they are not happy with eating pesticides treated products, but they do not recognize POPs in particular. The concept of green products (chemicals free food) is encouraged by both the government and the local NGOs. However, this thought could be a useful background for carrying out targeted public awareness programs on POPs pesticides and other POPs chemicals. This will be also an opportunity to correct some extreme thoughts about using chemicals.

Jordan has a number of environmental NGOs. They have considerable awareness activities. Through their awareness programs and campaigns, they did a lot of positive effects in the public attitudes.

Most of environmental concerned institutions have their own awareness activities. In most cases these activities are coordinated with NGOs and the media.

Within the NIP project activities, several workshops were held in the context of NIP preparation. During inventories preparation a kind of awareness was carried out for industrial, agricultural and power generation sectors. More awareness programs and activities are planned to be performed for specific target groups. It is believed that the level of awareness is still low especially in PCBs and PCDD/PCDF related issues.

Jordan government has recognized the necessity of environmental education. Consequently, the majority of public and private universities and collages have environmental departments. Regular environmental courses have been introduced to different school classes. NGOs with collaboration with the Ministry of Education encourage the establishment of environmental clubs or /and committees within schools. Although such activities are not carried out specifically for POPs, they include some information and knowledge about different POPs related issues.

2.3.8.3 Existing Systems to Communicate Such Information to the Various Groups

There are different methods to communicate the information. These methods depend on the type of targeted group, the degree of technical details and the way that the information can be used.

For governmental institutions the most used system is composition of permanent committees that have regular meetings. Although such committees have specific task to work on, they can be information communication tool to the represented institutions, and to other groups afterwards. An example describing such committees is Pesticides Registration Committee. The committee is composed of representatives from the Ministry of Agriculture, Ministry of Health, Ministry of Environment, National Center for Research & Technology Transfer, University of Jordan, Royal Scientific Society, Association of Agricultural Materials Merchants, Association of Agricultural Engineers, Pesticides Factories and Vet-Drugs Factories.

Information communication to public can take a form of awareness programs through workshops, seminars, news letters and by media. More than 90% of Jordanians have a certain level of education. Almost all Jordanian families have colored TVs. Moreover, the access to internet is available for a considerable percentages of the people. So, the media and the internet are crucial tools of communication in Jordan.

There is no integrated unified system for the exchange of national information with respect to chemicals in Jordan. This matter calls for the existence of a developed information network that link between the various governmental and NGO's to facilitate obtaining information pertaining to chemicals in all stages of its handling.

In view of multiplicity of the bodies concerned with the management of chemicals and consequently the multiple functions and methodology of each of them, the Environmental Sector Committee in the National Information Technology Center decided to select a national sub-focal point to coordinate information available with the concerned authorities on an internet page located in the Environment Health Directorate in the Ministry of Health. The governmental parties and industrial corporations are provided with the information needed on the various chemicals by fax, personal visit and e-mail. It was recently connected within the Internet network of the National Information Center so as the information would flow easily to the parties participating in the Environment Sector Committee of the National Information Technology Center, and thus help the decision markers in obtaining information on the spot. For the time being, all important information on the home page relevant to chemicals was completed as the available information on chemicals within the reach of all parties were collected. Also, the electronic link with the Customs Department was made (National Chemical Profile, 2002)

2.3.8.4 Mechanism for Information Exchange with other Parties to the Convention

Usually the information exchange with other Parties to the Convention take place via internet and E-mails. In some occasions the information could be directly exchanged in the regional and/or international meetings, workshops and conferences.

2.3.9 Relevant Activities of Non-Governmental Stakeholders

Government of Jordan has been always encouraged non-governmental organizations and private sector organizations to partnering developmental activities. There are a handful numbers of NGOs are working in the field of environment and ecology. The NGOs are providing both information and services in making a safer environment and also contributes in wastes management of the country. The activities of the majority NGOs in Jordan with regard to environment ranges from promote safe environment, preservation of nature and ecology, protection and improvement of environment and obviously raise awareness of the people.

Basically NGOs undertake environmental activities which could be categorized under the following the broad category[1]

- to assist for protection of environment and ecology
- promote safe environment
- help people rehabilitations if require in protecting environment system and ecology

- information dissemination on adverse effect of hazardous wastes and chemical
- organize people's participation in managing vulnerable environments
- Encourage the environmental awareness for the various sectors of the community sectors with the aim of creating national and individual interest with the environmental issues.
- Co-operate with other environment societies to influence the decision- makers for preservation of natural resources in the Kingdom
- Support local industries through encouraging citizens to use the recycled materials.
- Encourage the preparation of studies and researches related to the natural environment, sponsor the positive opinions and trends in this respect, document results, enhance knowledge of the species of plants and place same under the hand of the public.
- Study and determine of consumer problems, as well as work with the official and national bodies and scientific institutions to overcome it

2.3.10 Overview of Technical Infrastructure for POPs Assessment, Measurement, Analysis, and Prevention Measures, Management, Research and Development Linkage to International Programs and Projects

Only compatibilities for analyses of pesticide is present in the country. Dioxins, Furans and PCBs are not being analyzed. The laboratories that analyze pesticides are present mainly at; Ministry of Agriculture, Ministry of Health, Different universities, and RSS.

The following institutions are experienced resources in organochlorine pesticides and polychlorinated biphenyls analysis in Jordan:

1. Ministry of Agriculture.
   - Center of Pesticides Analysis and Their Residues
   - Lap of
2. University of Jordan:
   - Environmental Pollutant Research Laboratory - Analytical Chemistry / Department of Chemistry.
   - Water and Environmental Research and Study Center.
3. Mo'ta University:
   - Water and Environmental Studies Center)POPs Laboratory(.
   - Engineering Faculty Laboratories.
4. Amman National University:
   - Organic and Pharmaceutical Organic Chemistry Laboratory.
   - Analytical Organic Chemistry Laboratory.
   - Automatic Analysis Laboratory.
5. Yarmouk University.
6. Hashemiya University.

7. Petra Private University.

8. Jordan University of Science and Technology.
   - Environmental Science Section.
   - Public Health.
   - Chemistry Section.

9. Royal Scientific Society.
   - Industrial Chemistry Center.
   - Environmental Research Center.

10. Ministry of Health.

11. Ministry of Energy and Natural Resources.

12. Ministry of Environment.
    Experience resources in Dioxins and Furans analysis are limited to University of Jordan: Environmental Pollutant Research Laboratory - Analytical Chemistry / Department of Chemistry.

There is limited number of PCDD/PCDF studies in Jordan. The most important are:

1. Dioxins and Furans in the Jordanian Environment, Part 1: Preliminary Study of a Municipal Waste Landfill Site With Open Combustion nearby Amman – Jordan, M.A. Alawi, H. Wichmann, W. Lorenz and M. Bahadir, Chemosphere (1996). Vol. 33, No. 5: 907-911.

2. Dioxins and Furans in the Jordanian Environment, Part 2: Levels of PCDD/PCDF in Human Milk Samples from Jordan. M.A. Alawi, H. Wichmann, W. Lorenz and M. Bahadir, Chemosphere (1996). Vol. 33, No. 12: 2469-2474.

3. Study of Dioxins/Furans in Soil and Biological Samples from the Municipal Old Landfill Site and its Surroundings at Marka. Ph.D. Thesis of Dr. Abdulrouf A. Abbas under the supervision of Prof. Dr. Mahmoud Alawi.

4. Identification and Quantification of Dioxins and Furans Releases in Jordan, Ministry of Environment, Amman – June 2003.

It is very essential to build capacity in the area of analysis of organochlorine pesticides, polychlorinated biphenyls and dioxins in terms of personnel, equipment and laboratories. Quality control/quality assurance procedures in analysis of these compounds have to be implemented. Interlab comparison must be performed within labs in the country and with external labs.

There is limited number of PCDD/PCDF studies in Jordan. However, the following studies and reports are available.

5. Dioxins and Furans in the Jordanian Environment, Part 1: Preliminary Study of a Municipal Waste Landfill Site With Open Combustion nearby Amman – Jordan, M.A. Alawi, H. Wichmann, W. Lorenz and M. Bahadir, Chemosphere (1996). Vol. 33, No. 5: 907-911.

6. Dioxins and Furans in the Jordanian Environment, Part 2: Levels of PCDD/PCDF in Human Milk Samples from Jordan. M.A. Alawi, H. Wichmann, W. Lorenz and M. Bahadir, Chemosphere (1996). Vol. 33, No. 12: 2469-2474.

7. Study of Dioxins/Furans in Soil and Biological Samples from the Municipal Old Landfill Site and its Surroundings at Marka. Ph.D. Thesis of Dr. Abdulrouf A. Abbas under the supervision of Prof. Dr. Mahmoud Alawi.

8. Identification and Quantification of Dioxins and Furans Releases in Jordan, Ministry of Environment, Amman – June 2003.

It is very essential to build capacity in the area of analysis of organochlorine pesticides, polychlorinated biphenyls and dioxins in terms of personnel, equipment and laboratories. Quality control/quality assurance procedures in analysis of these compounds have to be implemented. Internal lab comparison must be performed within labs in the country and with external labs.

