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The Islamic Republic of Iran

National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants

July 2008

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More than … specialists, members of scientific faculties at different universities in Iran and the University of Michigan, several international consultants and senior experts at different ministries and organizations have cooperated with the office of POPs Enabling Project in preparing this NIP. We are very grateful for their invaluable contributions. A list of individual names and organizations contributing to the preparation of this document is provided in Annex 2.

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Foreword

Persistent Organic Pollutants (POPs) are toxic chemicals that adversely affect human health and the environment around the world. Because they are transported by wind and water, POPs released in one country can affect people and wildlife far from their initial point of release. The pollutants persist for long periods in the environment, accumulate in organisms and pass from one species to the next through the food chain. To address this global concern, I. R. of Iran signed the Convention on Persistent Organic Pollutants (POPs) in May, 2002, joining forces with more than 150 other countries to support and implement a groundbreaking United Nations treaty in Stockholm, Sweden.

Under this treaty, known as the Stockholm Convention which entered into force on May, 2004, I. R. of Iran and other signatory countries agree to reduce or eliminate the production, use and/or release of 12 key POPs chemicals: Aldrin, Chlordane, DDT, Dieldrin, Endrin, heptachlor, Hexachlorobenzene, Mirex, Toxaphene and PCBs beside Dioxins and Furans. The Convention also specifies a scientific review Process that could lead to the addition of other POPs chemicals of global concern.

Many of the POPs included in the Stockholm Convention are no longer produced or used in the I. R. of Iran. None of the listed POPs pesticides, for example, are now manufactured or registered for use in our country. However, Iranians and Iranian habitats like others in the world can still be at risk from POPs, from unintentionally produced POPs that are released in the I. R. of Iran, and from POPs that are released elsewhere and then transported here (by air or other means, for example). The Stockholm Convention will add an important global dimension to our efforts to protect the health of our citizens and our environment. It will ban production, limit uses and reduce or eliminate release of these POPs chemicals.

Other protocol obligations include the application of best available technology (BAT) and best environmental practices (BEP) to limit air emissions from major stationary sources of Dioxins, Furans, Hexachlorobenzene and PCBs. For this, I. R. of Iran will consider and take initiatives to modernize, monitor and control its industrial sectors in order to reduce emissions to the acceptable levels. I.R.I. will also apply other control strategies, provided they achieve equivalent emission reduction as an alternative compliance option.

I. R. of Iran started developing this National Implementation Plan on POPs in 2003 in fulfillment of her obligations under the Stockholm Convention according to Article 7. Preliminary inventories on POPs pesticides, PCBs, unintentionally produced Dioxin and Furans were compiled. Consequently, a defined clear overview of the use and releases of these substances (under the Convention) through their life cycle (import, export, transport, distribution, use and disposal) in Iran was attained. Moreover, this process enabled the I. R. of Iran to define national priorities according to the criteria set in full coordination with all the relevant authorities and ministries.

The activities carried out throughout the project were implemented under the auspices of the National Steering Committee of the project including all the interested ministries, authorities, NGOs, and the private sector.

In developing the NIP relevant international experience has been taken into account. Moreover, the NIP, takes into consideration the linkages between the three relevant international conventions managing chemicals, i.e., Stockholm, Rotterdam and Basel, as well as any further additions to the Strategic Approach on International Chemical Management.

The POPs NIP for the I.R. of Iran, presented below, has defined objectives and actions, a financial cost and a time schedule for the management of POPs till 2020 in accordance with the principles agreed upon during the Earth Summit of Johannesburg, which states that 2020 should be the year for reducing the hazardous impact of chemicals on health and environment.

Consequently, the NIP for POPs in the I. R. of Iran has been issued to include an introduction, three main chapters in addition to two annexes in about 128 pages.

Executive Summary

Government's Commitment to Convention Implementation

Persistent organic pollutants (POPs) possess toxic properties, resist degradation, bio accumulate, and are transported, through air, water and migratory species, across international borders and are deposited far from their place of release. They accumulate in terrestrial and aquatic ecosystems. Even very low exposure to POPs may induce cancer, cause damage to the central and peripheral nervous systems, cause immune system diseases. POPs are harmful to reproduction and can disturb normal development of infants. Therefore, POPs pose a great threat to sustainable development.

The Stockholm Convention on Persistent Organic Pollutants aims to reduce, eliminate and prevent POPs pollution and to protect human health and the environment. The list of POPs chemicals covered by the Convention include pesticides, some industrial chemicals as well as unintentional by-products.

The Iranian government signed the Stockholm Convention on Persistent Organic Pollutants (hereinafter referred to as the Stockholm Convention or the Convention) on 23rd May 2001 and it was ratified on 6th February 2006 in the Iranian Parliament?.

As required in Article 7 of the Stockholm Convention, the Iranian government shall develop and transmit to the Conference of the Parties the National Implementation Plan of the I. R. of Iran for the Implementation of the Stockholm Convention on Persistent Organic Pollutants. This document constitutes the above-mentioned National Implementation Plan, hereinafter referred to as NIP.

As proclaimed by the ratification of the Convention, the Iranian government solemnly commits itself to fulfilling the obligations specified by the Convention, comply with the national strategy of sustainable development and, given the support by the Convention's financial and technology transfer mechanisms, implement the requirements of Convention. Additionally, the Government will establish and improve corresponding administrative systems and develop and implement related policies and necessary action measures so as to achieve the control objectives required by the Convention. The roles and responsibilities of the institutions have been elaborated in section 3.3.1.

The I. R. of Iran will, as per NIP action plans, adjust product and industrial structures, promote cleaner production, boost effective utilization of resources, create new economic growth possibilities, increase employment opportunities, improve the environmental awareness of the whole society and the level of public participation, and ultimately promote sustainable development.

In addition to the aforementioned tasks, I. R. of Iran will, based on its actual situation, improve the policies and regulations designed to fulfill objectives of Convention implementation, strengthen institutional capacity, and carry out Convention implementation activities in a stage-wise program and by region and industry section, so as to achieve the following objectives:

1. Development of legal frame work and its enforcement and capacity building of Government Institutions for Managing POPs
2. Prohibition and prevention of the import and use of POPs pesticides, completion of Pesticides and Contaminated Soil Inventory, Capacity building for enforcement and Awareness raising, Predicting Fate and Transport of POPs in the Caspian Sea, the Persian Gulf and the Oman Sea, and POPs Pesticide Stockpile management and disposal according to a carefully designed HSE management system alongside all the needed guidelines;
3. Achievement of an environmentally sound management of currently used equipment containing PCBs in demonstration provinces and identification of high-risk equipment containing PCBs in use;
4. Implementation of the measures for Best Available Techniques and Best Environment Practices (BAT/BEP) for new sources in key sectors with unintentional POPs release; taking prioritized BAT/BEP measures for existing Dioxin release sources in key sectors of key regions, and basically controlling the increasing trend of Dioxin release.
5. Improvement of the support systems for the environmentally sound management and disposal of POPs wastes; and beginning to achieve the environmentally sound management and disposal of identified POPs wastes.
6. Ensuring appropriate, full and timely information exchange between government Ministries and the Convention and dissemination of information on POPs related international developments
7. Achievement of the proper organization of POPs information and outreach, creation and implementation of educational programs on POPs, increasing NGO capacities for creating POPs public awareness and information dissemination, raising POPS awareness among priority groups
8. Development of sound research, development, and monitoring system for POPs in the country

Hazards and Impacts of POPs in the I. R. of Iran

POPs pesticides have never been produced in Iran, all POPs pesticides used are of foreign origin and no re-export of these compounds to other countries is occurring. All POPs pesticides use was banned in Iran in 1977. Only Toxaphene was not included in the original list of banned substances which was formally banned in 1984. Therefore, existing stockpiles of these chemicals in the Ministry of Jihad-e Agriculture storage houses were purchased before the above mentioned dates. The legislation permitted use of DDT for human health purposes and malaria vector control, under supervision of the public health authorities until 1992 after which its use has been discontinued by orders of the Ministry of Health and Medical Education.

Pesticide manufacturing and distribution has until recently been a fully government managed activity. In recent years an opening-up of the pesticide manufacturing and distribution to the private sector has taken place. This means that it is less likely that any old POPs pesticides stockpiles would be in possession of the private sector manufacturers or distributors. However, there is a possibility of illegal trafficking of POPs pesticides through the Iranian borders.

The issue of PCBs are quite novel to Iran. Consequently the current laws and regulations are not covering any stage of the PCB lifecycle such as use, handling, storage or disposal. This regulatory absence indicates that the presence and amounts of PCBs have not been investigated before the POPs Enabling Activity project and development of the NIP. Therefore, only rough estimations can be drawn which is about 25,300,000 Kg. It can be said for sure that there is a considerable PCB issue in Iran which needs firm steps to be taken in order to prevent releases of PCBs in the environment due to inappropriate waste management or spillage.

Unintentional POPs or dioxin-like compounds constitute the third group of POPs substances. These pollutants, consisting of PCDDs (dioxins) and PCDFs (furans) as well as unintentionally produced HCB and PCBs, are mainly released as unintentional by-products from industrial point sources and diffuse sources of uncontrolled activities, such as waste burning.

Iranian inventory of Dioxin-like compounds of about 1.568 kg TEQ/year is considerable compared with inventories of industrialized countries which are in the range of 0.1- 4.0 Kg TEQ/year. Clearly, level of releases indicate the need for commencing a more systematic management of unintentional POPs releases.

At present, Iran does not have a complete set of regulations and standards on POPs in foods, feedstuff and electrical and mechanical equipment. This hampers the protection of human health and that of animals and plants. Without adequate laws and regulations it is difficult to carry out supervision of domestic products and to prevent foreign products containing or contaminated with POPs entering the country. On the other hand, the issue of POPs residues in some products is obstructing export of Iranian products. Cases concerning international trade blocked due to Dioxin content higher than standards are increasing year by year. As many developed food importing countries stopped using POPs and reduced their releases, the background values of POPs in their environment are gradually decreasing. This may result in even more rigorous restrictive protection measures for the trading of commodities, especially food. As a result, I. R. of Iran will face even more severe challenges in foreign food trade.

Chapter 1 Introduction:

1.1 Background

Persistent organic pollutants (POPs) possess toxic properties, resist degradation, bio accumulate, and are transported, through air, water and migratory species, across international borders and are deposited far from their place of release. They accumulate in terrestrial and aquatic ecosystems. Even very low exposure to POPs may induce cancer, cause damage to the central and peripheral nervous systems, cause immune system diseases. POPs are harmful to reproduction and can disturb normal development of infants. Therefore, POPs pose a great threat to sustainable development.

The Stockholm Convention on Persistent Organic Pollutants (hereinafter referred to as the Stockholm Convention or the Convention) aims to reduce, eliminate and prevent POPs pollution and to protect human health and the environment. The Stockholm Convention includes 30 articles and 6 annexes with the following obligations:

The first group of 12 POPs has to be controlled as specified in the Convention's Annexes which includes:

- Annex A (intentionally produced chemicals): Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene, Mirex, Toxaphene and PCBs;
- Annex B (intentionally produced chemicals): DDT;
- Annex C (unintentionally produced chemicals): polychlorinated dibenzo-p-dioxins and dibenzofurans (collectively referred to as Dioxin), Hexachlorobenzene and PCBs.

The Convention requires that actions be taken on the aforementioned 12 POPs:

- Annex A: Eliminate production, use, import and export of such chemicals.
- Annex B: Gradually eliminate or restrict production, use, import and export of such chemicals.
- Annex C: Within two years of the date of entry into force of the Convention, develop and implement action plans to identify release of chemicals listed in Annex C and gradually reduce their release by applying Best Available Techniques and Best Environmental Practices (BAT/BEP); phase in use of BAT for new sources in the categories listed in Part II of Annex C as soon as practicable but no later than four years after the entry into force of the Convention; and for existing release sources listed in Annex C, gradually implement BAT/BEP to reduce their releases.
- Stockpiles and wastes of Annex A, Annex B and Annex C: develop appropriate strategies for identifying POPs stockpiles and wastes; manage stockpiles, as appropriate, in a safe,

efficient and environmentally sound manner; take appropriate measures so that such wastes, including products and articles upon becoming wastes are handled, collected, transported and stored in an environmentally sound manner; and gradually reduce or eliminate releases from stockpiles and wastes.

General provisions contained in the Convention include Party obligations to:

- Develop and endeavor to implement a plan for the implementation of their obligations under the Convention within two years of its entry into force, (National Implementation Plan for POP, the POPs NIP).

- Report to the Conference of the Parties on measures taken to implement the Convention;

- Facilitate and undertake information exchange on POPs including the establishment of a national focal point for this purpose;

- Facilitate and promote awareness, education, and the provision of information to the public, particularly for decision-makers and effected groups; and

- Encourage and undertake research, development and monitoring of POPs and their alternatives, and support international efforts along these lines.

The Convention includes a procedure for adding additional POPs for coverage in order to respond to new threats that maybe identified in the future.
It is recognized that many Parties will need technical and financial assistance in order to implement all the above provisions.

Chapter 2 Basic Situation of the Country

2.1. Country Profile

2.1.1. Geography

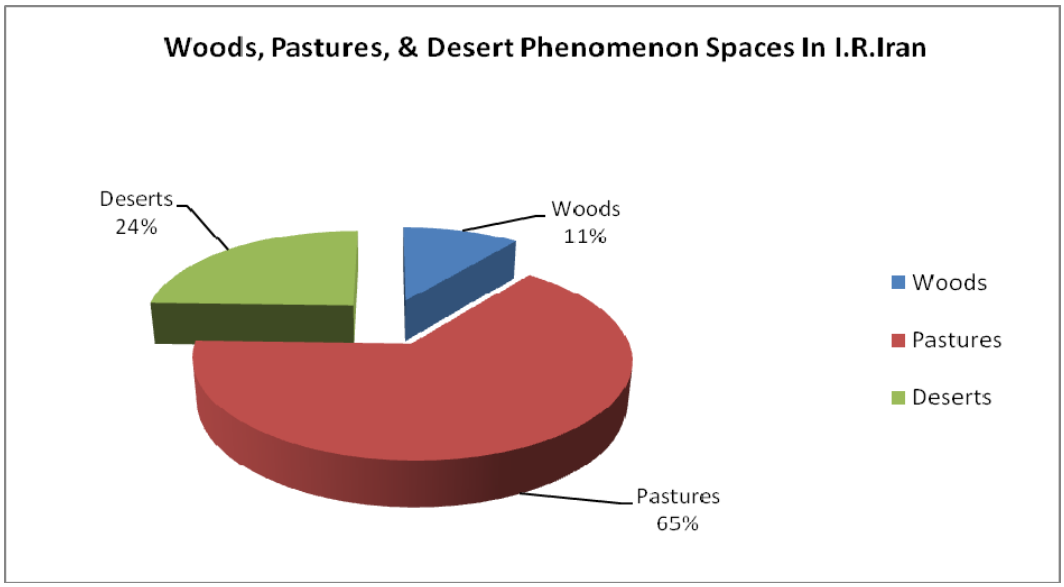
The Islamic Republic of Iran comprises a land area of over 1.64 million square kilometers (the 17th country in the world by land area). It is located in south west of Asia and is one of the Middle-East countries. It is bounded by Turkmenistan, the Caspian Sea, Azerbaijan and Armenia on the north, Afghanistan and Pakistan on the east, the Persian Gulf and the Oman Sea on the south, and Iraq and Turkey on the west. Totally Iran has a border of 8731 kilometers of which 2700 kilometers go for water borders and 6031 kilometers for land borders. The highest point in Iran is Damavand mount being 5671 meters high. The longest river is the Karun river being 890

kilometers long (the only navigable river). The largest lake is the Orumieh Lake with an area of 4868 square kilometers. The largest island is Qeshm with an area of 1491 square kilometers. The official language is Farsi (Persian). Some of the major cities are Mashad, Isfahan, Tabriz, and Shiraz.

Iran's total area is slightly over 1.64 million square kilometers, of which almost 1.63 million square kilometers is land mass. Its mainland coastlines include 2,040 kilometers on the Persian Gulf and the Oman Sea and 780 kilometers on the Caspian Sea.

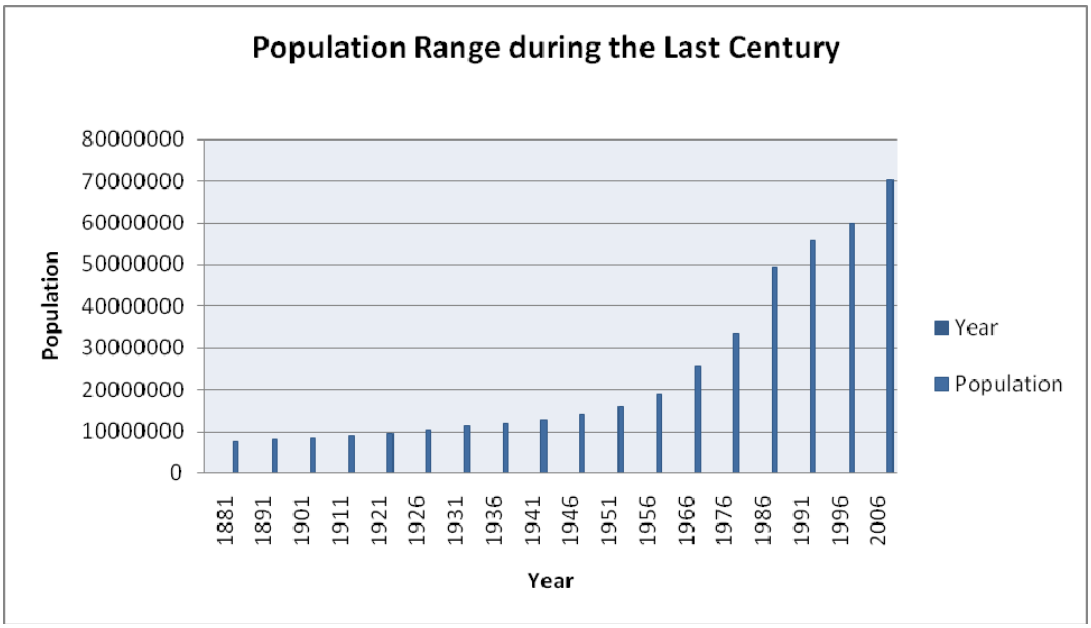
Iran has rugged and mountainous rims surrounding several basins that collectively are known as the central plateau. These basins vary in elevation from 900 to 1,525 meters above sea level. East of the central plateau are two large desert regions, a salt desert in the north and a rock and sand desert in the south. There are lowland areas along the Caspian coast, in Khuzestan Province at the head of the Persian Gulf, and at several dispersed locations along the Persian Gulf and the Oman Sea coasts.
Iran's climate is mostly arid and semi-arid, with a humid, rain-forest zone along the Caspian coast. Temperatures average between 10° and 25° C in the winter and between 19° and 38° C in the summer.
Of Iran's land surface, 65 percent is classified as meadows, pastures and arable land and 11 percent forest and woodland. The remaining 24 percent is desert and mountains (Fig. 1).

Figure 1: Woods, Pastures, & Desert Spaces in I.R. of Iran



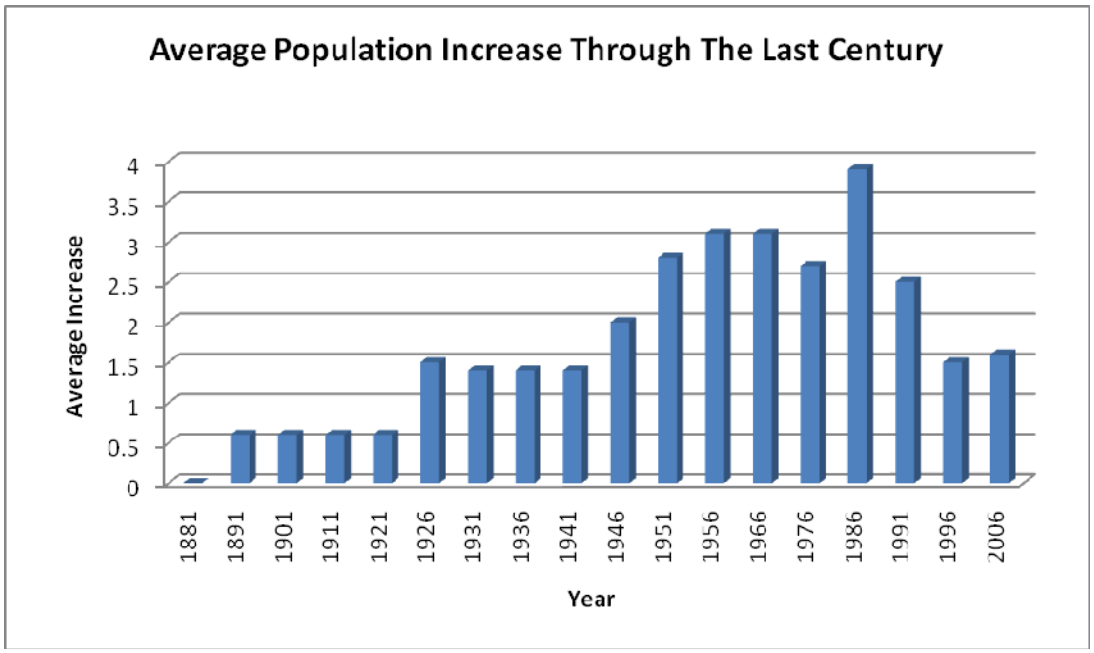
In 2007, Iran's population was estimated at 70,495,782, less than one third lived in rural settlements and more than two-thirds in urban population centers (Fig. 2).

Figure 2: Population of the country during the Last Century



Population density is 43 people per square kilometer. In 2006 the annual population growth rate was 1.61 percent (Fig. 3).

Figure 3: Percent Population Growth Rate during the Last Century



According to a 2006 estimate, 26 percent of Iran's population was younger than 15, and only 5 percent was older than 65.

In 2006 the overall life expectancy was 70.5 years: 69.0 years for men, 72.0 years for women. The birthrate was 16.8 per 1,000 population, the death rate 5.6 per 1,000 population, and the infant mortality rate 41.6 per 1,000 live births. Between 1979 and 2005, the fertility rate has decreased from about 7 to 1.8 children born per woman (www.sci.org.ir).

2.1.2. Political and Economic Profile

Political Structure

The form of the government of Iran is that of an Islamic Republic, endorsed by the people of Iran in the referendum of March 29 and 30, 1979. The highest official in the country is the Supreme Leader.

In the Islamic Republic of Iran, the affairs of the country are administered on the basis of public opinion expressed by the means of elections or referenda. The separation of the three branches of the power including the Executive, the Legislature and the Judiciary is ensured. Resolving disputes and regulating the relationship between these three branches of power has been vested in the Supreme Leader.

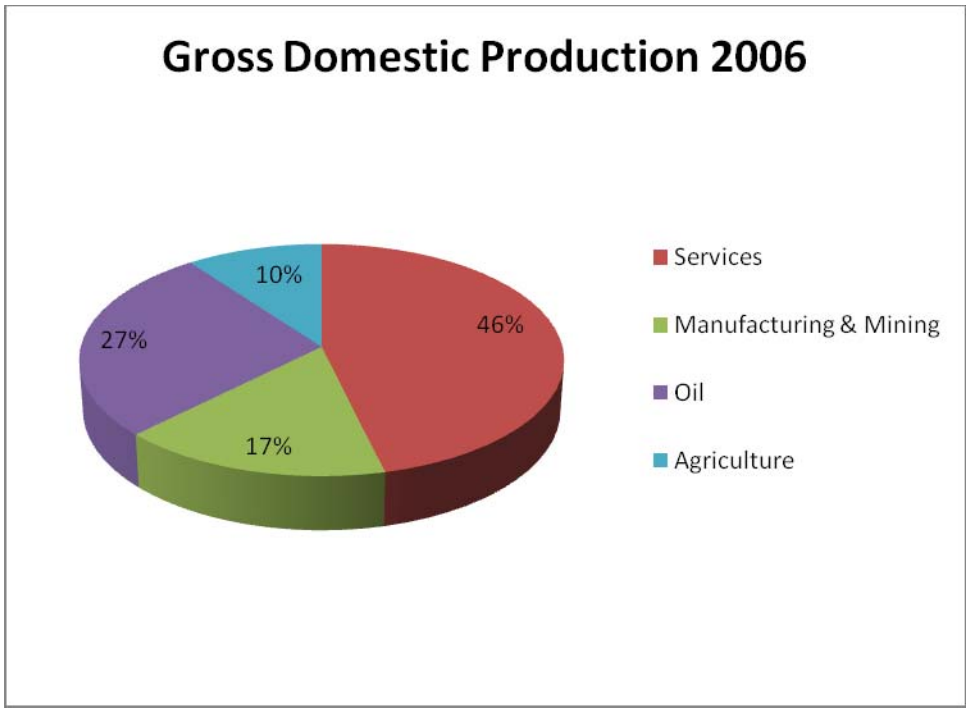
The function of the Executive power, except in the matters that are directly placed under the jurisdiction of the Supreme Leader by the Constitution, is to be exercised by the President and the Ministers. The President is given the position of the Head of the Executive Power. The President is elected to a four-year term with a two-term limit.

The function of the legislature is to be exercised through the Islamic Consultative Assembly (Majlis), consisting of the 290 (as of 2007) elected representatives of the people, who are also elected to a four-year term. A 12-member Council of Guardians ensures that legislation is in accordance with the Constitution and Islamic precepts.
The Expediency Discernment Council rules on disputes between the Majlis and the Council of Guardians where such disputes occur. The function of the judiciary is to be performed by Courts of Justice. The Supreme Leader appoints the Head of the Judiciary for a five-year term.

Membership in International Organizations: Islamic Republic of Iran is a member of the following international organizations: Colombo Plan, Economic Cooperation Organization, Food and Agriculture Organization, Group of 24, Group of 77, International Atomic Energy Agency, International Bank for Reconstruction and Development, International Civil Aviation Organization, International Control Commission, International Criminal Police Organization (Interpol), International Federation of Red Cross and Red Crescent Societies, International Finance Corporation, International Fund for Agricultural Development, International Labor Organization, International Monetary Fund, International Organization for Migration, International Telecommunication Union, Islamic Development Bank, Organization for the Prevention of Chemical Weapons, Organization of Petroleum Exporting Countries, Pollution Control Agency, United Nations, United Nations Committee on Trade and Development, United Nations Educational, Scientific and Cultural Organization, United Nations Office of the High Commissioner for Refugees, United Nations Industrial Development Organization, Universal Postal Union, World Confederation of Labor, World Federation of Trade Unions, and World Health Organization.

