Persistent Organic Pollutants
and the
Stockholm Convention:
A Resource Guide

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1. Introduction

The World Bank is an implementing agency with the United Nations Environment Program and United Nations Development Program of the Global Environment Facility (GEF). The GEF has been named as the interim financial mechanism for the Stockholm Convention on Persistent Organic Pollutants.

This *Persistent Organic Pollutants and the Stockholm Convention: A Resource Guide* incorporates a "primer' on persistent organic pollutants, including brief descriptions of the 12 persistent organic pollutants or POPs listed in the Convention, together with an overview of the Convention. It was prepared for use by decision-makers and a general audience.

2. Persistent Organic Pollutants (POPs)

2.1 General characteristics of persistent organic pollutants

Persistent organic pollutants are organic (carbon-based) compounds that include synthesized substances (pesticides and PCBs). Other substances are by-products generated as a result of human and natural activity, of which human activity accounts for the major proportion of releases (dioxins and furans). Extensive scientific studies have shown that POPs are some of the most dangerous pollutants released into the environment by humans.[1] Persistent organic pollutants have four key characteristics in common:

1. Persistent organic pollutants are TOXIC, causing adverse health effects, such as birth defects, damage to immune and respiratory systems, and critical organs. Hormone system dysfunction associated with POPs includes damage to the reproductive system; sex-linked disorders, and shortened lactation periods for nursing mothers. As well, endocrine disruption can have developmental and carcinogenic effects.

   Women, infants, and children appear to be especially vulnerable to certain effects of POPs. Evidence suggests that exposure of the fetus to even minute concentrations of some POPs (one tenth of one part per trillion or the equivalent to one second in 3,169 centuries[2]) can cause adverse effects at critical junctures in development that persist later in the individual's life.[3] These effects can include neurophysiological effects, such as attention deficits, learning disorders, behavioral problems (e.g., increased aggressivity) and poor gross and fine motor coordination.

   Exposure to POPs can result in death in humans (including aborted fetuses) and wildlife.

2. POPs are ENVIRONMENTALLY PERSISTENT. They resist breakdown by natural

[1] Of the approximatley 100,000 manufactured chemicals in use in Europe, toxicological understanding is limited to approximately 400. The European Environment Agency and the United Nations Environment Programme (UNEP) report that there is insufficient toxicity and eco-toxicity data for the 2000–3000 large volume chemicals on the European market (Annual Message 2 on the State of Europe's Environment Report, *Chemicals in the European Environment: Low Doses, High Stakes?* 1999). Similarly, of the 3000 chemicals that the United States imports or produces at more than 1 million pounds/year, 43 percent have no testing data on basic toxicity and only seven prevent have a full set of basic test data (US EPA, Chemical Hazard Data Availability Study, htttp://www.epa/gov/opptintr/chemtest/hazchem/htm, 11/02/2002).

[2] Calculation by Dr. Theo Colborn, author of *Our Stolen Future.*

[3] In animal studies, monkey foetuses exposed to dioxin at levels similar to human breast milk contamination (5 ppt -25 ppt or parts per trillion) showed evidence of learning disabilities.

processes, and, in some cases, remain in the environment for decades. Within the Stockholm Convention, persistence is determined by evidence of a half-life of the chemical in water greater than two months, or a half-life in soil greater than six months, or a half-life in sediment greater than six months.

3. POPs resist breakdown in water but they are soluble in fatty tissue, which makes them bioavailable to mammals. They bioaccumulate exponentially up the food chain, reaching the greatest magnitudes in predatory birds, mammals and humans. In addition, these substances bioconcentrate under typical environmental conditions. Bioconcentration is the process by which animals absorb high concentrations of POPs directly from their environment, rather than from a combination of eating other animals and environmental exposure. For example, some POPs present in water have been observed to bioconcentrate in the fatty tissue of fish by factors of up to 70,000 times the concentrations of the same POP present in the water column.

4. POPs are semi-volatile and thus are capable of TRAVELLING GREAT DISTANCES through cycles of evaporation and atmospheric cycling and deposition (referred to as the "grasshopper effect"). Wind and water carry these chemicals great distances regionally and globally.[4] POPs are volatile at warm temperatures and condense at cooler temperatures, reaching their highest concentrations in the cooler regions of the world (northern latitudes and high altitudes). POPs have been found on every continent on the planet, and in every major climatic zone, including the world's most remote regions, such as the open ocean and deserts, and in every wildlife species and human being.

2.2 Exposure pathways and health effects

In both wildlife and humans, establishing a direct link between exposure to persistent organic pollutants and health effects is difficult because every individual is exposed to a wide diversity of contaminants. Because these contaminants accumulate in fatty tissues, the first exposure in humans occurs in the foetus, when a percentage of the maternal “burden” of accumulated toxics is transported across the placenta.[5] While many of these chemicals pose serious environmental and human health risks on their own, the cumulative health effect that a combination of these chemicals may have is potentially of even greater concern.

Wildlife species, some of which are utilized by countries or jurisdictions within nations as "indicators" of risk to humans, are exposed to persistent organic pollutants through their natural environment and their diets. Laboratory and field-based studies suggest a variety of health effects on wildlife, including immunotoxicity, dermal aberrations, impairment of reproductive performance, deformations, hormonal deficiencies, cancer, increased mortality and overall population declines.

Laboratory and field-based studies suggest the following human health effects from exposure to POPs: allergies, hypersensitivity, nervous system damage, reproductive and immune dysfunction,

[4] The United States Environmental Protection Agency noted in its investigation leading up to its 2000 reassessment of dioxins and furans that the distances travelled by these substances prior to deposition may not be as great as for other POPs; for example, it is possible that they are transported and deposited on a continental, as opposed to global, scale (observation made during a presentation of the Government-to-Government Experts Workshop of the North American Task Force on Dioxins and Furans, and Hexachlorobenzene of the North American Commission for Environmental Cooperation).

[5] For example, the United States EPA draft 2000 reassessment of dioxins and furans and dioxin-like PCBs indicates that 12 percent to 14 percent of a US citizen's lifetime accumulation of these substances is received by the foetus.

neurobehavioral and developmental disorders, endocrine disruption and cancer. Many persistent organic pollutants are considered possible human carcinogens by the International Agency for Research on Cancer (IARC) of the World Health Organization.

In addition to exposure as foetuses in the womb, humans are exposed to persistent organic pollutants through diet, occupation, and natural and indoor environments.

Occupational and accidental exposure incidents in developing countries and countries with economies in transition are likely to be higher than in developed nations, given the greater limitations on human and financial resources, and the need for these countries to devote a larger percentage of their resources to responding to cataclysmic events, such as hurricanes, severe floods and forest fires, and to improvements to basic sanitation infrastructure. As well, the large percentage of small- and medium-size enterprises relative to larger industrial operations in many developing nations has implications for national capacity with respect to assessing risks of exposure, outreach/training and application of quality assurance/quality control mechanisms in the work place.