Information Management Capacity
The POPs Unit at the Ministry of Environment has initiated and developed different inventories and database related to POPs. During the implementation of the NIP and the development of the detailed inventories,
This database will be made accessible to the public and international stakeholders. It should be taken into consideration that some of the biggest companies have expertise and accumulated expertise in the management of certain aspects of the POPs issue. During the implementation process, their
Inclusion will also be sought.

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

2.3.11.1 Pesticides

Scientific knowledge about identification of impacted populations or environments, estimated scale and magnitude of threats to public health and environmental quality and social implication for workers and local communities, are significantly not sufficient. In general, the previous issues are lacking research, studies and projects in Jordan on various POPs. The available data on these issues can be summarized mainly from a study conducted by the University of Jordan in 1996 in central Jordan Valley

a. Identification of Impacted Populations by Pesticides
The study showed that 54 % of the farmers believe in the advantages of pesticides and 86 % of the local citizens know their disadvantages. However, some banned chlorinated hydrocarbon pesticides by Jordanian government and listed the Stockholm

Convention, were found in the samples analyzed from common vegetables. It is proper to categorize the impacted populations to:

1. Workers of Formulated Pesticides:
There are 15 manufactures to formulate pesticides up to 2005. No survey or study has been done on impact of pesticides on workers in these industries.

2. Agricultural Engineers, Technicians and Workers in Private Agriculture Companies:
There are 86 agricultural companies in Jordan in 2005 dealing with importing and producing pesticides, in addition to 167 commercial agricultural small shops in 2005 to sell pesticides in Jordan. Most of these companies are located in Amman, and central and north of Jordan Valley. No survey or study has been done to know the impact of pesticides on these populations.

3. Workers of Pesticide Loading, Transporting and Storing:
No survey has been done to know the impact of pesticides on these populations.

4. Pesticide Application Workers:
Few studies have been carried out on application workers. In the University of Jordan study, average cholinesterase has been raised by 95.62 % of its activity when workers with organophosphate and carbonates after two months of working away from pesticide applications.

5. Population Surrounding the Sprayed Area:
No survey studies have been carried out to know the impact of pesticides on populations living surrounding sprayed areas. The results of the University of Jordan study on cholinesterase activity showed significantly more in children living in central Jordan Valley (3.459) with intensive use of pesticides compared with those in Amman (Jabal Al-Hashmy) (3.421) with light use of pesticides.

6. Population of Jordan:
Few studies have been carried out on pesticide residues which might reach human beings through the food chain, particularly some chlorinated hydrocarbon pesticide residues which was found in mothers' milk in Jordan.

b. Determination of Impacted Environments by Pesticides

1. Air:
There are no real field studies about contamination of air with pesticides neither banned chlorinated hydrocarbon nor allowed pesticides.

2. Water:
Jordan such as many countries has understood the problem size and done several studies. All conducted studies showed that there was no contamination of drinking

water with residues of chlorinated hydrocarbon pesticides. Despite these results continuous pesticide monitoring in drinking water and other types of water are needed particularly chlorinated hydrocarbon pesticide residues.

3. Soil and Sediments:
Few studies on pesticide residues particularly chlorinated hydrocarbon compounds in soil and sediments have been carried out in Jordan. All studies showed the occurrence of chlorinated hydrocarbon pesticide residues in soil of open field and under plastic houses conditions and sediments of agricultural regions. More studies are needed. Soil in some regions particularly Jordan Valley has lost most of its fertility due to the intensive use of pesticides or the previous use of chlorinated hydrocarbon pesticides. Study on effect of pesticides on soil microorganism is also needed.

4. Wildlife:
No survey or study on effect of pesticide particularly chlorinated hydrocarbons on wildlife such as birds, wild animals and honey bees have been carried out.

5. Agricultural Commodities:
Some studies showed the presence of chlorinated hydrocarbon residues in samples of vegetables, fruit trees and field crops local and imported ones. More studies are needed to be sure that food is free of these banned compounds.

c. Threat of Pesticides on Public Health

1. Acute toxicity:
Those numbers of poisoning accidents (53 cases) between 1997 and 2002 could not represent the actual status due to the lack of documentation for poisoning cases in hospitals and health centers. However, 27-69 % of poisoning cases indoors were due to pesticides handling and storing. Projects for improvement of poisoning documentation are needed, in addition to national poisoning center to be established in Jordan to take care of all related issues.

2. Chronic Toxicity:
Banned chlorinated hydrocarbon pesticide residues were found in some samples of local or imported agricultural and food commodities. In addition, these banned compounds were found in imported and local animal products and mothers' milk. International references indicate the possibility for these compounds to cause carcinogenic effects, mutagenicity, teratogenicity, fetotoxicity and reproduction effects. A total of 3362 cases of cancer were recorded among Jordanians in 2000. This figure increased to 4187 in 2002. There is no documented link between exposeure to pesticides and cancer cases yet; research studies and monitoring of pesticide residues particularly chlorinated hydrocarbons in food study are needed to minimize the potential health risks.

d. Threats of Pesticides on Environment:

The pesticides particularly chlorinated hydrocarbon compounds have an adverse effect on the different environmental systems in Jordan and every where in the world. This effect leads to negatives changes in the food chain. It is well known that 0.1 % of the sprayed pesticide is able to reach the target. The remained amount of pesticides goes to soil, water, air, wild life and food chains. The chlorinated hydrocarbon residues in Jordan were found in soil, sediments and in few cases in water. Eggs of several wild birds were not able to hatch due to the effect of DDT on its calcium. Residues of some chlorinated hydrocarbon pesticides were detected in fish in Jordan Valley. Many rodentia fish were found poisoned in Jordan Valley which in its turn killed many of a Grey Arelea cenerea. The actual threats of pesticides particularly chlorinated hydrocarbon as pollutant, on the environment needs to be studied to decrease its threat.

e. Economic-Social Implications of Pesticides on Workers and Local Communities:

Field surveys done by the Ministry of Environment in 2004 (Table 2.24) showed that still few percentage of farmers use banned chlorinated hydrocarbon pesticides particularly Aldrin, Dieldrin, Toxaphene and DDT. The study of the University of Jordan concluded that most of the people living in Jordan Valley surrounding farmers are highly aware of the disadvantages of pesticides on health and environment, but not able to avoid the hazardous effects due to their occurrence in the vicinity of agricultural regions. The survey covered 96 farmers in the Jordan Valley, the pesticide usage by farmers aimed to increase profit gained from crop yield by decreasing financial cost and increasing incomes, ignoring the side effect on public health and environment.

Most farmers take the needed information about pesticides from agricultural engineers of the Ministry of Agriculture (31.3 %), their own experience (20 %), extension bulletins (13.3 %) and from national media (9.5%). This means that the agricultural engineers always need to be highly educated with the necessary knowledge about pesticides.

23 % of the farmers harvest their crops without considering waiting period for pesticides. This leads to conclude that economic aim for farmers is more important than public health of the community and environment, to improve their economic status by increasing the profits. Some farmers believe that the more than use of pesticides, the more crop yield they will have. About 65.5 % of the farmers believe that the customers know of pesticide residues in crops and in spite of that they continue buying them. Farmers will continue using pesticides, despite that some of the consumers might not buy their crops that are treated with pesticides. Farmers believe also in continuing the use of pesticide, despite the increase in pesticide price. The economic factor is very important in using pesticides by farmers. The use of pesticides might decrease the need for labors particularly for getting rid of weeds, fungi and insects. Learned farmers use pesticides more than others but they do not know enough about the disadvantages and proper use of pesticides.

Table 2.24: Number and Percentage of Farmers who use Banned POPs Pesticides in 2004.

Pesticide common name	number	%
Aldrin	2	28.5
Chlorodane	0	0
Dieldrin	1	14.3
Endrin	0	0
Hebtachlor	0	0
Hexachlorobenzene	0	0
Murex	0	0
Toxaphen	2	28.5
DDT	2	28.5
Total	7	100

2.3.11.2 PCBs and Unintentional By-Products

Scientific knowledge about identification of impacted populations or environments, estimated scale and magnitude of threat to public health and environmental quality and social implication for workers and local communities in Jordan does not exist up today. Projects on these important issues are needed.

2.3.12 Details of any Relevant System for the Assessment and Listing of New Chemicals

Most of the pesticides from the persistent organic pollutant listed in the Stockholm were banned in Jordan before being enacted. Most hazardous pesticides as persistent organic pollutant but not listed in the Stockholm convention was banned in Jordan.
The objective of new chemicals assessment is to provide a consensus scientific description of the risks of exposure to new chemicals on health and environment. A system for the assessment of new chemicals does not exist in Jordan. The published assessment reports and other related documents performed and prepared by the developed countries and the various relevant international organizations can be used as the basis for taking preventive actions against adverse health and environmental impact. The assessment document are often used as the basis for establishing guidelines and standards for the use of chemicals, both new and existing, thus eliminating or reducing human health risks associated with particular classes of chemicals (e.g. pesticide), protecting vulnerable groups, (e.g. Children), the elderly, and workers, and reducing or eliminating risks to the wider environment.