Economy
Iran's economy is dominated by the oil industry, which is run by the Government. Because 80 percent of export earnings come from oil and gas and accrue to the government as revenue, world prices for those commodities have a major impact on Iran's budget. The State also owns and administers several large industries. The private sector includes automobile, textile, metal manufacturing, and food-processing factories as well as thousands of small-scale enterprises such as workshops and farms. Economic reforms have been underway since the late 1980s aiming at making Iranian industry more competitive internationally. Measures have included selling off government enterprises to the private sector, reducing subsidies, creating an equitable income tax system, and cutting high tariffs that protect local manufacturing from foreign imports. Development planning is done in the form of Five-year Development Plans, the fourth of which began in 2005.
In 2005 Iran's Gross Domestic Product (GDP) was estimated at US$182.5 billion, an increase of 5.6 percent over the 2004 figure, yielding about US$2,680 per capita. In 2004 GDP increased by 4.8 percent. For 2006, GDP growth was projected to be 4.8 percent. In 2005 services contributed 47.3 percent, manufacturing and mining 16.7 percent, oil 27.9 and agriculture 10.4 percent of GDP.

Figure 4: Gross Domestic Product in 2006



The government's anti-inflationary policies have reduced inflation from the 1999 rate of 30 percent. The rate for 2003 was 17.6 percent. The rates for 2004 and 2005 were 16.8 and 16.0 percent, respectively.

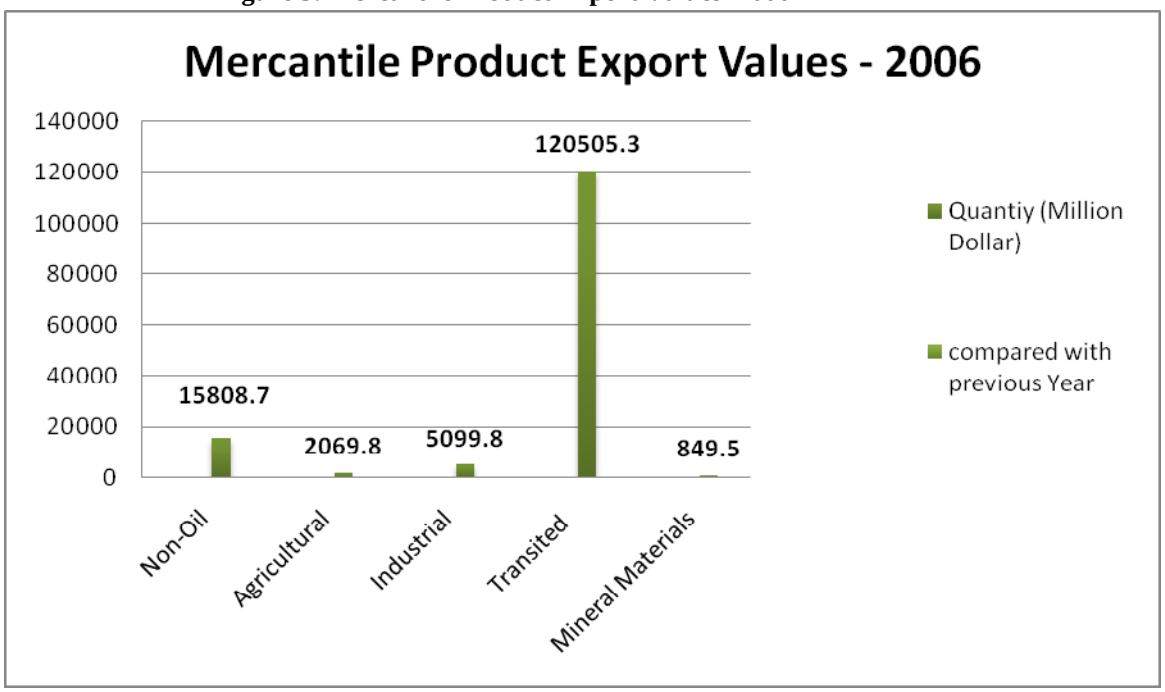
2.1.3. Profiles of Economic Sectors:

Agriculture, Forestry, and Fisheries: Iran's diversity of terrain and climate enable cultivation of a variety of crops. The country is a net importer of grains, especially rice, and a net exporter of fruits, nuts, and various specialty crops. The main crops are wheat; rice; barley; pistachio nuts, almonds, hazelnuts, walnuts, and other nuts; oilseeds; legumes; dates; citrus and other tree fruits; grapes; melons; vegetables; saffron; sugar beets; tea; cotton; and tobacco. About one-third of agricultural income comes from livestock; with the exception of sheep and goats, which are raised by pastoral nomads, most livestock is raised on small farms. Iran has a long tradition of fishing in the Caspian Sea, in the Persian Gulf, and on inland rivers. The Government Fisheries Company (Shilat) establishes fishing quotas. Most of the actual fishing is undertaken by small-scale, private fishermen. The economically most important product of the fishing industry is caviar from Caspian Sea sturgeon. Iran has only about one percent forest cover. The major commercially useful forests are located in the Alborz Mountains, especially on the southern slopes above the Caspian Sea coast. Smaller forests, principally of oak and other deciduous trees, are scattered throughout the western and central Zagros Mountains. Iran is a net importer of

timber products. Illegal logging and clearing of woods for agriculture have depleted forests in the Alborz, and government replanting programs have been hindered by illegal harvesting of trees.

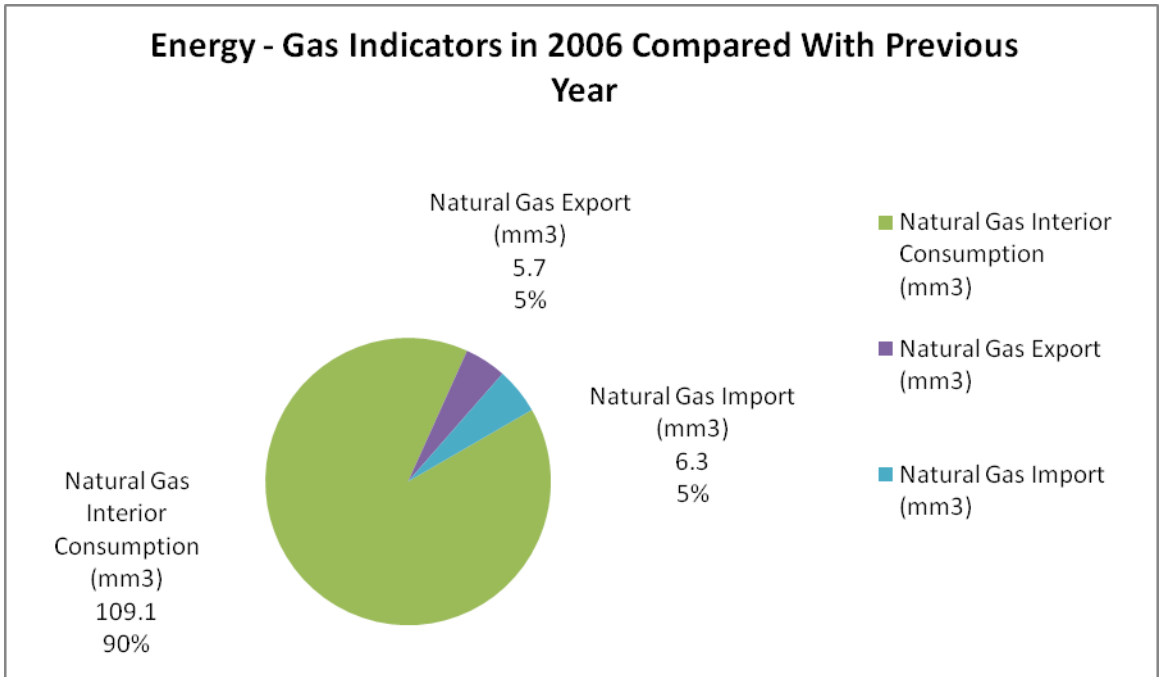
Industry and Manufacturing: In the 1990s, growth was hindered by low private investment levels, although government expenditures based on revenues from high oil prices stimulated public investment and also directly stimulated consumer demand and the petrochemicals industry. That industry, dominated by the state-owned National Petrochemicals Company, has grown rapidly, with an output in 2002 of US$1.4 billion. The industry has received substantial foreign investment. The steel industry, centered in Ahwaz, Esfahan, and Mobarakeh, also has grown rapidly since 1990. The output goal for 2004 was 8.5 million tons. Automobile manufacture has benefited from licensing agreements with European and Asian manufacturers, particularly Peugeot, Hyundai, and Nissan.
Processing of agricultural products also is an important industry and is dominated by domestic private firms. Among the major subsectors is grain processing as well as fruit and vegetable canning. The textiles industry, based on domestic cotton and wool, employed about 400,000 people in 2000. The construction industry has grown rapidly since 2000 because of Government investment in infrastructure projects and increased demand for private housing.

Figure 5: Mercantile Product Export Values- 2006



Energy: Iran possesses abundant fuel resources from which to generate energy. Nevertheless, in 2005 Iran spent US$4 billion dollars on fuel imports, mainly because of inefficient domestic use. Iran also needs a diversification of its alternative energy resources to avoid fossil based energy shortages like what was encountered during winter 2007. Oil industry output averaged 4 million barrels per day in 2006.

Figure 6: Energy - Gas Indicators in 2006 Compared with Previous Year



Large share of Iran's natural gas reserves are believed to remain largely untapped, although gas already accounted for nearly one-half of the domestic energy consumption. With massive government investments planned, the share of gas in energy production is expected to rise quickly in ensuing years.

By 2004 the addition of new hydroelectric stations and the streamlining of conventional coal- and oil-fired stations Iran increased its installed capacity to 33,000 megawatts. Of that amount, about 75 percent was based on natural gas, 18 percent on oil, and 7 percent on hydroelectric power. In 2004 Iran opened its first wind-powered plant and started the drilling phase of its first geothermal plants, and the first solar thermal plant was to come online in 2009.

Demographic trends and intensified industrialization have caused electric power demand to grow by 8 percent per year. The government's goal of 53,000 megawatts of installed capacity by 2010 is to be reached by bringing on line new gas-fired plants financed by independent power producers, including those with foreign investment backing, and by adding hydroelectric and nuclear power generating capacity. In 2005 Iran's electricity imports were greater than its exports by about 500 million kilowatt-hours; exchanges were made with all neighboring countries except Iraq.

2.1.4. Environmental Overview:

More than one-tenth of the country is forest covered. The most extensive growths are found on the mountain slopes rising from the Caspian Sea, with stands of oak, ash, elm, cypress, and other valuable trees. On the plateau proper, areas of scrub oak appear on the best-watered mountain slopes, and villagers cultivate orchards and grow the plane tree, poplar, willow, walnut, beech, maple, and mulberry. Wild plants and shrubs spring from the barren land in the spring and afford pasturage, but the summer sun burns them away (http://en.wikipedia.org/wiki/Wildlife_of_Iran). According to FAO reports (Unasylva- vol. 8, No. 2-The work of FAO- http://www.fao.org/docrep/x5371e/x5371e08.htm), the major types of forests that exist in Iran and their respective areas are:

1. Caspian forests of the northern districts (3.3 million ha.)
2. Limestone mountainous forests in the northeastern districts (Juniperus forests, 1.3 million ha.)
3. Pistachio forests in the eastern, southern and southeastern districts (2.6 million ha.)
4. Oak forests in the central and western districts (10 million ha.)
5. Shrubs of the Kavir (desert) districts in the central and northeastern part of the country (1 million ha.)
6. Sub-tropical forests of the southern coast (500,000 ha) like the Hara forests.

Especially in urban areas, vehicle emissions, refinery operations, and industrial emissions contribute to poor air quality. Although most cars use unleaded petrol, Tehran is rated as one of the world's most polluted cities. Much of Iran's territory suffers from desertification and/or deforestation. Industrial and urban wastewater has contaminated rivers and coastal waters and threatened drinking water supplies. Wetlands and bodies of fresh water increasingly are being depleted as industry and agriculture expand, and oil and chemical spills have harmed aquatic life in the Persian Gulf and the Caspian Sea. The international rush to develop oil and gas reserves in the Caspian Sea presents that region with a new set of environmental threats (http://www.mongabay.com/reference/country_profiles/2004-2005/Iran). Although a Department of the Environment has existed since 1971, Iran has not developed a comprehensive policy of sustainable development because short-term economic goals have taken precedence.

2.2. Institutional, Policy and Regulatory Framework

2.2.1. Legislative Framework & Environmental and Sustainable Development Policies

The regulative instruments covering persistent organic pollutants (POPs) and various aspects of chemicals' management and environmental protection are divided into national Acts and Laws, By-Laws, The Rules approved by High Councils, and Government Criteria and Guidelines.

Acts and Laws

Constitution

Article 50 of the Constitution of the Islamic Republic of Iran approved in 1979 (1358) covers environmental protection and pollution prevention.

This article underlines sustainable development and the rights of the future generations, 14 years prior to the Rio Conference.

According to the Article 50, any kind of activity which disturbs the environmental balance and causes irretrievable destruction or pollution to the environment, is forbidden. Since all laws and regulations have to be ratified and construed in the framework of Constitution, this article is regarded as one of the most significant legal principles in Iran regarding the prevention of production and emission of any kind of pollutants including POPs.

Environmental Protection and Enhancement Act was ratified in Iranian Parliament (Majlis) in 1974 (1353 H.S. According to the Iranian National Calendar), authorizes the Department of the Environment (DoE) to act against and prevent any kind of pollution and every kind of activity that distorts the balance in the environment. Article 6 indicates that Department of the Environment (DoE) not only has to prevent the use of agricultural pesticides or any other substances that can be harmful to the nature and environment, it should also prepare and ratify the required standards and criteria in order to prevent water, soil and air pollution and distribution of solid garbage and waste material and agents that have harmful effects on environment and then manage their monitoring. According to article 9 of this law, every kind of action that may lead to the environmental pollution is forbidden. It states, if pesticides have harmful effects on the environment, the Department of the Environment (DoE) would inevitably recommend a revision in the existing regulations about the use of pesticides and finding a substitute for the used substances and policies.

Article 11 defines the process of controlling polluting factories.

Air Pollution Act was passed in the Islamic Consultative Assembly (Parliament) in 1995 (1374, H.S. According to the Iranian National Calendar) and can be invoked about issues on controlling combustion processes, unintentional and unwanted generation of pollutants especially relating to

melting copper or iron and steel as well as aluminum and zinc production. Articles 12 to 20 of this act can be used to prevent pollution and mainly to control unintentional pollutions.

Waste Management Act passed in the Islamic Consultative Assembly in 2004 (1383 H.S.) is a specific regulation for managing waste material from the first stage of generation to the stage of discharging and recycling of municipal wastes, industrial wastes, agricultural wastes such as wastes from pesticides, wastes from hospitals and hazardous waste materials, controlling pollutions resulting from burning corpses and function of corpse-burners are also the issues concerning this act and Air Pollution Prevention Act.

Game and Fish Law passed in 1967 (1346 H.S.) and its 1996 (1375 H.S.) amendment, in line with Conference of International Convention on Trade of Endangered Species of wild fauna and flora (CITES) and Conference of Migratory Species (CMS), helps control species which may be the carriers of collected persistent organic pollutants and might carry it worldwide. Veterinary Code has the same role about domestic animals and pets.

Plant Protection Act was passed in 1967 (1346 H.S.) in Islamic Consultative Assembly. Due to the provisions of this code, Plant Protection Organization is bound by duty to lead the campaign against pests and widespread diseases of plants.

According to the Nota Bena of Article 6 of this act, Plant Protection Organization is obliged to determine types and ingredients of pesticides and their use for preventing humans and animals from being poisoned. The Plant Protection Organization is also being charged with preparing the health guidelines and informing the public of the risks.

Article 13 requires Plant Protection Organization to compile and disseminate technical directions and instructions in order to prevent the poisoning of humans, domestic animals and honeybees.

Article 17 of this law states that importing, manufacturing, transportation, packing, distributing and exporting pesticides, herbicides, fungicides and plant hormones is subject to receiving due license from the Ministry of Jihad-e-Agriculture.

Fourth Development Plan Act (Ratified in 2004 A.D. or 1383 Hegira)

There are no certain and definite rules in the Fourth Plan Act that would facilitate or create the necessary ground for enforcing conventions such as POPs Convention; however there are very limited cases about environmental preservation in chapter 5 of this act that implicitly consider some mechanisms for strengthening environmental principles about pollutants and can be considered as present but limited (applicable only for five years) regulations. One of these regulations is clause (b) of article 61 of Fourth Development Plan about compiling principles of controlling import, manufacture, formulation and consumption of pesticides and their environmental effects and in this way it can be regarded as related to persistent pollutants.

Clause (b) of article 68 of Fourth Development Plan is also compiled with the aim of reducing environmental pollutants but its enforcing mechanism applies to the foundation of National

Environmental Fund and providing financial and credit support in order to decrease the pollutants and is not directly concerning the subject of this study.

2.2.2 Roles and Responsibilities of Institutions Involved in POPs Life Cycles

Governmental organizations including ministries, institutes and companies as well as public nongovernmental organs and nongovernmental organizations are to a different degree legally responsible or interested in issues about persistent organic pollutants and chemical substances management.

Department of the Environment (DoE)

This organization was reestablished into the present structure and format in 1971 (1350) for ensuring protection of the environment and prevention of pollutions. This organization works under the president and is headed by the deputy of president and is regarded as a supervisory, supra divisional, ruling system. Articles 1 and 6 of the Environmental Preservation and Improvement Act determine the legal authority and competency of Department of the Environment (DoE) as was stated in section (1.2). This organization is legally responsible for controlling polluting sources and pollutions.

In this organization, the Division of Human Environment is responsible for implementing the requirements of Stockholm Convention. The general responsibility of supervising the accomplishment of the Waste Management Act is upon this organization.

Ministry of Health and Medical Education

The Ministry of Health and Medical Education is responsible for medical education and research. The Ministry is also supervising the public health system.

The Ministry is responsible for enforcing of laws regarding sanitation and drugs and the Adjective Regulation of Sanitary Supervision over Toxic (except pesticides) and chemical substances. Controlling the contaminant levels and health effects of non-agricultural toxic and chemical substances is among the responsibilities of the Deputy of Sanitary Affairs of this ministry. Supervising medical and hospital wastes is also one of the responsibilities of this ministry.

Ministry of Jihad-e-Agriculture

Issues relating to usage of pesticides and chemical fertilizers come under the responsibility of the Ministry of Jihad-e-Agriculture. The duties and legal responsibilities of supervising manufacturing, importing and consuming pesticides is one of the responsibilities of Plant Protection Organization which is a governmental organization affiliated to this Ministry. The main duty of this organization is to fight the pests and widespread diseases of plants; therefore, prior to controlling and preventing the use of pesticides, it cooperates with the farmers for the development, distribution and consumption of agricultural pesticides. The Ministry of Jihad-e-

Agriculture lately began some activities towards biologic campaign against pests and replacing use of pesticides with this method. The responsibility of supervising the agricultural wastes and corpse-burning is with this ministry.

Ministry of Commerce

Ministry of Commerce is responsible for national commercial policies and import and export affairs. All goods, products and materials which are imported to or exported from the country are controlled under the Regulations of Import and Export. The Ministry of Commerce is responsible for compiling these regulations and principles and declares them to the customhouse to be enforced. This Ministry takes the required procedures with the cooperation of the Ministry of Jihad-e-Agriculture, the Ministry of Health and Medical Education, and Department of the Environment in order to compile, control and supervise regulations of import and export of chemical substances.

Ministry of Foreign Affairs

As the competent ministry in charge of foreign affairs, The Ministry of Foreign Affairs is responsible for implementing the overall national foreign policy and regulating diplomatic relations to protect the nation's national and international interests on behalf of the government of the Islamic Republic of Iran.
The Ministry has the following responsibilities: Managing multilateral and bilateral foreign affairs including various international treaties and agreements such as the Stockholm Convention on POPs, Rotterdam Convention on PIC, Basel Convention on transboundary movements of hazardous wastes and their disposal, Intergovernmental Forum on Chemical Safety (IFCS) and the Strategic Approach to International Chemicals Management (SAICM), establishing links with all related international bodies as national liaison ministry and contact point and assisting related internal agencies in reviewing current domestic policies and laws and taking necessary measures in accordance with the constitutional processes for the implementation of the related obligations.

The Office of National Authority for Chemical Conventions is in charge of managing the Ministry's responsibilities related to chemical safety.
The National Authority leads Inter-ministerial Commission on Chemical safety (IMCCS) which is formed by inter-governmental representatives from different internal agencies relevant to chemical safety. The Commission exchanges information on domestic and international matters and sets priorities on chemical safety among relevant ministries and agencies. It seeks strategic and effective communication, cooperation and coordination among them. It draws related national policies and positions to be addressed to the relevant international bodies, authorities, or conferences.

In accordance with decision SC-2/16 of COP 2, the National Authority for Chemical Conventions acts as the official contact point which sends and receives all formal communications and performs administrative functions under the Convention. For the proper implementation of the Stockholm Convention the current project on "Iran POPs Enabling

Activity" was signed by the United Nations Development Program (UNDP) on one side and the Ministry of Foreign Affairs on the other side on behalf of the Islamic Republic of Iran and on August 8th, 2002. Thereafter, the Department of the Environment (DoE) was designated as the implementing agency. Any relevant report to or contact with international bodies is done through the Commission and the National Authority. In line with such responsibilities, the first national report of the Islamic Republic of Iran pursuant to Article XV of the Stockholm Convention on POPs, was elaborated in the Commission and submitted to the Convention Secretariat by the National Authority on July 29th, 2007.

Ministry of Industries and Mines

The Ministry of industries and mines is responsible for industries and mines activities. This ministry as the main responsible organ of producing, establishing and managing the industrial and mining affairs is attempting to develop the industries and mines with easy availability of services and environmental conservation and also conducting all the affairs related to the investment, production and operation in new industrial and mineral units.

The industry and mine sectors have formulated their strategies for sustainable development on the basis of optimal use of the sectors' relative advantages. Identification of novel and environmentally-friendly methods of exploiting mineral reserves that help promote rapid and consistent growth of the sector while safeguarding the country's national resources; upgrading technical skills, and innovation in environmental management and environmental engineering to help to upgrade the existing technologies and obtain self-sufficiency in designing and producing the relevant engineering equipments; attaining a desirable environmental status in pace with developments in this sector are among the responsibilities of this ministry.

The main duties and legal responsibilities of the ministry are compilation of industrial and mineral development strategies; Fixing of program policies and general criteria in industrial and mines sectors; Planning for increasing productivity in the section; Compilation and fixing of export development policies and technical engineering services based on the export policies; Supporting actions related to growing of productivity.

Customs Administration

Iranian customs Administration is affiliated to the Ministry of Economic Affairs and Finance. Its duty is to control import and export across the borders of the country. The customhouses located in the borders of Iran should observe and enforce tariffs and regulations that have been prepared by the Ministry of Commerce and ratified in the cabinet.

Municipalities

Municipalities are under the supervision of the Ministry of Interior. They are responsible for the management of urban solid wastes.

Environmental Nongovernmental Organizations (NGOs)

Although nongovernmental organizations are not legally responsible for controlling pesticides, chemical substances and persistent organic pollutants and are not authorized to take procedural measures, and enforce regulations and legal requirements of the convention, they play an important role in public awareness and informing and encouraging the officials and common people to decrease or even eliminate the use of dangerous chemical substances and Persistent Organic Pollutants.

These NGOs often conduct trainings, build capacities and assist the government in implementing environmental treaties. At present there are about five hundred (500) NGOs for environment in the country. A large number of them are already involved in caring for environment and human health. They try to compensate for organizational deficiencies and take steps for ameliorating the POPs control within the regulatory authorities.

Given the many sectors and activities concerned with POPs the concerned legal and regulatory authorities are not properly coordinated in order to prepare an optimal response for implementing the Stockholm Convention in Iran.

The following issues are assessed to contribute towards the current sub-optimal response:

- Lack of a supervisory board, council or committee to coordinate the activities of different ministries and public organizations in order to facilitate the exchange of information and to satisfy the expectations of the convention.
- Absence of the representatives of NGOs in the Environmental High Councils or integrated committees.
- Lack of infrastructure to enable and develop capacity in executive agencies in order to facilitate the convention.

2.2.3 Related International Commitments and Obligations

I. R. of Iran has actively participated in developing international legislation and codes of conduct in order to protect the global and regional environment. Iran is a party to all central global conventions on chemical management, and is actively pursuing their further development for ensuring a protection of the global commons from poorly managed chemicals and releases as well as coordination of the activities under these Conventions. Iran is further party to a number of regional agreements on protection of shared water bodies in the Caspian Sea and the Persian Gulf. Table 1 below gives the year of ratification by I.R. of Iran to relevant environmental agreements. Iran has also actively contributed towards emerging international initiatives for ensuring sound chemicals management. Iran has particularly supported the work undertaken by SAICM, Strategic Approaches to International Chemicals Management, amongst others by serving on the Executive Board of its Quick Start Program.
Iran is also active participant of the Inter-Governmental forum on Chemical Safety (IFCS) and is currently its vice president for the Asia Pacific region. The Third Conference of the Parties of the Stockholm Convention elected Iran as one of the Vice-Presidents for the Asia Pacific region,

whose terms of office commenced upon the closure of the Third meeting of the Parties and would run until the closure of the Fourth meeting of the Parties.
I. R. of Iran supports an approach of coordinated/integrated implementation of the Basel, Rotterdam and Stockholm Conventions that can be presented through the following points:

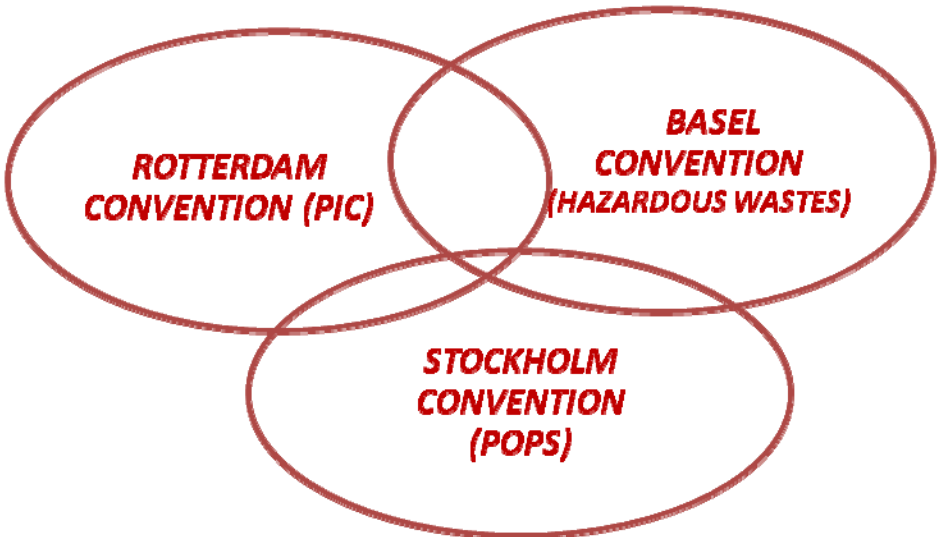
a. Ratification Status

(1) Basel Convention (BC)
• Basel Convention on the control of transboundary movements of hazardous waste
• Adopted in 1989.
• Entered into force on 5, May1992.
• I. R. of Iran signed the Convention in March, 1989 and ratified it in January, 1993.

