INFORMATION DOSSIER

FOR THE REASSESSMENT OF PRODUCTION AND USE OF

POLYCHLORINATED TERPHENYLS (PCTs)

UNDER THE
UNITED NATIONAL ECONOMIC COMMISSION FOR EUROPE
PROTOCOL ON PERSISTENT ORGANIC POLLUTANTS (POPs)

PREPARED FOR TECHNICAL REVIEW BY THE

UNITED NATIONAL ECONOMIC COMMISSION FOR EUROPE
TASK FORCE ON PERSISTENT ORGANIC POLLUTANTS (POPs)

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EXECUTIVE SUMMARY

Protocol Requirement
Under the UNECE POPs Protocol (Annexes I and II), the Parties agreed to reassess the production and use of Polychlorinated Terphenyls (PCTs) by December 31, 2004.

Context
During negotiations of the UNECE POPs Protocol, it became evident that the definition of Polychlorinated Biphenyls (PCBs) sometimes differed between the European Union and other UNECE countries. In the European Union, PCTs are included in certain legislation together with Ugilec under the definition of PCBs. However, Canada and the United States (US) have chemically specific definitions, such that “PCBs” includes only isomers of polychlorinated biphenyls and “PCTs” includes only isomers of polychlorinated terphenyls. As a result, the UNECE POPs Protocol considers “PCBs” to be only isomers of polychlorinated biphenyls, and production and use of PCTs and Ugilec will be reassessed.

PCTs have the chemical formula $C_{18}H_{14-n}C_{ln}$, in which $n$ is the number of chlorine atoms, which can range from 1-14. The physical and chemical properties of PCTs are very close to those of PCBs, differing only in the addition of a phenyl ring for PCT. PCTs have also been used as PCB substitutes. Over eight thousand different congeners of PCTs theoretically exist, which is forty times greater than the 209 possible PCB congeners. PCTs are yellow resins that have a number of qualities which make them useful for industrial purposes.

Conclusion Regarding Production and Use of PCTs
Polychlorinated terphenyls were produced in four UNECE countries - the United States, France, Germany and Italy. The only other known historical producer of PCTs is Japan. Total global production of PCTs is estimated to have been 60,000 metric tonnes between 1955 and 1980. Production quantities of PCTs were 15-20 times less than the chemically similar PCBs.

Production of PCTs is not known to occur anywhere since the early 1980s and there is no known current production of PCTs in the UNECE region.

Polychlorinated terphenyls are known to have been used historically in several UNECE countries (Canada, US, Austria, Bulgaria, France, Germany, Italy, Latvia, Monaco, Spain and Sweden). Experts in a few countries indicate that PCTs have never been used (Cyprus, Czech Republic, Lithuania, Norway and Slovakia). In the majority of responding countries, historical use of PCTs is unknown due to insufficient information. However, historical PCT use in these countries is possible or even probable, given its wide range of applications, and its use as a PCB substitute in many products up to the 1970s and longer.
PCTs are not known to be currently used in the UNECE region. However, similar to PCBs, they may be found in old existing electrical capacitors, transformers and other equipment, or as constituents or contaminants of some existing products and treated materials.

Based on the questionnaire responses, UNECE countries in North America, ongoing and new members of the EU, as well as Monaco, Norway, and Switzerland have taken, or are required to take, measures to ensure destruction or disposal of PCTs in an environmentally sound manner, and to ensure that the transboundary movement of PCTs is conducted in an environmentally sound manner. In these countries, there are no known stockpiles of PCTs, and measures to destroy and/or dispose of PCTs are similar to measures to destroy and/or dispose of PCBs.

In other non-EU countries, the existence of PCT stockpiles is unknown in Armenia, Bulgaria, Georgia, Kazakhstan, the Republic of Moldova and Turkey; and there are no stockpiles in Croatia. Armenia, Bulgaria, Croatia, Georgia, the Republic of Moldova and Turkey either have or are developing national laws and regulations for disposal and transboundary movement of hazardous wastes in an environmentally sound manner. Bulgaria and the Republic of Moldova are following the EU Directive regarding PCT disposal. Disposal measures for PCTs are unknown for Kazakhstan.

All Parties to the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP) have ratified the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (with the exception of the United States, which is a Signatory). Therefore, notwithstanding current disposal measures, all UNECE CLRTAP members are required to ensure that destruction or disposal and/or transboundary movement of PCT wastes are conducted in an environmentally sound manner, as part of their obligations under the Basel Convention, and in the United States as part of stringent national regulations.

Based on the questionnaire responses, UNECE members in North America, ongoing and new members of the EU, Norway and Switzerland, have taken or are taking measures to directly prohibit or effectively control production and use of PCTs, through regulations on production and/or marketing, use, and import. In addition, Armenia, Croatia, Georgia, Monaco, the Republic of Moldova and Turkey also have taken actions to control production and use of PCTs. Control actions are not in place in Bulgaria and are unknown in Kazakhstan. Most UNECE countries taking control actions have an exemption of PCT use for scientific research and/or analytical purposes.

PCTs are controlled in a number of international agreements: the Basel Convention on Control of Transboundary Movements of Hazardous Wastes and their Disposal; the OECD Red Tier List of Wastes; the Rotterdam Convention on Prior Informed Consent (PIC); and the Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal.

Number of responding countries to Questionnaires
Thirty-two UNECE members responded to Questionnaires requesting information on production and use of PCTs:

**Parties to the UNECE POPs Protocol:** Austria, Bulgaria, Canada, Czech Republic, Denmark, Finland, France, Germany, Luxembourg, Republic of Moldova, The Netherlands, Norway, Slovakia, Sweden, Switzerland

**Signatories to the UNECE POPs Protocol:** Armenia, Belgium, Croatia, Cyprus, European Community, Ireland, Italy, Latvia, Lithuania, Poland, Spain, United Kingdom of Great Britain and Northern Ireland, United States of America

**Parties to the UNECE Convention on Long-Range Transboundary Air Pollution:** Georgia, Kazakhstan, Monaco, Turkey
1 INTRODUCTION

1.1 Protocol requirement

Under the UNECE POPs Protocol (Annexes I and II), the Parties agreed to reassess the production and use of Polychlorinated Terphenyls (PCTs) by December 31, 2004.

1.2 Context for reassessment

During negotiations of the UNECE POPs Protocol, a Designated Expert meeting on POPs in Rome, Italy from March 24-26, 1997 proposed that PCBs be defined under the UNECE POPs Protocol in accordance with EU Directive 96/59/EC, to mean:
- Polychlorinated biphenyls;
- Polychlorinated terphenyls (PCTs);
- “Ugilec”: monomethyl-tetrachlorodiphenol methane, monomethyl-dichlorodiphenyl methane, monomethyl-dibromo-diphenyl methane;
- any mixture containing any of the above mentioned substances in a total of 0.005% by weight.

Canada and the US objected to this definition because their jurisdictions have a more chemically specific definition and “PCB” includes only isomers of polychlorinated biphenyls. The other compounds (PCTs and ugilec) included in the definition of PCBs in certain European Union legislation, would be viewed as separate chemical entities in Canada and the US. In these two countries, PCTs and Ugilec have either not been regulated or are regulated in a different manner than PCBs.

During subsequent negotiations of the POPs Protocol, a compromise was reached. Under Annexes I and II of the UNECE POPs Protocol, only isomers of polychlorinated biphenyls are considered PCBs, and production and use of PCTs and Ugilec will be assessed under the Protocol by the end of 2004.

1.3 Chemical Information

Common Name  Polychlorinated Terphenyls (PCTs)

Other Names  Polychloro Terphenyls or Polychloroterphenyls

CAS No.  61788-33-8

Chemical Type  Polyhalogenated Organo Compound

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1 In its regulatory documentation, the United States Environmental Protection Agency refers to CAS No. 61788-33-8 as “chlorinated terphenyls”. For consistency, this dossier will use the term polychlorinated terphenyls (PCTs).
Chemical Formula  Chemical formula can be given as \( \text{C}_{18n} \text{H}_{14-n} \text{Cl}_n \), in which \( n \) is the number of Chlorine atoms, which can range from 1-14.

Chemical Structure  The physical and chemical properties of PCTs are very close to those of PCBs, differing only in the addition of a phenyl ring for PCT. Over eight thousand different congeners of PCTs theoretically exist \([12, 20]\)\(^2\), which is forty times greater than the 209 possible PCB congeners \([20]\).

Characteristics of PCTs For Commercial Use

Polychlorinated Terphenyls (PCTs) are yellow resins that have a number of qualities which make them useful for industrial purposes. These qualities are similar to Polychlorinated Biphenyls (PCBs), and PCTs have also been used as PCB substitutes. PCT products contain small amounts of PCBs, generally 0.5% but up to 10% \([1]\).

Characteristics of PCTs include: very low electrical conductivity and extremely high resistance to thermal breakdown; insolubility in water, but soluble in various organic solvents and oils; resistance to attack by corrosive chemicals such as alkalies and strong acids; heat stability and non-flammability. PCTs have been used in both closed systems, such as electric transformers, and open-ended applications, such as lubricating and cutting oils.

The main uses of PCTs have been as \([1, 3]\):

- plasticizers in synthetic resins, adhesives, lubricants, paper coatings, investment casting waxes, printing inks, carbonless copying paper, sealants - e.g., for concrete stave silos - and caulking compounds;
- fire-retardants;
- vapour suppressants to extend the kill-life of insecticides;
- coatings to render fabric flame-proof, rot-proof and water-repellent, and in the manufacture of brake linings, abrasives for grinding wheels, lacquers, varnishes and paints;
- impregnants for braided cotton and asbestos insulation, in electrical wire and cable coatings, and as dielectric sealants;
- PCT-containing waxes used in making dental casts, costume jewellery and precision-cast aircraft parts.