2.3.13 Details of Any Relevant System for Assessment and Regulation of Chemicals Already in the Market.

The Pesticides Section of the Plant Protection Department of the Ministry of Agriculture is the implementing authority of the Pesticides Ordinance, Pesticides Rules and the Pesticides Technical Committees decisions.

- Technical Pesticides Registration Committee, which was entrusted with the duty of selecting or specifying the kinds of agricultural pesticides that are permitted for circulation, and specifying their prices, specifications, registration conditions, as well as conditions of their trade. A technical committee, composed of representatives of the various specialized governmental and academic agencies was formed in 1975 for purposes of registration of the pesticides entering the Kingdom, studying their potential risks and recommending prohibition of their entry if it was proven that they are harmful to human health and/or environment. The Pesticide Registration Committee continues to ban pesticides according to the recommendations received from international bodies concerned with the risks of pesticides and their impact on human health and environment. The Head of Pesticides Section acts as the Secretary of the Technical Pesticides Registration Committee while the Director, Plant Protection Department acts as The Technical Pesticides Registration Committee Chairman.

3. STRATEGY

3.1 Policy Statement

Jordan is one of the leading countries in the developing world and the region that has look after the local environment since 1970s. The remarkable step was the establishment of the Department of Environment in 1980. The leadership of the country always insisted to adhere to the international community and United Nations requirements and instruments concerning all issues especially environmental protection. The Environmental policy of Jordan is defined by the National Environment Strategy. It is considered an important national document and source book, and the National Socio-Economic Development Plan as well as other similar level planning documents related to economy, agriculture and health sectors. These create a common foundation for the development and implementation of the national sustainable development policy.

Jordan enjoys a fragile eco-system: potable water is scarce and a very short coast line of less than 27 km; arable land is limited; and energy sources are few. Thus, protecting natural environment and the base of national economy is very important. These are directly linked to regional and global environmental pollution and degradation. The environmental policy of Jordan emphasizes on the coordination effort on regional and global basis in close cooperation with concerned international bodies and agencies addressing all global environmental issues, such as Ozone Layer Depletion; POPs and Greenhouse Gas Emissions.

Improved quality of life for the people of Jordan, economic growth, protection of the environment and maintenance of the natural environmental-balance are related together and very important to achieve only sustainable developments. Such a rational approach should promote environmental protection and sustainable development strategy in Jordan.

The Government of Jordan is committed to manage POPs chemicals with the main aim of protecting its people and environment. As an active member of the international community, Jordan will also undertake essential measures for protecting the global environment from negative impacts of dissemination of POPs compounds through out the world. It will implement, in the future, most practical and appropriate activities concerning the prevention of spreading of POPs into the environment and eliminate POPs from local environment in compliance with the provisions of the Stockholm Convention. It is anticipated that the Jordanian environmental policy will take the following initiatives in order to achieve sound environmental management of POPs compounds in all sectors of the economy:

- Reduce possibility of human exposure to POPs compounds.
- Eliminate intentional and unintentional releases of POPs into the environment by applying the principle of best environmental practices.
- Upgrade existing institutional and legal frameworks for proper management of POPs.
- Develop structure for long-term monitoring programme of POPs residues in biological and physical environment to determine the present status and to develop future trends.

- Ensure full inspection of suspected contaminated sites through field investigations and tests.
- Phase out the use of POPs compounds as requested by the convention.
- Eliminate existing stockpiles and wastes of POPs compounds in environmentally sound manner.
- Intensify public awareness campaigns about detrimental effects of POPs compounds to human health.
- Continue international cooperation on POPs management and information exchange.
- Develop efficient cooperation between stakeholders and the concerned governmental institution to promote successful solution to POPs problems.

3.2 Implementation Strategy

It is anticipated that Government of Jordan, represented by the Ministry of Environment, will implement the National Implementation Plan (NIP) by involving experts from public and private sectors as well as concerned NGOs with environmental issues. Because sound management of POPs demands an active participation from all stakeholders in addition to governmental institutions.

A National Implementation Unit (NIU) will be established within the Ministry of Environment as a leading body and focal point to implement the NIP. The NIU should comprise representatives from main stakeholders, researchers and academicians, NGOs and donor organizations. The main tasks of NIU are follows:

- Supervise NIP implementation and evaluate the progress every year.
- Supervise POPs management
- Coordinate between different parties involved in NIP implementation
- Manage funding for the different activities.
- Assign different activities to different institutions to carry out the different parts of NIP.
- Upgrade the POPs inventories and NIP according to the Stockholm Convention.
- Organize training for POPs concerned employees and workers such as plant protection engineers, electric engineers, environmental engineers, chemists, customs officers, border control officers, technicians…etc. particularly those responsible about chemical management, wastes,…etc.
- The existing national POPs monitoring programme and/or network will be strengthened and supervised directly by the NIU, for a better environmental monitoring of different POPs compounds and residues.

This should involve various laboratories, such as Ministry of Agriculture, Ministry of Health, Department of Customs and Universities, in Jordan. The extensive accumulated experience in pesticides, Agricultural pests and public health diseases their control and special laboratories in universities and research centers would be of great importance and helpful for monitoring impact of POPs compounds on human health in Jordan, but after upgrading and strengthening of such laboratories.

3.3 Activities, Strategies and Action Plans

3.3.1 Activity: Institutional and Regulatory Strengthening Measures

Objective

The prime objective of this activity is to strengthen institutional and legal frameworks for sound management of POPs, and to ensure compliance to the requirements and obligations of the Stockholm Convention.

Activities:

1. Establish a National Implementation Unit in the Ministry of Environment with detailed responsibilities
2. Ensure the compliance of Jordanian legislation with the requirements of the Convention and Protocol by revision of existing legislation; identification of gaps; recommendations for amendments; stakeholders consultations.
3. Revise existing legislations to ban any future production, use, export and import of POPs.
4. Enforce waste management legislations related to previous pesticide usage.
5. Develop the necessary institutional and technological basis for the safe waste management of PCB containing equipment and PCB containing waste, as well as implement timely and safe collection and elimination of PCB containing waste.
6. Enforce adequate monitoring practices of POPs emissions and implement preventive measures to decrease unintentional POPs emissions.
7. Develop guidelines to determine the suspected contaminated sites
8. Inspect suspected past and present contaminated sites.
9. Introduce and adopt guidelines and standards for acceptable limits of POPs emissions in different environmental elements.
10. Enhance efficient cooperation between stakeholders and concerned institutions, NGOs, local communities and research centers

3.3.2 Activity: - Measures to Reduce or Eliminate Emission From Intentional Production and Use.

Objectives:

The objectives of this activity are to improve or to establish legal and administrative measures to get red of present and future production and uses of Pops.

Activities:

1- Prevention of illegal use and handling of DDT.
2- Establish monitoring programmes for POPs based on Jordan's international commitments.
3- Strengthen the environmental inspection departments in the different competent authorities.

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

Objectives:
The objectives of action plan are to continue to enforce banning POPs Pesticides and to eliminate their residues in the environment components through proper environmental approaches.

Activities:

1. Define stockpiles of existing banned POPs pesticides
2. Label and repack of POPs pesticides stockpiles properly
3. Store and/or dispose of POPs pesticides stockpiles in an environmentally sound manner.

3.3.4 Production, Import and Export, Use, Identification, Labeling, Removal, Storage and Disposal of PCBs and Equipment Containing PCBs (Annex A, Part II Chemicals)

Objective
The main objective is to prepare inventories on equipment containing PCBs, prepare technical standards concerning analysis, transportation, storage, exchange, decontamination and destruction of PCBs; and develop system for monitoring of contaminated areas and point sources.

Activities:

1- Conduct comprehensive field surveys in order to complete the PCBs inventories on the national level.
2- Develop guidelines for collection and safe disposal of contaminated oils and equipment.
3- Define, label, and store stockpiles of existing contaminated oils and equipment
4- Clean or replace contaminated equipment.
5- Dispose of PCBs stockpiles and/or contaminated equipment in an environmentally sound manner.

3.3.5 Activity: Production, Import and Export, Use Stockpiles and Wastes of DDT (Annex B)

Objectives:
The main objectives of this action plan is to prepare and adopt of a strategy for control, completion, collection, and disposal of DDT in Jordan, and secure environmentally sound destruction of stockpiles of DDT in Jordan.

Activities:

1. Define stockpiles of existing banned DDT
2. Label and repack of DDT stockpiles properly
3. Store and/or dispose of DDT stockpiles in an environmentally sound manner.

3.3.6 Activities: Register of Exemption and the Continuing Need for Exemption (Article 4)

Periodical assessment and evaluation of the POPs situation may indicate the need for specific exemption, in such case the Convention secretariat will be informed.

3.3.7 Plan Actions: Measures to Reduce Releases From Unintentional Production:

Objectives:
The prime objective is take necessary measures in order to reduce the releases of PCDD/PCDF, PCBs and HCBs.

Activities:

1. Control of solid waste open burning
2. Develop and enact proper procedures to collect and dispose medical waste in environmentally sound manner
3. Improve usage and/or disposal of sludge generated from wastewater plants.
4. Improve current disposal operations by adopting sanitary land filling of waste.
5. Study the feasibility of upgrading existing and/or constructing regional medical waste incinerators.
6. Support the hazardous waste management project in Suwaqa, south of the capital city Amman.
7. Enhance and support renewable energy projects, rationalize energy use and encourage production and use of clean fuels such as natural gas and bio-fuels.

