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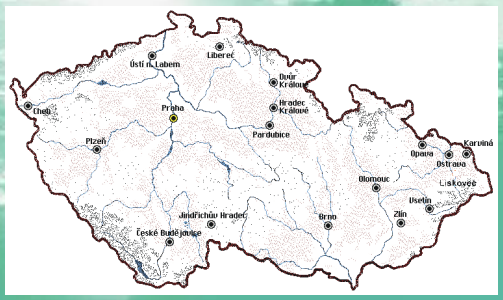
PROJECT GF/CEH/01/003
ENABLING ACTIVITIES TO FACILITATE EARLY ACTION ON THE IMPLEMENTATION OF THE STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS (POPs) IN THE CZECH REPUBLIC



THE NATIONAL IMPLEMENTATION PLAN FOR IMPLEMENTATION OF THE STOCKHOLM CONVENTION IN THE CZECH REPUBLIC

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List of abbreviations

International organisation and conventions	
CEECs	Central and Eastern European Countries
CEFIC	The European Chemical Industry Council
CLRTAP	Convention on the Long-Range Transboundary Air Pollution
EC	European Commission
EU	European Union
EMEP	Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe
FAO	Food and Agriculture Organization
IPCS	The International Programme on Chemical Safety
IRPTC	International Register of Potentially Toxic Chemicals
IUPAC	International Union of Pure and Applied Chemistry
NIP	National Implementation Plan
SC	Stockholm Convention
SNAP	Selected Nomenclature for Air Pollution
UN ECE	United Nations European Commission for Economy
UNEP	United Nations Environmental Programme
Substances of concern	
POPs	Persistent Organic Pollutants
PTS	Persistent, Toxic Substances
PBTs	Persistent, Bioaccumulative, Toxic compounds
OCCs	Organochlorinated Compounds
OCPs	Organochlorinated Pesticides
ALD	Aldrin
CHL	Chlordane
DIE	Dieldrin
DDTs	Σ DDT + DDE + DDT
DDT	p, p´-DDT (4,4'-DDT) = 1,1,1-trichlor-2,2-bis(4-chlorfenyl)ethane
DDE	p,p´-DDE = 1,1-dichlor-2,2-bis(4-chlorofenyl)ethylene - product of dehydrochlorination
DDD	p,p´-DDD = 1,1-dichloro-2,2-bis(4-chlorophenyl)ethane - product of dechlorination
END	Endrin
HPT	Heptachlorine
HCB	Hexachlorobenzene
HCHs	Σ α + β + γ + δ + ε isomers of hexachlorocyclohexane
LIN	Lindan, γ–isomer of hexachlorocyclohexane
MIR	Mirex

TOX	Toxaphene
SCCPs	Short chains chlorinated paraffins ($C_{10} - C_{13}$)
PBDEs	Polybrominated diphenylethers
PAHs	Polyclic Aromatic Hydrocarbons
NAP	Naphthalene
ACL	Acenaphthylene
ACE	Acenaphtene
FLR	Fluorene
PHE	Phenanthrene
ANT	Anthracene
FLU	Fluoranthene
PYR	Pyrene
BaA	Benz[a]anthracene
CHR	Chrysene
BbF	Benzo[b]fluoranthene
BkF	Benzo[k]fluoranthene
BaP	Benzo[a]pyrene
INP	Indeno[1,2,3-cd]pyrene
DBA	Dibenzo[a,h]anthracene
BPE	Benzo[g,h,i]perylene
PCBzs	Polychlorinated benzenes
PCPs	Polychlorinated phenols
PeCP	Pentachlorophenol
PCBs	Polychlorinated biphenyls
Delor 103 - 106	Business name of technical mixtures of PCBs which were produced in Chemko Strážské
PCTs	Polychlorinated terphenyls
PCDDs/Fs	Polychlorinated dibenzo-p-dioxins and dibenzofurans
PCDDs	Polychlorinated dibenzo-p-dioxins
PCDFs	Polychlorinated dibenzofuranes
	D – Di, Tr – Tri, T – Tetra, Pe – Penta, Hx – Hexa, Hp – Hepta, O - Okta
DL PCBs	Dioxin-like polychlorinated biphenyls
Parameters, properties, etc.	
ADI	Acceptable Daily Intake
BAF	Bioaccumulation Factor
BCF	Bioconcentration Factor
BAT	Best Available Technology/Technics
BEP	Best Environmental Practice