1.4  Methodology

**UNECE ad hoc Expert Group on POPs**

Following adoption of the POPs Protocol in 1998, Parties to the Convention felt that some further assessment work on POPs would be appropriate prior to entry into force of

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\(^2\) Throughout this document, references are included in square brackets \([ \) and are numbered in chronological order of publication.
the Protocol. To this end the UNECE Executive Body established an ad hoc Expert Group on POPs (Expert Group). At the first meeting of the Expert Group, held in The Hague on November 6-8, 2000, Canada volunteered to develop an information dossier and to lead a review of the requirements of PCTs as set out in the Protocol.

A literature search was conducted in Spring 2001 of publicly available information on the production, use and control of Polychlorinated Terphenyls (PCTs) within the UNECE region. A first draft of the PCT information dossier (entitled Working Draft no. 1) was circulated to members of the Expert Group for comment in July 2001. Also included was a request for country-specific information on production and use of PCTs, through an accompanying questionnaire (PCT Questionnaire No. 1): Review of Information on the Production and Use of Polychlorinated Terphenyls (PCTs) in the UNECE Region.

A revised draft was presented at the second meeting of the ad hoc Expert Group on POPs in Torun, Poland October 24-26, 2001. Subsequent to the second Expert Group meeting, additional information was received on UNECE country-specific production and use of PCTs through a February 2002 questionnaire coordinated by the Secretariat (PCT Questionnaire No. 2): Questionnaire on the Use and Production of POPs and Other Substances in the UNECE Region. Twenty-seven UNECE countries responded to this questionnaire.

The final PCT information dossier [56] was presented to the Expert Group at its third meeting in June 5-6, 2002 in Geneva, Switzerland. This meeting also completed a summary report to the UNECE Working Group on Strategies and Review [57], including PCTs, as part of a compendium of information on the existing obligations for substances listed in the Protocol on POPs.

**UNECE Task Force on POPs**

Following the entry into force of the UNECE POPs Protocol in October 2003, the Executive Body established the Task Force on POPs in December 2003. The workplan of the Task Force indicates that, among other activities, it will discuss and prepare elements of technical reviews regarding the scheduled use reassessments, evaluations and reviews, taking into account the results of the work conducted by the former Expert Group on POPs, for submission to the Working Group on Strategies and Review in 2004.

At its first meeting in The Hague, The Netherlands March 1-3, 2004, the Task Force on POPs agreed that, while the Expert Group’s existing dossiers provide a good basis for starting the necessary reviews / re-assessments, further work was required. The revised dossiers would be prepared according to an agreed-upon structure and timetable, for presentation and completion at the second meeting of the Task Force on POPs in Prague, Czech Republic in May 31-June 3, 2004. Canada agreed to continue as the lead expert on reassessment of PCTs and would take responsibility for updating and rewriting the dossier.

A key component of the revised dossier is inclusion of additional input received in the
March 2004 version of the questionnaire (PCT Questionnaire No. 3), entitled the Questionnaire on the Use and Production of POPs Subject to Review and Reassessment under the Protocol in the UNECE Region.

2 PRODUCTION, USE AND CONTROL ACTION IN THE UNECE REGION

2.1 Production

PCT production occurred over the same period as PCB production, but during that time production quantities of PCBs were 15-20 times those of PCTs. Between 1955 and 1980, total global production of PCTs is estimated to have been 60,000 metric tonnes [20].

Historical Production in the United States

In the United States, PCTs were manufactured by Monsanto Industrial Chemicals Company under the Aroclor product line, starting in 1929. Monsanto also produced a hydraulics/lubricant product called Pydraul which sometimes contained PCTs [1]. Another Monsanto product, Montar 5, might also have contained PCTs [1, 3].

Monsanto was the leading (and probably only) US producer of PCTs [1]. In the Aroclor series, “pure” terphenyls-only products were indicated by 54 in the first two places of the four digit product code (e.g., Aroclor 5432, 5442 and 5460), with the last two digits representing the weight percentage of chlorine [13]. Some other Aroclor products contained PCB-PCT blends.

Monsanto's total PCT production from 1959-1972 was about 50,000 metric tonnes [6], equal to 15% of its PCB production during that time [13]. PCT production peaked in 1971 at 9,200 metric tonnes/year [5] and was voluntarily terminated by the company in 1972 [1] because concerns had arisen over the environmental effects of the chemically similar PCBs and because all uses were dispersive [3]. Consequently, there has been no known production of PCTs in the United States since 1972 [28].

Historical Production in Europe

In Europe, there were several manufacturers of PCTs [1, 6, 8]:

- **Germany** - PCTs were produced by Bayer under the Tradenames Leromoll and Clophen Harz (W), up to 1974 [23] or 1977;
- **Italy** - PCTs were produced by Caffaro under the Tradename Cloresil (A, B, 100), between 1948 and 1978 [33, 80];

3 Several PCTs are listed on the 1978 Toxic Substances Control Act (TSCA) Inventory of existing chemical substances. Under TSCA Section 8(a), any new production of PCTs must be reported (49 FR 11181, March 26, 1984). Since no reports have been received under this regulation, no production or importation appears to be ongoing. However, an unqualified statement that PCTs are not produced in the US is not possible since there are certain exemptions to the reporting obligations (e.g., for research and development, small manufacturers, by-products and impurities) [73].
• **France** - PCTs were produced by Produits chimiques ugine Kuhlman under the Tradenames Electrophenyl T-60 and Phenoclor, 1966 to 1980 [22].

Total production at one French facility was 4,000 metric tonnes, with no information available on other facilities [22]. Production figures for the French product Electrophenyl T-60 from 1976, 1977, and 1978 were 587, 685, and 600 metric tonnes, respectively [6]. Production in Italy was 2,500 metric tonnes [80]. Kimbrough, 1980 [3] found no production or sales figures published for the other European manufacturers.

**Historical Production in Other Regions**

Outside of the UNECE region, the Japanese company Kanegafuchi produced PCTs under the Tradename Kanechlor C from 1955 up to 1972 [1]. Total production of PCTs in Japan during this period was about 2,700 metric tonnes [6].

By 1984, the US Environmental Protection Agency (EPA) stated that production of PCTs was not known to occur anywhere [5]. There is no evidence in the literature that PCTs have ever been manufactured in any other country than those listed in this document: the United States of America, Germany, Italy, France and Japan.

**Current Production in the UNECE Region**

Through the Questionnaires, UNECE Country Experts confirm that:

1) PCTs are no longer produced in France, Germany and Italy, and are no longer known to be produced in the United States;

2) PCTs have never been produced in Armenia, Austria, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Finland, Georgia, Lithuania, Republic of Moldova, Kazakhstan, Latvia, Norway, Poland, Slovakia, Spain or Sweden;

3) Historical production of PCTs is unknown in Belgium, Denmark, Ireland, Luxembourg, Monaco, The Netherlands, Switzerland, Turkey and the United Kingdom. There is no current production in these countries (except Luxembourg – current production unknown).

**2.2 Use**

**Canada**

In Canada, PCTs were imported and used commercially, although quantities are unknown. Documented historical uses of PCTs were as pressure sensitive adhesive for weather-strip backing, as plasticizers for urethanes, and in paints. All uses of PCTs were terminated in the mid-1970s [1].

**United States**

Before 1973, PCT use in the United States was mainly as a plasticizer in adhesives, inks, sealants, caulking compounds and waxes [3, 5, 28]. After Monsanto ceased production of PCTs in 1972, use continued in the US through imported PCTs, mainly for waxes for investment casting [5]. Chlorinated terphenyl was last imported in the US in November 1979, when the only US importer decided to stop marketing PCTs because
the level of PCB contamination contained in the product was greater than allowed by US PCB regulations. There are currently no active pesticide registrations for PCTs in the US [73]. PCTs are not known to be currently used in the United States [5, 28].

Europe
Respondents indicated that PCTs have been used for a variety of purposes in Europe: in electric transformers, capacitors and other electrical equipment; as lubricants in hydraulic systems; as heat exchanger fluid; as plasticizers, anti-corrosives and/or antifoulants in paints, sealants, adhesives and plastics; as additives in printing inks and in hot-melt glues; in wax for high precision casting; as carriers for insecticides; in coatings and cabling insulation.

In many countries, respondents indicated that PCTs were used historically, but that PCTs are no longer used (except possibly in existing equipment such as transformers and closed electrical systems, and existing products and treated material). These countries are Austria, Bulgaria, France, Germany, Italy, Latvia, Monaco, Spain and Sweden.

In some countries, PCT historical use is unknown, but PCTs are currently not used, or not known to be used (except possibly in existing equipment such as transformers and closed electrical systems, and existing products and treated materials): Belgium, Denmark, Finland, the Netherlands, Poland, Switzerland, and the United Kingdom.

There is no historical or current use of PCTs in Cyprus, Czech Republic, Norway, and Slovakia.

Historical and current use of PCTs is unknown in Armenia, Croatia, Georgia, Ireland, Kazakhstan, Luxembourg, the Republic of Moldova, and Turkey.

Note: Specific uses in responding countries are listed in Appendix A.

2.3 Disposal

Canada
Wastes that contain more than 2 mg/kg of PCTs are listed as Hazardous Waste under Schedule 3 of CEPA 1999 and require export or import notification. Within Canada, hazardous waste treatment and disposal facilities are sited and certified by provincial authorities. Federal regulations are presently being developed to control the interprovincial movement of hazardous waste. The disposal of PCTs in Canada would be managed in an environmentally sound manner, consistent with Canada’s obligations under the Basel Convention, federal and provincial regulations. There are no stockpiles of PCTs in Canada.