(2) Rotterdam Convention (RC)
• Rotterdam Convention on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade.
• Adopted in 1998.
• Entered into force on 24, February 2004.
• I. R. of Iran signed the Convention in February 1999 and ratified it in August, 2004.

(3) Stockholm Convention (SC)
• Stockholm Convention of the elimination or/and removal of the Persistent Organic Pollutants (intentional or unintentional releases).
• Adopted in May, 2001.
• Entered into force in 17, May, 2004.
• I. R. of Iran signed the Convention in May 2001 and ratified it in February 2006.

The 3 Conventions together cover elements of "Cradle-to-Grave" Management.



Relation between the three conventions (Basel, Rotterdam and Stockholm)

b. Area of Concern

(1) Basel covers hazardous waste.
(2) Rotterdam covers 22 pesticides and certain formulations of others, plus 5 industrial chemicals.
(3) Stockholm covers 9 pesticides, and 3 industrial chemicals and byproducts.
(4) Evaluating/regulating new and existing chemicals (RC and SC).
(5) Import/export controls (BC, RC, SC).
(6) Waste management (BC and SC).
(7) Hazard communication (BC, RC, SC).
(8) Alternatives (SC).
(9) Environmental releases (SC).

c. Existing Chemicals

(1) Rotterdam recommends final regulatory actions for banned or severely restricted chemicals.
(2) Stockholm eliminates certain chemicals from production and use.

d. Import/Export

(1) Basel Convention
• Implements a prior informed consent procedure.
• Strengthened by later decisions, it bans export of hazardous waste from developed to developing countries.
• Bans importation of HW through ratified "Ban Amendment", which supports the entry into force of ratifying the Decision.
• Controls the transboundary movements of hazardous chemicals.

(2) Rotterdam Convention
• Establishes a compulsory Prior Informed Consent procedure
• Is based on earlier voluntary guidelines
• Uses Decision Guidance Documents
• Improves capacity to prevent unwanted imports and avoid future stockpiles of obsolete pesticides

(3) Stockholm Convention
• Restricts import/export of POPs.
• Supports environmentally sound disposal.

e. Waste Management

(1) Basel Convention
• Supporting environmentally sound management: "taking all practical steps to minimize the generation of hazardous waste and strictly controlling their storage, transport, treatment, reuse, recycling, recovery and final disposal, the purpose of which is to protect human health and the environment."
• Minimizing waste generation and taking concrete steps to establish disposal facilities within our own capabilities.
• Supporting environmentally sound management (ESM) of hazardous waste.
(2) Stockholm Convention
• Developing strategies to identify POPs waste and manage them in an environmentally sound manner.
• Destroying or irreversibly transforming wastes containing POPs.
• Preventing the creation of POPs in waste.
• Supporting concepts of Best Available Techniques (BAT) and Best Environmental Practices (BEP)

f. Hazard Communication
It means communicating the information concerning hazardous substance and wastes to the secretariat, competent authorities and the public.

g. Replacement
The Stockholm Convention requires information exchange and research on POPs alternatives.

h. Technical Assistance
- Technical cooperation trust fund of Basel Convention.
- Rotterdam Convention acknowledges the need for technical assistance.
- "Financial mechanism" of Stockholm Convention.

i. Training and Technology Transfer for Regional Centers
- Basel Convention centers are available.
- Stockholm Convention centers as a matter for decision by future conference of the parties.
- The SC utilization of Basel centers.

j. Requirements to Comply with

- Taking into consideration the SAICM output of integrated management of hazardous substance.
- Defining a realistic set of priority areas of chemicals and waste management.
- Establishing the multi-stakeholder national coordinating team, and developing its operating procedures and organizational structure.
- Drafting a work plan and time framework for the regional action plan.
- Strengthening the legislative infrastructure by filling in existing gaps and weaknesses.
- Setting strategies for better coordination and collaboration.
- Developing the procedure and methodology of illegal traffic of hazardous substances and waste.
- Preparing a national strategy.
- Consultation with all key stakeholders and community groups on national and regional levels
- Developing the understanding of private sector, industry and business concerning their expected roles.

Table 1: ***I.R. of Iran is a party to the following agreements on Chemicals and pollution***

Name	**Year Ratified**
Stockholm Convention on Persistent Organic Pollutants	2005
BASEL Convention on Transboundary Movements of Waste	1989
Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for certain hazardous Chemicals and Pesticides in international trade	2004
Ramsar convention on wetland protection (convention on wetland of international importance specially as water foul habitat)	1971
MARPOL 73/78 convention on marine pollution control	2002
London convention on marine disposal and dumping	1996
Convention on International Trade in Endangered Species of wild fauna and flora	1973
Convention on the conservation of migratory species Bonn	1979
Kuwait regional convention for co-operation on the protection of the marine environment from pollution	1978
Protocol concerning regional co-operation in combating pollution by oil & other harmful substance in case of emergency, Kuwait	1978
Protocol concerning marine pollution resulting from exploration and exploitation of the continental shelf, Kuwait	1989
Protocol on the control of marine transboundary movements and disposal of hazardous waste and other wastes, Tehran	1998
Frame work convention for the protection of the marine environment of the Caspian Sea Tehran	2003

Vienna convention for the protection of the ozone layer	1987
Montreal protocol on substances that deplete the ozone layer	1987
United Nation Framework convention on Climate Change	1992
Kyoto protocol to the United nations framework convention on climate change	1998
OPRC convention on oil pollution response	2002
Convention on Biological Diversity	1992
Cartagena protocol on bio-safety to the Convention on Biological Diversity, Nairobi	2000
United nation convention to combat desertification in those countries experiencing serious drought and/or desertification	1994
International convention relating to intervention on the high seas in case of oil pollution casualties, Brussels	1969
Protocol related to intervention on the high seas in cases of pollution by substances other than oil, London	1973
International convention on salvage, London	1989

2.2.4 Existing Legislation Regarding POPs

Executive By-Laws of Regulations of Plant Protection, article 31 of Adjective Regulations of Plant Preservation ratified in 1967 (1346 H.S.) indicates that manufacturing, formulation, import, transportation and consumption of pesticides and herbicides is subject to examination, confirmation and receiving license from the Plant Protection Organization.

Executive By-Law of Control of Poisonous and Chemical Substances, was ratified in the cabinet in 1999 (1378 H.S.) and supervises the use of poisonous and chemical substances. Articles 3 to 10 of this regulation are dedicated to the issues relating to the safety and safeguarding the health of human beings against chemical pollutants and poisonous substances. According to these articles, manufacturing and formulation, transportation, packaging, importing and exporting, purchasing and consuming hazardous substances is subject to the related legal procedures and formalities and receiving license from the Ministry of Health and Medical Education. In conformity with the provisions of Nota Bena 1 and 2 of article 9, all the manufacturers of hazardous substances are obliged to include related warnings on product labels about the dangers of the substances and reusing the containers.

Regulation of Environmental Health was passed in the cabinet in 1992 (1371 H.S.). This regulation is dedicated to the issue of controlling the factors affecting the living environment of human beings and endangering physical, mental and social health of man. As per the provisions of article 2 of this regulation, every kind of action that is assumed as a threat for the public sanitation and health is forbidden.

Regulation of Hard and Detrimental Professions, ratified in the cabinet in 1992 (1371 H.S.) defines hard and detrimental profession as a job that is carried out in a working place where the

physical, chemical, mechanical and biological factors are not standard and the worker would suffer tensions greater that what he/she may physically or mentally endure and would result in being affected with professional illness and its related problems. Article 14 addresses spraying pesticides in orchards and farms and antisepticising poultry-keeping site and locations while poisoning and Article 15 relates to occupations and workers who are directly involved in manufacturing and handling hazardous chemicals and pesticides.

Import and Export Regulation

Based on the schedules and tariffs of Regulation of Import and Export which is passed every year in the cabinet, according to a suggestion made by Ministry of Commerce, import and export of chemical substances is subject to the license issued by the Ministry of Jihad-e-Agriculture and in some cases by the Ministry of Health and Medical Education. In part 6 of chapter 29 of the Regulation of Import and Export, the requirements of importing all kinds of organic chemical substances are mentioned. These rules would permit some chemical substances that are included in the index of POPs be strictly controlled and even their import and export be restricted or forbidden.

In addition to the laws and regulations passed by the government, in some cases High Councils such as Environmental High Council or governmental organizations have approved rules and instructions regarding chemical substances as well as on protection of humans and the environment against the effects of such substances. Some key rules and instructions are given below.

Environmental High Council has approved some principles and standards by ratifications number 134 and number 135 (passed in 1370 H.S.). It has also passed rules and principles regarding the necessity of environmental evaluation of large factories such as manufacturers of steel, copper, aluminum and zinc.

High Council of Technical Preservation has determined some principles and standards regarding assigning the allowable limits of hard and detrimental professions and the conditions of working environment.

As per the provisions of articles 8, 9 and 10 of the Regulation of Environmental Sanitation, the Ministry of Health and Medical Education has compiled and applied instructions regarding the environmental sanitation and disposing rural wastes and fighting disease vectors.

As per the provisions of article 2 of the Adjective Regulations of Hygienic control on Poisonous and Chemical Substances, the Committee of Coordination, Control and Supervision over Poisonous Substances, has compiled supervisory instructions and has introduced them to be enforced.

According to the Adjective Regulation of Plant Protection, the Supervisory Committee of Importing, Manufacturing and Consuming Pesticides and Chemical Fertilizers has prepared and applied instructions regarding importing and consumption of pesticides.

All the principles, standards and instructions mentioned above have been verified by the head of the committee or the minister under a certain entry number and are published and are available in the general regulations of the related organizations.

Efficacy of Laws and Regulations and Functions of Executive Organizations

Review of laws and regulations that are enforced in the country as well as the structure and statutory powers of institutions in Iran shows that the laws and regulations to some extent cover the requirements of the Stockholm Convention. The main challenge for execution of obligations and regulations imposed by Stockholm Convention is to provide a complementary coordinating structure and mechanism such as a national commission or association to establish and develop coordination between responsible apparatus and organizations that have something to run with the Stockholm Convention.

The following legislative capacities and situations exist among key Iranian authorities concerning particular POPs chemicals and their management:

The Ministry of Jihad-e-Agriculture can, through Plant Protection Organization, control all pesticides subject to administrative regulations for plants safety in particular article 31 of the law (Plant Protection Act of 1967) and based on the pursuing regulations issued by the Pesticide Supervisory Board of Iran. In line with the international consensus a ban using POPs pesticides was issued in 1977. Only Toxaphene was not listed in this original POPs pesticide banning list. However, its ban order followed in 1984.

The Ministry of Health and Medical education appropriates administrative and regulative tools for controlling of chemical substances hazardous for human health. This Ministry has banned the use of DDT for malaria vector control since 1992 and at present alternative integrated methods as recommended by WHO are being practiced when needed.

Regulations for import and export allow the country to control the limitations and injunctions in imports and exports of chemical substances as included in appendix A of convention. Customhouses have necessary efficiency to control this because they are the principal controlling system of the country.

All laws and regulations covering industrial emissions and releases are sufficiently enforceable by the structure and powers owned by Department of the Environment (DoE). For unintentional POPs point releases, such as in steel mills, copper melting mills and aluminium mills problem may be controlled in two stages:

- Planning stage: Any new industrial undertaking needs to submit an Environmental Impact Assessment, EIA, subject to article 105 of 3rd Plan for economic, social and cultural development of the I. R. of Iran and in accordance with the rules as approved by Environment High Council (E.H.C). According to this article, all plans and projects for development and production must environmentally be assessed in the stage of feasibility study. This stage allows DoE to assess whether applied activities are prone to generate

Persistent Organic Pollutants, and hence subject to Guidelines for Best Environmental Practice and Best Available Technologies (BEP/BAT) as laid down by the Convention.

- During industrial production, controlling pollutants releases is exercised based on articles 11 and 12 of Environmental Protection and Enhancement Act and articles 15 & 16 of Air Pollution Act and existing case law for controlling water contamination. Alternatively in the operation stage, control and enforcement can be based on waste Management Act, which can be also utilized for controlling non-point sources of unintentional POPs releases such as burning of urban or hospital wastes.

Based on these laws, there is a possibility to control and prevent the unintentional Persistent Organic Pollutants emissions, though more specific guidance on emission limits and their reporting and measurement is needed.

Steps and Considerations for Enhancing the Legal Coverage of POPs in the I. R. of Iran

In summary, Government Organizations can, in the framework of existing laws and regulations covering environmental and health protection, regulate and execute rules on hazardous substances listed in the Stockholm Convention.

An appropriate legal framework for covering substances in the Stockholm Convention exists in the I. R. of Iran through Environmental Protection Laws, Wastes Management law, Plant Protection law as well as Executive Regulations for control and monitoring pesticides, hazardous chemical agents and their import & export, as well as regulations covering industrial releases.

However, it appears that it is, in some cases, necessary to formulate more detailed policies, guidelines, terms and regulations to fully conform to the requirements of the Stockholm Convention.

Overall the following deficiencies in the regulatory structure for POPs management have been identified:

- Lack of specific codes to control, generate, store, sale and supply, transport, apply and use of POPs as included in the list of Stockholm Convection (PCBs and obsolete POPs pesticide stocks).
- Lack of specific codes and rules to control, generate, store, sale and supply, transport, apply and use of POPs as included in the list of Stockholm Convection (PCBs and obsolete POPs pesticide stocks).
- Lack of specific emission and release limits for industrial and other activities generating POPs, particularly unintentional POPs.

- Lack of specific limit values for POPs contamination in food, feed and various environmental compartments (soil, water, sediment etc)
- Lack of efficient emergency response to counter the ecological effects of possible POPs releases.
- Lack of regulations to punish those who violate the laws and regulations about POPs including unauthorized production, transportation, export & import, transaction and consumption.
- Lack of requirements to monitor POPs releases.

2.3 Assessment of the POPs Issue in the I. R. of Iran

2.3.1. Assessment of POPs Pesticides

POPs pesticides have never been produced in Iran, all POPs pesticides used are of foreign origin and no re-export of these compounds to other countries is occurring.

In line with the internationally developing consensus on the risks associated with POPs pesticides, the production and use of all POPs pesticides was banned in Iran in 1977. Only Toxaphene was not included in the original list of banned substances and was formally banned in 1984. Therefore, existing stockpiles of these chemicals in the Ministry of Jihad-e Agriculture store houses were purchased before the above mentioned dates.

The legislation permitted use of DDT for human health purposes, including for malaria vector control, under the control by the public health authorities until 1992. After this date its use has been discontinued by orders of the Ministry of Health and Medical Education.

The pesticides manufacturing, formulation and distribution has until recently been a fully government managed activity. A change of this regime by opening-up the pesticide manufacturing and distribution to the private sector has taken place in recent years. This means that it is less likely that any old POPs pesticides stockpiles would be in possession of the private sector distributors.

On the other hand, the market liberalization has increased pesticide prices and the control of their distribution and use is less effective. There is hence a possibility of illegal POPs pesticides trafficking through the Iranian borders.

The Office of the Environment and Sustainable Agriculture of the Ministry of Jihad-e-Agriculture made an inquiry into possible stockpiles of pesticides in the Government institutions. Initial statements made by the top officials in the Agricultural Supportive Services Company and the Central Organization for Rural Cooperatives of Iran stated that there were no expired POPs pesticide stockpiles.

However, responses received from the provincial offices of Jihad-e-Agriculture were to the contrary. It should be mentioned that most of these stockpiles are reported in the storage houses belonging to the provincial Agricultural Organization Offices before their merger with the Jihad-e-Agriculture Development Organization. All of these stockpiles belong to the Government and no POPs pesticide stockpiles belonging to the private sector were reported.

Due to uncertainty in condition and quantities of possible POPs Pesticides in the country, a systematic inventory exercise was extended to the pesticides store houses of the Ministry of Jihad-e- Agriculture all over the country. For identification of stockpiles, inventory and sampling, a team composed of a pesticide expert, a sampling technician, subtask leader, and in some occasions the National Consultant of POPs Pesticides Enabling Group in Iran visited the storage houses belonging to the Ministry of Jihad-e-Agriculture.

According to the inventory results, Ministry of Jihad-e-Agriculture warehouses have stockpiles and wastes containing five of POPs pesticides. The pesticides are: Aldrin, Dieldrin, Endrin, DDT and HCB. The total amount detected so far is 52,990 Kg. Most of these pesticides are produced in the U.S.A. and have been purchased mostly just before the Islamic revolution in the country.

In addition, Ministry of Health and Medical Education still holds stockpiles of DDT in 10 of its provincial storage houses from the former Malaria Vector Program. The overall quantity of these stockpiles is 17,800 Kilograms. The breakdown of the stocked DDT in provincial storages is given in section 2.2.3. The POPs pesticides stockpiles identified are given in Table 2 below:

Table 2: POPs Pesticides Identified in Iranian Warehouses

No.	Name of pesticide	Amount
1	Aldrin	6,305 L
2	Dieldrin	15,784 L
3	H.C.B	5,859 Kg
4	DDT	18,000 +17,922[1] Kg
5	Endrin	7,042 L
Total		**71,912 Kg**

Many of the POPs pesticides in warehouses, managed by Ministry of Jihad-e-Agriculture, were kept for many years under improper conditions. Many of them have leaked and polluted the soil and potentially the groundwater.

It is estimated that about 3,000,000 Kg of highly contaminated soil is present at and around the pesticide storage sites. As the historical use and waste management practices in the country were questionable, an investigation into the overall POPs pesticide contamination was conducted. The study shows POPs pesticide contamination in samples taken from 15 of the 18 provinces in low concentration (ppb range). However, due to the limited number of samples, it is difficult to make a definitive scientific judgment on the severity and extent of POPs contamination and its risk to the population at this stage.

Provincial Distribution of the POPs Pesticides

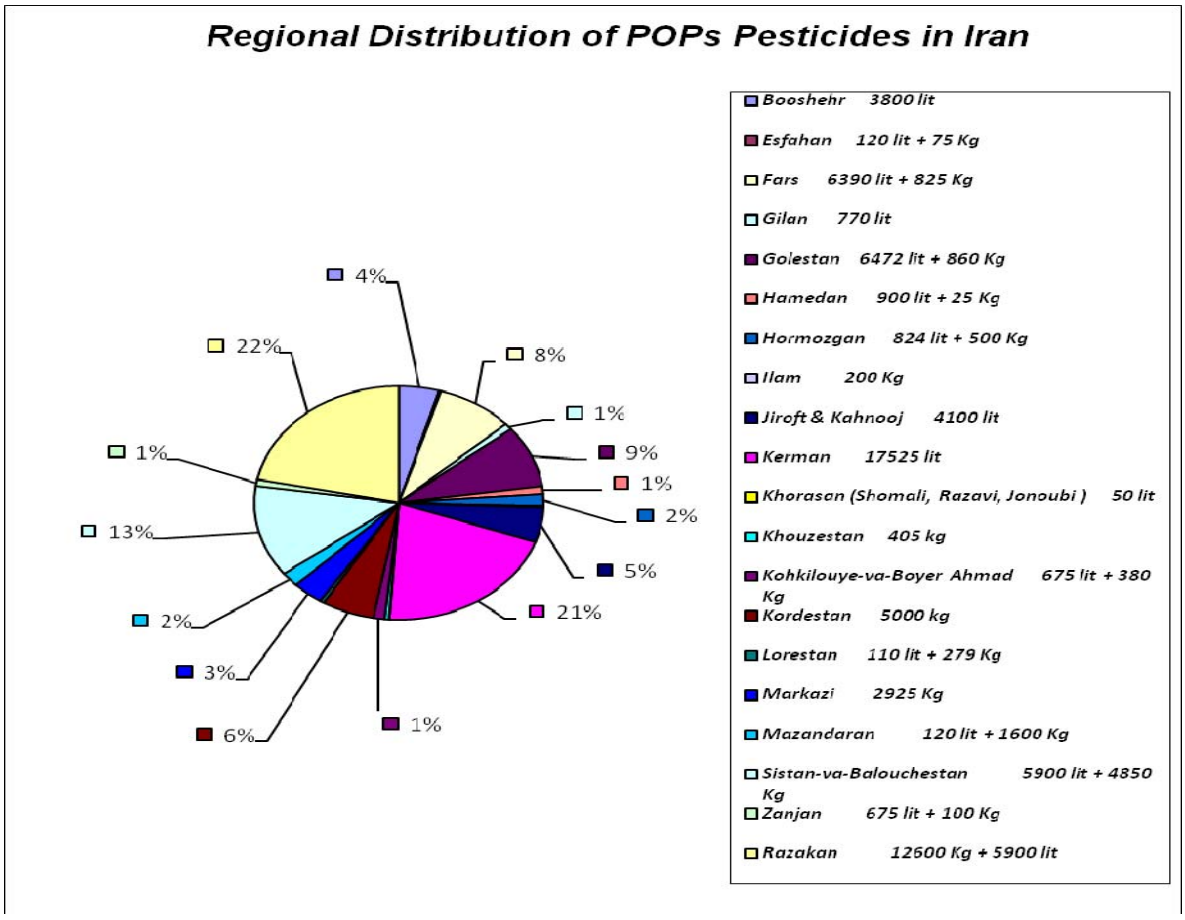
In general the north-west provinces of the country, i.e. East and West Azarbaijan and Ardebil are reported free of the POPs and unknown pesticides. Also a good number of provinces located in the inner part of the country are either free of these pesticides or have small reported stockpiles. Provinces which are free of POPs, are: Charmahal, Qazvin, Qom, Semnan, Tehran and Yazd and

[1] This 17,922 Kg refers to the DDT stockpile stored at Medical Universities specified under section 2.3.3.

those provinces reported with low stockpiles are Esfehan, Zanjan, and Kohkilouyeh & Boyer Ahmad. Only Markazi province had a noticeable volume of POPs pesticides in the central region. Relatively larger stockpiles of POPs pesticides are found in the Western border provinces and more so in the Eastern border provinces. In the western region, Kermanshah province was reported free of POPs pesticides, Khuzestan province, a heavily agricultural province, was reported with low stockpiles, Ilam and Lorestan provinces were reported with small stockpiles, while Kordestan and Hamedan had noticeable amounts of POPs pesticides.

Provinces bordering the Caspian Sea in the north, i.e. Gilan, Mazandaran and Golestan have all large stockpiles of POPs pesticides. While those on the shores of the Persian Gulf and the Oman Sea, i.e. Bushehr and Hormozgan have reported a lesser amount. Three provinces of Fars, second in the farming land area in the country and Kerman and Sistan & Baluchestan in the eastern borders of Iran with Pakistan have all reported high stockpiles of POPs pesticides. An exceptionally low stockpile has been reported in three Khorasan provinces with the largest areas in the country and borders with Afghanistan and Pakistan, while the largest stockpile has been reported in the Central Storage House of Plant Protection Organization.

Figure 7: Regional Distribution of POPs Pesticides in Iran



Recommendations for Managing POPs Pesticides in Iran

1. Completing/extending POPs pesticide inventory and contamination investigation to all provinces
2. Disposal of POPs pesticides in warehouses. Taking into consideration the need for proper HSE Procedures during re-packing, transport and disposal.
3. Remediation of polluted soil and prevention of further soil contamination around pesticide storage sites.
4. Ensuring effective control of trafficking of the POPs pesticides across the borders.
5. Investigating, modeling fate and transport, and taking necessary actions on POPs pesticide contamination in the marine environment (Caspian Sea, Persian Gulf, and the Sea of Oman)
6. Providing an awareness program for the farmers, plant protection specialists, Applying Integrated Pest Management practices through Farmers' Field School- IPM/FFS, and educating the public about the presence of local risk factors related to POPs pesticides

2.3.2 Assessment of PCBs

PCBs have been historically used in various industrial and consumer applications. Some important uses include, electrical insulation in transformers and capacitors, industrial coolants, lubricants and hydraulic fluids, plasticizers, adhesives, fire retardants, de-dusting agents, pesticide extenders, inks, carbonless reproducing papers.

PCBs may still be around in equipment and products made before 1990, such as old fluorescent lighting, electrical devices, hydraulic oil at mines, liquid in heat exchangers, lubricants, softener for plastics and glues, laminating agents in paper production, impregnating agent, fire retardants, additives in cement plasters and casting agents, additives for insecticides, sealing liquids in measuring instruments and heavy oil in ring scales.

Many of the listed uses are in so called "open uses" which management, identification and disposal for them is practically impossible. Therefore PCB management is emphasizing closed uses, such as di-electrical uses in transformers, capacitors and switch gears**,** as well as hydraulic fluids.

Present PCB Situation in Iran

The issue of PCBs are quite novel to Iran, consequently the current laws and regulations are not covering any stage of the PCB lifecycle such as use, handling, storage or disposal.

This regulatory absence has lead to a lack of statistics about the amount of PCBs in the country before the POPs Enabling Activity project and development of the NIP.

First estimates:

In 2003 Department of the Environment compiled a first estimate of PCBs in Iran. Much of the data was retrieved from reports from the Ministry of Energy (Tavanir Organization). The estimate is given in (Table 3).

Table 3: Estimation of PCBs in I. R. of IRAN

Ministry Or Organization	PCBs (Tons)	PCBs Polluted Oil (Tons)	PCBs Polluted Equipments (#)	PCBs in Use (Tons)	Equipments containing PCBs (#)
Power & Energy	200	1000	2000	600	1000
Industries & Mines	200	200	500	200	200
Oil	150	150	300	150	200
Defense	100	100	250	100	100

Private Sectors	100	100	250	100	100
Total	750	1550	3300	1150	1600

As this estimate was done only for a part of the possible PCB holders, a PCB inventory program with a task team of 8 persons was launched. This task team included representatives from the following ministries:

- Ministry of Energy
- Ministry of Industries & Mines
- Ministry of Petroleum
- Ministry of Health and Medical Education
- Department of the Environment (DOE)
- Ministry of Defense
- Others Private Organization

The inventory team contacted possible PCB holders through questionnaires and site visits. In addition to sending questionnaires to potential PCB holders, an investigation using PCB detection kits were performed at selected sites. Facilities that may be in possession of PCB containing equipments include electric utilities, industrial facilities, large construction companies, harbors and ship repair companies, retro filling and electro-service companies, waste management companies, manufacturing plants, metallurgical industry, machinery industry, chemical & petrochemical industry, food and consumer industry, large agricultural complexes, electronics, railroad systems, mining operations, military installations, and landfills and transformer repair workshops. The result of this investigation is given in Table 4 below.