HRGC/HRMS	Combination of high resolution gas chromatography and high resolution mass spectrometry
I-TEQs	International Toxic Equivalents
log K_{OW}	logarithm of the distribution coefficient of the n-octanol-water
TEFs	Toxic Equivalent Factors
TDI	Tolerable Daily Intake
National institutions etc.	
CAFI	State Agricultural and Food Inspection
CEcoI	Czech Ecological Institute
CEI	Czech Environmental Inspection
CHMI	Czech Hydrometeorological Institute
CISTA	Central Institute for Supervising and Testing in Agriculture
CR	Czech Republic
ITC	Institute of Technical Chemistry
MoE	Ministry of Environment
MoH	Ministry of Health
MoA	Ministry of Agriculture
MoIaT	Ministry of Industry and Trade
MoT	Ministry of Traffic
MU	Masaryk University
NIPH	National Institute of Public Health
NPOPsINV CR	National inventory of persistent organic pollutants of the Czech Republic
Project TOCOEN	Research project (Toxic Organic Compounds in the Environment)
RECETOX	**R**esearch Centre for **E**nvironmental **C**hemistry and **E**co**TOX**icology, EC Centre of Excellence
R – T & A	Consortium RECETOX – TOCOEN & Associates, National implementing agency for preparation of NIP
REZZO	Registry of Emissions and Sources of Environmental Pollution (CR)
RIASC	Research Institute of Amelioration and Soil Conservation
SRS	State Plant-medical Administration
SVA	State Veterinary Administration
TOCOEN, s.r.o.	Private, consultancy company
WRI	Water Research Institute

EXECUTIVE SUMMARY

Project for the preparation of the National Implementation Plan (NIP)

The national implementation plan (NIP) for the implementation of the Stockholm Convention on Persistent Organic Pollutants („Stockholm Convention, SC“) in the Czech Republic was prepared within the framework of the project „Enabling activities to facilitate early action in the implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs) in the Czech Republic“, UNIDO Project No.: GF/CEH/01/003.

The project submitter was the United Nations Industrial Development Organisation (UNIDO) by proxy of the COUNCIL OF THE GLOBAL ENVIRONMENTAL FACILITY (GEF) in the function of executive agency for this project, with headquarters at Wagramer Strasse 5, A-1220 Vienna, Austria.

The Consortium RECETOX - TOCOEN & Associates, Kamenice 126/3, 625 00 Brno, Czech Republic was appointed the function of National Implementation Agency (NIA) (Project Focal Point), represented in economic, financial and organisational issues by TOCOEN, Ltd., Kamenice 126/3, 625 00 Brno.

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Project objective

The primary objective of the given project is to assist the Czech Republic in implementing the Stockholm Convention and to prepare and receive acceptance of its National Implementation Plan on Persistent Organic Pollutants (POPs).

Basic information

The Czech Republic is considered to be the one of the most industrially developed countries of the European Union associated nations. Simultaneously it is also a country whose industrial development in the past forty years has led to a variety of negative implications with respect to the environment.

In the period following its political changes, however, development not only led to a very extensive change in the legal sphere as a necessary basis for improving the situation, but also to extensive changes with respect to the entry of pollutants into the environment, as well as to costly and extensive measures leading to the liquidation of old burdens and environmental contamination.

The POPs problem is very significant under the current Czech conditions. In comparison to other EU associated countries however, the Czech Republic is involved in a number of activities, programmes and projects, which deal with solving the problem of persistent organic pollutants in various aspects. However, there are still a number of localities highly contaminated by polychlorinated biphenyls and

polychlorinated dibenzo-p-dioxins and dibenzofuranes. The Czech Republic has a very successful tradition with respect to inventories of POPs emissions and their assessment in various environmental components. On the other hand, there is a lack of broader understanding of this problem both from the side of the Ministry of Environment as well as from other departments, state and local authorities, industry, and the general public. These substances are often the subjects of various rather speculative campaigns not always based on a serious understanding of the problem. Increasing the professional as well as the public awareness of these problems was also one of the objectives of the implementation project.

Project goals

The project had five basic goals with the following outcomes:

1. Inception phase, involving the establishment of coordinating mechanisms and project organisation, managerial structure, an approved work plan - the final outcome of this phase was the organisation of the Inception Workshop – IW;
2. Conducting a POPs inventory, establishment of necessary national infrastructure and the necessary capacities for its realisation - the outcome of this phase was the development of the Initial National POP Inventory - INPOPsINV;
3. Determining priorities and subjects of implementation - the outcome was the organisation of the National Priority Validation Workshop - NPVW;
4. Formulation of the National Implementation Plan - NIP and Specific Action Plans on POPs – SAPsPOPs, including their expert evaluation;
5. Approval of the National Implementation Plan at the level of involved institutions and groups - organisation of Endorsement Workshop.