2.3 The Dirty Dozen

The Stockholm Convention on Persistent Organic Pollutants (May 2001) focuses on reducing and eliminating releases of 12 POPs (coined the "Dirty Dozen" by the United Nations Environment Programme (UNEP)). These 12 chemicals include eight pesticides (aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex, and toxaphene); two industrial chemicals (polychlorinated biphenyls and hexachlorobenzene); and two unintended by-products, dioxins and furans.

Each of these substances is described briefly in this section. Tables 1 and 2 at the end of this section provide supplementary information.

Aldrin

Aldrin is an insecticide primarily used against soil and crop pests, such as corn rootworm, wireworm, rice water weevil and grasshoppers. Aldrin is most commonly used on corn, potato and cotton crops. It is used also used to protect wooden structures from termites. Aldrin readily converts to dieldrin in plants and animals and, therefore, residues of this chemical are usually found in small amounts. Aldrin has low toxicity to plants, but has adverse effects on aquatic invertebrates, particularly insects. Acute exposure to aldrin has caused death in waterfowl, shorebirds, fish and humans. The International Programme on Chemical Safety (IPCS) estimates the fatal dose for humans to be five grams. The most common human exposure pathway is via food, particularly dairy products and meat. Aldrin has been banned or severely restricted in many countries.

Chlordane

Chlordane is a broad-spectrum agricultural insecticide used on crops, such as vegetables, grains, maize, potatoes, sugarcane, fruits, nuts, cotton and jute. It is also used to combat termites. Chlordane can kill aquatic invertebrates, fish and birds. Bioconcentration, rather than bioaccumulation, seems to be the process of greatest concern. Chlordane is suspected of damaging the human immune system and is listed as a possible human carcinogen. The most common human exposure pathway is through the air, particularly from indoor environments. Chlordane has been banned or severely restricted in dozens of countries.

DDT

DDT was broadly used during World War II to control insects (namely mosquitoes) that spread diseases such as malaria, dengue fever and typhus. After the War, DDT was also used on agricultural crops such as cotton. DDT is still used in many countries to control insect vectors that carry disease. Concerns about the serious environmental effects of DDT, particularly on birds, resulted in many countries banning or severely restricting its use in the 1970s. DDT's breakdown products include DDD/TDE and DDE, each of which possesses its own toxic characteristics. DDT is highly toxic to fish, causing severe behavioural changes and death. Acute toxicity of DDT in birds has been observed to affect reproductive success (for example, it causes eggshell thinning in birds of prey). The long-term chronic health effects of DDT on humans include immune system depression and estrogen-like alterations during reproductive development. DDT and its metabolite DDE are listed as possible human carcinogens, particularly as regards hormonal cancers, such as breast cancer. Humans are mainly exposed to DDT through their food; in fact DDT has been detected in food and breast milk all over the world. To date, 34 countries have banned DDT and 34 have severely restricted its use.

Dieldrin

Dieldrin is an insecticide used against termites, textile and agricultural pests, and insect vectors of disease. The main crops treated with dieldrin include corn, cotton and potato. The use of dieldrin as a vector control has been banned in some countries because of concerns related to the environment and human health. Dieldrin has low toxicity to plants but high toxicity to insects, fish and aquatic animals (frog embryos, for example, have been noted to develop spinal deformities when exposed to dieldrin). Toxic effects on birds and mammals vary. Dieldrin is suspected of negatively affecting the immune response in humans. Humans are exposed to dieldrin through their food (mainly dairy products and animal meats). It is important to note that because aldrin easily converts to dieldrin in plants and animals, levels of dieldrin reflect total concentrations of both chemicals.

Endrin

Endrin is an insecticide used against pests of cotton, rice and corn. It has also been used as a rodenticide to combat mice and voles. Many animals can metabolize Endrin. Therefore, it does not accumulate as severely as some of the other persistent organic pollutants. However, endrin is highly toxic to fish and other aquatic organisms. Endrin is suspected of suppressing the human immune system. As with many of the other POPs, humans are exposed to endrin through their diet, although intake levels are usually noted to be very low.

Heptachlor

Heptachlor is an insecticide used to combat soil and crop pests (particularly of cotton), termites, grasshoppers, fire ants, and mosquitoes (to control malaria). Heptachlor is metabolized to heptachlor epoxide, which has a similar toxicity level to heptachlor. Heptachlor is toxic to wildlife even at low concentrations. In birds, exposure to the chemical has induced behavioural changes, reduced reproductive success, and mortality. Heptachlor is listed as a possible human carcinogen. The main exposure pathway

for humans is through their diet, namely meat. Several countries have banned or restricted the use of this chemical.

Mirex

Mirex is an insecticide used against fire ants, western harvester ants and yellow jacket wasps in the United States, leaf cutter ants in South America, harvester termites in South Africa, and mealy bugs in

Hawaii. Mirex is also used as a fire retardant in plastics, rubber, paint, paper and electrical goods. Mirex is one of the most stable and persistent POPs. The chemical is toxic to plants (affecting their development and growth), aquatic organisms (crustaceans are the most sensitive), fish (affecting their behaviour) and birds. Mirex is listed as a possible human carcinogen. Humans are exposed to mirex through their diets, particularly meat, fish and wild game, although intake levels are generally below residue tolerances.

Toxaphene

Toxaphene is an insecticide used to protect cotton, cereal grains, fruits, nuts and vegetables. Toxaphene is also used to combat the ticks and mites that are parasitic to livestock. Toxaphene is a mixture of up to 670 chemicals. It is non-toxic to plants, highly toxic to fish and has been noted to cause reproductive disorders birds. Toxaphene has been listed as a possible human carcinogen. Humans are exposed to the chemical through their diets, but levels detected in food are usually very low.

Polychlorinated biphenyls (PCBs)

PCBs are a family of 209 compounds composed of attached benzene rings with varying numbers and locations of chlorine atoms. They are resistant to heat, non-flammable, have a low vapour pressure and a high dielectric constant. PCBs were first manufactured in 1929 for industrial use, primarily as heat exchange fluids and as an insulating medium in electrical capacitors, transformers, hydraulic and heart transfer systems. They continue to be used in electrical transformers and capacitors. They have also been used in sealants used for weatherproofing, and in carbonless copy paper, paint additives, adhesives and plastics. Many of the countries that formerly produced PCBs ceased production in the 1970s; however, PCBs remain in the environment for decades, where they are available for uptake and subsequent bioaccumulation in organisms. PCBs are also by-products of incomplete combustion and industrial processes. They include 13 compounds which exhibit extremely toxic, dioxin-like properties.

PCBs are toxic to aquatic organisms and fish, and cause reproductive failure, immune suppression in a variety other wildlife species.