United States
The United States takes measures to ensure that destruction or disposal of PCTs, and transboundary movement of PCTs, is done in an environmentally sound manner. When PCTs are present in hazardous wastes, they would be subject to stringent regulations governing their destruction and disposal under the Resource Conservation Recovery Act that are similar to the stringent regulations for PCBs under the Toxic Substances Control Act [42, 73]. These regulations ensure that destruction and disposal, and the exporting and importing, of all hazardous wastes occur in an environmentally sound manner. While PCTs are not specifically identified in the regulations, they would be controlled under the regulations as halogenated organics. The United States is a signatory to the Basel Convention, but has not yet ratified it. No stockpiles of PCTs have been identified [42, 73].

**European Union Member States**

The Council of the European Union (EU) is the main legislative and decision-making body in the EU. It brings together the representatives of all the Member State governments - when they decide the major policy guidelines - at the level of presidents and prime ministers, i.e. as the European Council. The Council - together with the European Parliament - sets the rules for all the activities of the European Community (EC).

The Council has issued several Directives concerning PCTs, including measures for control actions and disposal. All Member States are subject to these Directives, which they are expected to implement through national legislation and regulations. In addition, Applicant Countries will be subject to these Directives if and when they succeed in becoming members of the EU.

**Ongoing EU Member States**
- Responding countries: Austria, Belgium, Denmark, Germany, Spain, France, Ireland, Italy, Luxembourg, The Netherlands, Finland, Sweden and the United Kingdom.
- Non-responding countries: Greece, Portugal

**New EU Member States (as of May 1, 2004)**
- Responding countries: Czech Republic, Cyprus, Latvia, Lithuania, Poland, Slovakia
- Non-responding countries: Estonia, Hungary, Malta

**Applicant Countries**
- Responding countries: Bulgaria, Turkey
- Non-responding countries: Romania

Under European Council Directive 96/59/EC, PCBs are defined as PCBs, PCTs, Ugilec, or any mixture of the three substances in a total of more than 0.005% by weight. Directive 96/59/EC lays down rules on the phase out of PCB/PCT containing equipment, their decontamination and disposal of PCBs, PCTs and some Ugilec-compounds [63]. Directive 96/59/EC requests member states to:
• set up and regularly update inventories of equipment with PCB/PCT volumes greater than 5 litres or 0.05 – 0.005 % by weight of PCBs;
• ensure that used PCBs are disposed of; and
• ensure that PCBs and equipment containing PCBs and PCTs are decontaminated or disposed of as soon as possible, at the latest by end of 2010.

Since the European Union regulates PCTs and PCBs together, equipment inventory information collected under Directive 96/59/EC, and information on PCB stockpiles, does not contain information specific to PCTs. EU respondents indicate that either there are no stockpiles of PCTs or that they are unknown in their respective countries.

Respondents from ongoing EU countries, some new EU members (Cyprus, Czech Republic, Latvia, Poland) and applicant EU member Bulgaria indicate that measures are in place to regulate disposal of PCTs together with PCBs according to EC Directive 96/59/EC, to ensure destruction or disposal of PCTs in an environmentally sound manner, and to ensure that the transboundary movement of PCTs is conducted in an environmentally sound manner.

Latvia and Turkey have hazardous waste regulations to dispose of PCTs / PCBs. Lithuania indicated that there are no measures to ensure disposal of PCTs in and environmentally sound manner. Information on disposal was not provided by respondent from Slovakia. There are no stockpiles of PCTs in Cyprus, Czech Republic, Latvia, Lithuania, Poland or Slovakia. Stockpiles are unknown in Bulgaria and Turkey.

Other European Countries
Monaco, Norway and Switzerland apply the same disposal measures for PCTs as for PCBs, to ensure that destruction or disposal of PCTs, and transboundary movement in an environmentally sound manner. There are no stockpiles of PCTs in these countries.

Armenia, Croatia take measures to dispose of PCTs in and environmentally sound manner, and regulate transboundary movement of hazardous wastes and their disposal. Georgia regulates transboundary movement of waste and a new waste management law is under development. The Republic of Moldova is undertaking steps to approximate national legislation in conformity with EU Directive 96/59/EC. Disposal measures in Kazakhstan are unknown. There are no stockpiles of PCTs in Croatia. Stockpiles are unknown in Armenia, Georgia, Kazakhstan and the Republic of Moldova.

Parties to the Basel Convention
All Parties to the UNECE Convention on Long-range Transboundary Air Pollution have ratified the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (with the exception of the United States, which is a Signatory).

As indicated in Section 3.1 of this document, under the Basel Convention: i) wastes containing PCTs are considered hazardous wastes; ii) Parties must take appropriate measures to ensure the availability of adequate disposal facilities for the
environmentally sound management of hazardous wastes; and iii) and transboundary movements of hazardous wastes or other wastes can take place only upon prior written notification by the exporting State to the competent authorities of the States of import and transit.

Note: Country specific responses on disposal are included in Appendix B.

2.4 Actions to Control Production and Use

Canadian regulations under the Canadian Environmental Protection Act 1999 prohibit the manufacture, processing, use, import and export of PCTs.

In the United States, the manufacture of PCTs is effectively controlled by the Toxic Substances Control Act and its regulations which severely restrict the manufacture, processing, distribution in commerce, and use of PCBs, since PCT products usually contain PCBs as an impurity (typically 0.5-5%).

The European Union considers PCBs and PCTs together as PCBs for the purposes of control action in certain legislation. While production of PCTs has not been regulated, since 1976 EU Council Directives have restricted, and eventually prohibited the marketing and use of PCTs or preparations with a PCT content higher than 0.005% by weight, including waste oils. Existing and new EU member states have developed, or will be required to develop, specific national controls on marketing and use of PCTs consistent with EU Council Directives. Some EU members have also specifically prohibited production (Austria, Belgium, Finland, Italy and Sweden) in national regulations.

Norway and Switzerland prohibit the production, marketing, import, export and use of PCTs.

While respondents from some non-EU UNECE countries (Armenia, Croatia, Georgia, Monaco) indicate that PCTs are subject to national control actions, measures regarding production and use are not specified. The Republic of Moldova is developing regulations following EU Directives on PCTs. Turkey has banned PCTs. Bulgaria does not have control actions for PCTs and control actions are unknown for Kazakhstan.

Most UNECE countries with control actions on production and use have an exemption for use in scientific research and/or analytical purposes.

Note: Country specific responses on control actions on production and use are included in Appendix C.

3 OTHER INFORMATION
3.1 Global Production / Use / Controls / Agreements

Production, Use and Control of PCTs
Outside of the UNECE region, the Japanese company Kanegafuchi produced PCTs under the Tradename Kanechlor C from 1955 up to 1972 [1]. There is no evidence in the literature that PCTs have ever been manufactured in any other country than those listed in this document: the United States of America, Germany, Italy, France and Japan. Except for Japan, there is no literature information available on use and control of PCTs outside of the UNECE region.

International Environmental Agreements dealing with PCTs
PCT is an identified substance in the following international agreements:
- OECD Red Tier List of Wastes. PCT wastes at a concentration level of 50 mg/kg or more are regarded as hazardous wastes;
- Rotterdam Convention on Prior Informed Consent (PIC) - Procedure for Certain Hazardous Chemicals and Pesticides in International Trade;
- Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal

The Basel Convention is particularly relevant, as:
- PCTs are characterized as hazardous waste: “Wastes, substances and articles containing, consisting of or contaminated with polychlorinated biphenyl (PCB), polychlorinated terphenyl (PCT), or polybrominated biphenyl (PBB), including any other polybrominated analogues of these compounds, at a concentration level of 50 mg/kg or more”; and
- All Parties to the UNECE Convention on Long-range Transboundary Air Pollution have ratified the Basel Convention (with the exception of the United States, which is a Signatory).

The 1989 Basel Convention established a framework for controlling the transboundary movements of hazardous wastes. A central goal of the Basel Convention is “environmentally sound management” (ESM) of hazardous wastes or other wastes – taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against adverse effects which may result from such wastes.

Under the Basel Convention, Parties must take appropriate measures to ensure the availability of adequate disposal facilities for the environmentally sound management of hazardous or other wastes. One of the guiding principles of the Convention is that hazardous wastes should be dealt with as close to where they are produced as possible, and transboundary movements of hazardous wastes or other wastes can take place only upon prior written notification by the exporting State to the competent authorities of the States of import and transit.
One of the main vehicles for the promotion of ESM is the preparation of technical guidance documents. A decision was taken by the Basel Technical Working Group at its 18th session in June 2001, establishing a working group to prepare draft technical guidelines on POPs as waste. Canada volunteered to revise the Basel Technical Guidelines on Waste Comprising or Containing PCBs, PCTs and PBBs (Y10) to reflect current international technical standards and regulatory aspects in the management of waste PCBs, PCTs and PBBs. The Basel Convention is considering draft technical guidelines on the ESM of PCBs, PCTs and polybrominated biphenyls (PBB) [81]. These technical guidelines address issues of PCB, PCT and PBB waste management, treatment, destruction and disposal practices. Draft guidelines were considered at the April 2004 meeting of the Open-ended Working Group of the Basel Convention.

3.2 Environmental Assessment of PCTs

In September 1977, a Canadian assessment report on PCTs, *Polychlorinated Terphenyls in the Environment* [1], recommended that “it appears to be most desirable to prohibit any future manufacture, importation, or commercial use, and to rigidly control any disposal of PCTs in Canada”. This assessment formed the basis for Canada’s decision to take regulatory action on PCTs.

The 1977 Canadian assessment made the following conclusions on the environmental effects of PCTs, relevant to the UNECE POPs criteria 4:

i) **Toxicity** Physiological effects include: the induction of the mixed function oxidase (MFO) enzymes in Japanese quail and in rats; low estrogenic activity in rats; extensions of the hepatic endoplasmic reticulum in rats; and gastic mucosal hyperplasia in monkeys;

ii) **Bio-accumulation** PCTs accumulate in the liver and in various other tissues of cod, rats, and mice.