Table 4: PCB Findings at Investigated Facilities

Name of Power plant	No. of Samples				Volume in liters below 50 ppm	Volume in liters above 50 ppm	Total Volume in liters
	<50 ppm	> 50 ppm	> 2000 ppm	Volume in liters over 2000 ppm			
Orumieh	6	-			15984	-	15984
Khoy	4	3			91264	13562	104826
Arak- Shazand	10	-			467455	-	467455
Gilan	27	-			498115	-	498115
Montazer Qaem	38	-					
Shahid Firoozi	6	6			10528	8661	19189
Shahid Rajaei	90	-			406184986	-	406184986
Bisotoon	19	1			145842	69284	215126
Toos	46	-			233792	-	233792
Tabriz	22	13			241150	445560	285710
Besat	6	2			126440	282	126722
Rey	49	10	3	3020	46195	7775	56990
Loshan	21	2			224457	2494	226951
Iranshahr	5	-			93498	-	93498
Hormozgan	12	1			11594	1247	13201
Mashhad	14	3			142500	18390	160890
Zarghan	7	-			195900	-	195900
Qom	39	-			؟	؟	؟
Fars Repair Shop	177	13			؟	106713	؟
Dez Dam	7	1			331100	47300	378400
TANESH Transfer	39	1			476300	9000	485300
West local Electricity	54	-			911655	-	911655
Technical Office of Tehran	16	3			539610	119861	659471
Gilan local Electricity	75	17			263204	3429	266673
Kerman Electricity	10	3			235340	37761	273101
West local Electricity	26	-			493300	-	493300
West local Electricity	71	-			20038600	-	20038600
West local Electricity	141	-			2490621	-	2490621
Yazd local Electricity	43	6	3	1693	788646	53134	843473
Hormozgan local Electricity	38	1	1	11547	755828	11316	778691
Kerman local Electricity	70	9			138524	120299	1505823
Gilan local Electricity	74	4			931784	33800	965584
Azarbaijan local Electricity	259	22	2	205	1388330305	65749	1388396259
Tehran Electricity	2	1			185	54	239
Azarbaijan Electricity	63	13			471886	47085	518971
Kangan	12		8	2426			
Boushehr	3		7	2564			
Hormozgan	-		35	32987			
Isfahan	-		31	30988			
Montazer Qaem	-		6	3243			
Rey				480			
Qaen				600			
Shirvan				800			

Zarghan				1000			
Total	**1601**	**137**	**96**	**91553**	**1825926948**	**1222796**	**1827905496**

Results of the PCB's Inventory Program

Overall, the PCB data obtained from different sources is not fully consistent. Therefore, only rough estimations can be drawn. It can be said for sure that there is a considerable PCB issue in Iran and firm steps needs to be taken in order to avoid releases in the environment from inappropriate waste management or spillage. (Table 5) below provides estimations for PCBs in Iran by Ministries or sectors.

Table 5: Estimated Values for PCBs Related Subjects for Different Sectors in the I. R. of Iran

Ministry or Sector	Number of "pure" PCB equipment	"Pure" PCBs in Use in tons	Weight of "pure" PCB equipment in tons	Number of PCB contami-nated equip-ment	PCB contaminated oil in tons		Weight of PCBs containing equipment in tons
					Over 50 ppm & Less than 2000 ppm	Over 2000 ppm	
Power & Energy	6200	1200	4200	2000	1530	120	7000
Petroleum	500	300	1050	400	200	200	1200
Defense	1000	200	700	400	300	300	700
Industries & Mines	2000	400	1400	200	400	400	1400
Others	500	200	700	200	200	200	700
Total	10200	2300	8050	3200	2630	1220	11000

Capacity Constraints and Recommendations for Managing the PCBs in Iran

Some of main problems identified during the PCB investigations are:

1. Lack of appropriate legal coverage for PCBs. This leads to difficulties in identification of the PCBs amounts in the country, possible imports, and risky situations at handling, storage, transport and disposal.
2. Unawareness of the public and workers about PCBs and their risks. Leading to exposure during maintenance, storage and disposal (possible re-use and recycling).
3. Lack of company-wise requirement for PCB management including identification, safety issues (maintenance, storage, etc.) as well as emergency response plan.
4. Unawareness and non-inclusion of PCB issues in the industrial control by government environmental and safety inspectors.
5. Non-availability of safe PCB disposal methods.

6. Uncertainties in PCB inventory, both when it comes to industrial size transformers and capacitors and open application (like hydraulic fluids etc).
7. Lack of capacity to analyze PCBs at provincial level.

Considering the above mentioned points, the following is recommended.

1. Strengthening of legislation and institutional infrastructure, PCB regulations covering all stages in the life cycle, including prohibition of the import, export and production of PCBs in the country
2. Better and more detailed identification of the PCBs amounts in the country
3. In-depth training and capacity building in PCB handling in the sectors holding high quantities of PCB equipment
4. Introduction of appropriate PCB management at PCB holder level, including maintenance, temporary storage area before being transferred for disposal etc.
5. Technological assistance and cooperation in appropriate technology for disposal and destruction of PCB wastes from old transformers and capacitors in destruction capacity for PCBs.
6. Awareness raising activities through arranging workshops, trainings and media information such as flyers, articles in newspapers, magazines and documentary films.

2.3.3. Assessment of DDT in Public Health Uses

Public Health Usage: In a survey by the Ministry of Health and Medical Education from the year 2000 to 2006 there has been about 15000 to 20000 cases of Malaria observed mostly in three southern and south- east provinces of Kerman, Sistan and Baluchestan and Hormozgan.

According to the regulations in the Ministry of Health and Medical Education use of DDT for the control of Malaria vector is forbidden since 1992. However, there are still stockpiles of DDT which amount to about 17922 kilograms in ten provinces in the country which are stored mostly in the medical universities' storehouses. These provinces include Mazandaran, Isfahan, Tehran, West Azerbaijan, Markazi, Khuzestan, Semnan, Hamedan, Chaharmahal and Bakhtiari and Razavi Khorasan (Table 6).

Table 6: The Amount of DDT Present in the Warehouses of the Medical Universities of Various Provinces

No.	Medical University (M.U)	Amount (Kg)
1	Beheshti M.U and Iran M. U (Tehran)	214
2	Chaharmahal and Bakhtiari	20
3	Hamedan M. U	4725
4	Isfahan M.U	1000
5	Khuzestan M. U	5750
6	Markazi M. U	10
7	Mazandaran M.U	34
8	Orumieh M. U (West Azarbaijan)	6000
9	Sabzevar M. U (Razavi Khorasan)	120
10	Semnan M. U	49
Grand Total		**17922**

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

In the past 20 years, world has identified the deleterious effects of a new group of persistent organic pollutants, unintentional POPs or dioxin-like compounds. These pollutants, including PCDDs (dioxins) and PCDFs (furans) as well as unintentionally produced HCB and PCBs, are mainly released as unintentional by-products from industrial point sources and diffuse sources of uncontrolled activities, such as waste burning.

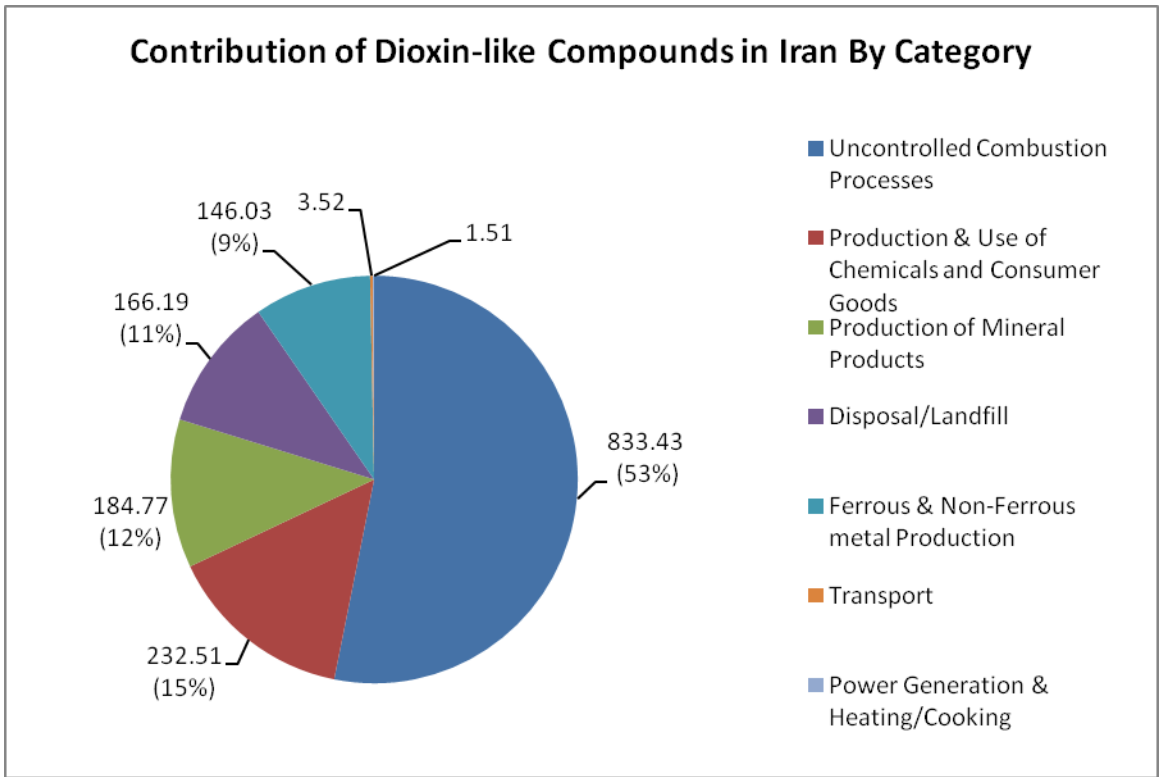
Dioxin-like components are very toxic substances and according to various studies, it is believed that these compounds can produce devastating impacts on environment and public health. Since, these new pollutants are persistent and can remain in environment for many decades, they have global implications.

The amount of dioxin-like compounds released from Iranian municipal and industrial sectors is (Fig. 8), estimated at 1.567Kg TEQ/ year (Table 7).

Table 7: Estimated Sector-Wise Released of Unintentional POPs in Iran

Cat.	Source Categories	Annual Releases (g TEQ/year)					Total
		Air	Water	Land	Product	Residue	
1	Waste Incineration	0.0	0.0	0.0	0.0	0.0	0.0
2	Ferrous and Non-Ferrous Metal Production	79.5	0.0	0.0	0.0	66.5	146.0
3	Heat and Power Generation	1.5	0.0	0.0	0.0	0.0	1.5
4	Production of Mineral Products	184.8	0.0	0.0	0.0	0.0	184.8
5	Transportation	3.5	0.0	0.0	0.0	0.0	3.5
6	Uncontrolled Combustion Processes	801.7	0.0	31.8	0.0	0.0	833.5
7	Production of Chemicals and Consumer Goods	0.0	0.1	0.0	232.4	0.1	232.4
8	Miscellaneous	0.0	0.0	0.0	0.0	0.0	0.0
9	Solid waste Disposal/Landfill	0.0	0.0	0.0	166.2	0.0	166.2
1-9	**Total**	**1071.0**	**0.1**	**31.8**	**398.6**	**66.6**	
	Grand Total						**1568**

Figure 8: Unintentional POPs Emissions by Category



Methodology for Estimation of Releases of Dioxin-like Components:

The release estimation of dioxin-like, PCDD/PCDF, compounds has been carried out by a methodology that has been devised by UNEP in the framework of the guidance for Stockholm Convention reporting. The basic aim of the approach, UNEP toolkit, is to enable an estimate of average annual release to each environmental medium (air, water, and land, in products and residues) for each process identified.

The estimation of PCDD/PCDF released to environment is calculated according to UNEP toolkit presented for nine categories of domestic, public and industrial activities. The basic formula used for estimation of PCDD/PCDF is as follows:

Source Strength (Dioxin emissions per year) = Emission Factor X Activity Rate

The PCDD/PCDF emission per year will be calculated and presented in micrograms of toxic equivalents (TEQ) per year. The annual Source Strength is calculated by multiplying the release of PCDD/PCDF per unit of feed material processed or product produced (*e.g.* ton or liter) – referred to as the Emission Factor – with the amount of feed material processed or product produced (tons or liters per year) – referred to as the activity rate.

Data Collection: Information regarding activity rate in accordance to criteria cited in UNEP TOOLKIT, was acquired from the Ministries of Industry and Mines, Jihad-e-Agriculture, Interior, Petroleum and other governmental agencies through official requests from the Department of the Environment.

In this round of data collection of Dioxin-like compounds in Iran, all data compiled were received from Iranian Ministries of Industries and Mines, Jihad-e-Agriculture, Petroleum, Interior, Energy and Municipalities. There were difficulties in gathering information from Ministries due to absence of or insufficient data. Hence, one of the recommendations for future inventories could be regarded as the introduction of a new discipline for data compilation in Iranian governmental sectors. Generally, improved data collection especially in uncontrolled burning of municipal and industrial solid wastes, agricultural lands, consumption of fossil fuels for vehicles, incineration of industrial and hospital wastes and household heating will be needed for future studies.

From the activity rates of the domestic, public and industrial sectors, the amounts of PCDD/PCDF emission per year released to the environment per sub-category was calculated by UNEP toolkit and summarized as total releases by category and total annual releases as represented in table 7.

The PCDD/PCDF releases by sub-categories are given in Tables 8 through 14 on the following pages.

Table 8: Category 2 Ferrous and Non- Ferrous Metal Production

Source Categories	Potential Release Route (µg TEQ/t)						
	Basis of Calculation (Toolkit)	Total	Air	Land	Water	Product	Residue
Aluminum Production (Processing scrap Al, minimal treatment of inputs, simple dust removal)	150 (air) - 200 (residue)	50994902	21854958				29139944
Aluminum Production (Pure primary Al plants)	ND	0	0				0
Aluminum Production (Scrap treatment, well controlled, good APCSl)	35 (air)- 400 (residue)	22185000	1785000				20400000
Brass&Bronze Production (Simple melting furnaces)	10 (air)	1797490	1797490				
Coke Production (No gas cleaning)	3 (air)	31350	31350				
Copper Production (Prim. Cu, well-controlled, with some secondary feed materials)	0.01 (air)	2260.445	2260.445				
Iron and steel production plants and foundries(Clean scrap/ virgin iron, afterburner, fabric filter)	3 (air) - 15 (Residue)	20344991.4	3390831.9				16954159.5

Iron ore sintering(Low waste use, well controlled plant)	5 (air) - 0.003 (residue)	49648181.05	49618410				29771.046
Lead production (Sec. from PVC/Cl2 free scrap, some APCS)	8(air)-5(residue)	38688	23808				14880
Thermal Wire Reclamation (Basic furnace with after burner, wet scrubber)	40(air)	323320	323320				
Zinc Production (Hot briquetting/rotary furnaces, basic control)	100 (air)	200000	200000				
Zinc Production (No dust control)	1000 (air)	468000	468000				
Total		**146034182**	**79495428**				**66538754**

Table 9: Category 3- Power Generation and Heating /Cooking

Source Categories	**Potential Release Route (µg TEQ)**						
	Basis of Calculation (Toolkit)	**Total**	**Air**	**Land**	**Water**	**Product**	**Residue**
Fossil fuel power plants (Light fuel oil/natural gas fired power)	0.5 (air)	590940	590940				
Fossil fuel power plants (Heavy fuel fired power boilers)	2.5 (air)	922877.4	922877.4				
Total		**1513817**	**1513817**				

Table 10: Category 4 - Production of Mineral Products

Source Categories	Potential Release Route (µg TEQ)						
	Basis of Calculation (Toolkit)	**Total**	**Air**	**Land**	**Water**	**Product**	**Residue**
Brick (Cyclone/no Dust Control)	0.2 (air)	21051085.91	21051085.91				
Cement Kilns(shaft kilns)	5(air)	163168305	163168305				
Ceramics (Cyclone/No Dust Control)	0.2 (air)	53499.46	53499.46				
Ceramics (Good dust abatement)	0.02(air)	42358	42358				
Glass (Cyclone/No dust Control)	0.2(air)	223859.7132	223859.7132				
Lime (Good dust abatement)	0.07(air)	237438.95	237438.95				
Total		**184776547**	**184776547**				

Table 11: Category 5 – Transport

Source Categories	Potential Release Route (µg TEQ)						
	Basis of Calculation (Toolkit)	**Total**	**Air**	**Land**	**Water**	**Product**	**Residue**
Transport(Unleaded fuel without catalyst)	0.1 (Air)	1330372	1330372				
Transport (Diesel engines)	0.1 (Air)	2196145	2196145				

Total		**3526517**	**3526517**				

Table 12: Category 6 - Uncontrolled Combustion Process

Source Categories	Potential Release Route (µg TEQ)						
	Basis of Calculation (Toolkit)	**Total**	**Air**	**Land**	**Water**	**Product**	**Residue**
Agricultural residue burning (in field), impacted, poor combustion conditions)	30(Air) - 10(land)	127120880	95340660	31780220			
Landfill fires	1000(Air)	706315465	706315465				
Total		**833436345**	**801656125**	**31780220**			

Table 13: Category 7 - Production and Use of Chemicals and Consumers Goods

Source Categories	Potential Release Route (µg TEQ)						
	Basis of Calculation (Toolkit)	**Total**	**Air**	**Land**	**Water**	**Product**	**Residue**
Chemical Industry(Chlorinated Pesticides- 2,4-D)	700 (Product)	6307000				6307000	
ECD/VCM/PVC (Old Technology, ECD/VCM/PVC)	1(Water)	49914			49914		
Leather Plants (Lower Limit)	10 (product)	7702777				7702777.47	
Pulp&Paper (Kraft process, old technology (Cl2)	8 (product)-4.5(water)-4.5(residue)	267750			70875	126000	70875
Pulp&paper (recycling paper)	10 (product)	1660700				1660700	
Textile Industry(Upper limit)	100 (product)	216527867				216527867	

Total		232516008			**120789**	232324344	**70875**

Table 14: Category 9 - Disposal / Landfill

Source Categories	**Potential Release Route (µg TEQ)**						
	Basis of Calculation (Toolkit)	**Total**	**Air**	**Land**	**Water**	**Product**	**Residue**
Composting(All organic fraction)	100(Product)	166191874.1				166191874.1	
Total		**166191874**				**166191874**	

Conclusions:

Iranian inventory of Dioxin-like compounds of about 1.568kg TEQ/year is considerable compared with inventories of industrialized countries which are in the range of 0.1- 4.0 Kg TEQ/year. Clearly the level of releases indicates the need for taking a more systematic approach to the management of unintentional POPs releases.

Recommendations:

1. Since the information gathered were insufficient, a new discipline for gathering data by Iranian authorities is required for the future inventories in coming years. Generally, improved data collection especially in uncontrolled burning of municipal and industrial solid wastes, agricultural lands, consumption of fossil fuels for vehicles, incineration of industrial and hospital wastes and household heating will be needed for future studies.
2. Enactment, enforcement and implementation of proper legislation for reduction of dioxin from uncontrolled burning of solid wastes and field burning of agricultural land, since at present burning residues of agricultural fields is a routine practice of combating agricultural pests and its magnitude might not have been exactly projected by governmental statistics.
3. The inventory clearly demonstrates the need for improvement of the current solid waste disposal practice and abatement strategies for industrial sources in Iran. Municipal solid waste disposal and industrial activities produce 53% and 47% of Dioxin-like compounds in Iran.
4. Introduction of Best Available Technology and Best Environmental Practice measures should be introduced for industrial sectors such as Textile, Cement production, Aluminum production, Iron and Steel plants.
5. Data collection of dioxin–like compounds release from source poorly investigated categories such as: category one (incineration of hazardous waste, medical waste), category three (domestic heating by fossil fuel) and category nine (landfill leachate, open water dumping and waste oil disposal) is needed.

2.3.5. Existing Programmes for Monitoring POPs Releases and POPs Research.

During the past decades, I. R. of Iran like many other developing countries increased the usage of pesticides in order to increase its food production. POPs pesticides were used and stored mostly in provinces with intensive agricultural activity in the country.
PCBs were imported into the country for many years after it was banned in the producing nations. Major parts of the PCBs were used in power transformers and capacitors mainly located and stored in industrial zones with the risk of contaminating soil, surface water and ground water in the industrial provinces.
Unintentional POPs, dioxins, have been emitted as undesired by-products in many industrial and domestic activities.
Very limited number of measurements of POPs pesticides and PCBs in the environment and other matrices such as agricultural products such as, milk, cheese, meat, fish and animal feed has been performed in Iran. The POPs measurements are performed by the Ministry of Health and Medical Education, Ministry of Jihad-e-Agriculture (DPPPC), Ministry of Industries and Mines, Department of the Environment, Iranian Standards and Industrial Research Institute (ISIRI) and some universities. The data obtained from these sources are not shared or compiled in a concerted manner for making an overview of the POPs contamination situation in Iran.

The POPs measurements are done without any regular and standard form or guidelines, and are not real monitoring activities as they do not clearly define the baseline nor are they repeated in order to show trends in POPs concentrations from which one could draw conclusions on the increased or decreased POPs risks.

No steps have been taken for analyzing and monitoring of unintentional POPs. No organization in Iran possesses the capacity to sample and analyze unintentional POPs. Consequently no data in this regard exists.

Current POPs Research Initiatives

In addition to the snapshot POPs investigations by government Ministries, some research related to POPs have been initiated in order to shed light on the status of particular issues potentially causing harm to humans and the environment.

These research efforts include:

- Fishery Research Institute: Measurements of POPs pesticides in aquatic media and fishery products as well as encouragement of research on the effects of pollutants on aquatic feed chain and fish.

- Toxicology Research Center of University of Tehran: POPs pesticides and PCBs, POPs effects on health (e.g. POPs effects on reproductive and endocrine system). Research on

correlation between feed and food POPs pollutants has also been conducted but not yet published.

Capacity Constraints Identified in the POPs Monitoring in Iran

No systematic POPs monitoring exists in Iran. Only sporadic measurements and projects have been undertaken. This creates both opportunities and challenges for the national POPs monitoring.
Firstly, an appropriate system can be developed which is always simpler than making a series of small amendments. Secondly, the laboratory network and the equipment have been upgraded in many government entities making it easier to confer them with additional sampling and analysis tasks also involving organic parameters, like POPs pesticides and PCBs.

On the challenge side the difficulty to establish standardized and reliable analysis results can be mentioned. The introduction of proper Quality assurance and Quality assurance and Quality Control measures at all laboratories participating in POPs monitoring will require some years to establish.

The absence of possibilities to analyse unintentional POPs will make the monitoring of unintentional POPs in Iran un-economical. Foreign laboratories may be used for isolated research projects, but for real monitoring analysis, capacity needs to be established. For more details see section 2.3.8.

Recommendations for Developing an Appropriate POPs Monitoring System

1. Establish a committee to set up a POPs monitoring program, involving all relevant Ministerial organizations, Institutions and Universities in the decision making committee.

2. Make a detailed evaluation of the existing sampling programmes and POPs findings available at different organizations and ministries.

3. Scope the POPs monitoring needs by determining exact kind of matrices to be monitored such as (meat, fish, dairy products, nuts, fruits, vegetables, crops, water…etc), priority parameters, sampling frequency and regions.

4. Make a detailed evaluation of the POPs analysis capacity at various central and provincial laboratories.

5. Establish a structured management system and outline each member's responsibility, including centralized storage and processing making all the data available to every involved organization.

6. Compile a POPs monitoring plan for Iran indicating existing capacities and a plan for enhancing capacity as needed.

2.3.6 Information, Communication, Awareness and Education

Information, communication, awareness and education about chemical hazards, ways of exposure and risks are one of the most cost-effective ways of decreasing harmful effects of chemicals. This has also been acknowledged in the Stockholm Convention on POPs. Article 10 of Stockholm Convention emphasizes the need for each Party to promote and facilitate public information, awareness and education.

During the past few years, public information about hazardous chemicals in air, food and water has increased, albeit from a very modest baseline. Most Iranians are aware that exposure to chemicals could threaten their health. Cancer is the most known disease that people correlate it with pollutants, especially food residues. However, public are much more familiar to microbial contaminants than chemical pollutants and through them, they are more concerned about pesticides and veterinary drugs than the others. People in general do not have any information on POPs and their harmful effects in particular.

Department of the Environment (DoE) is charged with duties and responsibilities of environmental research, environmental policy making, environmental planning, environmental monitoring and environmental coordination of both national and international issues.

In addition, DoE serves as a coordinator among the other ministries, which are charged with specific aspects of environmental management.

Besides DoE, many other ministries and institutes are involved in POPs management and obviously have information and outreach responsibilities on these.

Consistent with obligation undertaken under Paragraph 1(a) of Article X of the Convention, the Commission on chemical Safety (IMCCS) exchanges information on domestic/international matters and priorities on chemical safety among relevant ministries and agencies and seeks strategic and effective communication/cooperation and coordination among them. It devises national policies and positions to be addressed to the international conferences of States Parties and meetings. It also liaises as necessary, any information and/or declaration requirements with the POPs Secretariat.

Ministries of Energy, Petroleum, Jihad-e-Agriculture, Industries and Mines as well as Health and Medical Education are in charge of management of POPs pesticides, PCBs and Dioxin/furan distribution, release minimization and elimination. Despite of the division of responsibilities there seems to be little information exchange on POPs chemicals among the ministries and government institutions.

There are more than 700 environment NGOs of which more than 70 work in Tehran. Their activities include awareness raising and education of the general public. They are mainly focused on bio-diversity and wildlife, air pollutants, protected areas. Few NGOs have formally trained experts but they are very interested, energetic and serious. According to the NGO central

councils in Tehran, no direct POPs related activities have been carried out by the civil society in Iran.

The most important NGO, named Basij, has an agreement with the DoE for contributing in various sections of the DoE 's projects on protection of the environmental.

Unfortunately there are only few courses about chemical risks, environmental pollutants or contaminants residues in food/air/water in the current educational system/curricula even in the scientific higher education. This is reflected in the knowledge level among professionals working in the field. In an awareness investigation interviewing 65 food inspectors, graduates and employees in laboratories or public centers, it was revealed that none were informed about POPs pollutants, contaminants or residues covered by Stockholm Convention.

This situation is not much better among decision makers, governmental stakeholders or environmental, medical and agricultural NGOs.

Information and Outreach Activities per POPs Category

Pesticides

The general knowledge of pesticides risks are much more widely distributed than the risks for the two other POPs categories. Carcinogenicity of pesticides as residues in food is a great concern among people but still they are not familiar with the particular problems related to POPs pesticides.

Existing POPs pesticides pose danger to the personnel working in the pesticide storage houses and people living around these sites. Although disposal of obsolete pesticides is of great concern, the governmental stakeholders are not aware how these storages could affect the ecosystem and public health or the people in charge are not organized to manage them at all. Further, the published guidelines for storage of pesticides as well as the training provided to storekeepers in pesticide management are inadequate.

There are some efforts by Ministry of Jihad-e-Agriculture, informing farmers about proper usage, disposal of excess pesticides or containers of pesticides and by Ministry of Health and Medical Education about avoiding exposure to harmful substances in villages, farms and factories. However the information sharing, outreach and education is not effective for avoiding production or exposure to hazardous chemicals including POPs and considering safety aspects in application of certain chemicals like pesticides.