Acute human exposure to PCBs can produce swelling of the eyelids, pigmentation of the nails and mucous membranes, fatigue, nausea and vomiting. Chronic exposure, including at low levels, can cause alteration to liver enzymes, rashes, acne, developmental, mental and behavioural problems, immune suppression, and possibly cancer. Studies of children in the United States (Michigan state) followed subsequent to exposure to PCBs while in the womb (via placental transfer) and from breast milk, manifested deficits in intellectual function, short-term memory loss, and hyperactivity and behavioural problems.[6] The WHO International Agency for Research on Cancer ranks PCBs as a probable human carcinogen. Humans are exposed to PCBs through their diet. Fish and marine mammals, because of their high fat content and elevated position in the food chain, are at risk of PCB contamination. They also constitute a major dietary food for some aboriginal peoples living in the Arctic. Vegetable oils and milk also constitute dietary pathways of exposure.

Hexachlorobenzene (HCB)

[6] Animal Studies associate low-concentration exposure to dioxins in rat foetuses with altered development of reproductive functions, including reduced sperm production in males upon maturation, abnormalities in anogenital distance, time to testis decent, and feminized sexual behaviour associated also with increased aggressively in male rats. Monkey foetuses exposed to dioxin at levels similar to human breast milk contamination (5 ppt -25 ppt or parts per trillion) showed evidence of learning disabilities.

Hexachlorobenzene (HCB) was first manufactured in 1945 for use as a seed treatment, especially for control of bunt wheat.[7] By the mid 1980s most nations had ceased its manufacture. Hexachlorobenzene is also generated as an unintentional by-product of the manufacture of pesticides, industrial chemicals (carbon tetrachloride, perchlorethylene, trichloroethylene and pentachlorbenzene, etc.); industrial processes (chlor-alkali plants that utilize graphite in their electrolytic cells, aluminium manufacture, pyrotechnic production, etc.); and as a result of incomplete combustion (burning of municipal waste). HCB has been detected in emissions of a variety of industrial processes, most likely reflecting use of products contaminated with HCB. HCB often appears as a contaminant in chlorinated pesticides (including pentachlorophenol, pentachloronitrobenzene dicloram, dacthal, chlorothaloril, picloram, simazine, and atrazine[8]). Other documented uses include as a raw material for synthetic rubber, a PVC plasticizer, a rubber-peptizing agent in the production of nitroso- and styrene- rubbers, and a chemical intermediate in dyes, and wood preservation.

In humans, acute exposure to HCB has resulted in photosensitive skin lesions, unusual hair growth, colic, severe weakness, kidney and liver damage, central nervous effects (including seizures), circulatory collapse and respiratory depression, debilitation, urinary, arthritic, neurological and metabolic disorders, and death. HCB has been linked to spontaneous abortions in humans and is listed as a possible human carcinogen. Foods of all types, but particularly dairy products and animal meat, from all over the world have been found to contain HCB. Even at low levels, HCB has been observed to produce a variety of adverse affects in aquatic animals, fish, birds and small mammals, such as fatigue and skin irritation, reproductive disorders, kidney and liver damage, cancer and death.

HCB has been found in Arctic air, snow, seawater, vegetation and biota. HCB can be re-released from incineration of waste contaminated with it,[9] while virtually 100 percent of HCB contaminant in pesticides is released to the air, posing a health risk to applicators.

Dioxins (polychlorinated dibenzo-p-doxins or PCDF)

Dioxins exist purely as a by-product of industrial processes; they are not produced commercially, nor do they have any known use. As with furans, they are produced unintentionally during combustion and incineration of chlorine-based chemical compounds with hydrocarbons (including via some natural processes, such as forest fires), chlorine-based pulp and paper bleaching, certain types of manufacturing and processing (including manufacture of some pesticides), and some industrial processes. The most notable sources are the burning of hospital, municipal and hazardous waste, emissions from automobiles, and the burning of peat, coal and wood.

There are 75 dioxin congeners, seven of which are of serious concern as regards toxicity and adverse health effects. The most toxic dioxin (2,3,7,8-TCDD) is used as standard against which other congers are compared, utilizing International Toxic Equivalency Factors or TEFs.

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[7] International Programme on Chemical Safety (IPCS), Persi*stent Organic Pollutants: An Assessment Report on DDT, Aldrin, Dieldrin, Endrin, Chlordane, Heptachlor, Hexachlorobenzene, Mirex, Toxaphene, Polychlorinated Biphenyls, Dioxins, and Furans*, L. Ritter, et al., Dec. 1995, <http://www.chem.unep.ch/pops/newlayout/infpopsalt.htm>, downloaded September 22, 2001.

[8] North American Commission on Environmental Cooperation, *Decision Document on Hexachlorobenzene Under the Process for Identifying Candidate Substances For Regional Action under the Sound Management of Chemicals Initiative,* citing Tobin, Known and potential sources of hexachlorobenzene ,in C.R. Morris, and J.R.P. Cabral, eds. Hexachlorobenzene: Proceedings of an International Symposium. International Agency for Research on Cancer, IARC Scientific Publications No. 77, Lyon, France. 3-11.1986), April 16, 1999.

[9] *Decision Document on Hexachlorobenzene under the Process for Identifying Candidate Substances for Regional Action under the Sound Management of Chemicals*, North American Commission for Environmental Cooperation, April 16, 1999.

Dioxins are toxic to fish, causing behavioural changes and death (early life stages are particularly sensitive). Dioxins have also been implicated in a diversity of developmental and digestive disorders in birds and other wildlife.

In humans, chloracne is the most consistent health effect observed with exposure to dioxins. Other health effects include fatigue, depression, personality changes and altered cellular and hormone levels (which can include immune, enzyme, reproductive and developmental disorders).

The foetus (via the placenta)[10] and breast-feeding infants are at higher risk of thalamic, pituitary and thyroid regulatory system problems. Exposure to dioxins is also thought to exacerbate endometriosis in women (a painful, chronic gynecological disorder in which uterine tissues grow outside the uterus). In extreme instances, and has been linked to impaired glucose tolerance and diabetes. The 2,3,7,8-Tetrachlorodibenzo-para-dioxin congener [1746-01-6] is classified as a human carcinogen and is a multi-site carcinogen in experimental animals, according to the World Health Organization's International Agency for Research on Cancer. The US EPA in its draft reassessment has classified 2,3,7,8-TCDD as a hormonal carcinogen. Humans are exposed to dioxins through their diet, namely the fatty portion of animal products.

Furans (polychlorinated dibenzofurans or PCDFs)

Furans, along with dioxins, are common by-products of PCB manufacture, waste incinerators, and auto emissions. There are 135 furan congeners. Furans have many of the same toxic affects on the health of wildlife and humans as do dioxins; however, the International Agency for Research on Cancer of the World Health Organization notes that scientific evidence suggests that furans are not classifiable as to their carcinogenicity to humans. Humans are exposed to furans in their food, again, mainly through the fatty portion of animal products.

[10] 5 The US EPA draft 2000 reassessment of dioxins estimates that in the United States, from 4% to 12% of a person's lifetime body burden is received while in the womb (a transferred of a portion of the dioxins accumulated in fat by the mother during her life to the foetus via the placenta).

Table 1. The twelve priority persistent organic pollutants listed under the Stockholm Convention.