3.3 Health Hazard Assessment of PCTs

In May 2002, the Joint Task Force of the European Centre for Environment and Health of the World Health Organization (WHO/ECEH) produced a Summary Report on Health Risks of POPs from Long-range Transboundary Air Pollution [55]. Canada prepared the section on Polychlorinated terphenyls.

The report notes that there is limited environmental data on PCTs. Available information indicates that PCTs are resistant to both biodegradation and photodegradation processes, which in combination with their lipophilicity and stability may indicate their ability to persist, bioconcentrate and biomagnify within the food chain. Generally, PCTs are assumed to be similar to PCBs with respect to environmental fate and transport processes and distribution. The toxicity of PCTs is considered to be very

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4 The Canadian Assessment did not include values for vapour pressure or persistence, and bio-accumulation was not expressed as a Bioconcentration Factor (BCF) of Bioaccumulation Factor (BAF).
similar to that of PCBs, which suggests long-term toxicity might be critical, although chronic toxicity information is lacking.

The report concludes that due to the limited and dated information available on PCTs, there is insufficient information to evaluate the health implications from long-term exposures to PCTs. Further studies are needed in order to be able to evaluate health impact of PCTs and their potential link to long-range transboundary air pollution.

4 CONCLUDING REMARKS ON THE PRODUCTION AND USE OF POLYCHLORINATED TERPHENYLS RELATIVE TO ANNEXES I AND II OF THE PROTOCOL

Production of PCTs

Polychlorinated terphenyls were produced in four UNECE countries - the United States, France, Germany and Italy. The only other known historical producer of PCTs is Japan. Total global production of PCTs is estimated to have been 60,000 metric tonnes between 1955 and 1980. Production quantities of PCTs were 15-20 times less than the chemically similar PCBs.

Production of PCTs is not known to occur anywhere since the early 1980s and there is no known current production of PCTs in the UNECE region.

Use of PCTs

Polychlorinated terphenyls are known to have been used historically in several UNECE countries (Canada, US, Austria, Bulgaria, France, Germany, Italy, Latvia, Monaco, Spain and Sweden). Experts in a few countries indicate that PCTs have never been used (Cyprus, Czech Republic, Lithuania, Norway and Slovakia). In the majority of responding countries, historical use of PCTs is unknown due to insufficient information. However, historical PCT use in these countries is possible or even probable, given its wide range of applications, and its use as a PCB substitute in many products up to the 1970s and longer.

PCTs are not known to be currently used in the UNECE region. However, similar to PCBs, they may be found in old existing electrical capacitors, transformers and other equipment, or as constituents or contaminants of some existing products and treated materials.

Disposal of PCTs

Based on the questionnaire responses, UNECE countries in North America, ongoing and new members of the EU, as well as Monaco, Norway, and Switzerland have taken, or are required to take, measures to ensure destruction or disposal of PCTs in an environmentally sound manner, and to ensure that the transboundary movement of
PCTs is conducted in an environmentally sound manner. In these countries, there are no known stockpiles of PCTs, and measures to destroy and/or dispose of PCTs are similar to measures to destroy and/or dispose of PCBs.

In other non-EU countries, the existence of PCT stockpiles is unknown in Armenia, Bulgaria, Georgia, Kazakhstan, the Republic of Moldova and Turkey; and there are no stockpiles in Croatia. Armenia, Bulgaria, Croatia, Georgia, the Republic of Moldova and Turkey either have or are developing national laws and regulations for disposal and transboundary movement of hazardous wastes in an environmentally sound manner. Bulgaria and the Republic of Moldova are following the EU Directive regarding PCT disposal. Disposal measures for PCTs are unknown for Kazakhstan.

All Parties to the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP) have ratified the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (with the exception of the United States, which is a Signatory). Therefore, notwithstanding current disposal measures, all UNECE CLRTAP members are required to ensure that destruction or disposal and/or transboundary movement of PCT wastes are conducted in an environmentally sound manner, as part of their obligations under the Basel Convention, and in the United States as part of stringent national regulations.

Control Actions on Production and Use of PCTs

Based on the questionnaire responses, UNECE members in North America, ongoing and new members of the EU, Norway and Switzerland, have taken or are taking measures to directly prohibit or effectively control production and use of PCTs, through regulations on production and/or marketing, use, and import. In addition, Armenia, Croatia, Georgia, Monaco, the Republic of Moldova and Turkey also have taken actions to control production and use of PCTs. Control actions are not in place in Bulgaria and are unknown in Kazakhstan. Most UNECE countries taking control actions have an exemption of PCT use for scientific research and/or analytical purposes.

Global Production / Use / Controls / Agreements

PCTs are controlled in a number of international agreements: the Basel Convention on Control of Transboundary Movements of Hazardous Wastes and their Disposal; the OECD Red Tier List of Wastes; the Rotterdam Convention on Prior Informed Consent (PIC); and the Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal.
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APPENDIX A  COMPILATION OF QUESTIONNAIRE RESPONSES ON USE OF PCTs

North America

Canada
In Canada, PCTs were imported and used commercially, although quantities are unknown. Documented historical uses of PCTs were as pressure sensitive adhesive for weather-strip backing, as plasticizers for urethanes, and in paints. By 1976, commercial use of more than 1 kg of either PCTs or PCBs was required to be reported under the former Environmental Contaminants Act. Three companies replied to the reporting notice, indicating that all uses of PCTs were terminated in the mid-1970s [1].

United States
Before 1973, PCT use in the United States was mainly as a plasticizer in adhesives, inks, sealants, caulking compounds and waxes [3, 5, 28]. After Monsanto ceased production of PCTs in 1972, use continued in the US through imported PCTs, mainly for waxes for investment casting [5]. The majority, if not all, imports came from France [3]. Imports were around 150 metric tonnes annually during the mid-1970s. During this period, the use of PCTs for investment casting wax has been estimated at 500,000 pounds (227 metric tonnes) per year of PCTs and one million pounds (455 metric tonnes) per year of Aroclor 5460 [3]. According to US Customs Service, chlorinated terphenyl was last imported in the US in November 1979. The only US importer decided to stop marketing PCTs because the level of PCB contamination contained in the product was greater than allowed by US PCB regulations, and PCTs were no longer used in the United States [5]. Current use of PCTs in the United States is unknown [28].

There are currently no active pesticide registrations for PCTs in the US [73].

Europe

Armenia
Historical and current use of PCTs is unknown [31, 58].

Austria
In Austria, PCTs were used as lubricants, in electric transformers, in electrical equipment, in hydraulic systems and as antifoulings. PCTs are not currently being used, as all uses of PCTs (and PCBs) have been prohibited since 1993 (however, they may still be present in treated material, transformers and other equipment) [29, 53, 59].

Belgium
PCT historical use is unknown, but there is no current use in Belgium. There were no uses after the production of PCTs was prohibited in Belgium together with the production of PCB’s in 1986. No data available, but mainly used in cabling isolation [79].
Bulgaria
PCTs were used in the past and are currently used in transformers, capacitors and mining [60].

Croatia
There is no official data on use of PCTs in Croatia, therefore past and present use is unknown. However, Askarels\(^5\) were used in Croatia (which are known to sometimes contain PCTs). The quantity of Askarels containing PCTs used in Croatia are not known [21]. Research work and monitoring of polychlorinated compounds conducted so far have not registered the use and consumption of PCTs. PCBs are mainly being used [52].

Cyprus
There is no historical or current use of PCTs [61].

Czech Republic
There is no historical or current use of PCTs [44, 74].

Denmark
PCT historical use is unknown, but there is no current use in Denmark [32, 62]. In the literature, Jensen [6] states that some Danish industry sources indicated that PCTs were previously used as a sealant/adhesive for thermo-windows, but that there were no ongoing uses.

Finland
PCT historical use is unknown, but there is no current use in Finland. While Finnish producers of capacitors and transformers have not used PCTs, imported transformers and capacitors may have included PCTs, even if there is no evidence or information. The same restrictions and other obligations have been applied for PCTs as for PCBs. No new PCB/PCT transformers have been taken into use after 1979. Small capacitors (capacity under 1 kVar) may have been imported until 1989 [45, 75].

France
In France, PCTs are no longer used. Previously they were used as plasticizers in paints; anti-corrosion paints; an additive in inks for printing offices; and in hot-melt glues and wax for high precision casting [22, 78].

Georgia
Historical and current use of PCTs is unknown [46].

Germany
PCTs are no longer used in Germany. PCT use probably stopped soon after 1974, but continued at least into the mid-1980s together with PCBs. PCTs were used in mixtures

\(^5\) Askarel is a generic term for a group of synthetic, fire-resistant, chlorinated aromatic hydrocarbons used as electrical insulating liquids.
with PCBs, as plasticizers, lubricants, carriers for insecticides, sealants, and coatings [23, 76].

**Ireland**
In Ireland, PCT use is currently unknown, but anecdotal evidence suggests that PCBs were not extensively used in Ireland [27, 64].

**Italy**
Historical and current use of PCTs is unknown. PCTs would have probably been used in adhesives and as an additive in paints [79]. PCTs are probably still present in transformers and closed electrical systems [33].

**Kazakhstan**
Historical and current use of PCTs is unknown [34].

**Latvia**
PCTs were used in the past. Use of polychlorinated terphenyls is forbidden, but PCTs were allowed to modify other products until 2003. PCT liquidation is permitted [35]. PCTs are currently used in electrical power transferring and transforming equipment – transformers, capacitors and switches [65].

**Luxembourg**
PCT use in Luxembourg is unknown but seems to be limited. This assumption on use needs to be verified [24].