The enforcement agencies, like agricultural, environmental and customs officials are not furnished with any information or education on POPs pesticides, though these have been identified as key groups for ensuring that no illegally imported POPs pesticides are in the market and being used.

Though pesticides are a subject to research and measurements in food and environment, their results are not yet compiled and organized for presenting as a coherent information and education material for different stakeholders.

Some training in safe application of pesticides are held by organization affiliated to Ministry of Jihad-e-Agriculture in villages. However, they are assessed insufficient for ensuring a proper information flow to farmers in relation to hazardous effects of pesticides in general and POPs pesticides in particular. Consequently, many farmers prefer the use of persistent pesticides instead of pesticides which decompose in environment soon.

Neither Health Committee of Television and other public information tools nor environmental NGOs, were provided with information on POPs pesticides or produced programs/news in this area.

PCBs

PCBs are widely found in equipments in Iranian industries, and are not covered by regulatory action. Besides private enterprises, PCBs are found in facilities managed by Ministry of Defense, Ministry of Energy and Ministry of Industries and Mines.

Despite of Health and Safety systems in place at many industries, PCBs issues have not been included as a separate part of these systems. Consequently no information and awareness efforts or workshops about PCBs exposure avoidance, minimization of releases, PCB impacts on environment and public health have been disseminated to workers or the general public.

Few years ago, a local newspaper revealed a stock of Askarel oil near a Tehran refinery center but news were not followed up which shows the lack of interest given to PCBs in health pages of newspapers or health programs of Radio and TV.

Research on PCBs has been restricted to ROPME activities and unrelated research on PCBs in surface waters, sediments, breast milk and some food items in academia. These results have not been compiled or organized yet. The knowledge of scientific and public NGOs especially environmental NGOs about PCBs is weak.

Unintentional POPs

Dioxin and dioxin-like contaminants are not known to most of the people. Neither the public nor governmental institutions in Iran have the needed knowledge about these toxic by-products. In a recent investigation on the knowledge of educated participants in a workshop related to Codex Alimentations, most participants claimed that they have never heard of POPs or dioxin like products in particular. This absence of dioxin discussions even among professionals may be due to the difficulty and requirement of sophisticated equipment for measuring dioxin. Consequently, there is no analysis of dioxins or evaluating the effects of these on public health in academia.

Though dioxins are emitted through industrial activities as well as uncontrolled waste and biomass burning, the most significant exposure occurs through the diet, i.e., fish, meat, or dairy products.

Any outreach activities on dioxins should hence be two-pronged, aiming at both emitting activities and intake/exposure.

Although there are ample information and awareness tools such as newspapers and TV in Iran, none of these have reports on unintentional POPs. There are further untapped resources among environmental NGOs and sub-divisions of ministries in charge of information dissemination, especially in villages and industrial urban areas, which could introduce dioxin effect, emission control and exposure minimization concepts to farmers, workers and people who are at risk.

Outreach efforts as a part of the POPs Enabling Activity Project

Some initial steps for increasing this awareness were taken as a part of the POPs Enabling Activity Project:

These activities include:

- A 3-day national workshop held in Tehran
- 18 workshops held in the provinces with a history of POPs pesticides usage
- Inventory of the POPs pesticides, as well as obsolete pesticides taken and documented by taking samples, pictures, and films
- Training of 65 food inspectors

Target Groups for POPs Awareness Raising and Education

Above paragraphs detailed the existing POPs information, education and outreach efforts in Iran as well as the deficiencies in this regard. Clearly there is a will to increase the level of knowledge of chemicals' risks and POPs exposure across the board. However, in order to prioritize the action for being as effective as possible in the outreach work the following groups should be particularly targeted:

- Government officials both at policy making and enforcement levels
- Farmers who are exposed directly to pesticides POPs and dioxin
- People living or working in contaminated areas where POPs pesticides or its chemical wastes have been dumped or stored
- Workers who are directly handling or maintaining power transformers or capacitors that are or may be PCB containing
- Workers and management in high dioxin emitting industries producing cement, aluminum, zinc, copper and so on, and inhabitants around these areas
- Workers who handle and transport POPs pesticides or PCBs
- Children and pregnant women

- General Public

Capacity and Means for Information Dissemination Communication and Outreach

At Ministry level, there is a central commission called National Commission on Chemical Safety led by the Ministry of Foreign affairs which is formed by governmental representatives and authorities relevant to chemical safety. The activities of this committee are to disseminate information through governmental system on national activities and international chemical safety issues, such as chemical and waste Conventions. Besides the Commission, there is no organized system for information exchange among authorities.

Ministries of Health and Medical Education, Jihad-e-Agriculture and Department of the Environment have health councils that could be tapped for POPs information dissemination. These councils have human resources that could contribute to educational programs including training of target groups.

Also the educational system at all levels would be an effective way, though largely untapped, means of disseminating POPs related information can be particularly achieved by inclusion of chemical risks and other POPs related topics in the higher educational curricula of Schools of Agriculture, Institutes of Nutrients, Schools of Fishery and Schools of Medicine and Veterinary Medicine as well as engineering departments. This would also increase the knowledge among public sector and industrial enterprises as the POPs trained students take on duties after graduation.

Among public enterprises, mass media have a health council that broadcast specific programs about health on TV or radio, therefore by encouraging and training them, the specific programs on POPs to raise public information will be broadcasted. All of newspapers (local and national) have health pages that can be occupied with articles about POPs as well.

Other effective ways of disseminating information to the general public, especially at village level, would be through religious leaders especially in areas where agriculture is more traditional.

Many environmental NGOs are interested and able in raising public awareness by distributing information distribution material such as brochures and posters or holding meetings for target groups and public. For example, Basij has great capacities for exchanging the information between government and public.

2.3.7. Overview of Technical Infrastructure for POPs Assessment

Laboratory Capacity in the I. R. of Iran

There are several state laboratory networks relevant to POPs in the I. R. of Iran. Ministry of Jihad-e-Agriculture, Ministry of Health and Medical Education and Department of the Environment all have networks of laboratories. These are headed by central laboratories in Tehran with branches in all regions. In addition, various academic institutions and research institutes carry out monitoring and research projects involving POPs analysis.

Before discussing the POPs laboratory capacity in various institutions and networks more in detail, it may be good to note that POPs pesticides, HCB as well as PCBs can be analyzed with existing equipments in Iran.

The laboratory analysis, both sample preparation and an actual measurement of dioxins is very challenging. For analyzing dioxins in food or other biotic matrices, or achieving ultra-trace detection limits of other POPs, requires a high resolution Gas-Chromatographer with Mass-Spectrometer analysis capability, preceding with advanced sample preparation and extraction.

At the moment, no laboratories are performing or accredited to perform dioxin analysis in the I. R. of Iran. Such an analysis capacity could be established at a selected national laboratory.

Department of the Environment

The Department of the Environment has a well equipped central laboratory and 24 provincial laboratories. The analysis performed covers various matrices from water and air to soil and biota. At central level the laboratory has 25 professional staff and is divided into 9 different laboratories. For POPs analysis, the Petroleum Hydrocarbon and Pesticides Laboratory is the most relevant. The laboratory has highly qualified staff and appropriate sample preparation and analysis equipment. The equipments for analysis include GC-ECD and GC-MS, which would cater for most POPs analysis, except dioxins. This laboratory is mainly performing analysis of organic contaminants in sediment and water samples but has the capacity of also preparing and analyzing biota and food samples, like the PCB analysis done in the framework of the POPs EA project. While the Central laboratory in DoE does not participate in international calibration and round robin programs, it uses international standard reference materials.

The Department of the Environment possesses a network of well-equipped laboratories at provincial level. The laboratories are typically fitted with GC-ECD or GC-MS which would potentially make it possible to analyze POPs in the regional laboratories. In practice, the laboratories in the regions are performing very similar analyses concentrating on physical and chemical characteristics of water and wastewater samples as well as inorganic compounds, and in some cases heavy metal content of water samples.

Ministry of Health and Medical Education

The Ministry of Health and Medical Education has several central laboratories involved in food and public health monitoring. The food monitoring network is extended also to provincial laboratories who are responsible for collecting food from the markets and analyzing these for ensuring that they are conforming to the current safety limits both when it comes to microbial concentrations and quality as well as contaminants.

Unfortunately, the contaminants analysis scheme does not include POPs chemicals. Because the POPs pesticides are banned, they are not expected to be found in threatening magnitudes in the foodstuff. Further no environmental quality or limit values have been established for PCBs or dioxins. Consequently there are no direct legal requirements that necessitate the POPs monitoring. Such limit and quality standards can be established under the more general provisions of the food laws requiring authorities to ensure safety of the food placed in the market.

The Ministry of Health and Medical Education central and provincial laboratory network has all necessary hardware for setting up POPs monitoring for selected POPs in selected food matrices. There is however no experience in undertaking such analysis. Consequently the establishment/inclusion of POPs in the activities of Ministry of Health and Medical Education monitoring will require a comprehensive training component which should put the emphasis on proper methods, introducing of standardized analysis protocols and ensuring use of proper standards/reference material as well as quality control.

Ministry of Jihad-e-Agriculture

Ministry of Jihad-e-Agriculture has a broad mandate of monitoring agricultural produce, soil as well as waters used for irrigation purposes. Due to the various agricultural circumstances that apply in the I. R. of Iran, the Ministry of Jihad-e-Agriculture has a separate institute which has the responsibility of setting the Maximum Residue Levels (MRLs) but not the actual monitoring. In this regard it should be noted that POPs pesticides as they are banned in agriculture practices are not routinely monitored in any crops or regions in the I. R. of Iran.

The Iranian Research Institute of Plant Protection (IRIPP) provides for the base research, sets standards and MRLs as well as trains the Ministry officials working in other departments and institutes in correct procedures. The Pesticides Residue Research Laboratory in Tehran is the central laboratory for investigating pesticide residues in agricultural produces. This laboratory has been upgraded with assistance of FAO and is now equipped with GC-MS, GC-ECD as well as appropriate hardware and laboratory facilities for performing quality analysis for all POPs pesticides. The laboratory will be acquiring international ISO 17025 accreditation in a very close future.

The Plant Protection Organization (PPO) has appropriate equipments and skills for undertaking POPs pesticides monitoring in agricultural products, if required. If such monitoring would be put in place, the analysis methods and protocols should be properly updated, and the staff should be

given some refresher training. This applies for the central laboratory and in particular for the provincial outfits of PPO. The capacity of PPO laboratories appears adequate for identifying smuggled/counterfeit pesticide formulations in the market.

Development of POPs Laboratory Capacity

Apart from dioxins all POPs sampling and analysis in the central laboratories of the ministries in the I. R. of Iran can be handled. There might be a need to update some professional capacity for obtaining reliable results and some additional personnel might be needed especially for sample preparation.

The introduction of new requirements for monitoring of food and environment, such as detecting POPs, and the need of having more detailed and updated monitoring results puts a lot of expectations on the existing institutions and laboratories. This makes a strong pressure for updating the current laboratories, both when it comes to equipment and the human capacity to carry out the more complicated analysis.

Much can be done through human capacity building and acquiring newer faster analysis equipment with auto samplers etc. Despite of this a thorough assessment of the roles and responsibilities of different institutions needs to be undertaken. All institutions involved will have to critically assess the current structure and requirements, while giving up and co-operating on certain sampling and analysis practices.

There is a need to decide a strategy as to how to cope with the question of dioxin analysis. One possibility is to use foreign laboratories. While this might be a good option (and the only one in the short run) at the time being, it would be highly recommendable that a capacity for dioxin analysis would be established in the I. R. of Iran.

While making such decisions, one needs to be aware of the cost involved and that the costs are not only related to the analysis equipment but also the staff involved in the analysis needs to be trained both for carrying out the sample preparation and the actual analysis. Due to the very low concentrations of dioxins, extreme requirements are needed in the sample preparation. While the same analysis equipment can be used for all samples, all environmental samples need separate premises for sample preparation as they may contain much higher concentrations of the analyzed compounds and could potentially contaminate other samples.

If a decision to establish dioxin capacity in the I. R. of Iran would be taken, there is also a need to obtain accreditation and participate in international inter-calibration. The preparations will take some years without actually trustworthy analysis being carried out. Further, a well-trained team of 5 to 10 fulltime personnel will have to be allocated for carrying out the dioxin analysis.

2.3.8. Identification of POPs Impacted Populations and Environments

While POPs are not acutely toxic in typical exposure/intake concentrations, the health effects are chronic, appearing only after repeated exposures and bio-accumulation.

Health effects associated with POPs exposure include neurological side effects on children, reproductive system hazards, neurobehavioral deficits, carcinogenicity, and hazards to immune system and endocrine disruptions.

Pathways and Routes for POPs Exposure

Food: POPs can be highly concentrated in the meat, eggs, dairy products and fish or in grazing animals in areas with even low levels of POPs. Predator species at top of the food chain, as well as bottom feeding fish, tend to contain the highest POPS levels.

Human Milk: The transfer of POPs from mother to child is an important pathway for POPs exposure to infants. One-sided nutrition and low bodyweight combined with not fully developed metabolism make breastfeeding infants particularly vulnerable to POPs.

Surface Soils: The health hazard is related to the potential for people to swallow small amounts of the soil or the contaminant entering the food chain by uptake of plants and grazing animals. POPs in soils spread by runoff to lakes and rivers and concentrate in fish and other wildlife. Infants who may eat small pieces of soil are particularly vulnerable.

Groundwater: POPs are hydrophobic and so it is quite rare for them to be found in groundwater apart from cases of large and continuous spillage. However, in areas with high water table levels, POPs can spread on the surface of groundwater as an immiscible NAPL with low, but still dangerous, solution concentrations in the groundwater itself.

In the Workplace: Repeated direct exposure to POPs is most common among the workers handling POPs in their everyday activities. To these groups belong electrical transformer maintenance workers and farmers unknowingly using POPs (despite of bans, possibly smuggled), or agricultural chemicals having POPs as impurities. Industrial accidents have been responsible for most cases of acute POPS poisoning in humans. Crews responding to electrical system fires and hazardous waste accidents also may be exposed to POPs.

Socio-Economic Consequences of POPs

Diseases originating from POPs exposure have many negative impacts on the health of families

and society. The acute and incurable diseases impose large financial burden on the society. Moreover, the long process of unsuccessful treatment of these serious diseases and loss of relatives would affect the psychological health of families.

There are other socio-economic costs, besides health related costs, for society. These include costs of producing healthy food in highly contaminated areas that are elevated and potentially unbearable. Given the long periods of time needed for many of POPs to undergo degradation in the environment, the farm soils contaminated with POPs will remain useless, or otherwise contaminated and contaminating, for a long while. This may force farmers to leave their farms and live in cities, increasing urban population and associated costs it imposes on urban areas.

Contaminated workplace impacts the health of crews and in addition to medical costs, imposes the subsequent costs for low productivity, or retirement and even death. De-contamination or cleaning of workplace from pollutants is expensive and requires sophisticated equipment and know-how.

A society highly contaminated with POPs could be prone to even more fundamental changes or functioning at a sub-optimal capacity as POPs exposure in children impair their learning and participation in social activities.

Identified Groups and Sectors Affected or Benefited by the Use of POPs in Iran:

As with all activities some groups are more affected by the POPs use and their harmful exposure. It should also be borne in mind that there are also groups and sectors in society that are benefitting from in-adequate POPs control.

Groups bearing negative consequences of POPs are:

- Iranian households (due to food, soil and water contamination which leads to disorders and diseases in children, and mothers, which in turn is the source of economic costs).
- Industrial workers like power plant or power station workers, (due to PCB contaminations), aluminum and brass industries, coke production, iron and steel plants, copper production, zinc and lead production, thermal wire reclamation(due to dioxin emission).
- Agricultural sector, possible direct exposure, and due to soil, water and product contamination
- Food sector, food export industry (due to potential losses for not complying with export standards).
- Health sector (due to increase of medical costs) which will be confronted with more cases of incurable diseases like cancers and decreasing efficiency and productivity.
- Private sector loss due to less economic activity which in turn lowers GDP.

- Government which is accountable for overall success or failure of the country, and is obliged to finance – directly or indirectly – the above mentioned costs.

Groups benefiting from low POPs control

- POPs using or emitting industries as no costs for POPs (dioxin, PCB) control is needed
- Exporting industries, as lower environmental standards may lower international competition
- Owners of above mentioned industries
- People directly or indirectly employed by above industries who are not directly exposed to POPs

Unfortunately, because of the complexity of the issues at hand and considerable lack of information and precise scientific facts about POPs in the country, an *assessment of social benefits and costs* due to use of or exposure to POPs is almost impossible to establish.

Likewise because of substantial lack of information, it is difficult to estimate the social costs of a no-action scenario on POPs.

However, considerable social and financial costs could be attributed to the latter scenario considering the impacts of POPs contamination on agriculture, food safety, ecosystem integrity, wildlife, POPs residues in food and the costs of health implications.

3. Strategy and Action Plan

3.1 Policy Statement

The policy behind I. R. of Iran's NIP is to identify and mitigate hazards of POPs with the purpose of protecting the national environment and human health from the risks of these hazardous substances, whether imported or generated locally. The risk management efforts should cover all stages of production, handling, storing, and safe disposal of the POPs chemicals and POPs contaminated wastes, as well as replacing the hazardous materials by safer alternatives. This can be achieved through the adoption of cleaner production approach and the application of the risk management methodology.

I. R. of Iran is a contracting party to the Stockholm Convention, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal and the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Dangerous Chemical Substances and Pesticides in International Trade. Iran's ratification of these agreements confirms commitment to an internationally coordinated effort for the protection of environmental and human health from the effects of hazardous chemicals including POPs.

The fulfillment of the Stockholm Convention commitments by the I. R. of Iran is coordinated by the Department of the Environmental (DoE). DoE will cooperate through the implementation plan with the Ministries of Jihad-e-Agriculture; Foreign Affairs; Trade; Health and Medical Education; Industries and Mines; Interior Affairs; Economy & Finance; Oil. Energy; and Science, Research and Technology.

3.2 Implementation Strategy for Tackling POPs

The NIP document is divided in two principal sections, the background or assessment part where the amounts of POPs stockpiles and releases are presented as well as a number of analyses of the preparedness of various sectors of Iranian society to manage POPs in an effective manner. The second part is outlining the policy response and developing action plans in various POPs relevant areas to achieve an adequate protection of human health and the environment. These action plans are developed from the basis of a multi-stake holder priority setting exercise. During this priority setting the POPs findings and assessments were presented to all interested parties, who then gave policy guidance on the content and emphasis of the Iranian POPs policy response to be laid down in the National Implementation Plan. The Iranian future POPs policy, including compliance measures for Convention requirements are given in a number of Action Plans and strategies. Each of these Action Plans includes several objectives and areas of actions in order to achieve a comprehensive response to the issue at hand. It should further be noted that the action plans are expecting activities of a number of concerned partners, ranging from government ministries and institutions to industries and private companies and civil society groups.

The Action Plans and Strategies included in the National Implementation Plan are the following:

1. Institutional And Regulatory Strengthening Measures
2. Production, import and export, use, stockpiles, wastes, reduction and elimination of POPs pesticides
3. Production, import and export, use, stockpiles, wastes, reduction and elimination of PCBs
4. Action Plan for reduction of releases from unintentional POPs releases
5. Strategy for identification of contaminated sites and remediation.
6. Strategy and Action Plan for Information exchange and stakeholders involvement
7. Action Plan for public awareness, information and education
8. Action Plan on Research, development, and monitoring of POPs

The plans cover a time period of up to 12 years from adoption, outlining the short, medium or long term nature of the required actions. Altogether it is estimated that the financial burden of implementing the plan is about $ 138,410,000. At this stage it is not possible to estimate exactly the concrete funding resources. To identify these it is necessary to take into consideration the potential financing sources:

1. The main financial burden will be on industries and companies who are to phase-out their PCB containing equipment and introduce cleaner production practices and technologies as per Convention guidance. It is estimated that approximately 2/3 of the combined expenses are accruing to industries and companies,
2. While approximately 1/3 of the funds will be required from the public sector, governmental and municipal institutions, and the international organizations in particular for the Research and Development and Awareness Action Plans.

3.3 Activities, Strategies and Action Plans

3.3.1 Institutional and Regulatory Strengthening Measures

The Government of the I. R. of Iran is committed to the protection of the health of workers and the public and to the protection of the environment from the harmful effects of pollutants. Nevertheless, in spite of the existing legislation, some strengthening is still needed in the present institutional and regulatory systems for enabling a proper execution of the National Implementation Plan (NIP).

This section gives anticipated measures of institutional, regulatory and enforcement actions that need to be undertaken in order to provide the operational capacity and legal basis to implement the POPs NIP in practical terms. These measures will be further detailed and made operational through technical guidance developed under respective pollutant based action plan.

Institutional Strengthening

Environmental Protection and Enhancement Act, authorizes the Department of the Environment (DoE) to act against and prevent any kind of pollution and every kind of activity that distorts the balance in the environment. Department of the Environment (DoE) shall not only prevent the use of substances that can be harmful to the environment, it should also prepare and adopt standards and criteria in order to prevent pollution of water, soil and air from emissions and waste material as well as manage their monitoring.

DoE has consequently the responsibility to regulate emissions and use of non-agricultural POPs chemicals as well as unintentionally formed and released POPs chemicals - dioxins and furans – and to develop contaminant emission limits and environmental quality standards for waters (drinking and inland surface waters). DoE has further a broad mandate to supervise the implementation of the Waste Management Act.

The Ministry of Health and Medical Education is responsible for enforcing of laws regarding sanitation and drugs and the Adjective Regulation of Sanitary Supervision over Poisons (except pesticides) and chemical substances. The Ministry is further responsible for setting appropriate food (and feed) safety limits for contaminants, such as heavy metals and POPs, and monitoring the adherence to these limits in food items placed in the market in the I. R. of Iran. Supervising medical and hospital wastes is also one of the responsibilities of this Ministry.

Ministry of Jihad-e-Agriculture has the duties and legal responsibilities of supervising the manufacture, import, distribution and use of pesticides. This duty is carried out by Plant Protection Organization (PPO) affiliated to this Ministry. The responsibility of supervising the agricultural wastes and corpse-burning is with this ministry too.

Ministry of Commerce is responsible for preparing and compiling national commercial policies and import and export affairs. All goods, products and materials which are imported to or exported from the country are controlled under the Regulations of Import and Export. The

Ministry of Commerce is responsible for compiling, in consultation with line-ministries, these regulations and declaring them to the Customhouse to be enforced.

Municipalities cannot be regarded as governmental organizations, but they are as public organizations responsible for offering public services in cities (in some districts it is the responsibility of counties). Furthermore, according to provisions in the Waste Management Act managing ordinary rural wastes falls under the responsibility of municipalities.

Successful implementation of the NIP will require participation of the above institutions and other relevant governmental and non-governmental organizations. However, the concerned authorities are not properly coordinated. In order to prepare an optimal response in implementing the Stockholm Convention in Iran increased efforts in coordination for achieving a concerted action on POPs is needed. In addition, there is a need to further increase the capacity of these institutions in order to ensure a successful management of POPs in Iran as well as for putting the NIP in practice. Ultimate coordination should be supervised by the IMCCS before reporting to the POPs Secretariat or other international bodies.

Institutional Responsibilities for POPs NIP Implementation

Upon adoption of the POPs National Implementation Plan, the Government of Iran, its Ministries and affiliated organizations are taking up additional responsibilities in order to manage POPs chemicals and releases according to the Convention requirements.

These additional responsibilities for the overall POPs management and implementation of the POPs NIP have been outlined below (Table 15). Furthermore, topic specific responsibilities for various stakeholders and governmental institutions are given in respective action plans. Due to these additional responsibilities and tasks required for management of existing and any future POPs and also the implementation of NIP, further resources and capacity-building are needed.

Table 15: Institutional Responsibilities for POPs NIP Implementation

INSTITUTIONS	RESPONSIBILITIES
Department of the Environment	• Set-up and ensure daily functioning of the POPs Office (tasks shown below) In addition: • Ensure overall coordination and inter-agency collaboration for POPs NIP Projects. • Identify and arrange for remediation of POPs contaminated sites. • Arrange for monitoring of POPs' residues in the environment. • Arrange for the environmentally sound disposal of POPs wastes in collaboration with the responsible ministries and municipalities. • Ensure application of BAT/BEP in different sectors. • Ensure integration of BAT/BEP in environmental permitting legislation and system. • Amend the legislative framework and follow-up on enforcement.
Ministry of Health & Medical Education	• Enforce adherence to POPs food and feed limit values through monitoring. • Ensure proper storage of DDT stockpiles at medical Universities • Arrange for the environmentally sound disposal of obsolete DDT and DDT wastes (in collaboration with Department of the Environment). • Collaborate with the Department of the Environment on awareness raising activities. • Ensure appropriate POPs exposure standards for workers in relevant sectors.
Ministry of Jihad-e-Agriculture	• Provide information to support the monitoring of POPs pesticides. • Ensure proper storage of identified POPs pesticides in Ministry's warehouses • Arrange for the environmentally sound disposal of POPs Pesticides and associated wastes (in collaboration with Department of the Environment). • Identify and arrange for remediation of 'Annex B' POPs pesticides contaminated sites in collaboration with Department of the Environment.
Ministry of Industries and Mines	• Appling advanced and environmentally-friendly technologies, rehabilitation and development in industrial. • Technical and financial support for the waste recycling technologies in the industrial. • Leading the industry and mine sectors to applying cleaner energy such as natural gas. • Promoting industrial and mineral areas with the goal of concentrating pollution sources. • Activating pollution controlling instruments and reviewing industrial final production technologies (such as cars). • Establishing suitable substructure of environmental condition and sustainable development. • Supporting research activities such as pollution control, and sustainable development and production of technical know-how and suitable establishment of pollution control instruments.
Medical	• Upgrade and modernize existing laboratories.

Universities, Central Laboratories, and research laboratories affiliated to responsible ministries	• Establish analytical capabilities of POPs compounds in organizations dealing with POPs. • Coordinate environmental monitoring programs of POPs' compounds. • Research on the effects of POPs on human health and the natural environment • Research on emission factor for release of uncontrolled POPs from burning of various biomasses.
Municipalities	• Upgrading the existing waste disposal facilities
Institute of Standards and Industrial Research	• Set up the standards for maximum levels of POPs in the food and feed. • Set BAT/BEP standards for avoiding unintentional POPs emission for selected industrial sectors. • Set up the standards required for the incinerators of medical and waste disposal. • Set up the standards required for the handling, storage and disposal of POPs.