Category	Chemical	CAS#	Stockholm Convention Annex[a]	Use[b]	Soil Half-life (in years)
Pesticides	Aldrin	309-00-2	A	insecticide	N/A
	Chlordane	57-74-9	A	insecticide, termiticide	1
	DDT	50-29-3	B	insecticide	10-15
	Dieldrin	60-57-1	A	insecticide	5
	Endrin	72-20-8	A	insecticide, rodenticide	Up to 12
	Heptachlor	76-44-8	A	insecticide, termiticide	Up to 2
	Hexachlorobenzene	118-74-1	A	fungicide	2.7-22.9
	Mirex	2385-85-5	A	insecticide, termiticide	Up to 10
	Toxaphene	8001-35-2	A	insecticide	100 days up to 12 years
Category	**Chemical**	**CAS#**	**Stockholm Convention Annex**	**By-product (typical formation)**	**Soil Half-life (in years)**
Industrial Chemicals	Hexachlorobenzene	118-74-1	A	by-product of manufacture (chlorinated solvents, pesticides), application of pesticides, incineration of HCB-containing wastes	2.7-22.9
	Polychlorinated biphenyls	1336-36-3	A	Industry manufacture; co-planar PCBs are a by-product of combustion	10 days to 1.5 years
Unintended By-Products	Dioxins	Several	C	by-product	10-12
	Furans	Several	C	by-product	10-12

Sources: The Stockholm Convention on Persistent Organic Pollutants, the International Program on Chemical Safety, Persistent Organic Pollutants: *An Assessment Report on DDT, Aldrin, Dieldrin, Endrin, Chlordane, Heptachlor, Hexachlorobenzene, Mirex, Toxaphene, Polychlorinated Biphenyls, Dioxins, and Furans*, L. Ritter, et al., submitted to the Second Meeting of the ISG, Intergovernmental Forum on Chemical Safety, ISG/96.5B, Dec. 1995.

[a] Annex A substances: slated for "elimination" in the Stockholm Convention. Annex B substances: slated for "restriction" for which there is a specified "acceptable purpose"; Annex C substances: continuing minimization and, where feasible, ultimate elimination of the total releases derived from anthropogenic sources.

[b] Typical uses; not to be confused with use exemptions listed in the Convention, which are noted in Table 4.

Table 2. Synonyms and trade names for the twelve priority POPs identified in the Stockholm Convention

Chemical	Some Synonyms and Trade Names
Aldrin	Aldrec, Aldrex, Aldrex 30, Aldrite, Aldrosol, Altox, Compound 118, Drinox, Octalene, Seedrin
Chlordane	Aspon, Belt, Chloriandin, Chlorkil, Chlordane, Corodan, Cortilan-neu, Dowchlor, HCS 3260, Kypchlor, M140, Niran, Octachlor, Octaterr, Ortho-Klor, Synklor, Tat chlor 4, Topichlor, Toxichlor, Veliscol-1068
DDT	Agritan, Anofex, Arkotine, Azotox, Bosan Supra, Bovidermol, Chlorophenothan, Chloropenothane, Clorophenotoxum, Citox, Clofenotane, Dedelo, Deoval, Detox, Detoxan, Dibovan, Dicophane, Didigam, Didmac, Dodat, Dykol, Estonate, Genitox, Gesafid, Gesapon, Gesarex, Gesarol, Guesapon, Gyron, Havero-extra, Ivotan, Ixodex, Kopsol, Mutoxin, Neocid, Parachlorocidum, Pentachlorin, Pentech, Ppzeidan, Rudseam, Santobane, Zeidane, Zerdane
Dieldrin	Alvit, Dieldrite, Dieldrix, Illoxol, Panoram D-31, Quintox
Endrin	Compound 269, Endrex, Hexadrin, Isodrin Epoxide, Mendrin, Nendrin
Heptachlor	Aahepta, Agroceres, Baskalor, Drinox H-34, Heptachlorane, Heptagran, Heptagranox, Heptamak, Heptamul, Heptasol, Heptox, Soleptacx, Rhodiachlor, Veliscol 104, Veliscol heptachlor.
Hexachlorobenzene	Amaticin, Anticarie, Buntcure, Bunt-no-more, Co-op hexa, Granox, No bunt, Sanocide, Smut-go, Sniecotox
Mirex	Dechlorane, Ferriamicide, GC 1283
Toxaphene	Alltex, Alltox, Attac 4-2, Attac 4-4, Attac 6, Attac 6-3, Attac 8, Camphechlor, Camphochlor, Chemphene M5055, chlorinated camphene, Chloro-camphene, Clor chem. T-590, Compound 3956, Huilex, Kamfochlor, Melipax, Motox, Octachlorocamphene, Penphene, Phenacide, Phenatox, Phenphane, Polychlorocamphene, Strobane-T, Strobane T-90, Texadust, Toxakil, Toxon 63, Toxyphen, Vertac 90%.
Hexachlorobenzene	See Above
Polychlorinated biphenyls	Aroclor, Pyranol, Pyroclor, Phenochlor, Pyralene, Clophen, Elaol, Kanechlor, Santotherm, Fenchlor, Apirolio, Sovol.
Dioxins	The US EPA reassessment lists more than 160 pesticides in which dioxins are a contaminant.
Furans	N/A

NOTE: This list is not intended to be exhaustive.

3. The Stockholm Convention on Persistent Organic Pollutants

This overview provides a summary of developments that led to the Diplomatic Conference in Stockholm in May 23, 2001, followed by a discussion of the Convention's provisions and the steps that will likely be required to implement these provisions. As of March 18, 2002, 122 countries have signed the Convention, of which five (Canada, Fiji, Lesotho, Netherlands and Samoa) have ratified.[11] (See Table 3 for a list of signatories by region).

3.1 Negotiations leading up to the Stockholm Convention

The Draft Stockholm Convention on Persistent Organic Pollutants (UNEP/POPS/INC.5/7) was concluded by the Intergovernmental Negotiating Committee (INC) for an Internationally Legally Binding Instrument for Implementing International Action on Certain persistent Organic Pollutants, at its fifth session, held in Johannesburg, Dec. 4-9, 2000. The Convention document is available through the UNEP official website on POPs, accessible via www.unep.org. (Go to http://www.chem.unep.ch/sc/ and see "Convention Text" at the top right of the page).

The work of the International Negotiation Committee (INC) began in 1997 under the auspices of the United Nations Environment Programme (UNEP) and the direction of UNEP's Governing Council (GC) as stipulated in GC Decision 19/13C. This decision called for the development of a legally binding instrument by 2000 and urged governments to take immediate action with the offer of UNEP assistance. Decision 19/13C was itself an outgrowth of the UNEP GC's decision of May 1995 to assess the chemistry, toxicology, transport and socio-economic issues for the 12 UNEP POPs, and the subsequent adoption by the UNEP GC and the World Health Assembly (WHA) of a September 1996 report of the Intergovernmental Forum on Chemical Safety (IFCS). The IFCS report concluded that there is "enough science to warrant immediate international action" and also recommended that the UNEP GC and WHA develop a global legally binding instrument to reduce and/or eliminate releases of the 12 POPs.