**Republic of Moldova**
Historical and current use of PCTs is unknown [25].

**Monaco**
PCTs and PCBs continue to be used in old electric transformers (installed before November 23, 1988). These transformers are being replaced in stages by new ones which do not contain PCBs or PCTs [50].

**The Netherlands**
Historical use of PCTs is unknown, but there is no current use [36, 67].

**Norway**
There is no historical or current use of PCTs [37, 68].

**Poland**
Historical and current use of PCTs is unknown. PCTs probably continue to be used in electro-energy devices (mainly in capacitors and more seldom in transformers) [69].

**Slovakia**
There is no historical or current use of PCTs [39].
Spain
PCTs were used up to 1999 for turbine lubricating systems (less than 0.1 metric tones), but are no longer used [49].

Sweden
There is no longer any use of PCTs. Past use of 60 metric tonnes in 1960 to 1970 was similar to PCBs: dielectric fluid in power transformers and capacitors, hydraulic fluid, heat exchanger fluid, plasticiser in paint, plastics and sealants [48, 77].

Literature information states that PCTs were used as fire retardants in the mid-1970s. In 1974, the total use in Sweden was estimated to be 5-10 metric tonnes. At the time of writing (1978) Renberg et al. found no figures available on the use of PCT in Sweden or any other country around the Baltic Sea [2].

Switzerland
There has been no use of PCTs since 1988. Use prior to 1988 is unknown [40, 70].

Turkey
Historical and current use of PCTs is unknown [71].

United Kingdom
PCT historical use is unknown, however it is likely that PCTs were used given the degree of industrialisation in the UK and the free trade in products likely to contain them. However no records have been found of the quantity used, destroyed or remaining in use. PCTs are no longer used, and regulations require any PCT containing appliance to have been identified and a destruction route put in place [41, 72].
APPENDIX B  COMPILATION OF QUESTIONNAIRE RESPONSES ON DISPOSAL OF PCTs

North America

Canada

There are no stockpiles of PCTs in Canada.

Wastes that contain more than 2 mg/kg of PCTs are listed as Hazardous Waste under Schedule 3 of CEPA 1999 and require export or import notification. Within Canada, hazardous waste treatment and disposal facilities are sited and certified by provincial authorities. Federal regulations are presently being developed to control the interprovincial movement of hazardous waste. The disposal of PCTs in Canada would be managed in an environmentally sound manner, consistent with Canada's obligations under the Basel Convention, federal and provincial regulations.

United States

Although the existence of US stockpiles is unknown, production of chemicals that may include or use stockpiles of PCT have not been identified [28, 73].

The United States takes measures to ensure that destruction or disposal of PCTs, and transboundary movement of PCTs, is done in an environmentally sound manner. When PCTs are present in hazardous wastes, they would be subject to stringent regulations governing their destruction and disposal under the Resource Conservation Recovery Act that that are similar to the stringent regulations for PCBs under the Toxic Substances Control Act [42, 73]. These regulations ensure that destruction and disposal, and the exporting and importing, of all hazardous wastes occur in an environmentally sound manner. While PCTs are not specifically identified in the regulations, they would be controlled under the regulations as halogenated organics. The United States is a signatory to the Basel Convention, but has not yet ratified it [42, 73].

The regulations to destroy PCBs under the Toxic Substances Control Act require a "Destruction Removal Efficiency" measurement of 99.9999% for PCBs. The regulations to destroy halogenated organics (such as PCBs and PCTs) in hazardous wastes under the Resource Conservation Recovery Act require a "Destruction Removal Efficiency" measurement of 99.99%. The hazardous waste regulations also require compliance with stringent limitations on emissions of carbon monoxide or hydrocarbons and site-specific process control of operating parameters such as combustion temperature and residence time. These additional controls tend to increase the overall destruction efficiency of the hazardous constituents. Disposal of PCBs and PCTs in hazardous wastes would take place only in specifically designed landfills (e.g., liners, landfill leachate collection and monitoring, and other waste input restrictions) [42, 73].
European Union

Since the European Union regulates PCTs and PCBs together, equipment inventory information collected under Directive 96/59/EC (below), and information on PCB stockpiles, does not contain information specific to PCTs.

Under Directive 96/59/EC, PCBs are defined as PCBs, PCTs, Ugilec, or any mixture of the three substances in a total of more than 0.005% by weight. Directive 96/59/EC lays down rules on the phase out of PCB/PCT containing equipment, their decontamination and disposal of PCBs, PCTs and some Ugilec-compounds [63]. Directive 96/59/EC requests member states to:

- set up and regularly update inventories of equipment with PCB/PCT volumes greater than 5 litres or 0.05 – 0.005 % by weight of PCBs;
- ensure that used PCBs are disposed of; and
- ensure that PCBs and equipment containing PCBs and PCTs are decontaminated or disposed of as soon as possible, at the latest by end of 2010.

European Union Member States

Respondents from European Union countries indicated that measures are in place to ensure destruction or disposal of PCTs in an environmentally sound manner, and to ensure that the transboundary movement of PCTs is conducted in an environmentally sound manner. In all of these countries, measures to destroy and/or dispose of PCTs are similar to measures to destroy and/or dispose of PCBs. Country specific responses on disposal are included below:

European Union – Ongoing Members

Austria

There are no stockpiles of PCTs [29, 53, 59].

EU Directive 96/59/EC concerning the disposal of PCBs and PCTs has already been implemented into Austrian national law.

PCTs and PCBs are considered as hazardous waste under Austrian waste management law and disposal is regulated under the waste control act. The disposal measures for both substances are identical. Regulations also lay down disposal instructions for PCT-containing liquids (“Abfallwirtschaftsgesetz 2002” (BGBl. I Nr.102/2002)) [59].

Hazardous waste is treated in one Austrian incineration plant (or exported abroad). According to the federal waste management plan, disposal of electrical equipment waste containing PCBs and PCTs was 151, 218, 245, 396, 137, 202, 79 and 41 tonnes per year from 1995 to 2002; and disposal of “secondary waste” from electrical equipment from conversion processes containing PCBs and PCTs was 192, 180, 73, 15 and 68 tonnes from 1998 to 2002 [29, 53, 59].
Belgium
Stockpiles of PCTs are unknown (all data relates to both PCTs and PCBs) [79].

Measures to destroy and/or dispose of PTCs are the same as the measures concerning the PCB's [43]. The Royal Decree of July 1986 deals with PCBs and PCTs, as well as with any preparation (including used oils) containing more than 0.01 % by weight of PCBs and PCTs. It prohibits all manufactures, imports, exports, sales, assignments free of charge of PCBs or PCTs, of products, devices, equipment's or fluids containing those substances, except for operations carried out under the wastes regulations. It compiles an inventory of all products, devices, equipment's, and storage's of PCBs or PCTs or fluids containing PCBs or PCTs. Those provisions do not apply to capacitors of less than one kilo [43].

Complementary legislation in the Flemish Region:
Liquids (such as hydraulic oils, insulating or heat transmission oils) that contain more than 50 ppm PCBs and/or PCTs are regarded as PCB/PCT-liquids according to current legislation in the Flemish Region. This is in accordance with the European Directive 96/59/EC. These liquids are destroyed by incineration.
Equipment that contains PCB/PCT-liquids (these are liquids with a PCB/PCT concentration above 50 ppm), for example transformers and capacitors, or that has contained them and has not been decontaminated is regarded as PCB/PCT-containing equipment. There is a PCB/PCT-plan that foresees in the gradual phasing out of all PCB/PCT-containing equipment. The PCB/PCT liquids are removed from the equipment and the equipment is decontaminated. “Decontaminated” means that the equipment is cleaned so that it can be re-used, recycled or disposed of. The PCB/PCT-liquids have to be separated from the equipment first and then incinerated, whatever is the concentration of the liquid in the equipment.

Waste equipment that contains PCB-containing parts (such as vehicle components) has to be dismantled in such a way that the PCB-containing parts are separated from the equipment and treated as PCB/PCT-waste as above [79].

Denmark
There are no stockpiles of PCTs [32, 62].

Denmark takes measures to ensure that destruction or disposal of PCTs, and transboundary movement of PCTs, is done in an environmentally sound manner. Denmark applies the same measures for PCTs as for PCBs [32, 62].

Ministerial Order no. 925 from 13/12-1998 regulates PCT, PCT and substitutes, amended by Ministerial Orders no. 818 and no. 820 of 29/09-2003. The order is the Danish implementation of EU Directive 96/59/EC [62].

Finland
There are no stockpiles of PCTs [45, 75].

Directive 96/59/EC is fully implemented:

- Transformers and capacitors (capacity over 1 kVAr) had to be taken out of use by the end of 1994. According to waste legislation PCTs are hazardous waste and have to disposed of accordingly;
- The disposal obligations concern also any other equipment or container than transformers and capacitors;
- The obligations are applied to any mixture containing PCTs and PCBs in a total more than 0.005 % by weight [45].

Import of PCTs requires consent of the competent authorities in accordance with the Basel Convention and the EU Council Regulation 259/93/EEC. PCT/PCBs have not been exported from Finland. Export would also require consent of the competent authorities [45].

**France**
There are stockpiles of PCTs [78].

Decree No. 2001-63 (January 2001) modifies No. 87-59 in accordance with EC Directive 96/59/EC. Under the Decree a national inventory of PCB/PCT holdings (over 5 dm³) will be conducted, and based on the results a national plan will be developed to decontaminate and eliminate inventoried equipment containing PCBs/PCTs by the end of 2010 at the latest (except for transformer liquids containing 50-500 ppm PCBs/PCTs - which will be eliminated once their use is terminated) [30].

An inventory of PCB in electric equipment in accordance with Decree No. 2001-63 / Council Directive 96/59/EC, was to be finished in summer 2002 [22, 78].