A number of experts, workers from interested institutions and foreign experts took part in preparing the inventory and preparation of the NIP.

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Stockholm Convention

The Stockholm Convention on persistent organic pollutants of May 22, 2001 binds its Parties to the elimination of production and use, or to the limited use of selected substances. Unlike the Protocol on Persistent Organic Pollutants to the CLRTAP Convention, which covers the UN ECE region, the Stockholm Convention is accepted globally and has specific targets even in developing countries. Lists of selected intentionally produced substances are found in Annexes A and B; Annex C lists unintentionally produced substances released during technological processes able to escape into the atmosphere as pollutants. A brief overview of the scope of the Stockholm Convention is demonstrated in Tables 1-3 below. The basic information concerning the substances included in National POP Inventory CR (NPOPsINV) which are components of the National Implementation Plan, are presented in the Annex 1.

Table 1: Stockholm Convention, Annex A: Elimination – part I

Chemicals	**Activity**	**Specific exception**
Aldrin No. CAS: 309-00-2	Production	None
	Use	Local ectoparasiticide Insecticide
Chlordane No. CAS: 57-74-9	Production	As allowed for the parties listed in the register
	Use	Local ectoparasiticide Insecticide Termiticide Termiticide in construction and dams Termiticides in roads Additives in plywood adhesives
Dieldrin No. CAS: 60-57-1	Production	None
	Use	In agricultural operations
Endrin No. CAS: 72-20-8	Production	None
	Use	None
Heptachlor No. CAS: 76-44-8	Production	None
	Use	Termiticide Termiticide in house construction Termiticide (underground) Adjustment, processing of wood For use in underground cabled vaults
Hexachlorobenzene	Production	As allowed for the parties listed in the register

Chemicals	Activity	Specific exception
No. CAS: 118-74-1	Use	Intermediate product Solvent in pesticides In temporarily closed space-limited system
Mirex No. CAS: 2385-85-5	Production	As allowed for the parties listed in the register
	Use	Termiticide
Toxaphene No. CAS: 8001-35-2	Production	None
	Use	None
Polychlorinated biphenyls (PCB)*	Production	None
	Use	Products used in accordance with regulations of part II of this Annex

Stockholm Convention, Annex A: Elimination – part II

Polychlorinated biphenyls

Each part shall:

- Accept the provision[1] for eliminating the use of polychlorinated biphenyls in devices (for example in transformers, condensers or other equipment containing liquid stores) by 2025;
- Support the provision for lowering the danger and risk during use of polychlorinated biphenyls;
- Make provisions for the environmentally sound waste management of waste fluids and devices contaminated by polychlorinated biphenyls with a PCB content higher than 0,005 % as soon as possible, but not later than 2028;
- Work out a report every five years on the advances in the elimination of polychlorinated biphenyls and organize a conference of parties.

Table 2: Stockholm Convention, Annex B: Limitation – part I

Chemicals	Activity	Acceptable purpose or specific exception
DDT 1,1,1-trichloro-2,2- bis (4-chlorophenyl) ethane no. CAS: 50-29-3	Production	Acceptable purpose: Used for coping with biological disease carriers in accordance with part II of this Annex Specific exceptions: Intermediate in the production of dicofol Intermediate

[1] Act no. 185/2001 Coll., on waste, imposes this obligation in §27 to the year 2010 (which is in accordance with the EU Directive 96/59/EC of September 16, 1996 on the disposal of polychlorinated biphenyls and polychlorinated terphenyls

Chemicals	Activity	Acceptable purpose or specific exception
	Use	Acceptable purpose: Used for coping with biological disease carriers in accordance with part II of this Annex Specific exceptions: Production of dicofol Intermediate

Stockholm Convention, Annex B: Restriction – part II

DDT (1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane[2]

- Establishing a DDT register;
- Using DDT for coping with biological disease carriers in accordance with suggestions and guidelines of the World Health Organisation;
- Supplying the Secretariat and the World Health Organisation with information about the use of DDT every three years;
- Development of safe alternative chemicals, and non-chemical products.