3.3.8 Activity: Measures to Reduce Releases From Stockpiles and Wastes

Objective:
The main aim is to reduce the releases from stockpiles and wastes by adopting the most applicable and acceptable measures.

Activities:

1. Adopt acceptable international standards and codes of practices in order to ensure safe storage of POPs stockpiles and waste
2. Apply best available technology and best environmental practices (BAT/BEP) in order to reduce and dispose waste in safe and environmental friendly manner.
3. Encourage participation of private sector in waste management.

3.3.9 Identification of Stockpiles, Articles in Use and Wastes

Objective

The objective of this action plan is to develop proper strategies to identify stockpiles of all POPs, and suspected contaminated.

Activities:

1. Complete of the database on hot spots, stockpiles, waste and contaminated sites
2. Develop and adopt measures to reduce releases of waste, stockpiles containing or contaminated with POPs, including PCBs compounds.

3.3.10 Manage Stockpiles and Appropriate Measures for Handling and Disposal Articles in Use

Objective :

Managing identified stockpiles of POPs and under take sound measures for final disposal to protect the environment.

Activities:

1- Establish of procedures for handling, disposal of stockpiles, articles in use and waste.
2- Complete of database of hotspot and contaminated sites.
3- Manage of waste in an Environmental sound manner.

3.3.11 Identification of Contaminated Sites (Annexes A, B and C chemicals) and Remediation in an Environmentally Sound Manner

Objective :

During the preparation of PCBs inventory, no attempt was made to identify contaminated sites with PCB compounds due to time and budget limitations as well as the absence of analytical capability of such compounds. Further more, no reliable data is available to decide which site is contaminated. From historical review and experience few suspected sites could be identified. These include old power stations, workshops for repairing transformers and capacitors and free zones at Zarqa and Aqaba.

Activities:

1. Conduct a thoroughly inventory of contaminated areas with an analysis of ecological risks and evaluate the need for decontamination
2. Establish a national centers for capacity building and technology transfer
3. Develop and upgrade proper labs for quantity analysis and providing existing analysis labs with advanced facilities to get accurate data and accelerate analysis procedures, to be internationally accredited
4. Remediation of POPs contaminated sites.

3.3.12 Activity: Facilitating or Undertaking Information Exchange and Stakeholders Involvement.

Objectives:
Develop an efficient information exchange at the national, regional and international levels and create mechanism for stockholder involvement in issues related to POPs

Activities:

1. Improve existing information exchange mechanisms on national level
2. Develop new information exchange mechanisms to fit the needs emerged from the progress of POPs related issues on national, regional and international levels.
3. Encourage, strengthen and maintain involvement of various stakeholders in POPs related issues.
4. Synergize different international agreements related to chemical and POPs issues.
5. Enable an easy access of public to data and available information.
6. Ensure exchanging educational and public awareness tools related to POPs and their alternatives at national and international levels.

3.3.13 Activity: Public Awareness, Information, and Education

Objectives:

1. To raise the public awareness on the POPs management related issues and specifically on this impact on human health and environment.
2. To encourage education on POPs include POPs in study programs of school and universities.

Activities:

1. Develop and approve a national plan for protecting public health from impacts resulted from exposure to POPs
2. Set a strategy for raising awareness campaigns
3. Raise awareness for decision- makers on POPs related issues.
4. Make information on POPs available to the public through different media channels)TV, radio, press and printed materials(.
5. Raise awareness on POPs related issues to public through different activities, focusing on specific target groups, such as industrial and agricultural sectors, women and children,… etc.
6. Publish different guidelines on the impacts and hazards of POPs on health and environment for the different exposed target groups.
7. Set a long-term plan to include POPs subjects in the programs of different educational stages.
8. Encourage postgraduate studies to conduct research in different POPs issues and provide the needed funds and facilities.

3. 3.14 Activity: Effectiveness Evaluation (Article 16)

Objectives:

The effectiveness will be evaluated periodically after the date this convention is enforced. The periodicity of the evaluation of the effectiveness will be decided by the Ministry of Environment.

The environmental monitoring data regarding POPs will also be evaluated under the supervision of the Ministry of Environment.

Activities:

1. Assign responsibilities to different institutions to avoid overlapping and unrequited repetition.
2. Update inventories on current health, and environment hazards of POPs
3. Analyze samples taken from different POPs suspected sites
4. Establish a system for monitoring, evaluating and following up.
5. Develop centers for analysis of Dioxins and Furans.
6. Upgrade the facilities at the different institutions dealing with POPs analysis.
7. Work on accreditation of labs for certain POPs analysis.
8. Develop of a system for safe storage for collection of POPs wastes.
9. Develop of POPs waste destruction and/or decontamination facilities.

3.3.15 Activity: Reporting

Ensure reporting in conducted in compliance with the requirement of the convention

3.3.16 Activity, Development and Monitoring (Article11)

Objectives:

The objectives of this activity are to monitor environment contamination with POPs and to conduct research on minimizing and eliminating POPs and its releases in Jordanian environment.

Activities:

1. Encourage research on POPs and their alternatives
2. Establish a National POPs Monitoring Committee for environmental monitoring of POPs, supervising research, development, discussing results and suggesting ideas, by the Jordanian government. This committee might consist of members from Ministry of Environment, Ministry of Agriculture, Ministry of Health, Ministry of Energy, Royal Scientific Society, Society of Environment.University of Jordan (Chemistry Department), University of Jordan (Center of water and environment) and three academicians. Accreditation for each selected laboratory should be made. The monitoring of POPs in the environment can be:
    a) Monitoring of POPs residues in mothers' milk.
    b) Monitoring of POPs residues in food staff, water, air, soil, sediments and animal products.
    c) Monitoring of PCBs level in electrical equipment.
    d) Monitoring of Dioxins and Furans from emission sources.
    e) Investigating of probable POPs contaminated sites.

3.3.17 Activity: Technical and Financial Assistance.

Objectives:
To identify the financial assistance needed for NIP implementation.

Activities:

1. Secure adequate technical and financial resources to establish and maintain the proposed permanent NIP unit.
2. Form an expert committee to identify the country needs of laboratories and related technical facilities. These facilities should be procured in earlier stages of the NIP project in the context of the Stockholm Convention on POPs.
3. Provide financial resources are needed for building the capacity of local specialists in PCDD/PCDF and other POPs subjects through appropriate training programs. Such programs can be implemented inside and outside the country in coordination with donors and the Stockholm Convention secretariat.
4. Review and consider the previous PCDD/PCDF initiatives and projects when preparing future POPs related proposals. This will result in avoiding the duplication in work and decrease the cost of project implementation.
5. Construct regional medical waste incinerators. It is recommended to construct 3 incinerators in the north, middle and south regions in the country.
6. Secure the needed financial and technical support for cleaning up and remediation measures that could be needed for the contaminated sites.
7. Enhance and support the renewable energy projects, rationalizing the energy use and encouraging the production and the use of clean fuel.
8. Safe storage and destruction of DDT and Dieldrin stockpiles in both ministries (Ministry of Health and Ministry of Agriculture) until such time that they disposed off properly with the assistance of the international institutions in accordance with the Basel Agreement.
9. Develop a national program for control of vectors of human diseases that are born by biological vectors, using the Integrated Vector Management (IVM) technique, including provision of support to such programs as the alternative pesticides are costly.

3.4 Development and Capacity-Building Proposals and Priorities

The main objective of Stockholm Convention is to protect human health through the elimination of the hazardous chemicals: chlorinated pesticides, polychlorinated biphenyls, dioxins and furans from the environment. This can be achieved by improving and establishing legal and administrative measures to get rid of present and future production and use of pops, increasing awareness on the dangers of using these chemicals, and to identify safe alternatives for chlorinated pesticides.

The preliminary inventory done in this work has been assessed. In light of the current situation in Jordan, measures to reduce or eliminate POPs from intentional and unintentional production and use have been identified.

Based on this, the following capacity building proposals are suggested:

I. Management Capacity Building

- Adopting the National Implementation Plan (NIP). This will be the focal point for all POPs activities in the country and will communicate with the secretariat of the Stockholm convention and with all institutions and stakeholders working with POPs in the country.
- Adjustment of laws and legislations by the Ministry of Environment to consider all issues related to POPs regarding manufacture, unintentional production, trade, handling, storage, use and disposal.
- Assigning responsibilities to different institutions to avoid overlapping and duplication.
- Development of human resources to be able to implement and enforce legislations and guidelines and environmental sound management of POPs.