Implementation of NIP and other related activities would be most effective if these are coordinated by a unit in a leading institution with the necessary administrative set-up and dedicated staff. A POPs Office would assume the NIP implementation coordination role with the following functions and responsibilities:

- Act as secretariat for POPs management;
- Coordinate and monitor activities of the various institutions which are assigned specific tasks under the NIP;
- Report, update and submit regular evaluation of POPs management to the Stockholm Convention Secretariat for POPs;
- Implement a notification and registration process with regard to specific exemptions and related issues on POPs;
- Provide and disseminate relevant Convention guidelines on e.g. BATs and BEPs and additional substances considered for inclusion in the Convention.
- Assist in mobilization of funds and resources for implementing the NIP;
- Evaluate NIP implementation progress at short, medium and long term;
- Coordinate the dissemination of public information, education and awareness programs on POPs;
- Be responsible for setting up and management of information exchange on chemicals, including POPs chemicals, in the country.

In view of the technical nature of the activities required to implement NIP and other obligations under the Stockholm Convention, it is recommended that the above responsibilities would be entrusted to the Department of the Environment. The Department of the Environment may also wish to integrate its work with other MEAs related to chemical conventions (Basel, Rotterdam and SAICM in particular).

Amendment of the Regulatory Framework

Government Ministries and affiliated organizations can, in the framework of existing laws and regulations covering environmental and health protection, regulate and execute rules on hazardous substances listed in the Stockholm Convention.

However, it appears in some cases, the laws and regulations are too general and do not specifically address specific Persistent Organic Pollutants as provided and required by Stockholm Convention. It is, therefore necessary to formulate more detailed policies, guidelines, terms and regulations to fully conform to the requirements of Stockholm Convention.

Following deficiencies in the regulatory structure have been identified:

- Lack of special codes to control, generate, store, sale and supply, handle, transport, apply and use of POPs as included in the list of Stockholm Convection (PCBs and obsolete POPs pesticide stocks)
- Lack of food and fodder limit values for POPs
- Lack of environmental quality standards for POPs
- Lack of efficient emergency response to counter the ecological effects of possible POPs releases
- Lack of regulations to punish those who violate the laws and regulations about POPs including unauthorized production, transportation, export & import, transaction and consumption
- Lack of specific emission and residue limits for industrial and other activities generating POPs, particularly unintentional POPs
- Lack of requirements to monitor POPs releases
- Lack of requirements to monitor POPs in food, feed and the environment

3.3.2. Action Plan for Institutional Regulatory Strengthening

In order to ensure an adequate capacity in Governmental organizations and full-regulatory backing of action to be included in the NIP the following institutional capacity building and regulatory action plan will be implemented (Table 16).

Table 16: Action Plan for Institutional Regulatory Strengthening

Objectives	1. NIP coordination for efficient NIP implementation	2. Development of legal frame work and its enforcement	**3.** Capacity building of Government Institutions for Managing POPs
Activities	Setting up POPs Office Coordinating and monitoring activities under the NIP Providing and disseminating relevant guidelines and other material developed by the Convention (e.g. BAT and BEP) Establishment of a central POPs tracking database Raising and coordinating funds and resources for implementing the NIP Evaluate NIP implementation progress at short, medium and long term Prepare reports to POPs COP Coordinate the dissemination of public information, education and awareness programs on POPs	Development/ revision of relevant laws and regulations, and integrate the requirements of Convention Development of POPs specific standards, including: POPs food (feed) quality standards, emission and environmental quality standards as well as definitions on POPs contaminated sites and specifications on acceptable disposal technologies for POPs Integration of BAT and BEP into EIA and other industrial permitting and enforcement legislation Development and training enforcement systems at import/export, unauthorized imports Development of technical guidance on POPs management not included in the sector wise action plans.	Capacity building for decision-makers on emerging issues in the Stockholm Convention (adding of additional POPs etc) Strengthen the capacity of responsible departments in POPs policy making, data collection, information exchange and project formulation Training and support to officials in Ministries and their experts in developing appropriate locally adopted technical standards for POPs Training in reviewing EIA and industrial permitting legislation in accordance with Stockholm Convention requirements

Expected Results	Convention implementation well coordinated Appropriate funds for NIP implementation ensured Overall POPs situation monitored and National reporting undertaken	Regulatory framework adapted according to Stockholm Convention requirements Technical POPs guidelines and quality standards adopted BAT/BEP guidelines phased-in. Industrial and border control strengthened	Appropriate and timely Government response to emerging Convention issues Line ministries ready for independently set POPs policies and set-up NIP Implementation projects
Responsible Institution	Department of the Environment	DoE, Ministry of Jihad-e-agriculture, Ministry of Health and Medical Education, Ministry of Commerce, Ministry of Interior	DoE, Ministry of Jihad-e-Agriculture, Ministry of Health and Medical Education, Ministry of Commerce, Ministry of Energy
Time Period	1 year setting up, ongoing	2-4 yrs enforcement ongoing	0-2 yrs
Estimated Budget	USD 50,000 annually	USD 250,000	USD 250,000
Source of Financing	Government	DoE, Legal authorities, Ministry of Jihad-e-agricultural, Ministry of Health and Medical Education, Ministry of Commerce, Ministry of Energy, GEF, International assistance	DoE, Ministry of Jihad-e-agricultural, Ministry of health, Ministry of Commerce, Ministry of energy, GEF, International assistance

3.3.3. Action Plan for Production, Import and Export, Use, Stockpiles, Wastes, Reduction and Elimination of POPs Pesticides

The POPs pesticides have been banned in Iran for many years. Therefore, not very large quantities of old POPs pesticide stockpiles have been identified. The actual POPs pesticide stockpiles can quite easily be managed if regarded in isolation. However, the POPs pesticide issue may need to be included in the overall obsolete pesticide management in Iran. The amounts of non-POPs pesticides are quite significant, i.e., up to 5000 tons.

Other recommendations for managing the POPs Pesticides in Iran identified during the compilation of POPs pesticide inventories include:

1. Completing/extending POPs pesticide inventory and contamination investigation to all provinces
2. Disposal of POPs pesticides in provincial warehouses. Taking into consideration the need for proper Health, Safety, and Environmental (HSE-MS) procedures during re-packing transport and disposal
3. Remediation of polluted soil and prevention of further soil contamination around pesticide storage sites
4. Ensuring effective control of trafficking of the POPs pesticides, including illegal imports
5. Investigating and taking necessary actions on POPs pesticide contamination in the marine environment (regional seas) by conducting research and developing a fate, transport, exposure, risk, and warning simulation tool (software)
6. Providing an awareness program for the farmers, plant protectionists, extensionists (Integrated Pest Management/Farmers' Field School- IPM/FFS) and public to educate them about the presence of local risk factors related to POPs pesticides

The devised POPs pesticides action plan will address these issues and will require concerted action from various ministries as well as private enterprises. The Ministry of Jihad-e-Agriculture will play a central role in the implementation of proposed actions on POPs pesticides as owner of wastes and as enforcement agency on pesticide distribution and use. Close cooperation from Department of the Environment on environmental effects and technical assistance on disposal is envisaged as is cooperation with Ministry of Finance and Custom house on illegal trafficking and imports of POPs pesticides (Table 17).

Table 17: Action Plan for Production, Import and Export, Use, Stockpile, Wastes, Reduction, R & D and Elimination of POPs Pesticides

Objectives	**Completion of POPs Pesticides and Contaminated Soil Inventory**	**Capacity Building for Enforcement and Awareness Raising**	**Predicting Fate and Transport for POPs in the Caspian Sea and the Persian Gulf and Sensitive Interconnected Ground Water Bodies in Surrounding Porous Matrices**	**POPs Pesticide Stockpile management and disposal**
Activities	Extend the POPs pesticide survey to those regions not surveyed in Phase I. Analyze all unidentified pesticides for possible POPs content. Complete POPs pesticide database. Complete geographical distribution, GIS, map of POPs Pesticides and contaminated sites in Iran with documented references	Train customs officials in identifying counterfeit pesticides. Establish a system for customs inspectors to analyze suspected pesticide imports. Raise awareness of potential new POPs formulation in the market and their hazards in the society. Introduce annual	Developing a conceptual mathematical hydrodynamic and mass transport model (surface and underground porous media) incorporating information with regard to water circulation regimes of the sea, seepage and draining regimes to the sea from surrounding agricultural run off and porous matrix, species migration and movement patterns, as well as POPs distribution and accumulation patterns in fish and other sea dependent fauna and flora. Developing a numerical computational flow and mass transport as well as bioaccumulation model based on the gathered information (for verification) and the conceptual mathematical model. Coupling the CFD and mass transport	Develop a HSE operation manual for the POPs stockpile management, handling, transport and disposal Re-pack POPs pesticides and highly contaminated waste at regional warehouses. Upgrade a central warehouse for safe interim storage of POPs pesticides and associated waste. Transport POPs pesticides and associated wastes to central storage.

	from all 30 provinces	sampling procedures for pesticide distributors to check for POPs formulations in the pesticides. Introduce a procurement procedure to prevent purchase of POPs or POPs containing pesticides in the country. Conduct awareness campaigns among farmers and distributors about the dangers of using POPs/unlicensed/counterfeit pesticides.	and bioaccumulation models to a fate prediction and decision making tool. Train decision makers and emergency response experts to utilize the models. Introducing the models to a wider extent in the region	Assess suitability of in-country disposal options and feasibility of establishing such capability for POPs together with other waste streams. Dispose POPs pesticides (through export if suitability and feasibility for in-country operations proves negative)

Expected Results	Documenting and labelling identified POPs Pesticides by type, amount, and form of container Country-wide POPs /obsolete pesticide GIS map and associated risk intensity map.	Increased capacity to control POPs entry at borders. Decreased availability and use of smuggled POPs pesticides. Increased awareness among farmers, distributors and the general public.	A tool to predict the fate and transport of contaminants in the Caspian Sea and the Persian Gulf, with specificity to POPs contaminants in order to predict exposure, risk levels, plan monitoring and design emergency response. Trained fate, environmental transport, exposure and risk evaluation experts to provide services and warnings nationally and regionally Developed the needed tool for the design of Pump and Treat Plans for containment, cleaning up and remediation of contaminated groundwater and soil where there is potential of seepage of POPs contaminated water from polluted groundwater to the larger water bodies of the Caspian Sea and the Persian Gulf Utilization of the models in the region in a wider geographical zone and a wider scope of applications with decreased POPs Pesticide contamination (and other potentially harmful contaminants)/ spread/ accumulation/ risk and exposure.	A HSE Operation Manual is developed for the safe and minimized risk shipping, handling, storage and safe keeping of the Pops pesticides Exposure to POPs pesticides and Releases of POPs pesticides from Stockpiles minimized POPs pesticides and associated waste repacked and transported to a safe temporary storage. Disposal options assessed. All identified POPs Pesticides and associated waste disposed safely.

			Having developed a valuable environmental protection tool which can be utilized and distributed by international organizations such as GEF, FAO, UNDP, UNEP, and WHO	
Responsible Institution	Ministry of Jihad-e Agriculture Department of Environment, Ministry of Health and Medical Education, DoE	Ministry of Jihad-e Agriculture, Ministry of Finance (Customs House)	Department of the Environment. Academia Ports and Navigation Organization of the Ministry of Roads and Transportation	Ministry of Jihad-e Agriculture, Department of Environment, Ministry of Health and Medical Education.
Time Period	Short-term 1-2 years	Short-term 1-3 years initial phase, continuous activity	Short-term 1-3 years for model development Medium term for roll-out, distribution, education and regional application	Short-term 1-3 years Medium term if in-country disposal capacity established.
Estimated Budget	100,000 USD	160,000 USD for the first three years 10,000 USD every additional year	290,000 USD for CFD model development, data collection, incorporation of data into the model and model verification.	45,000 USD HSE Operation Manual Development, 400,000 USD for repacking and transfer,

	Total: 100,000 USD	Total: 160,000 USD + 10,000 USD/Year	175,000 training, regional outreach. Total: 465,000 USD	800,000 USD upgrading of Central Storage, 100,000 USD Assessment, 300,000 USD Disposal Total: 1,645,000 USD
Source of Financing	Government, Foreign Assistance	Government, private pesticide importers and distributors	Government, Foreign Assistance: Caspian Environmental Programme (CEP) & EU, ROPME, GEF	Government, Foreign Assistance

3.3.4. Action Plan for Production, Import and Export, Use, Storage and Disposal of PCBs and Equipment Containing PCBs

During the assessment of the PCB situation in Iran, a considerable lack of proper management of PCBs containing oils, equipment and associated operations has been observed. Due to serious problems covering the whole country, an appropriate managerial action plan must be taken (Table 18).

The issues needing immediate attention includes:

1. Lack of appropriate legal coverage for PCBs, including technical guidance for specific stages in PCB management
2. Unawareness about PCBs and their risks, leading to exposure during maintenance, storage and disposal (possible re-use and recycling)
3. Lack of company-wise requirement for PCB management including identification, safety issues (maintenance, storage, etc.) as well as absence of an emergency response plan
4. Unawareness and non-inclusion of PCB issues in the industrial control by government environmental and safety inspectors
5. Non-availability of safe PCB disposal methods
6. Uncertainties in PCB inventory, both when it comes to industrial size transformers and capacitors as well as open applications (like hydraulic fluids, etc.)
7. Routines to sample and analyze PCBs at provincial level

As many of the PCB containing or contaminated equipment are in possession and owned by private industries, the action taken for properly managing PCBs in Iran will be to a high extent a cooperative action between private and public sector institutions. This cooperation will commence with a thorough identification, labeling and registration exercise in order to keep track of all PCBs in Iran.

It is envisaged that the public sector, mainly the key ministries will develop the regulatory instruments and technical guidelines for safe PCB management, whose implementation will be mainly the responsibility of the entities in possession of the PCB containing and contaminated equipment. In order to support this, authorities will support training programs aimed at reducing PCB releases at handling and de-commissioning stages.

The PCB owners are expected to start phasing out PCB containing equipment gradually, and there is hence a need to establish appropriate temporary storage places where out-of use equipments as well as drained oils can be safely stored before final disposal.

Final disposal alternatives for identified PCBs still need to be assessed in detail, and against the background of uncertainties in the inventory data. While several options, including export, may be feasible for pure PCB oils, capacitors and absorptive waste streams, the amount of estimated contaminated oils and metallic waste indicates that in-country solutions are probably economically viable.

Table 18: Action Plan for Production, Import and Export, Use, Storage and Disposal of PCBs and Equipment Containing PCBs

Objectives	**1. PCB management plan and technical guidelines**	**2. Identification of further PCBs and development of analysis capacity**	**3. Sound Management of PCBs and PCB-contaminated equipments**	**4. PCB disposal and capacity for in-country disposal**
Activities	Clarification of the objectives for the management of PCBs in the country Establishment of a PCB committee supported by the POPS Office Development of a more detailed PCB management Plan, requiring planning and action of all PCB stakeholders Strengthening of legislation, PCB regulations covering all stages in the life-cycle, including prohibition of the import, export and production as well as labeling, handling, transportation, storage and disposal. (Adopted under Regulatory Strengthening Action Plan).	Set deadlines for PCB holder reporting on PCBs in their possession Set-up a PCB help line in the POPs Office Organize workshops for facilitating the PCB identification Develop a web based data reporting tool for PCB holders Labeling of equipment containing PCBs Investigate existence of additional PCB waste streams in Iran Equip or upgrade existing regional environmental laboratories for PCB oil analysis Train all laboratory personnel in sample preparation and PCB analysis	Training and capacity building activities in PCB handling, storing and transportation of the equipment and waste. Train all personnel working with PCBs containing equipment in TAVANIR (Ministry of Power & Energy) in the handling, use, storing of the equipment and waste Development of PCB management plans at PCB holder level, including maintenance, and temporary storage as well as contingency planning Elaborate an appropriate nation-wide system for PCB storage including cost distribution Construct adequate interim facilities for safe storage of PCB wastes Re-pack and move existing stored PCB waste oils and material into	Development of adequate and proper guidelines for shipment of PCB wastes for disposal including procedures for permits/licenses to be able to export PCB wastes (Basel Convention) Feasibility studies for setting up in country disposal capacity for different PCB waste streams, including pure oils, highly contaminated materials, de-contaminating lightly PCB contaminated oils and disassembling/ cleaning of associated equipment Setting-up appropriate technology for disposal and destruction of PCB wastes as per feasibility study

	Information dissemination to raise awareness of PCB risks and the new technical requirements	Train Customs Officers in identification of PCB equipment and organize testing possibilities at imports	storage facilities Drain and shift PCB oils and equipment to temporary storages as being phased out from service	
Expected Results	Roles and responsibilities for different stages in PCB management clarified and documented Clear technical requirements for all stages of the PCB life-cycle developed. All workers dealing with PCB containing equipments will be more knowledgeable	All PCB contaminated transformers and capacitors identified All PCB equipment and waste labeled Additional PCB streams identified Reliable PCB estimates established and data properly stored Regional PCB analysis capacity ensured Customs officers trained to identify PCB oils/equipment	Less risk of exposure to PCBs for workers Less risk of PCB release and contamination Existing PCBs and associated equipment properly managed Existing stockpiles and waste equipments adequately stored	Existing pure or highly concentrated PCB oils disposed through exportation Capacity to dispose oils with various PCB concentrations and associated equipment established in I. R. of Iran All PCB wastes soundly disposed
Responsible Institution	Department of the Environment Ministry of Power & Energy Ministries of Industries & Mines, Health, and Defense	Department of the Environment (DoE) PCB Committee (POPs Office) Ministry of Power & Energy Ministries of Industries & Mines, Health, and Defense	Ministry of Power & Energy Department of the Environment (DoE) Ministries of Industries & Mines, Health, and Defense PCB Committee (POPs Office)	Ministry of Power & Energy Department of the Environment (DoE) PCB Committee (POPs Office)

Time Period	Short-term 2 years	Short-term 3 years	Short-term 3 years	Short term feasibility study and first export disposal. Medium- term for in-country disposal
Estimated Budget	USD 500,000	USD 1,600,000	USD 3,200,000 + cost of equipment replacement	USD 10,000,000 cost of pure PCB disposal + USD 10,000,000 disposal of contaminated oils and equipment
Source of Financing	Government	Government, Private Industries, International assistance	Government, Private Industries, International assistance	Government, Private Industries, International assistance

3.3.5. Registration for Specific Exemptions.

The assessment of the use of POPs pesticides and current industrial production processes did not reveal the need for I.R. of Iran to register any specific exemptions as laid down in Article 4, and specified in Annexes A and B of the Stockholm Convention.

3.3.6. Action Plan for Reduction of Releases from Unintentional POPs Releases

The estimated releases of unintentional POPs in Iran are 1.568 Kg TEQ/year. Despite the uncertainty of this estimate due to lack of specific data, the releases are very significant, compared internationally.

The process of compiling the unintentional POPs inventories highlighted the need for systematizing the data for appropriately estimating releases as well as building the capacity to sample and analyze unintentional POPs emissions. Further, many of the current waste management practices were identified to raise unintentional POPs emission. Also many technologies used in Iranian industries are high dioxin emitting and require improvements for minimizing emissions.

The following unintentional POPs issues and recommendations for addressing them were identified in the unintentional POPs assessment phase.

1. Generally, improved data collection especially in uncontrolled burning of municipal and industrial solid wastes, agricultural lands, fossil fuels used in vehicles, incineration of industrial and hospital wastes and household heating will be needed for future studies.
2. Enacting, enforcement and implementation of proper legislation for reduction of dioxin from uncontrolled burning of solid wastes and field burning of agricultural land. At present burning residues of agricultural fields is a routine practice of combating agricultural pests and its magnitude might not have been exactly projected by governmental statistics.
3. The inventory clearly demonstrates the need for improvement of the current solid waste disposal practice and abatement strategies for industrial sources in Iran. Municipal solid waste disposal and industrial activities produce 53% and 47 % of dioxin-like compounds in Iran.
4. Best Available Technologies and Best Environmental Practices measures should be introduced to industrial sectors such as Textile, Cement production, Aluminum production, and Iron and Steel plants.
5. Lack of data collection of dioxin–like compounds release from source categories dealing with incineration of hazardous waste, medical waste, domestic heating by fossil fuels, landfill leachate, open water dumping and waste oil disposal.

Addressing the unintentional POPs issues requires joint efforts from governmental and industrial partners as well as municipalities particularly when it comes to waste management practices. Changing waste management practices will require considerable financial resource input. Due to

this, the reduction of unintentional POPs emissions from uncontrolled waste burning should be seen in a wider waste management context (Table 19).

Table 19: Action Plan for Reduction of Releases from Unintentional POPs Releases

Objectives	1. Increased accuracy of future U-POPs inventories and awareness raising	2. Preventing uncontrolled combustion of municipal, agricultural & industrial solid waste	3. Assessment of environ-mental and health impacts.	4. Controlling U-POPs release from industrial processes
Activities	Establish a U-POPs staff position at POPs office Determine reporting requirements and responsible entities for future U-POPs inventories Introduce and agree with future reporting system with line ministries and companies Compile appropriate awareness material for sector and industrial partners Conduct a number of provincial and industry sector-wise workshops for ensuring data reporting and raising awareness	Update legislation and enforcing laws prohibiting burning municipal solid wastes Enactment and enforcement of laws prohibiting field burning Adoption of legislation and enforcing laws for proper land filling of municipal & industrial wastes Introduction of re-use and re-cycling of wastes, particular of industrial waste Awareness raising among general public on the harmful effects of waste burning	Enable Iranian DoE in sampling and analyzing of U-POPs from industries and environment Conduct detailed environmental and human health assessment due to presence of U-POPs in hot spots pinpointed in the inventory Investigate correlation between chronic diseases (i.e. cancers) and U-POPs exposure at selected sites	Make a detailed investigation in technologies and key process parameters in high U-POPs emitting industrial sectors (chemical industries, production of mineral products, and ferrous and non-ferrous metal production) Make site specific U-POPs minimizing and cleaner production production/modification plans as per BAT and BEP Carry-out plans by implementing improved in-house practice and management actions, technology change and update as appropriate

Expected results	More accurate inventories and efficient compilation of U-POPs data available Data for refinement of U-POPs action available Increased cooperation between industrial partners and authorities on unintentional POPs emissions Increased awareness of unintentional POPs issues	Appropriate laws and control structures for preventing uncontrolled burning of wastes Re-cycling and re-use schemes for preventing burning of industrial waste introduced Awareness of harmful effects from waste burning increased	U-POPs technical and enforcement capacity increased Transparency of present U-POPs situation and establishment of needs for site specific risk management measures	Considerable reduction of U-POPs release from targeted industrial sectors Increased worker and population protection from contaminant releases Effective cleaner production and U-POPs minimizations systems introduced (BAT/BEP) Decrease of industrial emissions and human/ environmental exposure beyond POPs Savings in Industrial unit production costs (raw material, labor, energy)
Responsible Institution	DoE, Ministries of Industry, Interior, Agriculture, Petroleum and Energy	DoE, Ministries of Interior, Agriculture, Industry Municipalities, regional administrations	DoE, Ministry of Health and Medical Education	Ministry of Industry, Industrial enterprises, Ministry of Science & technology
Time Period	Short-term 1-2 years	Short and medium term2-5 years	Short-medium term2-5 years	Medium to long term, 5-12 years
Estimated Budget	USD300,000	USD2,000,000	USD1,000,000	USD100,000,000
Source of Financing	Government, International Assistance	Government (central, provincial), Municipalities, International Assistance	Government, International Assistance	Industries, Government and International Assistance

3.3.7 Action Plan for Identification of Contaminated Sites and Remediation

Site contamination by POPs was studied in a general way as part of the POPs pesticide stockpile investigation at Jihad-e-Agriculture provincial warehouses. The investigation which was done without sample taking or in-depth site characterisation estimated the pesticide contaminated soils to 3,000,000 Kg. This figure was arrived at through visual assessment can vary considerably depending on the spread of the contaminants. It can be assumed that some of this contamination is from POPs pesticides though the extent is difficult to determine without further site characterization and sampling. Overall the issue warrants further research according to priorities set by the first investigation as well as implementing low cost risk reduction measures such as access control, fencing etc. appropriate hazard communication in form of signs, notices etc.

In addition to provincial pesticide sites, former pesticide manufacturing and formulation plants may be POPs contaminated. Therefore, the site investigation should be extended to such sites. Also the DDT storage areas at medical universities can potentially be contaminated and needing remediation. An assessment of this need can be done during re-packing and transfer of these stockpiles

Due to absence of legislation, PCB site contamination has not been studied in Iran. Taking into consideration those considerable amounts of PCB equipment has been identified in the country a restricted site investigation into transformer service areas and warehouses is warranted. Also there may exist sites were PCB equipment or oils have been improperly dismantled or disposed, that may be highly contaminated.

Investigation into individual PCB transformers should be considered if a leakage has occurred particularly if the transformer has been located in residential areas or other high risk areas such as food (feed) production facilities.

For unintentional POPs there is no clear evidence of highly contaminated sites. With emerging knowledge of point source releases or articles contaminated unintentional POPs, investigations to such site contamination may be considered. With the lack of in-country analysis capacity it may be worthwhile to restrict such investigations only to sites with particularly strong indications of unintentional POPs contamination.

It is, without a systematic site characterization and risk assessment, too early to speculate about potential remediation strategies or techniques for any POPs contaminated site that may be needing remediation. Considering the novelty of the POPs issues in the country it may be prudent to restrict action in the short-term to increasing the capacity within government and private sector institution for making detailed site assessments and application of remediation techniques. This would ensure a timely and appropriate response when POPs contaminated sites are identified (Table 20).

Table 20: Action Plan for Identification of POPs Contaminated Sites and Remediation

Objective	**1. Capacity building for avoiding POPs releases from potentially contaminated sites**	**2. Minimization of POPs pesticides exposure from site contamination in vicinity of former POPs pesticide storage and handling facilities**	**3. Action on risk reduction of site contamination from PCB equipment**	**4. Action on risk reduction from potentially dioxin contaminated sites**
Activities	Training on site characterization, sampling planning and sampling techniques Training in site data analysis, risk assessment and prioritization of remediation methods Training in suitable site remediation techniques for POPs including low cost risk reduction measure	Prioritize former pesticide storages and pesticide plants for in-depth site investigation Carry-out site investigation, sampling, analyzing and risk assessment for priority sites Adopted low-cost risk reduction measures at severely contaminated POPs pesticide sites Plan and implement site remediation at selected high risk sites	Map transformer main-tenance sites, sites for transformers dismantling and PCB equipment in high risk areas Investigate occurrence of major leaks of PCBs from individual transformers or ware -houses. Prioritize sites and conduct site sampling, analysis and risk assessment for the sites Plan and implement site remediation at selected high risk sites	Map potential highly dioxin contaminated sites Conduct trainings in sample taking and preparation for dioxin analysis Analyze collected samples Plan and implement site remediation at selected high risk sites

expected Results	Departmental officials and private sector enterprises able to conduct site characterization, prioritization and remediation planning	All former pesticide sites investigated for contamination Sites ranked according to their risks to the environment and human health Low-cost risk reduction measures implemented at priority sites Site remediation conducted at high risk sites	High-risk PCB sites mapped Sites ranked according to their risks to the environ-ment and human health Site remediation conducted at prioritized sites	Potentially dioxin contaminated sites identified Capacity for sampling and sample preparation for dioxin analysis raised Dioxin contamination confirmed and remediation/risk reduction undertaken
Responsible Institution	Department of the Environment	Ministry of Jihad-e- Agriculture (MoJA) Department of the Environment Provincial Environmental departments	Ministry of Energy, DoE, Private and public industries	
Time Period	Short-term: 1-2 years	Short-term: Investigations and low-cost risk reduction measures Medium term: decide priority sites and undertake site remediation	Short-term: Mapping and investigations Medium term: decide priority sites and undertake site remediation	Medium term: Mapping of situation and training Long-term: Analysis and needed remediation

Estimated Budget	USD100,000	USD1,000,000 + remediation costs	USD500,000 + remediation costs	USD500,000 (including analysis, but not analytical equipments)
Source of Financing	Government, GEF, international assistance	Government, MoJA, DOE GEF International assistance	Government, Ministry of Energy, DoE GEF International assistance	Government, Ministry of Industries, DoE GEF International assistance

3.3.8 Strategy and Action Plan for Information Exchange

Each party is required to facilitate or undertake the exchange of information relevant to the reduction or elimination of the production, use and release of POPs, including information relating to their alternatives, risks and economic and social costs. Information may be exchanged directly between the parties or through the Secretariat. Each party is required to designate a national focal point for information exchange. Article 9 specifies that confidential information must be protected, but lays down that information on health and safety of humans and the environment is not regarded as confidential.