**Germany**
There are no stockpiles of PCTs [23, 76].

All provisions of Directive 96/59/EC have been transposed into German law [76]. PCTs have to be disposed of according to “PCB-Abfallverordnung” (30 June 2000).

Germany has already disposed of the majority of PCB containing fluids by incineration. PCB containing fluids include all fluids containing more than 0,005% of PCB, PCT or polychlorinated diphenylmethanes [47]. By now around 100 tonnes of PCB-containing fluids are inventoried still being in use in Germany, down from 280,000 tonnes in the early 1990s [76].

PCB and PCT containing fluids are combusted in special incineration plants, transformers and capacitors are emptied and afterwards disposed of in underground landfills (former salt mines).

**Ireland**
The existence of PCT stockpiles is unknown [64].
In accordance with EU Directive 96/59/EC on PCB/PCT, a project is being undertaken to create an inventory of PCB and PCT holdings greater than 5 dm³, and to propose plans and outlines for the disposal of all holdings. The project will also provide a history of PCB/PCT activity in Ireland and the effect that Irish and EU legislation has had on its use [27].


- Article 14 of the Regulations sets out the obligations of holders of PCBs, used PCBs or contaminated equipment. Decontamination and labeling requirements are also specified.
- Article 15 requires that information on holdings of PCBs be provided to the Environmental Protection Agency.
- Article 16 sets out the following prohibitions on use of PCBs:
  (a) the importation, production or supply to another person of PCBs or contaminated equipment;
  (b) with effect from 1/9/98, the holding or use of PCBs or contaminated equipment, other than PCBs or equipment which have been notified to the Agency under Article 15;
  (c) the separation of PCBs from other substances for the purpose of reusing the PCBs;
  (d) the addition of PCBs to transformers or other equipment; and
  (e) the maintenance of transformers containing PCBs, other than the maintenance of transformers which are in good working order and do not leak and where such maintenance is for the purpose of ensuring that the PCBs contained in the transformers comply with technical standards or specifications regarding dielectric quality.

The Irish Environmental Protection Agency published a Management Plan for PCBs in August 2002, and for the purposes of the plan PCTs are considered a subset of PCBs. The EPA has also prepared a National Hazardous Waste Management Plan [64].

**Italy**
The existence of PCT stockpiles is unknown [33].

PCTs are regulated together with PCB according to Directive 96/59/EC and D. Lgs 99/209. PCB/PCT containing equipment must be inventoried. If the PCB/PCT content exceeds 500 mg/kg it must be destroyed, disposed of, or decontaminated by 2005. If the PCB/PCT content is less than 500 mg/kg it will be eliminated at the end of its working life [33].

**The Netherlands**
There are no stockpiles of PCTs [36, 67].

PCTs are regulated together with PCBs according to EC Directive 96/59/EC [36, 67].
Spain
There are no stockpiles of PCTs [49].

As foreseen in the European legal framework (2000/76/EC Directive) and Spanish National Plan 2001-2010 for PCBs and PCTs (Resolucion 9-4-01 B.O.E. no 93 18-04-01) [49].

Sweden
There are no stockpiles of PCTs [48, 77].

PCTs are included in the definition of “PCB product” in the legislation, both in Sweden and in the European Union, and in the Based Convention [48, 77].

United Kingdom
The existence of PCT stockpiles is unknown [41, 72].

The United Kingdom takes measures to ensure that destruction or disposal of PCTs, and transboundary movement of PCTs, is done in an environmentally sound manner. The Environmental Protection (Disposal of Polychlorinated Biphenyls and other Dangerous Substances - England and Wales) Regulations 2000 (SI 2000/1043), the Environmental Protection (Disposal of Polychlorinated Biphenyls and other Dangerous Substances - Scotland) Regulations 2000 and the Environmental Protection (Disposal of Polychlorinated Biphenyls and other Dangerous Substances - Northern Ireland) Regulations 2000 include PCTs in the definition of PCBs. The regulations came into effect in May 2000, and are for the purpose of implementing EU Council Directive 96/59/EC on PCB disposal [14, 41]. They require holders of PCBs, PCTs and Ugilec at concentrations greater than 0.005% to register them by July 31, 2000 and to destroy them, except in certain circumstances, by the end of December 2000. The regulations give statutory force to some of the provisions of a United Kingdom Action Plan for the Phasing Out and Destruction of Polychlorinated Biphenyls (PCBs) and Dangerous PCB Substitutes, also in accordance with EU Council Directive 96/59/EC [17].

European Union – New Members (as of May 1, 2004)

Cyprus
Measures (e.g., Regulation 636/2002 issued under the Hazardous waste law of 2002) are based on EU Directive 96/59/EC [61].

Czech Republic
There are no stockpiles of PCTs]. Existing PCB inventories do not contain any information on PCTs [74].

The 96/59/EC Directive is fully transposed in the Czech Republic [74].

The Czech Republic is taking measures to ensure the destruction or disposal of PCTs,
and transboundary movement of PCTs, is done in an environmentally sound manner. There are sufficient capacities for disposal (incineration) of PCTs (POPs) in the Czech Republic, with one hazardous waste incineration plant for PCBs [74].

In accordance with Act No. 185/2001 Coll. on Waste in the Czech Republic:

- PCB means polychlorinated biphenyls, polychlorinated terphenyls, Monomethyl-tetrachlorodiphenyl methane, Monomethyl-dichlorodiphenyl methane, Monomethyl-dibromodiphenyl methane and any mixtures containing any of the above substances with a concentration in excess of 50 mg/kg;
- Equipment containing PCB means any equipment that contains or used to contain PCB, such as transformers, condensers, tanks containing left-over filling, etc. and that was not decontaminated;
- Decontamination is any and all procedures enabling that equipment, objects and substances contaminated with PCB may be re-used, re-cycled or removed. Such procedures may include PCB replacement with appropriate PCB-free substances;
- Equipment containing PCB and subject to record-keeping means equipment that may contain substances with PCB content, in particular oil transformers, condensers with fluid dielectric, hydraulic mining equipment, vacuum pumps, industrial equipment using heat-conducting fluids (duplicators, road gravel pre-coating facilities, etc.) or parts of such equipment containing more than 5 litres of fluids.

In the above-mentioned Act on Waste there are further set:

- Obligations Pertaining to the Management of PCB and PCB-containing Waste and Equipment; and
- Record-keeping and Reporting in Respect of Storage of PCB-containing Equipment and Substances.

In accordance with Decree No. 384/2001 Coll. on managing PCBs there are set:

- Technical requirements for managing polychlorinated biphenyls, polychlorinated terphenyls, Monomethyl-tetrachlorodiphenyl methane, Monomethyl-dichlorodiphenyl methane, Monomethyl-dibromodiphenyl methane and all mixtures containing any of these substances in concentration higher than 50 mg/kg (here-in-after called “PCB”) and technical requirements for equipment containing these substances including measures to protect human health and the environment;
- Arbitration methods and the method to determine the total concentration of PCBs in substances and equipment containing PCBs;
- Details on the way of proving non-existence of PCBs;
- The way of labeling equipment containing PCBs and being subject to record-keeping;
- The way of labeling decontaminated equipment;
- Records of the equipment and substances containing PCB and the way of their reporting.

Annexes of this Decree on managing PCBs contain:
• the list of analytical methods to determine PCB content;
• the checklist for inventory of equipment and substances according to Act on Waste.

Latvia
There are no stockpiles of PCTs [65].

There are no differences between measures to destroy and/or dispose of PCTs and PCBs. Relevant legislation:
• Cabinet of Ministers regulation Nr. 76 “Regulation of waste import into territory of Latvia for recycling purposes and procedure of waste export and transit”
• Cabinet of Ministers regulation Nr. 117 “Regulation on use and labeling of hazardous chemical substances containing equipment and products and list of hazardous goods” [65].

Lithuania
There are no stockpiles of PCTs [66].

Poland
There are no stockpiles of PCTs [38, 69].

PCTs have not been identified in Poland and have not been proved to exist. Inventories that have been carried out regarded PCBs (electrical equipment, oils etc.), but they also included PCTs (although they have not been separately identified). Inventories on emissions into the air covered only PCBs [69].

Poland takes measures to ensure that destruction or disposal of PCTs, and transboundary movement of PCTs, is done in an environmentally sound manner. Withdrawn capacitors and transformers are temporarily stored at the place of their use (in the plants) and then they are exported for decontamination. It is expected that PCTs and PCBs will soon be disposed of in domestic installations in Poland. At present measures are generally directed towards PCBs. The problem of PCTs is not identified separately [38, 69].

Slovakia
There are no stockpiles of PCTs [39].

European Union – Applicant Countries

Bulgaria
The existence of PCT stockpiles is unknown [60].
Bulgaria takes measures to ensure that destruction or disposal of PCTs, and transboundary movement of PCTs, is done in an environmentally sound manner:

- Bulgarian regulation on disposal of PCBs/PCTs is under preparation, which will transpose European Directive 96/59/EC;
- A National Hazardous Waste Center is planned, where PCBs/PCTs will be disposed according to EU Standards;
- Bulgaria is party to the Basel Convention;
- Regulations have been enacted since 1998 on the cases when a permit is required for import, export and transit of waste and on the conditions and procedure for its issuance [60].

**Turkey**
The existence of PCT stockpiles is unknown [71].

According to the Hazardous Waste Control Regulation, PCBs and PCTs are hazardous wastes. The PCBs originated from electric power station (transformer and liquids) are disposed in İzmit - İZAYDAŞ A.Ş. (Clinical and Hazardous Waste Incineration and Energy Generation Plant) and also in Germany.

Ministry of Environment and Forestry have not yet prepared a special regulation on waste containing PCBs and PCTs. Soil, oil, transformers and condensers contaminated with PCBs are called hazardous waste according to Hazardous Waste Control Regulation which came into force August 27, 1995 [71].