II. Technological Infrastructural Capacity Building

- Identify and assess all laboratories in the country dealing with POPs analysis and assessment.
- Upgrade the facilities at the different institutions dealing with POPs and their analysis.
- Establish a center for the analysis of dioxins and furans
- Put a plan for interlab comparison, proficiency testing and lab accreditation.
- Training on safe collection and storage of POPs wastes
- Establishment of POPs waste destruction and or decontamination facilities.
- Get rid of POPs stockpile pesticides in an environmentally sound manner.
- Suggestion of alternative pesticides and their safe use and storage.
- Arrange for proper storage of stockpiles until the possibility exists for getting rid of them in an environmentally sound matter or exporting them outside the country to a place where safe destruction of these chemicals is possible.
- Education on handling of these compounds if used.
- Collect all the information available at all institutions working on residues of POPs about levels of these compounds in the environment.
- Prepare a detailed workplan for field investigation all over the country to assess the degree of pollution with these compounds or their degradation products.
- Preparation of a national plan to combat diseases that affect humans using integrated vector management concept.
- Provide the cross points at the boarders and quarantine centers with pesticide data base and ensure that the scientific name and Cas. No. for each chemical is used.
- Set standards for the levels of the different POPs that are allowed for different environmental elements including: water, soil, sediments, and follow the pollution with these compounds in the food chain until mother's milk and human tissues are reached and set limits for POPs in these matrices.This can

be based on international experience and the surveys that are conducted in the country.

- Carry out a socioeconomic assessment to study the impacts of using POPs or reducing them and using their alternatives.
- Conduct risk, health, and environmental impact assessment of POPs.
- Establish a computerized data base on POPs and make this available for all stakeholders and researchers.

III. Awareness Program

- Prepare a detailed awareness plan to cover :
    1. POPs: how they are produced, their danger, and how do they accumulate in the environment for the different sectors of the society.
    2. Make the people, especially the farmers, aware of alternative pesticides and their safe use.
    3. Educate decision makers and legislators on the danger of these compounds.
    4. Introduce these compounds to the students in the curricula in high schools and at universities.
    5. Make the information about POPs available to the public by different means.
    6. POPs awareness campaigns should address NGOs, and women societies.

3.5 Timetable for Plane Implementation and Measures of Success

The proposed planning timetable is presented in Annex 7.

3.6 Resources Requirement

I. Institutional Framework Requirements:

- The Ministry of Environment personnel should be capable of controlling the use and emission of POPs chemicals in the country.
- The Ministry of the Environment personnel should be technically and legally aware of all issues related to complying with Stockholm convention.
- Regular Monitoring of these chemicals to check for compliance with standards can be conducted either by the ministry of environment personnel or be contracted to an accredited institution/s in the country.
- Plant personnel should be trained to be capable of checking the emissions of POPs on continuous basis.
- Coordination between all institutions working on POPs should take place to avoid unnecessary duplication.
- There should be a policy set for POPs issues and application of Stockholm convention and this should be institutionalized and be independent of who the decision maker is.

II. Capacity Building Requirement

Capacity building is required in the following areas:

- Laboratories dealing with monitoring and analysis of POPs:
  These should be upgraded in terms of instruments, space, and training of personnel. Accreditation of these labs is essential to ensure the quality of the data obtained by these labs.
- There is a need to establish a lab in the country capable of analyzing dioxins and furans.
- Establishing a data base for POPs is essential .A net work between all stakeholders should be created.
- Research in POPs regarding their release and transfer in the environment, health effects, safe alternatives, safe destruction and disposal, advances in analytical methods for their analysis and monitoring is highly required.
- Human resource development in all the above mentioned areas is a necessity for the successful implementation of the Stockholm convention. This requires conducting training courses on the, national and international level, information exchange, training towards graduate degrees (masters and PhDs), and conducting awareness workshops.

To achieve these requirements funding is required. This has been estimated to reach a total value of US$ 10,035,000.

ANNEXES

Annex 1: Existed legislations to manage chemical materials for different Institutions and departments that are related to the POPs

Legislation	Concerned party	Chemical materials	Target of the legislation	Articles related	Implementation
Temporary law of environment no 1, year 2003	Ministry of Environment	Hazardous chemical materials and wastes	Protecting environment from different environmental pollutants, its elements and managing waste resulted from it	4, 6, 8, 11/A	
Temporary law of agriculture no 44, year 2002	Ministry of Agriculture	Veterinary tools, medical living preparations, pesticides, fertilizer poisons	Increasing producing food, agricultural products and sustain ability in using natural resources without harming the environment and providing health protection for the animal, plants, food furtuns and to combat blast	21, 20, 32/5, 39/b/5, 45, 51/c/1, 55/7, 57/c/9, 61	Effective
Temporary law of public health no 54, year 2002	Ministry of Health, Greater Amman Municipality, ministry of rural and municipalities affairs	Medicines, chemical materials that don't contain organism whether it was an element or a mix, medical wastes	Protecting public health	32, 33, 34, 36, 35, 45, 44, 49, 46/a/6, 49/b/2	Effective
Law of crafts and industries no 16, year 1953	Ministry of Health, Greater Amman Municipality, ministry of rural and municipalities affairs	Chemical and industrial material and their waste	Organism works in industrial and crafts sectors through setting health standards for managing industrial and crafts structures	6, 4, 11, 12	Effective

Legislation	Concerned party	Chemical materials	Target of the legislation	Articles related	Implementation
Instructions of the management of medical waste no1, year 2001, issued in according with the modified by law of private hospitals no 16, year 2001, and the modified by law for the licensing and management medical and private laboratories no 18, year 2001	Ministry of water (MORMA)	Medical wastes pressurized cans poisonous genes waste, organic solvents, cleaners disinfection and sterilization products	Organizing the process of managing medical wastes in a safety environmental method	All sections	Effective
The managing and handling of hazardous and harmful substances by law	Ministry of Environment	Chemicals and hazardous materials and their wastes	Protecting the environment of different environmental pollutants their elements and managing all the waste resulted from them	All sections	
Law of import and export no 21, year 2001	Ministry of trade and industry, customs department, ministry of health, Greater Amman Municipality, public security, ministry of agriculture	Generally chemical matters	Monitoring the process pf import and export	5/a, 5/b, 6/a, 6/b	Accepted

Legislation	Concerned party	Chemical materials	Target of the legislation	Articles related	Implementation
Import and export bylaw no 7, year 1993	Ministry of trade and industry, customs department, ministry of health, Greater Amman Municipality, public security, ministry of agriculture	Chemical materials	Monitoring the process pf import and export	7	Accepted
Instructions of import and export no 1, year 1999	Ministry of trade and industry, customs department, ministry of health, Greater Amman Municipality, public security, ministry of agriculture	Chemical materials regulated by ministry of health, public security , ministry of agriculture			

Legislation	Concerned party	Chemical materials	Target of the legislation	Articles related	Implementation
Law of Jordanian work and its modification, year 2002	Ministry of work	Chemical polluants in occupationnel environment	Providing safety requirements and occupational health to guarantee safety of workers	78, 80, 81	Accepted
Bylaw of forming committees and safety occupational health observers no7, year 1998	Ministry of work		Appointing specialized staff in following up occupational safety inside establishments (observers and the committee)		Accepted
Regulations specialized in protecting workers from environmental risk, issued in accordance with resolutions of article no 79 of work law	Ministry of work		2,27,26,8,of article 2		Accepted
Resolution special to works restricted to operate women in them, 2001	Ministry of work		Considering the special health condition of women and the negative effect that is possible to occur in result of handling with some chemical substances		Accepted
Modified table for allowed standards	Ministry of work		Protection of health and securing of workers through granting a work environment empty from chemical risks		Accepted

Legislation	Concerned party	Chemical materials	Target of the legislation	Articles related	Implementation
Customs prizing bylaw issued in accordance with customs law no 29, year 1998 Custom lab bylaw no 51, year 1961	Ministry of financial Custom department	All imported and exported materials	Determining imported and exported materials, and classifying them customlly to determine customs fees subjected on them determine materials mentioned as production input in industry or the ones prepared for industrial usage	Chapter 25-40 of table of custom pricing	Accepted
Bylaw of the ports corporation no 51, year 1961	Ministry of transport ports corporation	All chemical materials loaded in ships and steamers (hazardous material)	Protection from marine pollution, protecting marine environment and surrounding from chemical risks and also protecting workers	Article no 18-22	Effective
Civil defense law no 57, year 2000	Ministry of interiors Civil defense directorate	All chemical and radioactive materials or poisons gases	Procurement and facing risks resulted from chemical substance (transfer, handling, storage, fires)	4/c, 76, 13/a, b, c, d, M14/A1, M17	Accepted
Instructions of transferring hazardous, explodable materials, issued in accordance to resolutions of section 2 paragraph A of the article 46 of the temporary law of traffic no 47, year 2001	Public security, civil defense, ministry of environment, free zone establishment customs department ports corporation	Hazardous and explodable materials	Monitoring the transfer of hazardous and explodable materials their modes of transfer	All sections	Accepted

Legislation	Concerned party	Chemical materials	Target of the legislation	Articles related	Implementation
Law of organizing natural Resources affairs no 12, year 1966	Natural resources authority electrical company	Harm resulted from the existence of quires and mines	Not harming irrigation resources that is resulted from pollutants	Article 61 all sections related	Accepted
General electricity law no 49, year 2002	Ministry of energy and mineral resources electrical company	Materials used to generate electricity	Licensing of establishing generation stations and allowing the usage of different materials in the sector's development according to public interest requirement and the interest of public projects, encouraging local an forcing investment in the sector to provide electrical energy for consumers in sufficient manner	M7/1/4, b/7, 5-4------28, 32, ------	Accepted
Free zones law no. 32, year 1984	Free zones corporation	Chemical materials interring the free zones	Allowing entrance of chemical materials on condition of getting the approval of the concerned parties or storage conditions/ chemical materials in free zones	5, 38, 22, 27, 37	Accepted
Bylaw of investing in free zone no 32, year 1984 Instructions of storage and investment in free zones year 1993	Free zone corporation	Chemical materials interring free zone	Organizing the process of entrance of goods into free zones Organizing transit goods Giving permissions to establish industrial projects inside free zones Organizing the entrance of primary materials to free zones	Article 22,5 All sectors	Accepted