In preparing for negotiations, UNEP and the INC sponsored eight sub-regional workshops in 1997 and 1998 that were attended by representatives of 138 countries. Additional workshops were held during the negotiation process from 1999 to 2000.

INC negotiations were initiated June 29, with the first session held in Montreal. Canadian John Buccini, then with Environment Canada, was nominated to chair the INC sessions. Subsequent sessions were held in Nairobi (INC 2, January 1999); Geneva (INC 3, September 1999); Bonn (INC 4, March 2000); and Johannesburg (INC 5, December 2000). The Johannesburg session was attended by representatives from 121 countries, various United Nations agencies and intergovernmental organizations, and 92 non-governmental groups, including representatives of industry association, environmental and health private non-profit groups, and indigenous groups.

[11] A 'regional economic integration organization' defined in Article 2, the definitions section of the Convention, is an organization constituted by sovereign States of a given region to which member States have transferred competence in respect of matters governed by the Convention and which has been authorized to sign, ratify, accept, approve or accede to the Convention.

Table 3. Signatories to the Convention by region as of March 18, 2002

Developed Countries	Latin America & the Caribbean	Europe & Central Asia	East Asia & the Pacific	South Asia
Australia Austria Belgium Canada Denmark European Community Finland France Germany Greece Iceland Ireland Italy Liechtenstein Luxembourg Malta Monaco Netherlands New Zealand Norway Portugal Spain Sweden Switzerland United Kingdom of Great Britain and Northern Ireland	Antigua and Barbuda Argentina Bolivia Brazil Chile Colombia Cuba Dominican Republic Ecuador El Salvador Guatemala Haiti Jamaica Mexico Nicaragua Panama Paraguay Peru United States of America Uruguay Venezuela	Albania Armenia Bosnia and Herzegovina Bulgaria Croatia Czech Republic Georgia Hungary Kazakhstan Latvia Poland Republic of Moldova Romania Slovakia Slovenia The former Yugoslav Republic of Macedonia Turkey Ukraine	Cambodia China Fiji Indonesia Lao People's Democratic Republic Micronesia, FS Papua New Guinea Philippines Republic of Korea Samoa Singapore Viet Nam **Middle East & North Africa** Algeria Djibouti Iran, Islamic Republic of Israel Jordan Kuwait Lebanon Morocco Niger Oman Saudi Arabia Syrian Arab Republic Tunisia United Arab Emirates Yemen	Bangladesh Niue Pakistan Sri Lanka **Africa, Sub-Saharan** Benin Burkina Faso Cameroon Comoros Congo Cote d'Ivoire Gambia Ghana Guinea Kenya Lesotho Madagascar Mali Mauritania Mauritius Mozambique Nigeria Senegal South Africa Sudan Togo United Republic of Tanzania Zambia Zimbabwe

3.2 Provisions of the Stockholm Convention

The Stockholm Convention provides subscribing Parties with basic objectives, principles and elements for use in developing comprehensive programs and control regimes with respect to persistent organic pollutants or "POPs."

The Stockholm Convention is structured to address POPs that are (1) **intentionally produced**, such as pesticides, insecticides, rodenticides and fungicides; (2) **produced intentionally and whose use is**

restricted to disease vector control, for example DDT for control of malaria; and (3) **produced and released unintentionally** as the result of human activity. The latter category includes dioxins, furans, dioxin-like PCBs, and hexachlorobenzene, that are generated primarily as by-products of incomplete combustion. POPs substances to be addressed via these categories are listed in annexes A-C, which are integral to the Convention.

The Convention's **control provisions**, which reference the substances via the annexes, are contained in three key articles**. Article 3** addresses intentionally produced POPs, **Article 5**, those produced unintentionally, and **Article 6** pertains to stockpiles and wastes of the 12 POPs. These articles and their provisions are discussed below, together with restrictions and specific exemptions that are set forth in **Article 4** and noted on a chemical specific basis in the relevant annexes.

3.2.1 Intentionally produced POPs

The Convention's goal for intentionally produced substances is elimination of their production and use.

Article 3 "Measures to reduce or eliminate releases from intentional production and use" is the central mechanism for achieving this goal.

The Convention is structured to “fast track” elimination of production and use, and also import/export, of the nine Annex A substances, inclusive of the seven pesticides—*aldrin, chlordane, dieldrin, endrin, heptachlor, mirex, and toxaphene* —and PCBs and hexachlorobenzene.

The goal with respect to DDT is “ultimate elimination” as noted in Annex B, Part II (discussed in Section 3.2.1.2 below).

Imports and exports of Annex A or B substances are also to be eliminated, except for environmentally sound disposal or provided via restriction provisions that pertain to use of DDT for vector control.

Measures for meeting obligations with respect to these provisions as well as others under the Convention are to be specified within the National Action Plan. The assumption is that proof of adopting such measures will be found in legitimate legislation, regulations, orders or other authoritative instruments of the Party's system of government.

3.2.1.2 Provisions Specific to Production/ Use of DDT

Parties shall eliminate the production and use of *DDT*—the only substance on the Convention’s restricted use list or Annex B—with the exception of those Parties that have notified the Secretariat of their intention to produce and/or use it for the sole use of disease vector control. Such production and use is to occur in accordance with WHO recommendations and guidelines and when "locally safe, effective and affordable alternatives are not available to the Party."

Those Parties that continue to use DDT until technically and economically feasible alternative products, practices and processes are available to them must notify the Secretariat and will be included on a publicly available DDT register maintained by the Secretariat. Registered Parties will be required to:

- report on quantities used every three years, conditions of use, and relevance to the Party's disease management strategy; and
- take measures to improve health care so as to reduce the incidence of malaria.

The Convention urges Parties to include an action plan specific to DDT within the National

Implementation Plan Development of that specifies how DDT use will be confined to disease vector management (see discussion under 2.1.5).

3.2.1.3 Specific exemptions

A number of "specific exemptions" for either production, or use, or both, are noted as regards elimination of Annex A substances and restriction of Annex B substances (DDT). Part I of Annex A (reproduced on the next page) lists specific exemptions as regards the production and/or use of these substances. There are two specific exemptions for DDT: (1) the one noted above for its use for disease vector control, and (2) its use as an intermediate in the manufacture of dicofol. Both these exemptions and "acceptable purposes" are noted in Part I, Restrictions, of Annex B.