In accordance with decision SC-2/16 of COP. 2, the National Authority for Chemicals Conventions is Iran's official contact point for the POPs Secretariat, and will also function as the national focal point for information exchange with other parties. The POPs Office will collect; sort and process the information referred to in article 9 and will forward them to the Inter-Ministerial Commission on Chemical Safety (IMCCS) located in Foreign Ministry. The IMCCS reviews the information and, if endorsed, exchanges them with the Secretariat and/or other parties through the National Authority for Chemicals Conventions. The POPs Office will also establish a website to give publicity to POPs knowledge and release relevant national information on Convention implementation.

3.3.9 Action Plan for Public Awareness, Information and Education

In article 10 of Stockholm Convention, public access to POPs information and overall awareness rising on POPs, make a critical role in project implementation. In this article promotion and facilitating awareness of POPs among policy and decision makers, industry and professional users, and general public especially women, children, and least educated people and also encouraging public participation in addressing POPs effects on health and environment is emphasized.

There are a number of well functioning means of creating public awareness and tools for disseminating POPs information.

Ministry of Health and Medical Education leads a commission with participation of several ministries and offices tasked with public health information dissemination. The central TV/Radio station has a health commission producing programs on identity and exposure to pollutants, the health effects and ways to eliminate them. In addition, all newspapers have health pages and most ministries have health offices. Also many NGOs have functioning channels for information dissemination and collection. At the local level, religious leaders can be encouraged to educate and inform the communities on POPs environmental and health topics. Besides them, there are many active NGOs who could be involved in POPs projects. With this entire situation, the public and stakeholder's awareness about POPs is not good enough. It may be due to a lack of a national plan that could organize all activities according to a time table and based on awareness priorities which is a lacuna in this area (Table 22).
POPs and hazardous chemicals/waste issues have not been included in the education program at any level. It is important to include such topics at all levels for ensuring that the awareness of the risks is integrated into the overall understanding of the society.
The Public awareness plan will include development and initiation of POPs information dissemination system for the public and government stakeholders, with an emphasis of targeting key groups as identified under the baseline section, namely:

- Government officials both at policy making and enforcement levels
- Farmers are exposed directly to POPs pesticides and dioxin
- People living or working in contaminated area where POPs pesticides or its chemical wastes have been dumped or stored
- Worker directly handling or maintaining power transformers or capacitors that are or may be PCB containing
- Workers and management in high dioxin emitting industrial manufacture (cement, aluminum, zinc, copper factories and so on) and habitants around these areas
- Workers who handle and transport POPs pesticides or PCBs
- Children and pregnant women
- General Public

Table 21: Action plan for Information Exchange and Stakeholder Involvement

Objective	**1. Ensure appropriate, full and timely information exchange between government Ministries.**	**2. Convention information and POPs international development disseminated**
Activities	Establishment of information exchange mechanism to facilitate cooperation among stakeholders and others in related regional/national/international centers Organize POPs data gathering and compilation from regional offices of respective ministry. Enable POPs office to compile sector wise data on POPs levels and action. Setting up of a network among focal point, stakeholders and key institutions Establishment of POPs data and NIP activity dissemination in a periodic newsletter produced by the POPs office.	Encourage and support stakeholders by easy access to latest national and international agreements, data and information. (POPs office, website) Organize round table workshops before and after key Convention meetings, such as COPs. Contract research institutions to gather information and suggest policy advice on upcoming convention issues, such as impact on adding new chemicals
Expected results	Increased awareness and high level of knowledge across all decision makers and various stakeholders on POPs POPs data gathering within ministries organized. POPs data and NIP progress data among ministries organized POPs and NIP information exchange between Ministries established.	Key ministries informed of emerging international POPs issues. Increased ownership of Convention matters within whole government. Clear understanding of Convention decisions on different sectors in Iran National POPs policy and implementation well coordinated.
Responsible institutes	DoE, Ministry of Jihad-e-agriculture, Ministry of health, Ministry of Commerce, Ministry of Interior, Ministry of Energy	Ministry of Foreign Affairs, Department of the Environment
Time period	0-3 years	1 year setting up,
Estimated budget	USD200,000	USD50,000 annually
Sources of financing	DoE, Legal authorities, Ministry of Jihad-e-agricultural, Ministry of health, Ministry of Commerce, Ministry of Energy, GEF, International assistance	Government

Table 22: Action Plan for Public Awareness, Information and Education

Objective	1. Properly organized POPs information and outreach	2. Create and implement educational program on POPs	3. Increase NGO capacities for creating POPs public awareness and information dissemination	4. Raised POPS awareness among priority groups
Activities	Establishment of an awareness and information expert position central POPs office Identify main stakeholders and experts and institutions working on chemical awareness Organize all involved institutions and specialized according to areas of interest and expertise Formulate a detailed POPs public awareness action plan Enact regulation enabling public participation in POPs decision making Implement the POPs public awareness plan	Revise current environmental curricula at all educational levels. Train representatives of Ministry of Education and Science and teachers in the new topics included. Encourage and provide facilities for students to hold seminars/ research in relevant to pollutants in general and POPs in particular Cooperate with media/ newspapers to prepare POPs educational programs for children and include it in their daily educational activities	Identify and organize religious, environment, scientific and public NGOs Categorize their abilities and activities Develop dissemination information material relevant to various organizations working with POPs information dissemination Train and prepare community and NGO leaders in POPs Devise a system for keeping organizations updated on information and aware of new emerging issues	Measure actual knowledge level among target groups Develop POPs information material for priority groups, pregnant women, farming community, PCB equipment handler, highly dioxin emitting industries and communities Develop suitable information materials Prepare and implement information campaigns to target as per public awareness plan Measure the post campaign awareness level and revise message and approach as appropriate
Expected results	Properly organized POPs outreach activities	Updated environmental curricula at all educational levels	Non-governmental entities organized POPs awareness raising	POPs information material for special targeted groups developed and disseminated.

	Detailed POPs outreach plan including roles, responsibilities and resources Appropriate regulatory system for public participation in POPs decision making	Increased capacity to educate on POPs issues among teaching and supervisory staff POPs issues integrated in the educational system	Non-governmental partners prepared to fulfill their role in the POPs outreach plan NGO POPs information activities implemented Regular update of POPs knowledge among NGOs achieved	Groups particularly at risk of POPs exposure educated and aware of the risks and ways of preventing POPs exposure. Effectiveness of outreach approach measured
Responsible institutions	DOE (POPs office Governmental Commission on Chemical Safety	High Commission of Cultural Revolution, Ministry of Education and Science	DOE (POPs office) Basij, other NGOs Religious institutions	DOE (POPs office), Ministry of Health, Ministry of labor, National Broadcasting Company
Time period	Short-term 1-2 years, ongoing	Short to medium term 1-5 years	2 years	Short to medium term
Estimated budget	USD550.000	USD300.000	USD400.000	USD800.000
Sources of financing	Government, foreign assistance	Government Foreign assistance	Government, Foreign assistance, NGOs	Government, trade unions, chambers of commerce

3.3.10 Action Plan on Research, Development, and Monitoring of POPs Chemicals

As discussed in section 2.3.5 no systematic POPs monitoring is organized for any contaminants in any environmental of food media in Iran. Establishing such monitoring is essential for many reasons. POPs monitoring will show:

1. Whether overall POPs exposure to humans or ecosystems exceeds safe levels
2. Whether the quality limits of different media (Human tissues including milk and blood; air; soil; drinking water, food items, etc.) exceeds safe limits
3. Whether action to reduce POPs releases or exposure has been successful, or whether additional measures are needed
4. Effectiveness of Government action, i.e. effectiveness of POPs NIP

Taken that the monitoring responsibilities are divided between different ministries and entities depending on the matrices (human tissues, soil, air, food, water, feed, agricultural produce etc). The division of responsibilities also raises the possibilities of duplication of effort and sub-optimal use of funds.
Because of the various existing responsibilities, a full-fledged POPs monitoring will include cooperation between several of governmental entities. Here the POPs office and Department of the Environment more widely can provide a valuable input in gathering details of all existing monitoring programs as the basis for the development of the over-arching POPs monitoring in Iran (Table 23).

The following recommendations done at baseline assessment stage will provide the backbone for developing an appropriate POPs monitoring:

1. Establish a committee to set up a POPs monitoring program, involving all relevant Ministerial organizations, Institutions and Universities in the decision making committee
2. Make a detailed evaluation of the existing sampling programmes and POPs findings available at different organizations and ministries
3. Scope the POPs monitoring needs by determining exact kind of matrices to be monitored such as (human tissues such as milk and blood, meat, fish, dairy products, nuts, fruits, vegetables, crops, water, air, soil,…etc), priority parameters, sampling frequency and regions
4. Make a detailed evaluation of the POPs analysis capacity at various central and provincial laboratories
5. Establish a structured management system outline each member responsibility, including centralized storage and processing making all the data available to every involved organization
6. Compile a POPs monitoring plan for Iran indicating existing capacities and a plan for enhancing capacity as needed

Table 23: Action Plan on Research, Development, and Monitoring of POPs Chemicals*

Objectives	**1. Ensuring adequate monitoring data for POPs risk assessment and decision making**	**2. Ensuring Laboratory capacity for monitoring POPs pesticides and PCBs**	**3. Establishment of dioxin sampling and analysis capacity**	**4. POPs research**
Activities	Establish a POPs monitoring committee, lead by the POPs Office Make a detailed evaluation of existing sampling programs and POPs findings available at different organizations and ministries Scope the POPs monitoring needs by determining matrices to be monitored such as (human tissues such as milk and blood, meat, fish, dairy products, nuts, fruits, vegetables, crops, water, air, soil…etc), priority parameters, sampling frequency and regions Establish a structured management system outline each member responsibility, including centralized storage and processing making all the data available to every involved organization Compile a POPs monitoring plan for Iran indicating existing capacities and a plan for enhancing	Make a detailed evaluation of the POPs analysis capacity at various central and provincial laboratories. Review of standard analysis protocols and agree the exact methodologies for POPs analysis in the monitoring system. Supply selected laboratories with possible additional hardware and ensure availability and resources for quality consumables. Arrange capacity building efforts (training) for on selected sampling and analysis methods. Ensure ongoing capacity building and quality assurance and control, by periodic training and control visits to POPs analyzing laboratories	Determine needs and main matrices to be analyzed for dioxins. Select institutions respon-sible for dioxin analysis. Construct suitable laboratory premises and equipments Obtain training and appro-priate know-how transfer for ensuring reliable analysis. Capacity building in sample taking (food, environment, human and industrial) and extraction methods for analysis preparation. Participate in international calibration and round robin quality control	Set-up/re-direct research funds to POPs Establish centers of research excellence for POPs, either per contaminant or by route of release/expos-ure Undertake research projects in determining baseline concentration of substances proposed to be included in the Stockholm Convention Propose monitoring and further research into POPs candidates

	capacity as needed			
Expected Results	Full review of existing POPs analysis and monitoring efforts A clear division of responsibilities on POPs monitoring established POPs monitoring data reporting and compilation agreed Final POPs monitoring plan for Iran agreed	POPs monitoring responsibilities per matrices, frequency and specific lab decided Common POPs analysis methods agreed Capacity to perform analysis by all contributing laboratories ensured and controlled	Dioxin measurement needs determined Dioxin analyzing organization designated Laboratory established and equipment procured Laboratory personnel trained to prepare samples and conduct reliable dioxin analysis	POPs investigation and analysis knowledge centers established Understanding of emerging POPs issues gained Baseline for future Convention discussions and substance additions established
Responsible Institution	DoE, line Ministries, Ministry of Health, research and academic institutions	DoE, line Ministries, research and academic institutions	Ministry of Health, industries, DoE Entity to host Dioxin lab	DoE Selected research centers Ministry of Foreign Affairs
Time Period	Short-term 1-3 years	2-5 years short to medium term. ongoing	Medium-term 4-7 years (establishment) Ongoing	Short-term 1-3 years Ongoing
Estimated Budget	USD 400,000	USD 1,000,000	USD 1,000,000 plus annual staff and consumable cost (DoE not include civil works for laboratory	USD 500,000
Source of Financing	Government	Government	Government	Government, regional research efforts

*** It should be note that project number 3 proposed in table 17 has a very strong R&D component and can also be considered in this category.**

3.4. Development and Capacity Building Proposals and Priorities

The NIP Action Plans are developed on the basis of the initial POPs inventories and the Priority Setting exercise conducted. The POPs Priority Setting workshop considered that the main problems and first priorities to address in Iran to be POPs pesticide contamination and unintentional POPs emissions, particularly from unintentional burning of waste. There was no clear number two priority class. Both POPs pesticide waste and management of PCB transformers in use scored very close to each other as number 2 priorities. Reflecting these priorities, any first capacity building proposals should try to target these first priorities.

Another dimension to consider when deciding on further capacity building proposals and priorities is the integration/merging of solutions technical preparedness to take action. In this regard, the national approach to disposal of POPs chemicals is one of the main points

Should there be separate initiatives, technologies and schemes, for POPs pesticides and PCBs, and how would these schemes interrelate with the overall obsolete pesticide and hazardous waste management needs in I. R. OF IRAN? Should one hazardous waste management and disposal center be established or should different hazardous waste streams be treated by various waste holding sectors at different locations. POPs disposal should be considered in the national hazardous waste management context rather than as a series of isolated efforts.

Further it should be clear to all stakeholders that management of outdated chemical products, independent of its original area of use, is a hazardous waste product to be primarily covered by hazardous waste regulations and authorities mandated to manage hazardous waste.

Capacity Building Proposals

POPs Pesticide Contamination

POPs pesticides concerns are mainly related to the possible spread of POPs pesticides from the unmanaged stockpiles to the surrounding environment and further to the food sources. The amounts of POPs pesticides found in Iran are quite low, but the perception among the decision makers is that this can be of great problem. It seems that the uncertainty of the extent of POPs in the environment and in particular food is the main concern.

The individual activities in this priority area are outlined in the relevant action plan. In short this would entail a completion of the stockpile investigation, re-packing, storage and ultimate disposal of the found pesticides as well as remediate/restrict access to the polluted sites. As there are limited experiences of such operations in Iran, proper know-how transfer will be required, overall this part is quite straight forward apart from the disposal, due to the absence of safe technologies in Iran to undertake disposal.

The additional aspects which should be taken into consideration and giving a great importance is determining the POPs pesticide contents in food items/agricultural produce in the vicinity and communities by the warehouses. This requires cooperation with the central laboratories and a phased development of capacity in the regional environmental and food laboratories in the regions to tackle contamination of food by organic contaminants. In order to address the concerns of POPs pesticide contamination, it is of utmost importance to compile analysis findings in a clear and systematic way as well as disseminate this information widely among residents and decision makers.

Unintentional POPs Emissions from Waste Burning

Waste burning or uncontrolled combustion of waste products is common in many parts of Iran. This activity includes both industrial and municipal waste burning as well as burning of agricultural waste.

The reasons for waste burning practices are many ranging from traditions (agriculture) to ignorance and unavailability of alternative practices (absence of collection and disposal of municipal waste). With such a multitude of reasons the approach for reducing these activities needs to include a number of approaches. It should further be remembered that with abundant energy reserves, Iranian municipalities and industrial companies are putting less importance in trying to generate energy from waste. Consequently waste operations are done merely for hygienic reasons and way of compacting/destroying waste products.

Maybe the biggest issue with municipal waste is the absence of both proper landfills and reliable collection systems and schemes particularly in the provinces. Organizing such schemes is a major undertaking both when it comes to investment and organization. Here it should be noted that benefits from organizing proper waste collection and disposal goes well beyond direct POPs issues, so reduction of unintentional POPs should be merely seen as an added value in organizing proper waste management.

Beside the infrastructural needs, the operational costs of waste management are considerable, so the waste generators, consumers and businesses, will need to understand that they will have to pay for the service. This will in addition of making waste schemes sustainable contribute towards reducing of the overall waste.

Taking the complexity of the reasons, various current and possible sustainable practices as well as the number of stakeholders involved in reducing unintentional POPs emission from waste burning, it may be advisable that a particular region would become a showcase area for dioxin minimization efforts in I. R. OF IRAN. Based on experiences from the showcase region a national program could be developed and later implemented/replicated through-out the country.

The project should cover all different uncontrolled combustion sources and be implemented in a province where there are already identified need and reserved financial resources for ameliorating the waste management system. The unintentional POPs concerns would in such a

program/project become an additional dimension in proper waste management rather than portraying POPs problems as the main reason for managing waste.

PCB Management

The issue of PCBs is recognized as a priority issue even if not considered as a prime interest to many stakeholders. This can be explained by the novelty of the problem as well as the restricted ownership of the PCB-contaminated oils identified so far.

The data presented in the inventory section provides for the first systematic estimate of the extent of the PCB problem in Iran. The data is not entirely reliable therefore a second round of investigations into PCB equipment needs to be undertaken. In order to make such estimation more reliable the regulatory acts for making it compulsory to report PCB containing equipment to authorities needs to be in force. This will also require further capacity building at laboratories to undertake PCB quantification in oils and particularly being ready to provide such services to private sector clients.

Further steps should include communication on hazards and the reduction of PCB exposure to handlers. This would be obtained through the labeling of equipment and the development of safety procedures at maintenance and contingency procedures, e.g. for fire risks. The risks would be reduced considerably if the above measures were coupled with the training of the maintenance staff and the procurement of appropriate personal protection equipment in addition to the monitoring of their use. All these actions require an increase in knowledge and capacity within the organizations and individuals.

The main challenge, however, will be to ensure a safe phase-out of the PCB containing or contaminated equipment. The NIP development process did not identify any suitable PCB disposal operations in Iran. On the other hand already some PCB transformers are being stored after phase-out waiting to be disposed. It seems not likely that appropriate disposal technologies, such as high-temperature hazardous waste incinerators, would be available in the short to medium term in Iran. Therefore a dismantling operation for pure or high concentration PCB oils containing needs to be established with cleaning/recycling of metal casings and cores as well as export disposal of the PCB oil and organic waste fractions. Also for PCB capacitors the export seems to be the only disposal option in a near future. First step for PCB capacitors management is a proper identification, with subsequent collection and proper storage.

Disposal/decontamination of slightly PCB contaminated transformer oils could be established in Iran quite rapidly if decisions and resources can be secured. A number of commercial technologies and vendors exist in the international market.

Process of Development of the NIP Implementing Projects

As seen from both the POPs action plans and the above paragraphs, taking effective action on POPs requires cooperation and consideration beyond the immediate issues at hand. Therefore,

there is a clear risk that POPs projects are being designed and implemented in a sub-optimal manner if co-operation between key actors are not fostered.

It is therefore important to establishing structures for this cooperation as well as a process where NIP Implementing projects are discussed from the stage of initiation until final approval. The planned POPs office within the Department of the Environment would be an ideal actor for ensuring that this coordination would happen. The POPs office could create a subcommittee on project formulation, where ideas inter-linkages between efforts as well as project financing would be discussed.

The POPs office would keep itself abreast of financing opportunities within Iran and internationally. This would entail following government and municipality plans and budget allocations in POPs relevant areas as well as apply ad-hoc financing for POPs projects.

For facilitating the development and finance of POPs initiatives, the POPs office would closely follow the possibilities and upcoming trends in international support for POPs control, both substantive programs by United Nation's specialized agencies and multi-lateral financial institutions as well as GEF, the interim financial instrument of the Stockholm Convention.

The POPs office would further keep contact with relevant industries in order to be informed about their plans for technology change etc. that could have a POPs impact, by reducing POPs releases and to guide industries to both POPs minimizing solutions and to available technical and financial support for such undertakings.

The POPs office personnel would also act as a clearing house to ensure that available capacity for instance on determining POPs concentrations in various matrices would be utilized in projects, already at the planning stage. This may be particularly important as line ministries are not always fully aware of the possibilities particularly at other organizations.

The role of clearing house and information distributions is equally vital for distributing investigation results, technical feasibility results etc. for keeping all stakeholders up-to-date with initiatives at various ministries and departments.

For ensuring that all possible inter-linkages and avenues of cooperation and optimization of approaches are taken into consideration in developing NIP implementing programs and projects, a working practice where all such projects are circulated for comments among the members of the POPs project formulation sub-committee before final approval should put in effect.

3.5. Timetable for NIP Implementation and Measures of Success, NIP Reporting and Follow-up

The POPs NIP for the I. R. OF IRANhas been developed with a view of having a plan which success and timeliness can be easily verified. All activities in the various action plans included in the NIP are presented as short, medium or long-term activities. The short term actions cover years 1-3, medium-term 4-7, and long-term action years 7-12 after adoption of the NIP.
The scheme for evaluation of the progress of the NIP has been adapted to this division of the action plans. Consequently an evaluation of the progress of the NIP is envisaged at the end of each phase of the overall NIP. It is envisaged that these evaluations will in addition to report the progress also provide an opportunity to further refine and detail the following phase in each area of activity.
The overall scheme for these evaluations as well as corresponding or coinciding Convention reporting is given in Table 24.

Effectiveness of the NIP

For ensuring that the POPs NIP stays relevant and addressing the key issues in Iran, a scheme for effectiveness evaluation of POPs NIP will be established.
In this regard it should be noted that the Stockholm Convention level is establishing its own schemes and requirements measuring the effectiveness of the overall convention, and I. R. OF IRANcan contribute to this process according to the Convention requirements, such as developing reporting as per Article 15 and possible POPs monitoring results.

The National NIP reporting and follow-up is divided into 3 stages:
1. Reporting on implementation of the NIP
2. Measuring the effectiveness of the NIP
3. Reporting to the Conference of the Parties the individual country efforts and measures to implement the convention provisions as well as obtained results.

1. Reporting on implementation of the NIP
This national reporting is done in order to follow-up and monitor that the action introduced in the NIP has indeed taken place. The reports are closely linked to the short, medium and long-term structure of the specific action plans of the NIP. The national report/review will establish which action is on track and for which the progress is lacking behind. The report should also identify the barriers to a full implementation of the agreed NIP action as well as report on successes and lessons learnt.
The report on implementation of the NIP should also give a picture of the financial contributions and overall budget for the accomplished parts of the NIP. This will enable economic efficiency calculations of the action.
The report of NIP implementation will be divided into topical sections dealing with POPs pesticides, contaminated sites, PCBs, dioxins, etc. in order to gauge sector performance. The report could further be divided according to type of action, like training, disposal, etc. completed and non-completed in order to get an understanding of where the major bottlenecks are.
2. Measuring the effectiveness of the NIP

This part of the national reporting deals with evaluating the NIP actions as to their effectiveness of decreasing levels or risks from POPs chemicals. In other words the effectiveness evaluation should measure whether the NIP is meeting the objectives set.
In contrast with the monitoring of the NIP process, where administrative, technological and financial reporting takes a central place, the effectiveness evaluation looks at the actual outcomes, levels of POPs in the environment and food. The effectiveness evaluation will hence measure the change in environmental levels of POPs and the exposure of POPs to humans after introduction of the measures proposed in the NIP.
The effectiveness evaluation would also cover issues relating to the cost effectiveness of the NIP. This would include an assessment of whether the selected approach and action is decreasing the risks from POPs in an economical way. The assessment would take into consideration the financial reports developed under previous heading.
The report of NIP effectiveness would provide the vehicle for introducing further POPs action or refinement of existing action and approaches if the effectiveness evaluation shows that the objectives for POPs risk reduction are not met. It is foreseen that such a review would take place before moving to medium and long-term time NIP action, respectively.

3. Reporting to the Conference of the Parties the individual country efforts and measures to implement the convention provisions as well as obtained results.
The Stockholm Convention stipulates specific requirements and timelines within which parties are expected to submit nationally agreed action (the NIP) and progress reports on its implementation.
Therefore national and international reporting will be linked a manner that most, if not all, data needed for the International/Convention level reporting can be obtained when collecting the national level data.

Table 24: The Stockholm Convention Obligations on Reporting Relevant for Iran

Convention obligation	Description of requirement	Periodicity
Article 5, subparagraph (a): Measures to reduce or eliminate releases from unintentional production	Requires each Party to develop an action plan, or where appropriate, a regional or sub regional action plan, and subsequently implement it as part of its implementation plan specified in Article 7, designed to identify, characterize and address the release of the chemicals listed in annex C of the Convention.	Within two years of the date in which the Convention enters into force for that Party
Article 5, subparagraph (a) (v): measures to reduce or eliminate releases from unintentional production	A review is to be undertaken of strategies to meet the obligations of paragraph (v) of Article 5 pursuant to the development of an action plan to identify, characterize and address the release of the unintentionally produced persistent organic pollutants listed in Annex C and their success.	Every five years
Article 7: implementation plans	Requires each Party to develop and endeavor to implement an implementation plan and transmit it to the Conference of the Parties and requires each Party to review and update its plan on a periodic basis and in a manner to be specified in a decision of the Conference of the Parties.	Transmission to the Conference of the Parties within two years of the date on which the Convention enters into force for that Party
Article 15: reporting	Each Party shall report to the Conference of the Parties on the measures it has taken to implement the provisions of the Convention and on the effectiveness of such measures in meeting the objectives of the Convention. In addition, each Party shall provide to the Secretariat: (a) Statistical data on its total quantities of production, import	To be decided by the Conference of the Parties

Convention obligation	Description of requirement	Periodicity
	and export of each of the chemicals listed in Annex A and Annex B or a reasonable estimate of such data; (b) To the extent practicable, a list of the States from which it has imported each such substance and the States to which it has exported each such substance.	
Annex A, part II subparagraph (g): PCBs	Requires each Party to provide a report every five years on progress in eliminating polychlorinated biphenyls and submit it to the Conference of the Parties pursuant to Article 15	Every five years

Measuring the Effectiveness of the Convention

The measurement of the effectiveness of the Stockholm Convention is an activity which will be initiated by the Conference of the Parties in line with Article 16: effectiveness evaluation.