Legislation	Concerned party	Chemical materials	Target of the legislation	Articles related	Implementation
Aqaba special economic zone law no 32, year 2000	Aqaba special economic zone authority	Chemical materials and waste generally	Monitoring the import, manufacture storage, transfer and export of chemical material Protecting the environment and guarantee sustainable development	Article 29. 52, 55	Effective
Bylaw of organizing the investment environment and develop it for the Aqaba special economy zone no 11, year 2000	Aqaba special economic zone authority	Chemical materials and waste generally	Permitting or not permitting the practice of an economical activity in the area	All sections	Effective
Bylaw of recording and licensing the establishment in the ASEZA no8, year 2000	Aqaba special economic zone authority	Chemical materials and waste generally	Clarifying banned and restricted activities in the area	All sections	Effective
Bylaw of environment protection in ASEZA no21 year 2000	Aqaba special economic zone authority	Chemical materials and waste generally	Protecting the environment from different pollutants, this includes: Setting requirements and standards approving to handle chemical materials and wastes in the area Managing solid waste hazardous waste and materials in the area Monitoring in porting, manufacturing, storage, transferring, exporting, handling chemical materials in the area	All sections	Effective

Legislation	Concerned party	Chemical materials	Target of the legislation	Articles related	Implementation
Customs bylaw no 91, year 2000	ASEZA		Monitoring operation of in porting, exporting, storage of the chemical material waste, and to follow the need of giving restricted or banned goods previous approval	All sections	Effective
Law of the development of Jordan Valley no 30, year 2001	Jordan Valley Authority/ ministry of water and irrigation	Chemical pollutant material	Developing the Jordan valley and environment	Article 38/1/1, 2-38/b, 38/c	Accepted
Standards and specification law no 22, year 2000	Institute of specifications and metrology. Other ministries	All goods imported that have specified expressions and symbols	Materials should be within allowed specifications from quality and public safety sides	Article 12-31-9	Accepted

Annex 2: Banned and usage restricted POPs according to PIC lists

Name of persistent organic material	Restriction degree	Details about forbidden
Chlordane	Final decision to forbidden its import	Its import and handling was forbidden in 1993
DDT	Final decision to forbidden its import	Forbidden resolution was published by PIC in 1993. It was expected that it would be used to eliminate Malaria, which continued until 1995, then it was banned by Ministry of Health
Dieldrin	Final decision to forbidden its import	It's import and handling was forbidden in 1980
HCH (mixed Isomer)	Final decision to forbidden its import	It's import and usage was forbidden in 1993
Heptachlor	Final decision to forbidden its import	It's import and handling was forbidden in 1980
Lindane (HCH)	Final decision to forbidden its import	It's import and usage was forbidden by Ministry of Agriculture in 1993
Texaphene	Final decision to forbidden its import	It's import and handling was forbidden in 1980
Poly chlorinated byphenyls	A final decision to forbidden its imports and usage in industry	Its import and handling was forbidden in 1996

Annex 3: Comparison between pesticide residues in the agricultural commodities in the study of 2004-2005 and studies conducted in 1993-1994, 1999-2000, 2000-2001, 2002-2003 for imported samples.

	Study in 1993-1994	Percentage %	Study in 1999-2000	Percentage %	Study in 2000-2001	Percentage %	Study in 2002-2003	Percentage %	Study in 2004-2005	Percentage %
Samples number	989	---	250	---	200	---	200	---	195	---
Number of samples that contain pesticides below MRL.	43	4.35	38	15.2	29	14.5	26	13	12	6.2
Number of samples that don't contain pesticides	946	95.65	212	84.8	170	85	174	87	183	93.8
Number of samples that contain pesticides higher than MRL.	---	---	---	---	1	0.5	---	---	---	---
Number of samples that contain pyrethroid compounds	3	0.3	17	6.8	10	5	6	3	4	2.1
Number of samples that contain organophosphorus compounds	10	10.01	26	10.4	21	10.5	12	6	9	4.6

	Study in 1993-1994	Percentage %	Study in 1999-2000	Percentage %	Study in 2000-2001	Percentage %	Study in 2002-2003	Percentage %	Study in 2004-2005	Percentage %
Number of samples that contain organochlorine compounds	34	3.44	5	2	6	3	2	1	---	---
Number of samples that contain banzelite compounds	2	0.2	2	0.8	2	1	4	2	2	1
Number of samples that contain phthalamid compounds	---	---	3	1.2	---	---	---	---	---	---
Number of samples that contain conzawl compounds	---	---	---	---	3	0.5	---	---	---	---
Number of samples that contain other pesticides group	---	---	---	---	1	0.5	4	2	1	0.5

Note: Samples may have more than one pesticide.

Annex 4: Results of RSS study about transformers in Jordan Electricity Distribution Company (JEDCo.)

Sample No.	Location	Country of origin	Oil Capacity (kg)	PCBs Conc. with Florisil EXCT (PPM)	PCBs Conc. with ACID EXCT (PPM)	PCBs Conc. with FSYRINGE (PPM)	Color
1	Swaileh 1	Korea	110	NIL			Yellow
2	Swaileh 2	Britain	760	NIL			Brown
3	Swaileh 3	Britain	640	NIL			Yellow
4	Gandel al-homar	Pakistan	426	0.085		0.33	Brown
5	Swaileh 4	Britain	860	NIL			Yellow
6	Swaileh 5	Britain	617	NIL			Brown
7	Swaileh 6	Korea	1160	NIL			Brown
8	Amman 1	Pakistan	362	NIL			Yellow
9	Amman 2	Fenland	680	NIL			Yellow
10	Amman 3	Italy	3400	NIL	NIL		Yellow
11	Amman 4	Korea	610	NIL			Brown
12	Amman 5	Italy	3400	NIL			Brown
13	Amman 6	Finland	650	NIL			Yellow
14	Amman 7	Finland	650	NIL			Yellow
15	Amman 8	Holland	830	NIL	NIL		Yellow
16	Amman 9	Finland	740	NIL			Yellow
17	Amman 10	Korea	1160	NIL			Brown
18	Amman 11	Korea	610	NIL			Brown
19	Amman 12	Britain	657	NIL			Yellow
20	Amman 13	Britain	584	2.28		0.3	Yellow
21	Amman 14	Holland	520	NIL			Yellow
22	Amman 15	Finland	1070	NIL			Yellow

Sample No.	Location	Country of origin	Oil Capacity (kg)	PCBs Conc. with Florisil EXCT (PPM)	PCBs Conc. with ACID EXCT (PPM)	PCBs Conc. with FSYRINGE (PPM)	Color
23	Amman 16	Britain	590	NIL			Yellow
24	Amman 17	Belgium	410	0.23		0.26	Yellow
25	Amman 18	Finland	1070	NIL			Yellow
26	Amman 19	Holland	520	NIL			Yellow
27	Amman 20	France	240	13.08		22.36	Yellow
28	Amman 21	Britain	1000	NIL			Brown
29	Amman 22	Britain	716	NIL			Brown
30	Amman 23	Britain	644	NIL			Yellow
31	Amman 24	Korea	1015	NIL			Brown
32	Amman 25	Korea	610	2.95		2.1	Brown
33	Amman 26	Britain	784	9.94		13	Dark Brown
34	Amman 27	Britain	8143	NIL			Green
35	Amman 28	Korea	610	NIL			Dark Brown
36	Amman 29	Belgium	960	NIL			Brown
37	Amman 30	Pakistan	362	NIL			Brown
38	Amman 31	Belgium	960	NIL			Brown
39	Amman 32	Korea	1015	NIL			Brown
40	Amman 33	Britain	776	NIL			Yellow
41	Amman 34	Italy	5250	NIL			Yellow
42	Amman 35	Britain	8143	NIL			Yellow
43	Amman 36	Fenland	680	NIL			Yellow
44	Amman 37	Britain	687	NIL			Yellow
45	Amman 38	Fenland	1070	NIL			Yellow
46	Amman 39	Britain	1050	NIL			Yellow
47	Amman 40	Fenland	680	NIL			Yellow
48	Amman 41	Britain	590	NIL			Yellow
49	Amman 42	Britain	854	NIL			Yellow
50	Amman 43	Italy	3400	NIL			Yellow
51	Amman 44	-	-	NIL			Yellow