Countries that did not indicate their intention to use these specific exemptions prior to May 21, 2001, on becoming a Party, may register for one or more specific exemptions in annexes A and B by informing the UNEP Secretariat, which will maintain a publicly available register. Registrations of specific exemptions with respect to a particular chemical expire five years after the date of entry into force of the Convention, unless a Party indicates an earlier date in the Register or an extension is granted by the Conference of the Parties (COP). The COP may decide to extend the exemption for a period of up to five years. Parties that intentionally produce or use POPs under the "specific exemptions" provisions ***must take measures to prevent or minimize human exposure and releases to the environment.***

3.2.1.4 Provisions specific to manufactured polychlorinated biphenyls

The Convention requires that all Parties cease production of PCBs and eliminate their use within in-place equipment, such as transformers and capacitors by 2025. In the interim, as specified in Part II of Annex A, the Parties must:

- make determined efforts to identify, label and remove from use equipment containing >10% PCB in volumes >5 litres;
- make determined efforts to identify, label and remove from use equipment containing > 0.05% PCB in volumes >5 litres;
- endeavour to identify, label and remove from use equipment containing > 0.005% PCB in volumes >0.05 litres;
- restrict use to intact and non-leaking equipment;
- prohibit use in equipment involved in food processing;
- promote electrical fire prevention measures and regularly inspect schools, hospitals and other public spaces with equipment containing PCBs;
- promote environmental sound waste management PCB waste; and
- report to the Conference of the Parties every five years on progress in eliminating PCBs in in-use equipment.

The environmentally sound management of PCB wastes is to be achieved by the Parties as soon as possible, but no later than 2028. The Conference of the Parties will review progress toward meeting 2025 and 2028 target at five-year intervals.

3.2.2 Unintentionally produced POPs

The Convention's goal for unintentionally produced POPs, expressed in Article 5, is continuing minimization and, where feasible, ultimate elimination of the total releases of Annex C substances derived from anthropogenic sources. Annex C lists four unintentionally produced POPs:
- Dioxins
- Furans
- Hexachlorobenzene
- PCBs

Table 4. Stockholm Convention Annex A: Specific exemptions for production and/or use

Chemical	Activity	Specific exemption
Aldrin* CAS No: 309-00-2	Production	None
	Use	Local ectoparasiticide Insecticide
Chlordane* CAS No. 57-74-9	Production	As allowed for the Parties listed in the Register
	Use	Local ecotoparasiticide Insecticide Termiticide Termiticide in buildings and dams Termiticide in roads Additive in plywood adhesives
Dieldrin* CAS No: 60-57-1	Production	None
	Use	In agricultural operations
Endrin* CAS No: 72-20-8	Production	None
	Use	None
Heptachlor* CAS No: 76-44-8	Production	None
	Use	Termiticide Termiticide in structures of houses Termiticide (subterranean) Wood treatment In use in underground cable boxes
Hexachlorobenzene CAS No: 118-74-1	Production	As allowed for the Parties listed in the Register
	Use	Intermediate Solvent in pesticide Closed system site limited intermediate
Mirex* CAS No: 2385-85-5	Production	As allowed for the Parties listed in the Register
	Use	Termiticide
Toxaphene* CAS No: 8001-35-2	Production	None
	Use	None
Polychlorinated Biphenyls (PCB)*	Production	None
	Use	Articles in use in accordance with the provisions of Part II of this Annex

These substances are released from thermal processes involving carbon-based organic matter and chlorine as a result of incomplete combustion or chemical reactions. The PCBs addressed Annex C are further defined as those consisting of aromatic compounds formed in such a manner that the hydrogen atoms on the biphenyl molecule may be replaced by up to ten chlorine atoms. Hexachlorobenzene is generated a by-product of manufacture and use of chlorinated solvents and pesticides.

In working to achieve the Convention goal of continual reduction and ultimate elimination, the Parties are required to:

- promote application of available, feasible and practical measures to achieve realistic and meaningful levels of release reduction or source elimination;
- promote development, and, where appropriate, require use of substitute or modified materials, products and processes to prevent formation and release of Annex C POPs;
- promote, and, as provided for in an action plan on Annex C substances (see 2.1.4 below), require use of best available techniques (BAT) for new sources within industrial source categories (Annex C, Part II) that have potential for comparatively high formation and release of POPs to the environment and phase in of any BAT requirements for these new sources. The four industrial source categories referenced are:
  - waste incinerators (municipal, hazardous and medical waste incinerators; sewage sludge

incinerators);
  - cement kilns firing hazardous wastes;
  - pulp production involving chlorine; and
  - thermal processes used in metallurgical industry (secondary production of aluminium, cooper or zinc; sintering plants in the iron and steel industries).

- promote the use of best available techniques (BAT) and best environmental practices (BEP) for new sources within the source categories listed in Annex C, Part III, and for existing sources within all categories in Annex C, Parts II and III. The Annex C, Part III list of other potential sources of formation of dioxins, furans and unintentionally produced PCBs includes:
  - open burning of waste, including burning of landfill sites;
  - thermal processes in the metallurgical industry not mentioned in Part II;
  - residential combustion sources;
  - fossil fuel-fired utility and industrial boilers;
  - firing installations for wood and other biomass fuels;
  - specific chemical production processes releasing unintentionally formed persistent organic pollutants, especially production of chlorophenols and chloranil;
  - crematoria;
  - motor vehicles, particularly those burning leaded gasoline;
  - destruction of animal carcasses;
  - textile and leather dyeing (with chloranil) and finishing (with alkaline extraction);
  - shredder plants for the treatment of end of life vehicles;
  - smouldering of copper cables; and
  - waste oil refineries.

The definitions of BEP and BAT are very broad and do not appear to favour any given technology or practice.

3.2.3 Stockpiles and wastes

Article 6, "Measures to reduce or eliminate releases from stockpiles and wastes," elaborates measures that each Party shall take to ensure that stockpiles consisting of or containing chemicals listed either in Annex A or Annex B and wastes, including products and articles upon becoming wastes, consisting of, containing or contaminated with a chemical listed in Annex A, B or C, are managed so as to be protective of human health and the environment.

Article 6 further requires disposal of stockpiles and POPs in wastes in a manner that destroys their content or irreversibly transforms them, such that the remaining product does not exhibit the characteristics of a POP (or as near to that standard as possible, taking into consideration BET, BAT, international rules, standards and guidelines). To this effect, Parties must:

- not allow recovery, recycling, reclamation, direct reuse or alternative uses of POPs in stockpiles, in wastes or extracted from wastes;
- not transport materials containing wastes or stockpiled POPs across international borders unless permitted by the Convention and not restricted by other international conventions, laws, or agreements (for example, the Basel Convention);
- develop strategies for identification of contaminated sites and, if remediation is attempted, requirements that such remediation be conducted in an environmentally sound manner.

3.2.3.1 Identification of stockpiles and treatment of wastes

Article 6, Paragraph 1, sets out requirements for the identification of stockpiles containing chemicals listed in Annex A or Annex B, for waste-containing products and articles in use, and for wastes consisting of, containing, or contaminated with a chemical listed in Annex A, B or C.

The ability to deal with obsolete pesticide stockpiles and contaminated waste site treatment is restricted by Article 6, Paragraph 2, to comprehensive and sophisticated procedures by personnel with training and expertise in hazardous waste management. Identification of stockpiles of Annex A and B chemicals and of products containing Annex C chemicals requires environmental sector specialists and trained inspectors to assess and characterize stockpiles and waste products. Developing regulations and procedures for the safe storage, transport and disposal of these waste stocks will require assistance from those with expertise in the handling and disposal of the specified hazardous wastes.

