United Nations

UNITED NATIONS

ENVIRONMENT PROGRAMME

UNEP

Inventory of World-wide PCB Destruction Capacity

First Issue
December 1998

Prepared by UNEP Chemicals in co-operation with
the Secretariat of the Basel Convention (SBC)

IOMC

INTER-ORGANIZATION PROGRAMME FOR THE SOUND MANAGEMENT OF CHEMICALS

A cooperative agreement among UNEP, ILO, FAO, WHO, UNIDO, UNITAR and OECD

The publication is intended to serve as a first guide on available PCB destruction facilities. While the information provided is believed to be accurate, UNEP disclaim any responsibility for the possible inaccuracies or omissions and consequences which may flow from them. Neither UNEP nor any individual involved in the preparation of this report shall be liable for any injury, loss, damage or prejudice of any kind that may be caused by any persons who have acted based on their understanding of the information contained in this publication.

The designation employed and the presentation material in this report do not imply any expression of any opinion whatsoever on the part of the United Nations or UNEP concerning the legal status of any country, territory, city or area or any of its authorities, or concerning any delimitation of its frontiers or boundaries.

This publication was developed under contract with AEA Technology Environment. Any views expressed in the document do not necessarily reflect the views of UNEP.

The photo on the cover page is taken from the UNEP/SBC pilot project in Côte d'Ivoire, 1997.

This publication is produced within the framework of the Inter-Organization Programme for the Sound Management of Chemicals (IOMC)

The Inter-Organization Programme for the Sound Management of Chemicals (IOMC), was established in 1995 by UNEP, ILO, FAO, WHO, UNIDO and OECD (Participating Organizations), following recommendations made by the 1992 UN Conference on Environment and Development to strengthen cooperation and increase coordination in the field of chemical safety. In January 1998, UNITAR formally joined the IOMC as a Participating Organization. The purpose of the IOMC is to promote coordination of the policies and activities pursued by the Participating Organizations, jointly or separately, to achieve the sound management of chemicals in relation to human health and the environment.

UNEP
CHEMICALS

Preface

PCBs are chemical substances which are persistent, bioaccumulate and pose a risk of causing adverse effects to human health and the environment. It is widely accepted that the use of such persistent, bioaccumulating and toxic substances cannot be considered a sustainable practice. However, for different social and economic reasons such substances are still in use and/or released to the environment. With the evidence of long-range transport of these substances to regions where they have never been used or produced and the consequent threats they pose to the environment of the whole globe, the international community has called for urgent global actions to reduce and eliminate releases of these chemicals.

UNEP's Governing Council, at its nineteenth session in February 1997 concluded that international action, including a global legally binding instrument, is required to reduce the risks to human health and the environment arising from the release of the 12 POPs (PCBs, dioxins and furans, aldrin, dieldrin, DDT, endrin, chlordane, hexachlorobenzene, mirex, toxaphene, and heptachlor). It requested UNEP to prepare for and convene by early 1998 an intergovernmental negotiating committee (INC), with a mandate to prepare an international legally binding instrument for implementing international action beginning with the 12 POPs. The UNEP Governing Council also requested UNEP to initiate a number of immediate actions involving development and sharing of information; evaluation and monitoring of the success of implemented strategies; alternatives to POPs; identification of sources of dioxins and furans and aspects of their management; identification and inventories of PCBs; and the worldwide available PCB-destruction capacity;

To promote development and sharing of information on the twelve specified POPs, UNEP has established a network of government designated focal points for exchanging technical information and obtaining expertise for the development of various products. By the end of 1998, 88 governments had designated 168 such focal points.

Information on available PCB-destruction facilities has been collected from UNEP’s POPs focal points during 1998 and has together with data from other sources, notably from the Secretariat of the Basel Convention (SBC) been incorporated into this inventory of the worldwide capacity to destroy PCBs. The inventory lists facilities that can store, handle and dispose of PCBs in various forms, and should provide a useful tool for national authorities and others concerned with the management of PCBs.

The inventory has been prepared under contract by the AEA Technology Environment, Culham, Abingdon, OX14 3DB, in the United Kingdom. Any views expressed in the document do not necessarily reflect those of UNEP Chemicals or the Secretariat of the Basel Convention.

UNEP would like to thank donor countries, especially the USA, for their contributions through which the production of this document was made possible. UNEP also thanks government contact points and others who contributed information to the inventory.