This Annex relates to the following persistent organic pollutants, which originate in, and are unintentionally released from anthropogenic sources:

Table 3: Stockholm Convention, Annex C: Unintentional production

Chemicals
Polychlorinated dibenzo-p-dioxins and dibenzofuranes (PCDD/PCDF)
Hexachlorobenzene (HCB) (no. CAS: 118-74-1)
Polychlorinated biphenyls (PCB)

Source categories (Part II)

The following industrial source categories have the potential for comparatively high formation and release of the above-mentioned chemicals into the environment:

a Waste incinerators including co-incinerators of municipal, hazardous or medical wastes or sewage wastes

b Cement kilns firing hazardous waste

c Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching

d The following thermal processes in metallurgy:

i) Secondary copper production

ii) Sinter plants in the iron and steel industry

iii) Secondary aluminium production

iv) Secondary zinc production.

[2] DDT was produced in Spolana Neratovice as a raw material for the production of Neratidine, Neracaine a Pentalidol; all production terminated within 1978 – 1983.

Polychlorinated dibenzo-p-dioxins and dibenzofuranes, hexachlorobenzene and polychlorinated biphenyls may also be unintentionally formed and released from the following source categories, including:

a Open burning of waste, including burning of landfill sites;

b Thermal processes in the metallurgical industry not mentioned in Part II;

c Residential combustion sources;

d Fossil fuel-fired utility and industrial boilers;

e Firing installations for wood and other biomass fuels;

f Specific chemical production processes releasing unintentionally formed persistent organic pollutants, especially production of chlorophenols and chloranil;

g Crematoria;

h Motor vehicles, particularly those burning leaded gasoline;

i Destruction of animal carcasses;

j Textile and leather dyeing (by chloranil) and finishing (with alkaline extraction);

k Shredder plants for the treatment of end of life vehicles;

l Smouldering of copper cables;

m Waste oil refineries.

The state of use of substances falling under the Protocol on Persistent Organic Pollutants in the Czech Republic is shown in Table 4 below.

Table 4: Overview of the POPs use in the Czech Republic

Substance (substances) / CAS	**Abbrev.**	**Reason for inclusion in the inventory**		
		List of SC	**List of UNECE POPs**	**Production/use/origin CR**
Organochlorinated pesticides				
Aldrin / 309-00-20	ALD	Yes	Yes	Not produced, not used; banned in 1980
DDT and its metabolites / 50-29-3	DDTs	Yes	Yes	Banned for use as a pesticide in 1974 in Czechoslovakia, although even after this year DDT was used in limited quantities in selected products, for example for head lice liquidation in Neratidine, Neracaine and Pentalidol products; it was phased out between 1978-1983.
Dieldrin / 60-57-1	DLD	Yes	Yes	Never registered.
Endrin / 72-20-8	END	Yes	Yes	Not produced or used, banned since 1984.
Heptachlor / 76-44-8	HPC	Yes	Yes	Not produced in the Czech Rep. its use for agricultural purposes was banned in 1989.
Hexachlorobenzene / 118-74-1	HCB	Yes	Yes	HCB is not produced in the Czech Rep.; its production in Spolana Neratovice was terminated in 1968. Its use as a pesticide was banned in 1977.
Chlordane	CHL	Yes	Yes	Never produced or used in the Czech Republic; never registered.
Lindan/Hexachlorocyclohexanes	LIN (HCHs)	No	Yes	In the former Czechoslovakia • -HCH was used in combination with DDT (products Lydikol and Gamadyn); after DDT was banned, it continued to be used for seed treatment. Currently its use is banned in the agriculture.
Mirex / 2385-5	MIR	Yes	Yes	Never produced or used in the Czech Republic; never registered.

Toxaphen	TOX	Yes	Yes	Not produced in the Czech Republic; its use was banned in 1986. In the years 1963 – 1987, a large quantity of products containing toxaphen (Melipax) was imported into the former Czechoslovakia.
Produced chemical substances or their mixtures				
Polychlorinated biphenyls	PCBs	Yes	Yes	Was produced in the former Czechoslovakia in the years 1959 - 1984
Hexachlorobenzene	HCB	Yes	Yes	HCB is not produced in the Czech Republic; its production in Spolana Neratovice was terminated in 1968.
Unintentional by-products from combustion and technological processes				
Polychlorinated dibenzo-p-dioxins a dibenzofuranes	PCDDs/Fs	Yes	Yes	
Polycyclic aromatic hydrocarbons	PAHs	No	Yes	
Hexachlorobenzene	HCB	Yes	Yes	HCB is a side-product of the production of industrial chemicals such as tetrachloromethane, perchloroethylene, trichloroethylene or pentachlorobenzene (for ex. production at the Association for chemical and metallurgic manufacturing in Ústí nad Labem). HCB is also formed during electrolytic chlorine production together with octachlorostyrene.
Polychlorinated biphenyls	PCBs	Yes	Yes	