3.2.4 Identification of new POPs

The Parties may submit proposals for the addition of new POPs to the Conference of the Parties, for consideration by its Review Committee. The Review Committee will utilize the screening provisions contained within Annex D to make recommendations to the COP in response to submissions for additional chemicals. The Party submitting a chemical for consideration must also include a statement of reasons for concern and need for global control.

3.2.5 Key elements for achieving plan goals

3.2.5.1 Implementation plans

The Stockholm Convention requires that the Parties develop Implementation Plans to indicate how they will develop and meet their obligations as Parties to the Convention. The Implementation Plans are to be transmitted to the Conference of the Parties within two years of the Convention entering into force.[12]

Article 7 sets out the requirement for production of Implementation Plans. The Implementation Plan is to explain how all of the requirements of the Convention will be implemented in each respective country.

While the Convention refers to ***national*** implementation plans, should it be determined that the institutional and technical capacity of a Party is insufficient for it to develop, implement and sustain all requirements of the Convention on its own, participation in a multi-Party effort for all or parts of an Implementation Plan can be considered via an authorized ***regional economic integration organization***. The Convention specifically provides for regional or sub-regional Action Plans.[13] This approach could prove attractive to many developing nations and EIT nations as a means of maximizing financial and other resources through strengthening of regional capacities.

In preparing the Implementation Plan, any Party subscribing to the Convention is required to set out in detail, and to review and update on a periodic basis, an outline that includes measures to:

- eliminate the production, use, importation and exportation of the nine persistent organic pollutants specified in ***Annex A***. Provision is made for exemptions for production and specific uses of some of these chemicals under specific circumstances;
- restrict the production and use of persistent organic pollutants listed in Annex B (DDT); and

[12] Article 20, Paragraph 1, states that the Convention enters into force on the 90th day after the deposit of the 50th instrument of ratification, acceptance, approval or accession. Paragraph 2 of Article 20 adds that the Convention enters into force on the 90th day following deposit of instrument of ratification from Parties subsequently ratifying.

[13] 8 Article 5(a) describing the obligatory action plan for measures to be taken to reduce or eliminate releases from unintentional production refers to development of an action plan, or, where appropriate, a regional or sub-regional action plan.

- identify and manage current stocks of persistent organic pollutants listed in Annexes A and B or chemicals that may be contaminated by pollutants listed in Annex C.

As part of the Implementation Plan, Parties are to develop and implement measures for the identification, safe storage, handling and disposal of stocks of prohibited or restricted pollutants or products containing the targeted pollutants.

3.2.5.2 Action plans

The Implementation Plan includes incorporation of two action plans, an obligatory action plan for unintentionally produced substances (Annex C substances) and a second action plan for Annex B substances (DDT) which "shall be encouraged" by the Conference of the Parties. The timetable for production of these plans is two years within entry into force of the Convention, given that they are required/proposed for implementation as part of the overarching implementation plan.

Action plan for unintentionally produced POPs
The purpose of this action plan is to identify, characterize and address releases of unintentional POPs (Annex C). The action plan is to include:

- an evaluation of national laws and policies relating to the management of these by-product chemicals;
- an evaluation of current and projected releases from source inventories, which must also be developed and maintained, taking into account the Convention's prescribed source categories and review controls
- reduction strategies for use of best environmental practices ("BEP") and best available techniques ("BAT");
- a schedule for implementation, including for action plan strategies and measures, and for reporting requirements; and
- steps to promote education and training with regard to, and awareness of, those strategies.

Action plan for restricted substances
The non-obligatory action plan for substances with restrictions (Annex B) applies to measures for the control of DDT as specified in Annex B, Part II, Paragraph 5 (a). The plan "shall include" provisions for the following:

- development of regulatory and other mechanisms to ensure that DDT use is restricted to disease vector control;
- implementation of suitable alternative products, methods and strategies, including resistance management strategies to ensure the continuing effectiveness of these alternatives;
- measures to strengthen health care and to reduce the incidence of the disease.

3.2.6 General obligations

The Convention sets forth a number of obligations that the Parties shall or which they are encouraged to undertake. These obligations, described briefly below, are set forth in different articles of the Convention.

3.2.6.1 National focal point

Under the Convention, each Party is required to designate a national focal point, whose role is to facilitate exchange of information on POPs and their alternatives.

3.2.6.2 Information exchange

Each Party is to facilitate or undertake exchange of information relevant to reduction or elimination of production, use and release of POPs, and POPs alternatives. The Secretariat shall serve as a clearinghouse mechanism for information on POPs, including information provided not only by Parties, but also by intergovernmental and non-governmental organizations. Health and safety information pertaining to humans and the environment shall not be regarded as confidential.

3.2.6.3 Technical assistance

The Convention requires that Parties establish, as appropriate, arrangements for the purpose of providing technical assistance and promoting the transfer of technology to developing country Parties and Parties with economies in transition relating to the implementation of the Convention. The Convention's language appears to indicate that this is a developed country responsibility toward developing countries and those with economies in transition. The Convention further states that these arrangements shall include regional and sub-regional centres for capacity building and transfer of technology to assist developing country Parties and Parties with economies in transition.

3.2.6.4 Public information, awareness and education

Each Party is required, within its capabilities, to promote and facilitate public participation, consultation and education. Strategies and mechanisms will need to be sensitive to social and cultural norms but, at the same time, be effective in advancing public awareness, particularly of hazards and risks associated with banned products (including stockpiles) and the permitted production and use of persistent organic pollutants. Community and culturally based behaviours may contribute to the loading of persistent organic pollutants; therefore, public education, cooperation and support may be essential for successful reduction efforts.

Article 10 further specifies obligations of the Parties with respect to promoting and facilitating information, awareness and education with respect to POPs and their alternatives, including:

- awareness among policy and decision makers;
- provision of information to the public;
- development and implementation of educational, training and public awareness programs (with emphasis as per Article 10.1(c) on programs geared to women, children and the least educated);
- public participation in developing and implementing measures to address POPs; and
- training and development programs for stakeholders.

3.2.6.5 Research, development and monitoring

The Convention provides general direction with regard to research and development activities by encouraging cooperative efforts at regional and international levels to gain economies of effort by avoiding duplication and to allow all Parties to tap into information for which it may lack the requisite resources or expertise to gather on its own. The goal is for development of research and monitoring strategies that can be pursued either by an individual Party alone, or cooperatively with other Parties.

Inventory information and monitoring to track environmental impact is required to provide information that can be used to gauge progress or regression in reducing the priority chemicals. The Convention lists the following inventory and monitoring needs:

- sources and releases to the environment;
- presence, levels and trends in humans and the environment;
- transport, fate and transformation;

- socio-economic and cultural impacts;
- tracking of reduction and elimination efforts; and
- harmonized methodologies for making inventories of generating sources and analytical techniques for the measurement of releases.