**Other UNECE Countries**

**Armenia**
The existence of PCT stockpiles is unknown [31, 58].

In Armenia there are no any special facilities for treatment or disposal of hazardous wastes. The import of hazardous wastes to the territory of the Republic of Armenia, irrespective of such wastes usage purposes, is prohibited by the Government Decision (№ 97 on 08.12.1995). Export of hazardous wastes is allowed provided that permission from the state competent authority is granted, if exporter-country has no technical capacity, facility or appropriate sites for such wastes disposal in environmentally sound way.

“The order of adjustment of hazardous wastes and other wastes import, export and transit over the territory of the Republic of Armenia” approved by the № 97 Government Decision on 08.12.1995, which regulates all the issues, concerning transboundary movement of hazardous wastes and other wastes, and their disposal.

“List of regulated and non-regulated wastes, their hazardous properties, documents on declaration, notification and disposal actions” prepared and agreed with Ministry of Economy and Finance, Custom State Committee, which was approved by decree of Ministry of Nature Protection on December 1999. This document was prepared
according to “The order of adjustment of hazardous wastes and other wastes import, export and transit over the territory of the Republic of Armenia” adopted by the № 97 Government Decision on 08.12.1995, which regulates all the issues, concerning transboundary movement of hazardous wastes and other wastes, and the disposal thereof.

According to the Governmental Decision No 121-N on January 30, 2003 “The order on licensing of activity on hazardous waste processing, treatment, storage, transport and disposal in the Republic of Armenia” any activity related to hazardous wastes should be licensed.

**Croatia**
According to the existing data, there are no stockpiles of PCTs in Croatia [52].

There are units containing PCBs and while in operation they are subjected to the control of Ministry of Labour and Social Welfare. When the units stop operating and become waste (hazardous waste) they are controlled and supervised by Ministry of Environmental Protection and Physical Planning. The same measures would be used for PCTs [52].

Since destruction and disposal of PCBs is performed by exporting units and equipment containing PCBs for incineration to the European Union states possessing PCB incineration plants, the same procedure is applied to PCTs, in compliance with the Basel Convention [52].

**Georgia**
The existence of PCT stockpiles is unknown, as there is no data on stockpiled PCTs. However, there are several current activities on assessment and/or GIS-mapping of hazardous chemicals and wastes [46].

Georgia is a party to Basel Convention. There is strict transitional law on transboundary movement of waste in force. A new waste management law is under development. A harmonized custom system is being prepared for introduction [46].

**Kazakhstan**
The existence of stockpiles is unknown [34]. It is unknown whether Kazakhstan takes measures to ensure that destruction or disposal of PCTs, and transboundary movement of PCTs, is done in an environmentally sound manner [34].

**Republic of Moldova**
The existence of stockpiles is unknown [25].

The Republic of Moldova is undertaking first steps on approximation of national legislation in conformity with EU legislation. In the project framework for the “**Preparatory EU Approximation Work of the Republic of Moldova in Integrated Pollution Prevention Control and Waste Management**”, the Republic of Moldova prepared tables
of contents (ToCs), ToCs analysis and a strategy project on approximation of legislation. This study included multiple EU Directives, including: IPPC Directive, Disposal of PCB/PCTs Directive (96/59/EC) etc [25].

After the Republic of Moldova became independent, legislative acts for management of toxic chemical substances, products and wastes were developed and introduced, including a Law on Wastes of Production and Consumption [25].

**Monaco**
There are no stockpiles of PCTs [50].

The same regulations apply to PCB and PCT (Ministerial Decree no 88-638 dated 28 November 1988. According to Article 7 of the Decree, wastes contaminated with PCB or PCT should be eliminated according to an environmentally sound manner. According to Article 6 of this Decree, wastes containing PCB or PCT are sent to an agreed elimination centre in Region Provence – Alpes – Cotes d’Azur in France [50].

**Norway**
There are no stockpiles of PCTs.

EU directive 1969/59 concerning disposal of PCBs and PCTs was implemented in Norway in 2000. Disposal of PCTs is not considered relevant in Norway, as PCTs have never been used [37, 68].

**Switzerland**
There are no stockpiles of PCTs [40, 70].

Switzerland takes measures to ensure that destruction or disposal of PCTs, and transboundary movement of PCTs, is done in an environmentally sound manner. Switzerland applies the same measures for PCTs as for PCBs [40, 70].
APPENDIX C  COMPILATION OF QUESTIONNAIRE RESPONSES ON ACTIONS TO CONTROL PRODUCTION AND USE OF PCTS

North America

Canada
Canada has prohibited the manufacture, processing and use of PCTs through regulations since 1979. The most recent Polychlorinated Terphenyl Regulations (1989) have been consolidated into the Prohibition of Certain Toxic Substances Regulations under the Canadian Environmental Protection Act (CEPA) 1999. The Regulations state that “no person shall manufacture, use, process, sell, offer for sale or import a prohibited toxic substance”, and PCTs are included in a Schedule listing prohibited toxic substances [15]. PCTs are listed as a Prohibited Substance on the Export Control List under Schedule 3 of CEPA 1999.

United States
The United States has eliminated all use of PCTs as active or inactive ingredients [8]. Since PCT products usually contain PCBs as an impurity (typically 0.5-5%), in the United States the manufacture of PCTs is “indirectly controlled” [5] / “effectively controlled” [4] by the PCB control provisions of Section 6(e) of the Toxic Substances Control Act (TSCA) and its regulations (at 40 CFR 761) which severely restrict the manufacture, processing, distribution in commerce, and use of PCBs [5, 28, 73]. Wastes contaminated with PCB concentrations of 50 ppm or greater are also subject to the TSCA.

Several PCTs are listed on the 1978 Toxic Substances Control Act (TSCA) Inventory of existing chemical substances. Under TSCA Section 8(a) on health and safety data reporting, notification is required of any current or proposed manufacture or import of PCTs [5, 16]. There are certain exemptions to these reporting obligations (e.g., for research and development, small manufacturers, by-products and impurities) [73].

In 1979, the Interagency Testing Committee (ITC) recommended that PCT be tested for environmental and health (carcinogenic, mutagenic, teratogenic) effects under Section 4(a) of the TSCA. However, the EPA decided in 1981 to exempt PCTs from ITC testing because of insufficient exposure since domestic production and importation of PCTs had apparently ceased [5, 16].

PCT manufacturers, importers, and processors were subject to TSCA section 8(d) health and safety data reporting obligations from 1982-1988. TSCA section 8(d) reporting obligations in effect at the time required persons that engage in or propose to engage in the manufacture, importation of a substance or mixture listed in 40 CFR 716.120, to submit health and safety studies for those substances or mixtures [28, 73].

European Union
While production of PCTs has not been regulated [63], the European Community has adopted a number of Directives aimed at restricting and then phasing out the marketing and use of PCTs, along with those on PCBs, as well as disposing and decontaminating equipment containing PCTs [54]:

The first pieces of EU legislation aimed at the gradual phasing out of PCBs and PCTs were Directives 76/769/EEC and 85/467/EEC, which:
- restricted (as of July 27, 1976 - 76/769/EEC) and then prohibited (as of Oct. 1, 1985 - 85/467/EEC) the marketing and use of PCBs and PCTs;
- restricted the use of PCBs and PCTs to closed system electrical equipment, certain electrical condensers, certain closed-circuit heat-transfer installations, and hydraulic fluid in any underground mining equipment;
- defined the threshold concentration of PCBs or PCTs in a mixture, including waste oil (lowered from 0.1% under 76/769/EEC to 0.01% under 85/467/EEC). Above the threshold the restrictions would apply; and
- set targets for eliminating PCBs and PCTs, while allowing member states to exempt any equipment, to enable continued use until the end of its service life.

A specific EU Directive 82/828/EEC on PCT allowed for its use until the end of 1984 in re-usable thermoplastic tooling compounds containing not more than 50 per cent PCT for certain uses.

Directive 89/677/EEC further tightened the concentration above which a preparation (mixture of substances) would be considered a PCB or PCT and thus subject to control from 0.01% to 0.005% by weight - including waste oils.

Directive 96/59/EC on the disposal of PCBs and PCTs defines PCBs for the purpose of the Directive as: PCBs, PCTs, Ugilec, any mixture of the three substances in a total of more than 0.005% by weight. The Directive lays down rules on the phase out of PCB/PCT containing equipment, their decontamination and disposal of PCBs, PCTs and some Ugilec-compounds [63]. Directive 96/59/EC amended Directive 76/403/EEC, requesting member states to:
- set up and regularly update inventories of equipment with PCB/PCT volumes greater than 5 litres or 0.05 – 0.005 % by weight of PCBs;
- ensure that used PCBs are disposed of; and
- ensure that PCBs and equipment containing PCBs and PCTs are decontaminated or disposed of as soon as possible, at the latest by end of 2010.

Exemptions: Directive 76/769/EEC stipulates that restrictions shall not apply to marketing or use for research and development or analysis purposes.

European Union Member States
Country specific responses on production and use are included below.

European Union – Ongoing Members
Austria

Austrian national regulations controlling PCTs [29, 53, 59]:

- Austria has prohibited: the production, placing on the market and application of PCTs and PCT containing formulations; production and placing on the market of PCT treated goods; and the use of hydraulic systems which contain a hydraulic liquid exceeding 30 ppm of PCTs. The refilling of transformers is only possible if the concentration of PCT does not exceed 30 ppm. ("Verbot von halogenierten Biphenylen, Terphenylen, Naphtalinen und Diphenylen" (BGBl. Nr. 210/1993));
- Austria has prohibited the production, placing on the market or use of antifoulings containing PCTs. ("Chemikalien-Verbotsverordnung 2003" (BGBl. II Nr. 477/2003))
- Lubricants with PCBs and PCTs must not be brought in commercial commerce. ("Verbot bestimmter Schmiermittelzusätze und Verwendung von Kettensägenölen" (BGBl. 647/1990))

Exemptions:
Production, placing on the market and application for scientific or analytical purposes;

Belgium

The production of PCTs was prohibited in Belgium together with the production of PCB’s in 1986. The Royal Decree of July 1986 prohibits all manufactures, imports, exports, sales, assignments free of charge of PCBs or PCTs, of products, devices, equipment’s or fluids containing those substances, except for operations carried out under the wastes regulations [43, 79]. Inspections are undertaken by the Environment Inspection and OVAM (Flemish Public Waste Agency), especially for transformers and capacitors. Exactly the same inspections apply as for PCBs [79].