Sample No.	Location	Country of origin	Oil Capacity (kg)	PCBs Conc. with Florisil EXCT (PPM)	PCBs Conc. with ACID EXCT (PPM)	PCBs Conc. with FSYRINGE (PPM)	Color
52	Amman 45	Britain	732	NIL			Brown
53	Amman 46	Britain	879	NIL			Dark Brown
54	Amman 47	Korea	4950	0.6		NIL	Dark Brown
55	Amman 48	Pakistan	600	0.1		NIL	Brown
56	Amman 49	Korea	4950	0.54		2.58	Dark Brown
57	Amman 50	Korea	1160	NIL			Dark Brown
58	Amman 51	Korea	1160	NIL			Dark Brown
59	Amman 52	Britain	784	0.13		0.11	Brown
60	Amman 53	France	240	16.3		20.16	Brown
61	Amman 54	Japan	850	0.12		NIL	Yellow
62	Amman 55	Britain	1060	NIL			Yellow
63	Amman 56	Korea	1160	NIL	NIL		Brown
64	Amman 57	Korea	660	NIL			Yellow
65	Amman 58	Britain	615	2.58		2.86	Yellow
66	Amman 59	France	585	1.81		NIL	Yellow
67	Amman 60	Britain	590	NIL			Yellow
68	Amman 61	Hungary	850	NIL			Yellow
69	Amman 62	Britain	580	NIL			Brown
70	Amman 63	Britain	759	NIL			Brown
71	Amman 64	Russia	800	NIL			Yellow
72	Amman 65	Britain	850	NIL			Yellow
73	Amman 66	Holland	520	NIL			Yellow
74	Used oil	-	-	NIL	NIL		Dark Brown
75	Remanufactured oil	-	-	NIL			Yellow
76	New oil	Britain	-	NIL			Yellow
77	Al-zarqa 1	Britain	784	4.79		10.1	Dark Brown
78	Al-zarqa 2	Britain	6180	NIL	NIL		Yellow
79	Al-zarqa 3	Italy	5	2.39		NIL	Yellow
80	Al-zarqa 4	USA	1135	NIL			Yellow

Sample No.	Location	Country of origin	Oil Capacity (kg)	PCBs Conc. with Florisil EXCT (PPM)	PCBs Conc. with ACID EXCT (PPM)	PCBs Conc. with FSYRINGE (PPM)	Color
81	Al-zarqa 5	Russia	375	NIL	NIL		Yellow
82	Al-zarqa 6	Turkey	725	NIL			Yellow
83	Amman 67	Britain	630	NIL	NIL		Brown
84	Amman 68	Britain	2400	NIL			Yellow
85	Amman 69	Finland	680	NIL			Yellow
86	Amman 70	Korea	1160	NIL	NIL		Dark Brown
87	Amman 71	Korea	1160	NIL	NIL		Dark Brown
88	Amman 72	Poland	680	NIL			Yellow
89	Amman 73	Britain	4700	3.05		8.34	Yellow
90	Amman 74	Korea	1160	NIL			Dark Brown
91	Amman 75	Korea	1160	NIL		8.34	Brown
92	Amman 76	Britain	4700	NIL	NIL		Brown
93	Amman 77	Britain	784	23.19		18.3	Yellow
94	Amman 78	Finland	680	NIL			Yellow
95	Amman 79	Finland	650	NIL	NIL	18.3	Yellow
96	Amman 80	Pakistan	510	0.14	NIL	5.32	Yellow
97	Amman 81	Korea	1165	NIL	NIL		Brown
98	Amman 82	Korea	610	NIL			Brown
99	Amman 83	Korea	1160	NIL	NIL		Dark Brown
100	Amman 84	Japan	610	NIL	NIL		Yellow
101	Amman 85	Pakistan	510	0.13	NIL	NIL	Yellow
102	Amman 86	Japan	830	NIL	NIL		Yellow
103	Amman 87	Korea	610	0.12	NIL	NIL	Dark Brown
104	Amman 88	Britain	695	NIL	NIL		Brown
105	Amman 89	Britain	463	NIL	NIL		Brown
106	Amman 90	Britain	807	NIL	NIL		Brown
107	Amman 91	Britain	784	0.45		3.56	Yellow
108	Amman 92	Britain	630	NIL	NIL		Yellow
109	Amman 93	Pakistan	510	41		NIL	Brown

Sample No.	Location	Country of origin	Oil Capacity (kg)	PCBs Conc. with Florisil EXCT (PPM)	PCBs Conc. with ACID EXCT (PPM)	PCBs Conc. with FSYRINGE (PPM)	Color
110	Amman 94	Korea	874	NIL			Yellow
111	Amman 95	Korea	630	NIL	NIL		Dark Brown
112	Amman 96	Britain	720	NIL	NIL		Brown
113	Amman 97	Britain	1304	NIL	NIL		Dark Brown
114	Amman 98	Britain	860	NIL	NIL		Yellow
115	Amman 99	Britain	860	NIL			Yellow
116	Al-zarqa 7	-	-	NIL			Yellow
117	Amman 100	-	-	NIL	NIL		Brown
118	Amman 101	-	-	3.79		0.40	Yellow
119	Amman 102	-	-	0.33		2.77	Yellow

Annex 5: Transformers inventory in the Central Electricity Generation Company (CEGCo).

Type	Capacity (kVA)	Voltage (V)	Current (A)	Oil type	Type of tap changer	Vector group
Main Transformer 1&2&3 NTR- ABB	40000	13800/ 132000	1674/ 175	Isovolt	Off-load	Dyn11
Unit Transformer 1&2 NITRV-ABB	3750	13800/ 3300	456/ 655	Isovolt	Off-load	Dyn1
Unit Transformer 3 ISETHP-ABB	3750	13800/ 3300	156/ 655	Isovolt	Off-load	Dyn1
Unit aux. Transformer 1&2 NITR-ABB	1725	3300/ 416	301/ 2394	Askeral	Off-load	Dyn11
Unit aux. Transformer 3 NITR-ABB	2000	3300/ 416	350/ 2778	Askeral	Off-load	Dyn11
Earthing – transformer 1&2&3 TMSE-ABB	50	13800/ 240	-	Askeral	Off-load	-
Plant transformer 1 NITR-ABB	3750	33000/ 3300	66/ 655	Isovolt	Off-load	Dyn11
Plant transformer 2 NITR-ABB	7500	33000/ 3300	131/ 1312	Isovolt	Off-load	Dyn11
Plant aux. transformer 1 NITR-ABB	1725	3300/ 416	301/ 2394	Askeral	Off-load	Dyn11
Plant aux. transformer 2 NITR-ABB	2000	3300/ 416	350/ 2778	Askeral	Off-load	Dyn11
Gas turbine Transformer 1 W.H Canada	16800	33000/ 10000	970/ 327	Isovolt	On-load	Ynd11
Gas turbine aux transformer	150	10000/ 416	8.6/ 208	-		-
Gas turbine transformer 2 dor 2500/30AEG	28000	33000/ 10000	1917/ 453	Isovolt	On-load	Ynd11

Type	Capacity (kVA)	Voltage (V)	Current (A)	Oil type	Type of tap changer	Vector group
Gas turbine 2 aux. transformer	200	1000/ 416	11.6/ 289	-	-	-
Main transformer 4&5&6&7 FUJI ELEC.	80000	132000/ 13800	350/ 3347	Shell diallab	Off-load	Yd11
Unit transformer 4&5&6&7 FUJI ELEC	7500	13800/ 3300	392/ 1640	Isovolt	On-load	Dy1
Unit aux. Transformer A 4&5&6&7 FUJI ELEC	1150	33000/ 416	201/ 1596	Dry type	Off-load	Dy11
Unit aux. Transformer B 4&5&6&7 FUJI ELEC	3000	3300/ 416	325/ 4160	Dry type	Off-load	Dy11
Erthing Transformer A 4&5&6&7 FUJI ELEC	75	13800/ 240	-	Dry type	Off-load	-
Plant Transformer 3&4 FUJI ELEC	7500	33000/ 3300	1640	isovolt	Off-load	Dy11
Plant aux. Transformer 3&4 FUJI ELEC	2000	3300/ 416	350/ 2780	Dry type	Off-load	Dy11

Annex 6: Transformers in IDECO which manufactured before 1980.

No.	Location	Oil Capacity	Weight (kg)	Capacity kVA	Year of manufacturing	Notes
1	Jarash Enbeh	400	1940	500	1979	Oil seepage / soil pollution
2	Jarash Enbeh	400	1940	500	1978	Simple old oil seepage
3	Jarash Swof	880	3650	1000	1979	Good .
4	Jarash Swof	660	2605	500	1976	Oil seepage / soil pollution
5	Jarash Swof	660	2605	500	1976	Simple oil seepage
6	Irbid	680	2605	-	1976	Good
7	Irbid	680	2605	-	1976	Good
8	Irbid	563	2022	-	1973	Good
9	Irbid	563	2022	-	1973	Good
10	Irbid	680	2605	-	1977	Good
11	Irbid			-	1960	Fixed in elico
12	Irbid	260	-	-	1968	Good
13	Irbid				1959	The label is not clear
14	Irbid				1979	The label is not clear
15	Irbid				1979	The label is not clear
16	Irbid	51 gallons	1009		1960	Good
17	Irbid				1963	The label is not clear
18	Irbid	4140	1384		1973	+type changer with 610 kg oil content
19	Irbid	1640	-		1970	Good
20	Irbid	1670	4863		1973	Good

Annex 7: Initial Estimation of Time and Budget for the Implementation of the Different Action Plans

YEARS	2006 - 2011	2011	
Action Plans			**Budget USD**
Institutional and Regulatory Strengthening Measures			**3,000,000**
1. Establish a National Implementation Unit in the Ministry of Environment with detailed responsibilities			
2. Ensure the compliance of Jordanian legislation with the requirements of the Convention and Protocol by revision of existing legislation; identification of gaps; recommendations for amendments; stakeholders consultations.			
3. Revise existing legislations to ban any future production, use, export and import of POPs.			
4. Enforce waste management legislations related to previous pesticide usage.			
5. Develop the necessary institutional and technological basis for the safe waste management of PCB containing equipment and PCB containing waste, as well as implement timely and safe collection and elimination of PCB containing waste.			