Legal problems connected with the preparation of the NIP

The legislative foundation for the preparation of the NIP is closely connected with the adoption of EC Directives in the Czech legislation. In order to get a clearer insight, and to be able to address the problem in an efficient way, the Commission has financed several studies and has proposed a number of Directives, whose goal is to reduce the releases of dioxins and PCBs into the environment, thereby reducing human exposure to these compounds, including the special Directive concerning the EU's implementation of the Stockholm Convention.

These Directives are focused on:

- Waste incineration
- Integrated pollution prevention and control (IPPC)
- The control of major accident hazards (Seveso Directives)
- Releases into water
- Restrictions on marketing and use of chemicals
- Transport and disposal of PCB-containing waste
- Animal nutrition

Environmental monitoring can be divided into three areas-components:

- environmental air (emissions and ambient air levels)
- water
- wastes and soils

although, in some elements, the interconnection can occur. In the past years, intense efforts have been made to change government laws, regulations, decrees and orders in these three areas in the Czech Republic, so that all new laws and regulations correspond to the EU Directives, Council Directives and Directives of the European Parliament and Council.

In general, it can be stated that new laws and regulations in the Czech Republic still do not fully correspond to/do not fully comply with the valid regulations of the EU, and will therefore be amended, updated and supplemented in the year 2004. This work will continue with newly arriving EU

Directives (for example a new Directive for PAHs – benzo(a)pyrene in PM10 aerosol fractions was expected in 2003).

From the presented overview it is clear that in the field of the environment, the European norms and legislation, especially concerning emissions, are applied. There is a significant application regarding POPs (especially in government Act. no. 354 and Act no. 356 of the Ministry of Environment), and because European norms do not include POPs in ambient air in other legislation, they are not applied in any of our regulations either. A mention of non-chlorinated PAHs in the Government Order No. 350 provides a reference to the regulations and methods of the US EPA.

Regarding water, the situation is similar to that of the environment; the inclusion in European norms and regulations is incomplete and will gradually be updated, new norms will be added to the Czech legislature, including POPs.

The conceptual and planning process in the area of waste management is determined by global strategic documents (Agenda 21), the politics of the EU and State Policies of the Ministry of the Environment of the Czech Republic (for example, an amendment was made regarding the problem of the waste import, which, not including temporary exceptions, is in accordance with the procedures of OECD, EU and the regime of the Basel Convention). Similarly, in the areas of environmental air and water, there are lingering problems related to the present development in this area too.

In April 2002, the European Commission newly defined EU policies in the area of soil protection. This is an extremely important document, because it emphasises the significance of the soil, its irreplaceability and at the same time, its imperilment. Human activities often lead to changes that ,are irreversible in case of the soil. This document presents a number of concrete, legislative steps, which will be taken for the establishment of the new policy concerning the soil protection (IP/02/763). The presented activity is one manifestation of the increasing pressure to create a unified strategy for the protection of the soil as a non-renewable resource (legislation for water and the environment).

Monitoring the load on the soil by hazardous substances, including persistent organic pollutants, is one of the pivotal areas of international activities and national legislative measures. The European Commission presented a proposal for a European Soil Monitoring System, which would assess the state of the soil by standard, unified procedures with complete assurance of quality control in laboratory work. The main monitoring areas should be the soil erosion, the decrease of organic matter in the soil, diffuse contamination and the loss of the biodiversity. The soil contamination is a significant element in the problem of the soil quality and degradation.

The total land area in the Czech Republic (according to the overview on the land resources) is 7 886 000 hectares. The agricultural soils take over 54% of the CR territory, i.e. 4 284 000 ha. The arable land share decreased from 75% (beginning of 1990) to 72% nowadays. Important part of the country, 2 634 000 ha, is covered by the wood lands.

Evaluations of the POPs load on the forest soil are only marginally touched by our study of Protected Areas, mainly due to a different methodological approach to this issue. The attention was focused on agriculturally utilised soils, and studies were carried out in relation to the food chain. The results of monitoring were significantly utilised during the creation of proposed background values of persistent organic pollutants (POPs) for legislative purposes (amendment/update of the Decree 13/1994 Coll.).