This article calls for an evaluation of effectiveness commencing four years after the date of entry into force of the Convention and periodically thereafter. It further calls for reports and information, including the reports and monitoring information called for in paragraph 2 of Article 16 (results of monitoring activities on a regional and global basis), the national reports submitted pursuant to Article 15 and non-compliance information provided pursuant to the procedures to be established under Article 17.

The main emphasis of the global effectiveness evaluation will be on measuring and reporting of actual POPs levels and trends. The Conference of the Parties has determined that the core data for the first evaluation are air monitoring and human exposure through human breast milk or human blood levels.

While Iran DoEs not have ongoing monitoring of POPs in these matrices, some relevant studies may exist which may be shared with the international community. Further steps for Iran to play an important part in the global monitoring network shall be considered as these plans become more developed by the COP.

Overall Structure of NIP Reporting and Follow-up

Taking into consideration both the structure of the NIP and its action plans as well as Convention reporting requirements, the following reporting will be affected in Iran.

Table 25: Planned NIP evaluation and Conference milestones and reporting requirements

Year	National milestone	Report	Convention Milestone	Convention Reporting requirement
2009			COP-4	
2010	Effectiveness evaluation baseline	POPs levels in environment		
2011	Short-term action evaluation.	Progress compared with target in NIP action plans.	COP-5	2nd National report[2]
2012				
2013			COP-6	
2014	Effectiveness evaluation	POPs levels in environment		Report on progress in elimination of PCBs
2015	Medium-term action evaluation	Review of PCB situation	COP-7	3rd National report
2016				
2017	Long-term action evaluation		COP-8	

Roles and Responsibilities for NIP Reporting and Effectiveness Evaluation

The implementation of the National Implementation Plan for POPs is a responsibility shared by the whole government. The proposed interventions in the NIP will be managed by a number of entities, both in the public and private sectors. Therefore, the responsibility of the reporting

[2] Current COP planning, final decisions awaited.

needs to be divided among a number of ministries and agencies. There is, however, a need to compile this information in the format requested by the Convention.

On the other hand, the effectiveness evaluation, particularly when it comes to measurement and reporting of environmental or food levels is a scientific exercise which is most efficiently carried out by a single organization, potentially in cooperation with few other institutions.

Against this background, it seems like the most efficient way of organizing the NIP reporting would be to give the compiling task to the POPs office to be established within Department of the Environment.

3.6 Financial Requirements and Arrangements

Proper management of POPs in Iran requires a concerted action from many stake holders. This will inevitably require some additional resources in form of human input, funds for setting –up appropriate management systems and investment in cleaner technologies, non-POPs containing equipment and monitoring equipment.

One should bear in mind when discussing additional resources for POPs management, which due to socio economic consequences these financial efforts for securing people and environmental health are less than resources required for not taking action considering the society as a whole. In addition to financial savings non-monetary social well-being will be enhanced particularly among most POPs exposed groups.

The NIP activities that I. R. OF IRANis committed, pursuant to the requirements under the convention on POPs reduction and control, to undertake are summarized below. Funds required to carry-out the near-term and mid-term and long-term goals of the National Implementation Plan includes expenses and incremental costs associated with these actions including:

1) Institutional regulatory strengthening (including expenses for NIP coordination for efficient NIP implementation, Development of legal frame work and its enforcement, Capacity building of Government Institutions for Managing POPs, etc.)

2) Phasing out of pesticide POPs (including Completion of POPs Pesticides and Contaminated Soil Inventory, Capacity building for enforcement and Awareness raising, Predicting Fate and Transport of POPs in the Caspian Sea and the Persian Gulf, POPs Pesticide Stockpile management and disposal, etc.);

3) Phasing out PCBs-containing electrical equipment in use (including expenses for PCB management plan and technical guidelines, Identification of further PCBs and development of analysis capacity, Sound Management of PCBs and PCB-contaminated equipments, PCB disposal and capacity for in-country disposal, etc.);

4) Adopting BAT/BEP to control unintentionally produced POPs releases (including expenses for Increased accuracy of future U-POPs inventories and awareness raising, Preventing uncontrolled combustion of municipal, agricultural & industrial solid waste, Assessment of environmental and health impacts, Controlling U-POPs release from industrial processes, etc.)

5) The investigation and disposal of obsolete and contaminated sites (including expenses for Capacity building for avoiding POPs releases from potentially contaminated sites, Minimization of POPs pesticides exposure from site contamination in vicinity of former POPs pesticide storage and handling facilities, Action on risk reduction of site contamination from PCB equipment, Action on risk reduction from potentially dioxin contaminated sites, etc.);

6) Information Exchange and stakeholder involvement (including expenses for Ensuring appropriate, full and timely information exchange between government Ministries and Convention information and POPs international development disseminated, etc.)

7) Public awareness, information and education (including expenses for Properly organized POPs information and outreach, Create and implement educational program on POPs, Increase NGO capacities for creating POPs public awareness and information dissemination, Raised POPs awareness among priority groups, etc.)

8) Research, development, and monitoring of Pops including expenses for Ensuring adequate monitoring data for POPs risk assessment and decision making, Ensuring Laboratory capacity for monitoring POPs pesticides and PCBs, Establishment of dioxin sampling and analysis capacity, POPs research, etc.)

Based on planned activities, expenses required to implement the National Implementation Plan are estimated as follows (Table 26):

Table 26: Planned Activities, Expenses Required Implementing the National Implementation Plan

Section No.	**Action Plan**	**Expenses**
3.3.2	Institutional and Regulatory Strengthening Measures	$ 500,000 + 50,000 annually
3.3.3	Production, import and export, use, stockpiles, wastes, reduction and elimination of POPs pesticides	$2,370,000 +10,000 annually
3.3.4	Production, import and export, use, storage and disposal of PCBs and equipment containing PCBs	$ 25,300,000
3.3.6	Reduction of releases from unintentional POPs releases	$ 103,300,000
3.3.7	Identification of contaminated sites and remediation	$ 2,100,000
3.3.8	Information exchange and stakeholders involvement	$200,000 +50,000(annually)
3.3.9	Public awareness, information and education	$ 2,050,000
3.3.10	Research, development, and monitoring of Pops	$ 2,900,000
Total		**$ 138,720,000 + 110,000/year**

In these calculations, it should be borne in mind that the costs exclude any project management expenses that may accrue if some of the activities are implemented as time limited actions in addition the available resources of the organizations involved. Further, any general waste management activities which is required to reduce Dioxin emission from uncontrolled combustion of waste are not counted in as the POPs dimension of such efforts are secondary.

Distribution of Costs and Sources of Funding

The accomplishment of planned NIP activities will necessitate expenditures among implementing partners, including government institutions, industrial enterprises and non-governmental organizations. The biggest financial share will be on industrial enterprises who will have to make sizeable investments in cleaner production methods and non-POPs containing equipment.

As a rough estimation it can be expected that 2/3 of the expenses will be for industries, while roughly 1/3 will be borne by the governmental and municipal budgets. The resource requirements may indeed be beyond the possibilities for some stakeholders. Consequently, the implementation of activities may be depending on availability of international funding, particularly funding for POPs action.

At this stage it is not possible to estimate exactly the concrete funding resources. To identify these it is necessary to take into consideration the potential financing sources:

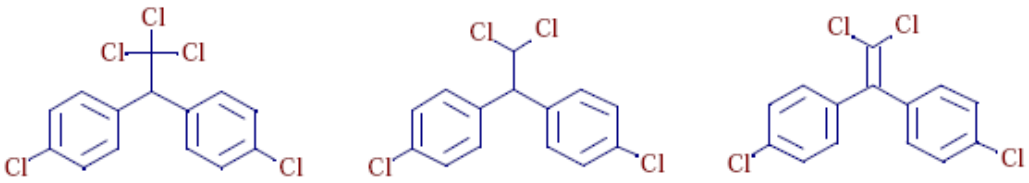
1) State, provincial and local budgets for the projects identified by NIP which will be included in Environment National Plan
2) Operational profits from companies expected to manage POPs issues according to NIP provisions and the environmental compliance imposed by the legislation
3) Sources of international financing, like multilateral credit institutions and funding the Global Environment Facility.

3.7 Annexes –

ANNEX 1
BASIC CHARACTERISTICS AND PROPERTIES OF INDIVIDUAL POPS

A1.1 DDT and its metabolites (DDTs)

DDT, or p,p´-DDT (1,1,1-trichloro-2,2-bis (p-chlorophenyl) ethane) respectively was identified as an effective insecticide in 1939. Its production and use at large began around 1944, and, the worldwide production was estimated to 2 million tones until the beginning of the 1970's. Developed countries began to ban the use of DDT for both the plant and agricultural products protection in the 1970's. In the monitoring of the DDT presence in the environment, the term "DDT" does not comprise only the p,p´-DDT being the proper active substance, but a whole group of similar substances. The isomer o, p´-DDT (its amount is dependent on the reaction conditions) is also formed in the DDT production, and reaction by-products include also isomers of dichlorodiphenyldichloroethane (p,p´-DDD and o,p´- DDD). In addition, DDT is dehydrochlorinated to the dichlorodiphenyldichloroethene (DDE) in the environment. Even these DDT metabolites are also very persistent and hazardous for health and the environment. The fact that the ratio of DDT/DDE changes over time significantly complicates the evaluation of trends resulting from the long-term monitoring programs of DDT and its metabolites in the environment.

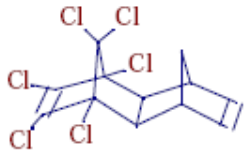


p, p´-DDT (4,4'-DDT) = 1,1,1-trichloro-2,2-bis(4-chlorophenyl) ethane
p,p´-DDD = 1,1-dichloro-2,2-bis(4-chlorophenyl)ethane - product of dechlorination
p,p´-DDE = 1,1-dichloro-2,2-bis(4-chlorophenyl)ethylene - product of dehydrochlorination

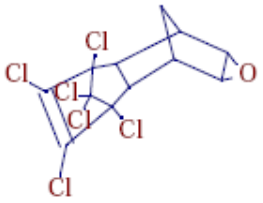
Generally, it can be stated, that DDT and its metabolites are very stable, low volatile substances of the lipophilic nature with the low water solubility and in the contrast, with a significant ability to accumulate in the fatty tissue of organisms and with the ability to adsorb at the surface of solid particles. These properties predetermine DDT and its metabolites to the long persistence in the environment and to the penetration into the food chains. The rate of DDT disappearance in various ecosystems can be described by first order kinetics with the half-life of 8-15 years, whereas the DDT is decomposed either chemically (by hydrolysis or photolysis) or biochemically by living organisms in water and in the soil.

A1.2 Polychlorinated cyclodienes (aldrin, dieldrin, endrin and isodrin)

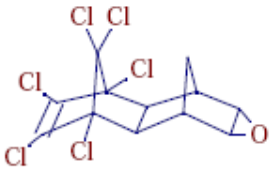
These chlorinated hydrocarbons are effective insecticides against ticks, moths, termites and other insects. To the lesser extent they were also used for seed treatment. Dieldrin is toxic for even for mammals, and it was even used as a rodenticide in the past.



Aldrin



Dieldrin

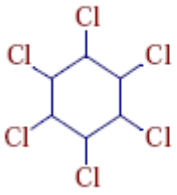


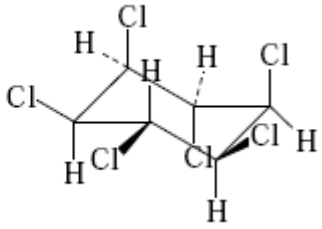
Endrin

Polychlorinated cyclodienes are chemically stable compounds of the lipophilic nature. Slow chemical and biological decomposition of polychlorinated cyclodienes takes place in a number of dechlorinating, dehydrochlorinating and hydroxylating reactions. Several metabolites become relatively soluble in water. They undergo photolytic changes and degradation when exposed to the light.

A1.3 Hexachlorocyclohexanes (HCHs)

Hexachlorocyclohexane was produced due to its insecticidal effects and was used in the agriculture as preparation for the extermination of animal and human parasites as well as for the treatment of the forests and other vegetation. γ-HCH is considered to be the most efficient insecticide out of five stereoisomers formed by the chlorination of the benzene, and therefore its raw product of the reaction is purified by the fraction crystallization to obtain the 99% γ-HCH isomer, i.e. lindane.



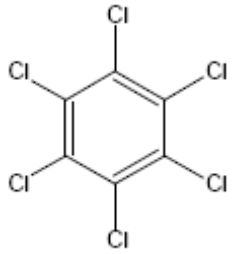


Isomers of HCH are relatively chemically stable compounds of the lipophilic nature. They are converted into the trichlorobenzenes or tetrachlorobenzenes by the gradual microbial dechlorination. Lindane is, in comparison with a number of other persistent organic pollutants (for example DDT, Aldrin, Heptachlor and others), more water soluble and his vapor tension is also higher; consequently, it has a relatively higher mobility in both atmospheric and aquatic environments.

A1.4 Hexachlorobenzene

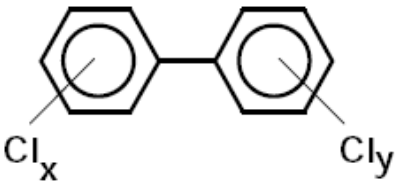
Hexachlorobenzene (HCB) is produced by the catalytic chlorination of the benzene or by the oxidation of the waste hexachlorocyclohexane (HCH) from the lindane production. Thus, HCB is a byproduct of the tetrachloromethane, perchloroethylene, trichloroethylene or pentachlorobenzene productions, important industrial chemicals (produced, for example, by the

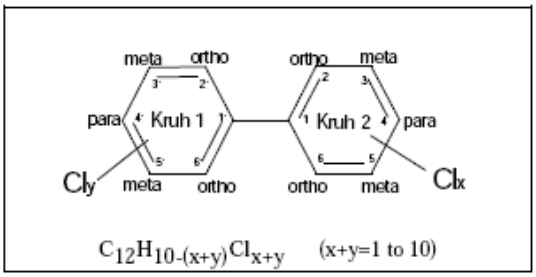
Association for Chemical and Metallurgic Production. HCB is also formed by the electrolysis – production of the chlorine - together with octachlorostyrene.
HCB is used as a fungicide, disinfectant and as a raw material or a by-product in the production of several chemicals (pentachlorophenol, several chlorinated aromatic hydrocarbons. It is used, as the industrial chemical, in the production of pyrotechnics, synthetic rubber and aluminum.



HCB is a very stable, low volatile substance of the lipophilic nature with low water solubility and, on the contrary, with a significant ability to accumulate in the fatty tissues of organisms and to adsorb on the surface of solid particles. It decomposes very slowly in the environment; chlorinated phenols are mentioned in the literature as its decomposition products. These properties predetermine HCB to the long persistence in the environment and to the penetration into food chains.

A1.5 Polychlorinated biphenyls (PCBs)
Polychlorinated biphenyls (PCBs) fall within the group of toxic and health hazardous substances, whose adverse effects on living organisms can take effects even in relatively low concentrations. They are organic compounds, whose hydrogen atoms of the biphenyl skeleton are substituted to a various degree by the atoms of the chlorine. Molecule of the PCB can contain a range of 1-10 chlorine atoms and according to their placement, 209 isomers (congeners) of PCBs may exist theoretically. However, only a few congeners dominate in industrially produced mixtures of PCBs and their distribution often determines the character, and thereby the usage of the given PCBs based product. Dominant congeners are then the subject to the analytical monitoring of PCBs in the environment. Their sum mathematically approximates the total PCBs content in the given matrix, and therefore, from the analytical perspective, it is also understand to be in practice, as the analytical determination of all PCB congeners is unrealistic. However, the situation may be significantly different from the toxicological point of view, as several minor congeners show toxicity up to an order higher than a number of major congeners.





PCBs are oily to waxy substances with excellent technical properties, such as chemical and physical stability even under high temperatures, incombustibility, immiscibility with water and high electrical resistance. These properties made PCBs a suitable material in many technical domains and resulted into their widespread use. Due to the fact that the information regarding their toxic properties was either not known or underrated, the massive spreading of PCBs was not alleviated by the more remarkable protective measures inhibiting their penetrating into the environment. The toxic character of PCBs even in very low concentrations was not definitely proven until the 1970's, moreover, it was also verified that the danger of the PCBs presence in the environment and in food chains is multiplied by the PCBs capability to accumulate especially in the fatty tissue of organisms. The production and use of PCBs in many countries of the world was then significantly limited and gradually completely terminated. PCBs fall into the group of persistent organic pollutants with a strong lipophilic nature creating a significant bioaccumulation. This fact multiplies their hazardous toxic properties, as they can accumulate in the fatty tissues and organs of humans and animals. A higher PCBs content is often accompanied by the presence of polychlorinated dibenzo-p-dioxins and dibenzofurans, i.e. substances that are several orders more toxically hazardous than PCBs alone. PCBs are deposited in significant amounts in aquatic environments - in river sediments, where a significantly higher PCB contents can be found in the so-called mud types of sediments with a higher proportion of the total organic matter than in sediments with the prevalence of the sand. PCBs of the ground sediments (in river beds), are decomposed very slowly under the anaerobic conditions, slow photochemical and biological degradation takes place with a half-life of several years range. UV radiation is a significant fastener of these processes, as under such conditions the benzene ring breaks. PCBs from water and water sediments are bioaccumulated by algae and by the plankton and thereby enter the food chains. The distribution coefficients between water and fats are so different high for many PCB congeners that fish living under the experimental conditions in water contaminated with trace concentrations of PCBs for extended periods of time, have increased the concentration of these substances in their bodies up to a thousand times. However, the PCBs distribution in the fish body is not uniform. For example carps have PCBs stored mainly in fatty tissues, in the head, in the central nervous system, gallbladder and in other internal organs, whereas their concentration in blood and smooth muscle are significantly lower.

The PCBs water solubility is very low and decreases with the increasing degree of the chlorination. For example, 2-chlorobiphenyl shows a solubility of 5.9 mg/l at 20º C, whereas decachlorobiphenyl only gives 0.015 mg/l. Under real conditions of the hydrosphere, the PCBs solubility in water can be significantly altered by the presence of the surface-active substances, of inorganic salts or high molecular natural substances of the humic acid type.

A1.6 Polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDDs/Fs)

Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) are to a different extent chlorinated tricyclic, aromatic hydrocarbons, whose presence in the environment is considered a significant problem due to the very high toxicity of some of their representatives. The non-expert literature, publications and other media have adopted the abbreviated term "Dioxins" and their findings in various components of the environment and especially in foods have repeatedly received a nation-wide interest.

The molecular structure of these substances is shown at the following charts:

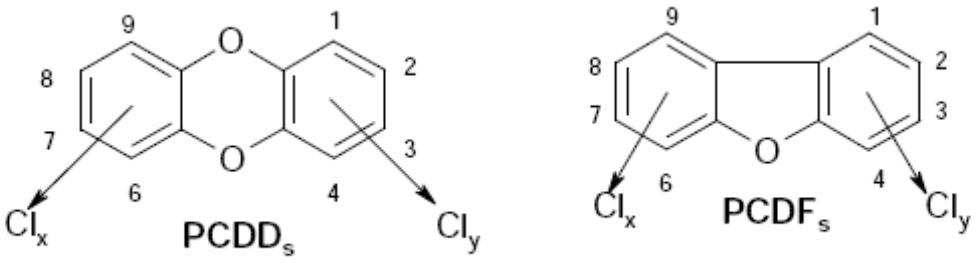


Chart of the structure of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDDs/Fs) 75 PCDD and 135 PCDF congeners belong to this group. 17 congeners chlorinated in the positions 2, 3, 7, and 8, and possibly others, are toxically the most hazardous, and along with so-called coplanar PCBs (no chlorine is located in the ortho position) are included in the total toxicological equivalent of TEQ. Conversely, PCDDs/Fs containing one up to three chlorine atoms are not considered toxically hazardous.

PCDDs/Fs are classified as typical POPs due to their physical and chemical properties. They have a very low solubility in water (especially those more chlorinated), low volatility, they are easily adsorbed to the surface of solid particles (high K_{oc} coefficient), and they only slowly undergo the decomposition. These properties predetermine that PCDDs/Fs, are found, of components of the hydrosphere, mainly in soil, silts and sediments, and, in a very limited amount, they are also found dissolved in the surface or other waters. Due to the high Kow distribution coefficients, they are able to bioaccumulate in the fatty tissue of animals and of humans. PCDDs/Fs enter human food products via the food chains, where the primary path leads via aquatic ecosystems to the fish meat and fats that serve either as the nutrition directly, or as a feeds additive for the livestock, where they get into their meat and milk. Another route for the PCDDs/Fs entry into foods is through the pasturage of the cattle, where dioxins enter via the atmospheric deposition.

A1.7 Polycyclic aromatic hydrocarbons (PAHs)

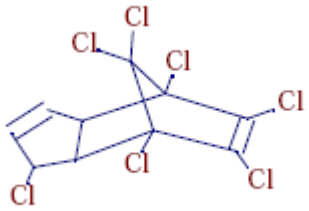
Polycyclic aromatic hydrocarbons are organic substances formed by two or more condensed benzene rings in a linear, angular, or cluster arrangement. Their ability to persist in the environment for a long time and due to their health hazard (they exhibit carcinogenic and mutagenic effects), they are considered typical representatives of priority persistent organic pollutants (POPs). Under standard conditions, they are usually colorless, white, or yellow solids, with relatively high melting and boiling points, depending on the number of the benzene rings and on the structure of the molecule. PAHs solubility in real surface and other natural waters is low and it decreases with the increasing number of benzene rings. PAHs solubility may significantly differ from the tabled values due to the different content of salts and of organic compounds. Waste waters containing a large amount of the surfactants, may increase the solubility of certain PAHs up to several orders; sea water, on the contrary, lowers the PAHs solubility due to the inorganic salt content. Temperature is also a significant factor regarding the solubility of these compounds, for example, the solubility of the anthracene increases five-fold with a temperature increase from 5 °C to 30 °C. PAHs are much more soluble in organic solvents, compared to water, in both aliphatic non-polar (pentane, hexane) or polar (methanol, dichloromethane) ones, as well as in aromatic solvents (benzene, toluene). PAHs have a significant capability to adsorb at the surface of solid particles. Due to this fact, they are both the atmosphere and the hydrosphere, adsorbed in significant amounts to the airborne or suspended small solid particles that they travel with through the environment. This fact is more significant for PAHs with a higher molecular weight, because adsorption on solid, or aerosol, particles is indirectly proportional to the partial vapor pressure, that decreases in PAHs with the increasing molecular weight.

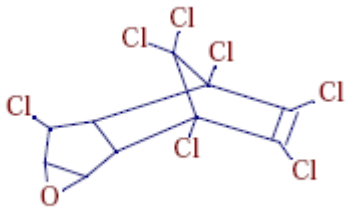
For the description of the PAHs behavior in the constituents of the environment and their accumulation in living organisms, it is necessary to know the values of the coefficients Kow (distribution coefficient for octanol/water) and K_{oc} (coefficient of adsorption on organic matter). The values log Kow and log Koc increase with the increasing number of benzene rings. For example, for naphthalene, the published values are Kow 3,37 and Koc 2,38 – 5,00, for benzo(ghi)perylene, the published values are Kow 6,5 a Koc 6,20 – 6,26. A significant physical PAHs property is the large diversity of their spectra in the ultraviolet and visible light ranges, and the fact, that the individual PAHs have their specific UV/VIS spectra. Due to the large amount of π - electrons, also PAHs exhibit a significant fluorescence, or even phosphorescence for some compounds. The above mentioned spectral properties are successfully utilized for both qualitative and quantitative PAH analysis. A significant chemical property of PAHs is the ability to form derivatives. Nitro derivatives are formed in the combustion at the presence of nitrogen oxides, sulphoderivatives at the presence of the sulphur dioxide, and chloroderivatives are formed during chlorination of PAHs. Some derivatives have exhibited stronger carcinogenic effects than PAHs alone.

A1.8 Heptachlor

Heptachlor is an organochlorinated insecticide used primarily for the extermination of soil pests and ants. It was also partly used for the extermination of insects found in households, agricultural and seed treatment areas. It is usually applied directly into the soil, sometimes even onto the leaves. Its insecticidal effects were described at the beginning of the 1950's, after its isolation

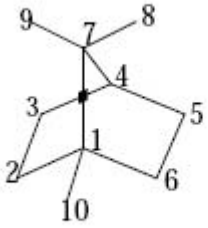
from the technical chlordane. It was commercially produced by Velsicol Chemical Corp. Generally speaking, heptachlor is a stable, low volatile compound of the lipophilic nature with a low solubility in water and, on the contrary, with the ability to cumulate in fatty tissue of organisms and to adsorb onto the surface of solid particles. These properties predetermine heptachlor to certain persistence in the environment, and to the penetration into the food chains. Its decomposition half-life in the soil is estimated to 9 to 10 months (The Pesticide Manual); a relatively quick hydrolysis to 1-hydroxy-chlordene occurs in the aqueous environments, followed by the subsequent epoxidation processes under the influence of microbial action. Experiments on mice and rats proved certain carcinogenic effects of heptachlorine.





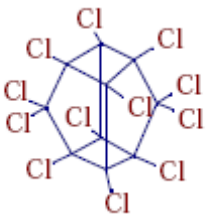
A1.9 Toxaphene

Toxaphene is a mixture of several hundred of individual compounds, which significantly complicates its identification and quantification.



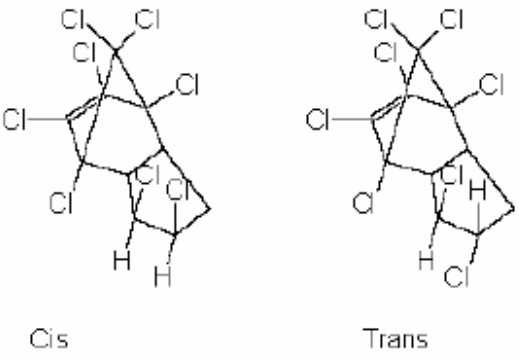
A1.10 Mirex

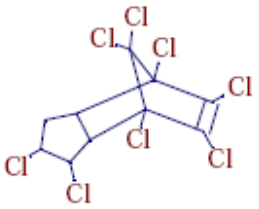
Insecticide used for exterminating ants and insects feeding on the green parts of agricultural plants. It is also used as an additive into several materials.



A1.11 Chlordane

The chlordane is, by its chemical composition, the 1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7ahexahydro- 4,7-methano-1H-indene and occurs in the form of two stereo isomers. It is a contact insecticide with a broad spectrum of use. It was commercially produced primarily by the Velsicol Chemical Corp. Chlordane also occurs in several stereoisomers. Its behavior and fate is determined by its chemical and physical properties that are similar to those of organochlorinated pesticides, i.e. they are capable of the high persistence in the various components of the environment.





ANNEX 2

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