This document provides a first attempt to explore the issue of the worldwide capacity to destroy PCBs. Depending on the availability of resources further work will be undertaken to complete and update this inventory and complement it on the wider issue of the environmentally sound management of PCBs.

Klaus Töpfer
Executive Director
United Nations Environment Programme

Click on heading or subheading to go to relevant page

1 Executive Summary

Information on the Worldwide PCB Destruction Capacity has been collected from questionnaires returned by UNEP POPs Focal Points. The questionnaire responses provide a useful body of information on the available facilities in Europe and Asia-Pacific. Few facilities were identified in Africa and Latin America, but a more complete response from these regions may not have identified many more facilities. Facilities in the USA and Canada were identified by the Focal Points to supplement the information in the low number of returned questionnaires. The very limited response from the new independent states of the former Soviet Union may not properly reflect the availability of facilities in that region.

Wastes and waste equipment accepted at the identified facilities are indicated in Tables. Incineration is the commonest method of waste destruction, in either purpose-built hazardous waste incinerators, and, in some countries, in cement kilns. Public acceptance of incineration is not universal and other methods of PCB destruction have started to be established commercially.

A summary of the available technology for treatment of PCB and PCB-containing wastes is included to assist the reader.

On a global scale, the main problem in dealing with remaining waste PCBs and PCB-containing waste equipment is not the availability of technology, or of destruction facility capacity, but of identifying waste inventories (in some countries), and planning and financing their destruction.

2 THE INVENTORY

This Inventory has been prepared for the United Nations Environment Programme (UNEP) with the aim of assisting readers who are involved in the management of certain organochlorine-containing wastes, either directly in the disposal / treatment of identified wastes or in regional waste management planning. The readership will include waste regulators, waste producers, and waste handling and disposal companies. The specific wastes considered are polychlorinated biphenyls (PCBs) and PCB-containing wastes and waste equipment. The Inventory presents information obtained during the study on established facilities for the management of these wastes. Many of these facilities treat, or are capable of treating, a wider range of chlorinated organic substances, and other wastes.

UNEP's involvement in the management of PCB wastes within the Persistent Organic Pollutants (POPs) Programme is described in **Background**. The reasons for the concern over the environmental impacts of PCBs and hence the need to ensure their proper disposal will be well known to many readers, but are summarised for completeness.

The majority of the information on PCB destruction capacity included within the Inventory was collected by means of a **Questionnaire**. The contents of the questionnaire are described in Section 4, as are the processes of information collection by UNEP and information analysis by the contractor.
Decontamination processes for PCB-contaminated equipment and processes for PCB destruction are described in **Sections 5 and 6** to enable the reader to understand the nature of the processes identified in the Inventory. These Sections concentrate on established processes for treatment and destruction of these wastes. In both Sections, the processes are compared to assist readers in judging the suitability of each process for particular wastes. **Section 7** identifies the importance of considering waste storage and transport as part of the management of these wastes.

Worldwide capacity for PCB destruction is described in **Section 8**, which forms the main part of the Inventory, and is based on the responses to the questionnaire. A regional approach has been adopted to assist in the judgement of the availability of particular technology options for identified waste. Contact Points for facilities for which questionnaires were received, and for additional facilities in Germany, Canada and USA, are provided.

The main conclusions from the study are provided in **Section 8**.

A copy of the Questionnaire and a List of Information Sources are provided in **Appendices** together with Technical Guidelines on wastes comprising or containing PCBs, PCTs, and PBBs prepared by the Technical Working Group of the Basel Convention.

3 BACKGROUND

Persistent Organic Pollutants (POPs) are chemical substances which are extremely stable, and are known to accumulate in biological tissue thereby posing a risk of adverse effects to human health and the environment. With the evidence of long-range transport of these substances to regions where they have never been used or produced and the consequent threats they pose to the global environment, the international community has on several occasions called for urgent global actions to reduce and eliminate releases of these chemicals. For example, the UNEP Governing Council, in addressing actions needed on POPs at its nineteenth session in January 1997, concluded that international action is required to reduce the risks to human health and the environment arising from the release of twelve specified POPs, including polychlorinated biphenyls (PCBs). UNEP has initiated a number of immediate actions involving development and sharing of information on the available destruction capacity for POPs, and other issues.