3.2.7 Reporting requirements

In addition to developing and acting on the Implementation Plan and delivering the plan to the Conference of the Parties as prescribed in Article 7, each party is required, as per Article 15, entitled "Reporting," to provide "at periodic intervals" to the Secretariat, statistical data on total (or reasonably estimated) quantities of production, import and export of each of the chemicals listed in Annex A and Annex B. A list of the States from which the party has imported each substance, and the States to which it has exported each substance is required, where practicable. The length of reporting intervals will be determined by the Conference of the Parties.

Specific reporting requirements include the following:

- Paragraph (g) of Part II to Annex A requires, pursuant to Article 15, the review every five years of progress in eliminating PCBs and reporting to the Conference of the Parties.
- Subparagraph 1(a)(v) of Article 5 requires, pursuant to Article 15, the review every five years of action plan strategies and their success of meeting Convention obligations with respect to Annex C substances.
- Under Article 10, Parties are encouraged to facilitate exchange of information relative to the reduction or elimination of the production, use, and release of POPs.
- Under Article 11, Parties are encouraged to incorporate research and development and monitoring actions as part of the national implementation plan to support the control of persistent organic pollutants.

3.2.8 Evaluation of effectiveness of the Convention

Article 16 of the Convention stipulates that the Parties are to conduct an evaluation of the effectiveness of the Convention four years after its entry into force. While specific criteria for evaluation are to be finalized by the first Conference of the Parties, the Convention does state that this evaluation will be based on monitoring data required under Article 16.

3.2.9 Financing

Provision is made for financing the costs associated with developing the capacity and establishing the programs and measures to implement the specific measures of the Convention.

The Conference of the Parties, at its first meeting, to be held within one year of ratification of the Convention, will determine which entity or entities shall participate in a financial mechanism for the provision of adequate and sustainable financial resources to assist developing country Parties and Parties with economies in transition in their implementation of the Convention. Such resources are to be provided on a grant or concessional basis. The mechanism selected, in addition to the entity(ies) selected to operate it, may include other entities providing multilateral, regional and bilateral financial and technical assistance. The Convention promotes multiple-source funding approaches, mechanisms and arrangements.

Projects will be **country driven** and should emphasis **cost-effectiveness** so as to maximize global benefits.

Each Party may also undertake to provide, within its capabilities, financial support and incentives in respect of national activities. Although not overtly stated, the provisions relating to creation of implementation and action plans on a regional basis provide a mechanism by which nations with common interests with regards to meeting their obligations under the convention can maximize resources, both financial and intellectual.

Long-term financing will be entrusted to one or more entities, including existing international entities, to be decided by the Conference of the Parties, under whose authority the fund shall be managed.
Under the terms of the Convention, developed country Parties are charged with providing new and additional financial resources to enable developing countries and EITs to meet their costs in implementing the agreement. A process by which this shall occur has not yet been elaborated.

3.2.9.1 GEF Interim Financial Mechanism

The *Global Environment Facility or GEF* has been named as the interim financial mechanism for the Convention. The fund is managed by three implementing agencies (IAs): the World Bank; the United Nations Environment Program (UNEP); and the United Nations Development Program (UNDP). The GEF shall operate the fund set aside for provision of capacity building funds through operational measures specifically related to POPs.

3.3 Typical steps required to implement the Stockholm Convention

Taken as a whole, the Stockholm Convention provides a **framework agreement** that lays the groundwork for a basic program for the Parties to manage and control persistent organic pollutants, and, ultimately, toxic substances. Its specific requirements, taken in operational sequence, ***constitute the development of the major components of a complete environmental protection program***. These components include the following:

- creation and maintenance of inventories of POPs sources;
- monitoring emissions and releases;
- tracking imports and exports of dangerous chemicals;
- hazard assessment;
- risk management;
- development of controls (via legislation/voluntary initiatives);
- compliance promotion, training, inspection and enforcement;
- reporting and evaluation;
- supporting research; and
- public communications, participation and education.

Convention provisions and potential requirements for expertise and services are noted in Table 5.

Table 5. Convention provisions and potential requirements for expertise and services

Convention Requirement	Specific Provision	Expertise/Service Potentially Required
Steps to prohibit the Intentional Production and Use of Annex A chemicals	3, a	• Inventory of Production Sources and Uses • Development of Production Prohibitions • Development of Import and Export Controls • Development of Administrative Monitoring and Tracking Systems • Socio-economic Impact Analysis
Listing of Exemptions to Annex A	Annex A Part I	• Identification of Production or Use Requirement • Production Process Engineering Expertise • Pesticides • Risk Analysis • Registering Exemptions
PCB – elimination, storage, disposal,	Annex A Part II	• Inventory of Production and Use • Development of Controls – production, use, storage, import/export, disposal • Chemical Assessment/Analytical Support • Administration and Tracking
Steps to reduce the Production and Use of Annex B chemicals	3, b	• Same as Above
DDT – phase out and replacement	Annex B Part II	• Inventory of Production Sources and Uses • Risk Analysis • Register Production and Use Exemption • Public Health Survey/ Epidemiology • Development of Additional Use and Controls • Administration and Tracking • Testing of Alternatives • Research and Monitoring [if applicable]
Reduce, Prevent and/or Eliminate Unintentional Production of and Use of Products containing PCDD/ HCB/ PCB	5,a-g Annex C Part II	• Inventory of Potential By-product Formation By Source Sectors / Sector Specialists for Incinerators, Cement Kilns, Pulp/Paper, Metals Sector, including, iron/steel, copper, zinc, aluminium production; Process engineering specialists • Stack Testing and Analytical Support • Pollution Prevention Sector Specialists • Waste Disposal • Regulatory Review and Gap Analysis / Legal-Institutional Review • Identification/Application of Best Environmental Techniques (BET) or Best Available Practices (BAT) • Training • Administration and Tracking
Stockpiles and Wastes	6, 1-2	• Inventory of Stockpiles and Wastes • Develop Programs for Management of Stockpiles, including storage, labelling, record keeping, transportation, disposal regulations • Administration and Tracking • Identification of Contaminated Sites • Soil Sampling and Analysis • Estimate Remediation Costs / Socio-economic

Convention Requirement	Specific Provision	Expertise/Service Potentially Required
	6, 1-2	Analysis • Selection of Remediation Technology • Medium- and Large-scale Project Management
Public Information, Awareness, Education	10, 1-5	• Development of Appropriate Communication Strategies • Development of Appropriate Informational Materials • Implementation of Public Awareness Initiatives • Training Programs / Workshops for Decision-Makers in Private and Public Sectors • Educational Programs for Delivery through School System • Identification of High-risk Populations [e.g. production workers or pesticides makers and applicators] • Tailored Information and Training Programs for High-risk Populations • Development of Public Reporting and Information Accessibility Initiatives
Research and Development and Monitoring	11, 1-2	• Development of POPs Research Strategy • Identification of appropriate objectives • Implementation of Research Strategy via partnerships with universities, industrial associations, international organizations • Seek and Create Information Exchange Venues • Capacity Building for Research and Monitoring
Financial Resources and Mechanisms	13, 1-8	• Development of a Resource Strategy • Development of Applications to Global Environmental Facility (GEF), World Bank and other Funding Institutions • Development of Partnerships, Consortia etc.