In the area of the human dietary exposure, the Organisation of the Department of Health and other departments almost completely use the legislature based on law no. 110/1997 Coll., on about food products and tobacco products, as amended.

The issue is adapted by the Decrees of the Ministry of Health regarding the problem of pesticides (Decree no. 465/2002 Coll.) and the issue of chemical requirements on the health regulations of food products (Decree no. 53/2002 Coll.).

Legislative framework of the PCB issue

- EU Directive 96/59/EC concerning the removal of PCBs and PCTs, considered as waste.
- The Decree of the Ministry of the Environment no. 302/1998 Coll., by which further conditions of the professional competency, the procedure for its determination, the procedure for determining health competency, the procedure for granting and revoking authorisation are defined, and that contains a list of selected dangerous substances and preparations, whose import and export is allowed only with the approval by the Ministry of the Environment, the content of the application for import and export and the method and details of documentation and notification of dangerous chemical substances and preparations, and its Annex no. 9 to the Decree no. 302/1998 Coll.
- Act no. 185/2001 Coll., on waste, and changes to some other laws.
- The Decree of the Ministry of Environment in agreement with the Ministry of Health no. 384/2001 Coll., on the handling of polychlorinated biphenyls, polychlorinated terphenyls, monomethyltetrachlorodiphenylmethane, monomethyldichlorodiphenylmetha-ne, monomethyldibromodiphenylmethane and all compounds containing any of these substances in concentrations above 50 mg.kg-1 (in handling of PCBs).
- The purpose of the documentation according to the above mentioned procedure was the initiation of the inventory of devices probably/potentially containing PCBs pursuant to the Council Directive 96/59/EC. Its provisions lasted until the validity of a new Act on waste, no. 185/2001 Coll., and of its implementing regulations, which more consistently transpose the inventory demands on devices containing PCBs.
- Realisation programmes for the waste management plans of the Czech Republic are an important part of the provisions/regulations aimed at waste containing PCBs/PCTs.

Assessment of the POPs issue in the Czech Republic

Assessment of chemicals pursuant to the Annex A, Part I chemicals (POPs pesticides): historical, current and projected production, use, import and export; existing policy and regulatory framework.

Currently it is not easy to conduct the inventory of organochlorinated POP pesticides retroactively. The necessary amount of data regarding production, use, distribution and storage is not available or is difficult to obtain and retrogressive reconstruction leads only to the rough estimates in some cases. Despite these facts, it was possible to gain a basic overview on production, distribution and application of OCPs. Old unused stocks remain a problem which may be present locally, and which was not carefully eliminated/liquidated in the past years. It is, among other things, also a consequence of the relevant legislation existing in the 1950's and 1960's that did not sufficiently identify the exact rules for manipulation, storage and liquidation of unused stocks of these substances and preparations. A relatively good situation exists in the case of agricultural applications, where the retrogressive reconstruction of the situation is possible, due to the existence of a former central registry, even though some aspects are problematic. The situation is worse in terms of the access to the information on their applications in communal hygiene or in the forestry.

Organochlorinated pesticides are not currently produced in the Czech Republic; there is no import and export either.

The majority of the stocks were removed/liquidated in the first half of the 1990's.

All POP pesticides are still detectable in abiotic and biotic environment, including humans due to their long-term production and application.

There is also the evidence of existing illegal deposits (dumping sites, stocks etc.), as proven by findings or for example, increased levels of contaminants in the environment after floods.

Assessment of chemicals pursuant to/based on the Annex A, Part II Chemicals (PCBs)

PCBs have not been produced since 1984.

They are neither imported nor exported to the Czech Republic (banned by the Act No. 158/2001 Coll.).

It is necessary to accomplish the inventory based on the Decree No. 384/2001 Coll. as soon as possible, including the inventory of contaminated sites and old environmental burdens and thoroughly/consistently impose sanctions on those failing to comply with the legal provisions/breaking the law.

Although there has been a significant decrease in the portion of wastes containing PCBs in higher concentrations, PCBs have been dispersed in the environment and the clear liability/accountability of owners of these wastes has been dispersed/dissipated/diminished in the consequence of the division and privatisation of large stately owned companies as well as to the emergence of the contaminated sites and abandoned facilities that the proprietors do not claim responsibility for.