Exemption: Scientific research allowed according to Royal Decision of 9 July 1986 [79].

Denmark

PCTs control actions are unknown. Exceptions are in place for scientific research [62].

Finland


- Ban of production, marketing and use of PCTs from January 1, 1990 [45, 75].

Import of PCTs requires consent of the competent authorities in accordance with the Basel Convention and the EU Council Regulation 259/93/EEC. PCT/PCBs have not been exported from Finland. Export would also require consent of the competent authorities [45].

Exemptions are in place for scientific research [75].

France

The Decree No. 87-59 (February 1987) Concerning the Marketing, Use and Disposal of PCBs and PCTs in France regulates the use of PCBs and PCTs. It also covers the
conditions of issue and withdrawal of licenses to firms which process waste containing PCBs, the rights and obligations of license holders and various other measures [7].

Decree No. 2001-63 (January 2001) modifies No. 87-59 in accordance with EC Directive 96/59/EC. Under the Decree a national inventory of PCB/PCT holdings (over 5 dm$^3$) will be conducted, and based on the results a national plan will be developed to decontaminate and eliminate inventoried equipment containing PCBs/PCTs by the end of 2010 at the latest (except for transformer liquids containing 50-500 ppm PCBs/PCTs - which will be eliminated once their use is terminated) [30].

**Germany**

PCTs are regulated together with PCBs according to EC Directive 96/59/EC [23]:

- Marketing and use of PCT are not allowed;
- Some smaller uses in equipment containing PCB/PCT may be ongoing until 2010 [76].

PCTs, preparations of PCTs (>50 ppm PCB or PCT) and articles containing PCTs may not be manufactured or used commercially according to Anhang IV - Verordnung zum Schutz vor gefährlichen Stoffen (Gefahrstoffverordnung - GefStoffV) Herstellungs- und Verwendungsverbote" [76].

Exemptions exist for small (analytical) quantities used in scientific research (e.g. monitoring) and for education and training purposes.

**Ireland**


In summary, Article 5 of the Regulations states that PCTs or preparations, including waste oils, with a PCT weight content higher than 0.005%, shall not be placed on the market or used except under the following conditions: specified equipment, plant and fluids which were in service on 30 June 1986 shall continue to be authorised until they are disposed of or reach the end of their service life; equipment and plant shall display instructions concerning disposal, maintenance and use [27].

Exemptions: for marketing and use for research and development or analysis purposes.

**Italy**

Manufacturing, processing and use of PCTs are prohibited [33].

Exemption: Uses for scientific research and analysis are allowed [80].

**The Netherlands**

PCTs are regulated together with PCBs according to EC Directive 96/59/EC [36, 67].

Exemptions: PCTs may only be used for scientific research [67].
Spain
Control actions are described in: the Spanish National Plan 2001-2010 (BOE no 93 18-04-2001) for PCBs and PCTs; European Directive 85/467/EEC 1-10-85; Spanish RD 1406/1989 November 10 limiting the marketing and use of substances and among them, PCTs; and Spanish RD 1378/1999 27 August re-establishing measures to eliminate and manage PCBs and PCTs and equipment containing them. (Note – This RD includes also the ad hoc measures for Uglec 141 and 121 or 21) [49].

Sweden
PCT are not allowed to be produced, treated, put on the market, be used or reused. Export and Import of products containing PCTs are prohibited. PCTs are included in the definition of “PCB product” in the legislation, both in Sweden and in the European Union [48, 77].

Exemptions: Products containing PCT are allowed to be stored temporarily. Exemption may be granted in exceptional special cases, e.g., for scientific research [77].

United Kingdom
Regulations deal with both PCTs and PCBs in the same approach [41].

European Union – New Members (as of May 1, 2004)

Cyprus
As of 1994, the import, use, etc., of PCTs in Cyprus is controlled by the Dangerous Substances Law of 1991 and regulations under preparation, which were expected to be enacted in 1994[11]. Import of PCTs is prohibited [61].

Czech Republic
The 96/59/EC Directive is fully transposed in the Czech Republic, and both PCTs and PCBs are treated in a similar manner [74].

Latvia
The following control actions are envisaged in legislation:

From year 2002:
It is prohibited to place on market types of equipment containing PCTs (including oil/waste products with PCT content higher than 0.005%) for following uses:

- Power transforming equipment, capacitors, resistors (closed systems)
- High and small capacity capacitors;
- Heat transfer fluids in closed systems;
- Hydraulic fluids for use in mining equipment.

From year 2003:
- It is prohibited to resell PCT containing equipment and fluids mentioned above;
• if there are no technically feasible replacing materials available, competent authorities may issue permit allowing to continue use of particular equipment containing PCTs;
• it is permitted to regenerate products containing PCTs all equipment containing PCTs, being used or placed in the market is required to be labeled [65].

Lithuania
Lithuanian has banned placing PCTs on the market for use. The use of equipment, plants and installations containing PCTs shall continue to be authorised until they are disposed of, or reach the end of their service life (if their exploitation started before entry into force of this Hygenic Standard) [66].

Poland
Both PCTs and PCBs are treated in the same way in the Polish practice; there are no separate measures for these groups of substances. An implementation plan for the PCB/PCT Directive 96/59/EC has been prepared in Poland. The requirements of this directive have been already introduced into the Polish environmental legislation in the Act on Environmental Law and in the Act on Waste. Poland’s control and licensing system for hazardous substances complies with the Basel Convention. Electrical equipment containing PCBs is exported legally for treatment abroad [38].

Slovakia
PCTs have no separate measures, but they would be treated similarly to PCBs [39].

European Union – Applicant Countries

Bulgaria
No control actions for PCTs [60].

Turkey
PCTs have been banned by the Ministry of Environment since 1996, under the Regulation on Dangerous Chemicals [71].

Other UNECE Countries

Armenia
According to the Governmental Decision No 121-N on January 30, 2003 “The order on licensing of activity on hazardous waste processing, treatment, storage, transport and disposal in the Republic of Armenia” any activity related to hazardous wastes, which includes PCBs/PCTs, should be licensed [58].

Under the implementation of “POPs Project in Armenia” the following national standards were prepared and approved:
• Water quality. Determination of certain organochlorine insecticides, polychlorinated biphenyls and chlorobenzenes gas chromatographic method after liquid-liquid extraction.
• Soil quality. Determination of organochlorine pesticides and polychlorinated biphenyls. Gas-chromatographic methods with electron capture detection [58].

Croatia
The use of PCB containing oils (including Askarels) is limited to closed systems only. However, PCTs are not mentioned in any regulations concerning usage [21].

There are units containing PCBs and while in operation they are subjected to the control of Ministry of Labour and Social Welfare - Regulations on Occupational Safety Relating to the Substances Containing PCBs/PCTs (Official Gazette 7/89) [21].

Since 1989 the "Ordinance on Control of Workers Exposed to PCBs, PCTs and PCNs" has been in force. However, only PCBs were analysed and no methods were introduced for controlling PCTs or PCNs in human samples or in other types of materials.

Georgia
According to the Law of Georgia on Hazardous Chemicals several ministries have shared responsibility to control of production (import), storage and/or disposal of hazardous substances [46].

Hungary
As of 1994, import of PCTs required permission from appropriate authorities. PCTs may not be used in preparations with a PCT content greater than 0.01% by weight [11].

Republic of Moldova
The following legislative acts for management of toxic chemical substances, products and wastes were developed and introduced after the Republic of Moldova became independent [25]:
• Law on Regime on Harmful Products and Substances
• Law on Licensing Certain Types of Activities
• Law on Wastes of Production and Consumption etc.

The Republic of Moldova is undertaking first steps on approximation of national legislation in conformity with EU legislation. In the project framework for the “Preparatory EU Approximation Work of the Republic of Moldova in Integrated Pollution Prevention Control and Waste Management”, the Republic of Moldova prepared tables of contents (ToCs), ToCs analysis and a strategy project on approximation of legislation. This study included multiple EU Directives, including: IPPC Directive, Disposal of PCB/PCTs Directive (96/59/EC) etc [25].
Monaco
The same regulations apply to PCB and PCT (Ministerial Decree no 88-638 dated 28 November 1988). Companies which want to change transformers containing PCT must declare it to a special commission in charge of the environmental protection. This commission also checks by means of technical inspections that such transformers are correctly used [50].

Exemption: According to Article 4 of the “Ordonnance Sourveraine no 9287 du 23 novembre 1988”, products containing PCB and PCT are exempted from regulation if they are used for scientific or technical research [50].

Norway
It is prohibited to import, export, produce, sell and use PCT and preparations with a PCT content > 0,005 % by mass [37].

Switzerland
PCTs-containing products are banned in Switzerland since 31 August 1988 according to the Swiss Ordinance relating to Environmentally Hazardous Substances of 9 June 1986: "All halogenated terphenyls with the formula C18HnX14-n with X= halogen and 0=< n <= 13 are prohibited for manufacture, supply, import and use" [26]. Switzerland applies the same measures for PCTs as for PCBs [70].

There is a general exemption that uses of POPs for scientific research purposes are allowed [70].