Polychlorinated biphenyls (PCBs) are a class of chlorinated hydrocarbons that have been used extensively since 1930 for a variety of industrial uses. They consist of two benzene rings joined by a carbon-carbon bond, with chlorine atoms substituted on any or all of the remaining 10 carbon atoms. PCBs include mobile oily liquids and hard transparent resins, depending on the degree of substitution. The value of PCBs derives from their chemical inertness, resistance to heat, non-flammability, low vapour pressure and high dielectric constant. As electricity came into widespread use during the first half of this century, equipment suppliers became major users of PCBs. Major applications were as coolants in transformers and dielectrics in capacitors.

The uses of PCBs can be classified as either closed or open. In **closed applications** it was the intention to prevent any loss of PCB by containment within a sealed unit. Contamination of the environment is then consequent upon equipment leaks, for example as a result of a fire. In **open applications** the PCBs are exposed to the environment, and some loss to the environment is inevitable. The major closed applications were as coolants in transformers and dielectrics in capacitors. PCBs were also included in the formulation of a wide range of products including: lubricants, cutting oils, sealing compounds (for the construction industry), adhesives, plastics and rubbers, insecticides, and in paint, varnishes, and other surface coatings including carbonless copying paper.

Between 1929 and 1989, total world production of PCBs (excluding the Soviet Union) was 1.5 million tonnes - an average of about 26,000 tonnes per year. Even after the US banned the manufacture, sale, and distribution of PCBs except in "totally enclosed" systems in 1976, world production continued at 16,000 tonnes per year from 1980-1984 and 10,000 tonnes per year from 1984-1989.

Many of the characteristics that make PCBs ideal for industrial applications create problems when they are released into the environment. The effects on humans and the environment primarily follow chronic exposure. Like many other chlorinated hydrocarbons, PCBs associate with the organic components of soils, sediments, and biological tissues, or with dissolved organic carbon in aquatic systems. PCBs volatilize from water surfaces in spite of their low vapour pressure, and partly as a result of their hydrophobicity. The chemical properties of PCBs favour their long range transport, and PCBs have been detected in arctic air, water and organisms. There is growing evidence linking PCBs and other persistent halogenated aromatic hydrocarbons to reproductive and immunotoxic effects in wildlife. Effects on the liver, skin, immune system, reproductive system, gastrointestinal tract and thyroid gland of laboratory rats have been observed and PCBs are classified as probable humans carcinogens (Group 2A) by the International Agency for Research on Cancer (IARC).

Despite the cessation of production in many countries from the mid 1970s, PCBs continue to be a pollutant of major concern on an international scale. There is still a substantial amount of PCB in use. This results from the long lifetimes of equipment such as transformers, and the exemption given in many countries for contained

use, at least for an initial period after imposing a production ban. There are quantities in storage awaiting disposal or at relatively high concentration in soils. Furthermore, there are indications that the production of PCBs has not completely stopped in all countries.

In addition to management programmes undertaken by individual countries and the global POPs convention presently under discussion, a number of international instruments have been developed to control dispersion of PCBs into the environment and to promote the environmentally sound management of PCBs. These include:

North Sea Conference members (Belgium, Denmark, France, Germany, Netherlands, Norway, Sweden, and United Kingdom)	Agreement to phase out and destroy the remaining PCBs in use by 31 December 1999
The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989)	Global Legal instrument concerning the environmentally sound management of hazardous wastes, including PCBs, and the control of their transboundary movements. As of 1 December 1998, 121 States and 1 Economic Integration Organization were Contracting Parties to the Basel Convention.
Washington Declaration, Nov 1995 (100 national governments)	Agreement to a Global Programme of Action to phase out POPs, including PCBs
Directive EC96/59 of the European Communities on the elimination of PCBs and PCTs and the phase out by the year 2010	Directive EC/96/59 of the European Council on the elimination of PCBs and PCTs. Aims at harmonizing EU member States legislation concerning the management of PCBs and PCTs in view of their progressive phase out by year 2010.
A new Protocol (1998) on Persistent Organic Pollutants (POPs) to the United Nations Economic Committee for Europe (UNECE) Convention on Long-range Transboundary Air Pollution (LTRAP)	42 countries in the northern hemisphere and the European Community will all be free to sign the POPs Protocol, which covers 16 substances including PCBs. The basic obligations of the Protocol stipulate a wide range of actions ranging from production and use bans and phase-outs, restricted uses and emission controls, and conditions for the disposal of POPs.