Contamination of food chains and of the human population by PCBs in CR ranges to the highest in Europe, despite its experienced significant decrease in the CR, and leads to the long-term load for the population (including the breast milk contamination), and to the risk for the ecosystems.

It is apparent that the production of (registered/recorded/filed) wastes will show increasing/growing tendency in the near future although, in principle it will be a short-term growth. Comprehensive/precise data will be available from the inventory of devices with PCBs content that will be performed according to Act no. 185/2001 Coll. However, it cannot be expected that, for example, the volume of registered/recorded hydraulic fluids should exceed 5% of the total quantity. Likely, it would be/is effective (due to the possible interchange during the inventory) that hydraulic fluids are balanced along with/together with insulation and heat transfer fluids.

As indicated above, additional devices exceeding the limit (50 ppm) provided by the law will undoubtedly be discovered during the planned complex/exhaustive inventory of devices containing PCBs and, subsequently, their owners will have to deal with their decommissioning/shut-down and disposal/liquidation. This is the way of entry/introduction of additional devices to the category of the waste containing PCBs. Furthermore, it is likely that within this exhaustive/complex inventory, additional out of service installations/devices containing PCBs, as well as various accumulators with contaminated fluids will also be discovered.

According to Council Directive 96/59/EC, any device containing PCBs must be put out of service operation, it can be assumed, that the amount of waste fluids with a high concentration of PCBs (10 000 ppm) - predominantly fluids in electrotechnical devices (condensers/capacitors) - destined for the liquidation may attain several tens of kilotons especially towards the end of the first decade of the 21st century.

Assessment of chemicals pursuant to the Annex B chemicals (DDT)

DDT has not been produced and used at the territory of the Czech Republic since 1974. The evaluation of its production and related problems are covered in the Chapter 2.3.1., together with other OCPs

Assessment of chemicals formed as undesired by-products pursuant to the Annex C Chemicals (PCDDs/Fs, HCB and PCBs)

It has already been stated that air/atmospheric POPs emissions have shown a significant decrease, including PCDDs/Fs emissions in the CR, similar to those in the EU. However, more important decrease occurred for the industrial sources, the rate of the emission decrease for non-industrial sources (combustion of fossil/solid fuels in households, waste combustion in households, fire) was lower.

Despite the fact that the atmospheric POPs emissions inventory in the Czech Republic including unintentional products such as PCDDs/Fs and PAHs is based predominantly on the use of our own

emission factors based on our own measurements of the most significant emission sources, there are a number of uncertainties.

At present, there are several possibilities for checking and preventing PCDDs/Fs and other POPs emissions. The measures to decrease the entry of PCDDs/Fs (into the atmosphere) are focused on the corresponding/relevant/matching substitutes of raw and source materials, modifications of the technological process (including the maintenance and operational control as well as the refurnishing the existing processes). Possible measures to be taken individually or in combination include:

- Primary measures focusing on materials,
- Primary measures focusing on process,
- Measures concerning waste gases/fumes,
- Cleaning techniques of the waste gas,
- Processes to cleanse the residues.

One of the ground materials for the NIP preparation is the EC Strategy for PCDDs/Fs and PCBs (Communication from the Commission to the Council, the European Parliament and the Economic and Social Committee: Community strategy for dioxins, furans and polychlorinated biphenyls (2001/C 322/02) (COM(2001) 593 final)), which has been accepted by the EU.

The existing emission inventory comprises in detail namely releases into the atmosphere, while only a minimum attention is drawn to the leaks into water, soil, products and wastes.

Information on the state of knowledge on landfills, contaminated sites and waste with the POPs content (quantity, identification, relevant guidance, regulations, remediation measures, data on releases from such sites)

It was supposed that for a precise audit of the PCBs occurrence in installations and store rooms would be possible to use values resulting from the obligatory (set by law) reporting of the PCBs occurrence and occurrence of the materials contaminated by the PCBs at the territory of the CR at the beginning of 2003. But as mentioned above, this activity has not been satisfactorily finished in the proposed period and to prepare the NIP, information provided by the Department of Waste of the Ministry of Environment was used.

The databases of the waste information system, of the chemical substance information system and of the pollution source information system cannot be used to identify potential sources of environmental contamination by other monitored substances because these substances are not among those stored in the above mentioned databases.

The information system on old environmental burdens (SESEZ) is currently used for the implementation of the Stockholm Convention as the essential source of information on contaminated sites in the Czech Republic.