YEARS	2006 - 2011	2011	
Action Plans			**Budget USD**
6. Enforce adequate monitoring practices of POPs emissions and implement preventive measures to decrease unintentional POPs emissions.			
7. Develop guidelines to determine the suspected contaminated sites			
8. Inspect suspected past and present contaminated sites.			
9. Introduce and adopt guidelines and standards for acceptable limits of POPs emissions in different environmental elements			
10. Enhance efficient cooperation between stakeholders and concerned institutions, NGOs, local communities and research centers.			
Measures to reduce or eliminate emission from intentional production and use.			**1,250,000**
11. Prevention of illegal use and handling of DDT.			
12. Establish monitoring programmes for POPs based on Jordan's international commitments			
13. Strengthen the environmental inspection departments in the different competent authorities			

YEARS	2006 - 2011	2011	
Action Plans			**Budget USD**
14. Production, import, and export, use, stockpiles, wastes of Annex A POPs pesticides (Annex A part I chemicals)			
15. Define stockpiles of existing banned POPs pesticides			
16. Label and repack of POPs pesticides stockpiles properly			
17. Store and/or dispose of POPs pesticides stockpiles in an environmentally sound manner.			
Production, Import and Export, Use, Identification, Labeling, Removal, Storage and Disposal of PCBs and Equipment Containing PCBs (Annex A, Part II chemicals)			**27,100,000**
18. Conduct comprehensive field surveys in order to complete the PCBs inventories on the national level.			
19. Develop guidelines for collection and safe disposal of contaminated oils and equipment.			
20. Define, label, and store stockpiles of existing contaminated oils and equipment			
21. Clean or replace contaminated equipment.			
22. Dispose of PCBs stockpiles and/or contaminated equipment in an environmentally sound manner.			

YEARS	2006 - 2011	2011	
Action Plans			**Budget USD**
23. Define stockpiles of existing banned DDT			
24. Label and repack of DDT stockpiles properly			
25. Store and/or dispose of DDT stockpiles in an environmentally sound manner.			
Measures to reduce releases from unintentional production:			**21,000,000**
26. Control of solid waste open burning			
27. Develop and enact proper procedures to collect and dispose medical waste in environmentally sound manner			
28. Improve usage and/or disposal of sludge generated from wastewater plants.			
29. Improve current disposal operations by adopting sanitary land filling of waste.			
30. Study the feasibility of upgrading existing and/or constructing regional medical waste incinerators.			

YEARS	2006 - 2011	2011	
Action Plans			**Budget USD**
31. Support the hazardous waste management project in Suwaqa, south of the capital city Amman.			
32. Enhance and support renewable energy projects, rationalize energy use and encourage production and use of clean fuels such as natural gas and bio-fuels.			
Measures to reduce releases from stockpiles and wastes			**11,500,000**
33. Adopt acceptable international standards and codes of practices in order to ensure safe storage of POPs stockpiles and waste			
34. Apply best available technology and best environmental practices (BAT/BEP) in order to reduce and dispose waste in safe and environmental friendly manner.			
35. Encourage participation of private sector in waste management.			
Identification of Stockpiles, Articles in Use and Wastes			**1,000,000**
36. Complete of the database on hot spots, stockpiles, waste and contaminated sites			

YEARS	2006 - 2011	2011	
Action Plans			**Budget USD**
37. Develop and adopt measures to reduce releases of waste, stockpiles containing or contaminated with POPs, including PCBs compounds.			
Manage Stockpiles and Appropriate Measures for Handling and Disposal Articles in Use			**4,100,000**
38. Establish of procedures for handling, disposal of stockpiles, articles in use and waste.			
39. Complete of database of hotspot and contaminated sites.			
40. Manage of waste in an Environmental sound manner			
Identification of Contaminated Sites (Annexes A, B and C chemicals) and Remediation in an Environmentally Sound Manner			**19,500,000**
41. Conduct a thoroughly inventory of contaminated areas with an analysis of ecological risks and evaluate the need decontamination			
42. Establish a national centers for capacity building and technology transfer			

YEARS	2006 - 2011	2011	
Action Plans			**Budget USD**
43. Develop and upgrade proper labs for quantity analysis and providing existing analysis labs with advanced facilities to accurate data and accelerate analysis procedures, to internationally accredited			
44. Remediation of POPs contaminated sites.			
Facilitating or Undertaking Information Exchange and Stakeholders Involvement.			**750,000**
45. Improve existing information exchange mechanisms on national level			
46. Develop new information exchange mechanisms to fit the needs emerged from the progress of POPs related issues on national, regional and international levels.			
47. Encourage, strengthen and maintain involvement of various stakeholders in POPs related issues.			
48. Synergize different international agreements related to chemical and POPs issues.			

YEARS	2006 - 2011	2011	
Action Plans			**Budget USD**
49. Enable an easy access of public to data and available information.			
50. Ensure exchanging educational and public awareness tools related to POPs and their alternatives at national and international levels.			
Public Awareness, information, and education			**1,000,000**
51. Develop and approve a national plan for protecting public health from impacts resulted from exposure to POPs			
52. Set a strategy for raising awareness campaigns			
53. Raise awareness for decision- makers on POPs related issues.			
54. Make information on POPs available to the public through different media channels (TV, radio, press and printed materials).			
55. Raise awareness on POPs related issues to public through different activities, focusing on specific target groups, such industrial and agricultural sectors, women and children,… etc.			
56. Publish different guidelines on the impacts and hazards of POPs on health and environment for the different exposed target groups.			

YEARS	2006 - 2011	2011	
Action Plans			**Budget USD**
57. Set a long-term plan to include POPs subjects in the programs of different educational stages.			
58. Encourage postgraduate studies to conduct research in different POPs issues and provide the needed funds and facilities.			
Effectiveness Evaluation (Article 16)			**9,450,000**
59. Assign responsibilities to different institutions to avoid overlapping and unrequited repetition.			
60. Update inventories on current health, and environment hazards of POPs			
61. Analyze samples taken from different POPs suspected sites			
62. Establish a system for monitoring, evaluating and following up.			
63. Develop centers for analysis of Dioxins and Furans.			
64. Upgrade the facilities at the different institutions dealing with POPs analysis.			
65. Work on accreditation of labs for certain POPs analysis.			

YEARS	2006 - 2011	2011	
Action Plans			**Budget USD**
66. Develop of a system for safe storage for collection of POPs wastes.			
67. Develop of POPs waste destruction and/or decontamination facilities.			
Reporting			**50,000**
68. Ensure reporting in conducted in compliance with the requirement of the convention			
Research, development and monitoring (Article11)			**1,000,000**
69. Encourage research on POPs and their alternatives			
70. Establish a National POPs Monitoring Committee for environmental monitoring of POPs, supervising research, development, discussing results and suggesting ideas, by the Jordanian government.			
Activity: Technical and financial assistance.			
71. secure adequate technical and financial resources to establish and maintain the proposed permanent NIP unit.			

YEARS	2006 - 2011	2011	
Action Plans			**Budget USD**
72. Form an expert committee to identify the country needs of laboratories and related technical facilities. These facilities should be procured in earlier stages of the NIP project in the context of the Stockholm Convention on POPs.			
73. Provide financial resources are needed for building the capacity of local specialists in PCDD/PCDF and other POPs subjects through appropriate training programs. Such programs can be implemented inside and outside the country in coordination with donors and the Stockholm Convention secretariat			
74. Review and consider the previous PCDD/PCDF initiatives and projects when preparing future POPs related proposals. This will result in avoiding the duplication in work and decrease the cost of project implementation			
75. Construct regional medical waste incinerators. It is recommended to construct 3 incinerators in the north, middle and south regions in the country			
76. Secure the needed financial and technical support for cleaning up and remediation measures that could be needed for the contaminated sites			
77. Enhance and support the renewable energy projects, rationalizing the energy use and encouraging the production and the use of clean fuel.			

YEARS	2006 - 2011	2011	
Action Plans			**Budget USD**
78. Safe storage and destruct of DDT and Dieldrin stockpiles in both ministries (Ministry of Health and Ministry of Agriculture) until such time that they disposed off properly with the assistance of the international institutions in accordance with the Basel Agreement.			
79. Develop a national program for control of vectors of human diseases that are born by biological vectors, using the Integrated Vector Management (IVM) technique, including provision of support to such programs as the alternative pesticides are costly.			
Total			**101,035,000**