A range of information on the contamination by PCBs was gained from other sources (see the Table and the reports/contributions by particular CEI inspectorates in the Annex 5). The inventory of installations/devices with PCBs content and of contaminated sites is currently in progress. However, the results are not quite satisfactory; sanctions should be imposed upon those who are not fulfilling the reporting as established by the law.

Spolana Neratovice in the district of Mělník has been identified as the only location/site containing a significant amount of PCDDs/Fs.

The landfills belonging to the Spolek pro chemickou a hutní Ústí nad Labem in Chabařovice (no longer in operation) and in Všebořice in the district of Ústí nad Labem (in operation) have been identified as sites containing significant quantity of HCB. Contamination by HCB has been proven in the closed operational unit of Spolana Neratovice, and HCB occurrence could be expected also at the landfill of Spolana.

The monitored pesticides have polluted the landfill/disposal site of the STS Slatiňany in Hodonín, in the district of Chrudim, and former pesticide in Šebáňovice, and Václavice in the district of Benešov.

The occurrences of namely DDT are expected in several old, shut-down landfills with uncontrolled regime, and, to a lesser extent in a number of sites where pesticides had been previously disposed by spilling or emptying into the ground rills.

In case of the further interest in more precise information about the occurrences of monitored substances, it would be a good idea to support the inventory by legal act that would impose some kind of the reporting obligation on both individuals and institutions, or by internal orders in the inspection authorities and state authorities.

Potential POPs releases into the environment are problematic in the case of their release into:

a) Into the soil, and into waters:
   - Unsecured old stocks of these compounds
   - Old disposal sites/landfills
   - Non-reported illegal dumping sites

b) Into the environment:
   - Small pollution sources, especially local furnaces, run by untrained (untrainable) individuals.

In spite of the fact that old environmental burdens have received much attention and significant financial resources in the past ten years, it is definitely not possible to state that all the cases have been resolved. It is difficult to evaluate what caused the present situation; the problem is the reality that the solution is very often time consuming, complicated by the stakeholders, often non-transparent and the result is the state that is far from any solution. In addition, there are a number of „deferred“ problems in the form of the illegal disposal sites/landfills, stock and eventually newly formed environmental burdens (Lhenice, Pozďátky). At present, these facts are rather discovered or identified by the actions of the non-governmental organisations and of citizens. The resolution of such cases is one of the highest priority of the NIP in the Czech Republic.

Summary of future production, use and releases of POPs – exemption requirements

POPs listed in the SC are not anymore produced and used in the CR nor imported to the CR. However, different situation exists in the case of the unintentional, by-products of technologic or combustion processes, as the emission inventory, provided on the basis of the measurement of emission factors in the most significant sources in the CR, proves that emissions of such compounds in the CR are ranked among the most significant in Europe. Moreover, it is not possible to assume that their important decrease would occur within 5 years.

Existing programmes for monitoring releases, environmental and human health impacts, including findings

Detail overview of monitoring programme realised in the Czech Republic, overview of laboratory capacities, POPs-related research projects under investigation is in detail included in NPOPsINV 2003 (Chapter 10, 11, 17).

Current level of knowledge, awareness and education among target groups

In the field of persistent organic pollutants, the Czech Republic has a long- lasting tradition in relation to their monitoring in components of the environment, in drawing up emission inventories, monitoring, research, and liquidation of these substances. Although this does not affect all POPs and all problems in the same way, the level of existing information is very high and comparable to a number of EU member states. Majority of existing information relates to/pertains to PCBs and some OCPs (DDTs, HCHs, HCB) and to matrices such as waters, soils, foods, and also humans. The Czech

Republic is the only country in Central and Eastern Europe that has its POPs emissions inventory based on an extensive set of emission factors measured on its own stationary emission sources. The situation is less favourable in the case of the mobile sources; due to the severe lack of measured POPs emission factors, as they do not belong to the limited components and therefore they are virtually not measured for vehicles.

Less information is available pertaining to certain types of OCPs (toxaphene, driens (aldrin, dieldrin), and chlordane) and especially to PCDDs/Fs. This is, in most cases, connected to analytical, financial, and instrumental demanding factor/intensity for the identification of these types of POPs. The situation, in terms of instrumental availability, changed significantly in 2002 when three high-resolution systems (HRGC/HRMS), suitable for the PCDDs/Fs determination in various abiotic and biotic matrices, were purchased. If the alternative methods are used, such as GC-MS/MS, the analytical process must be decisively validated.

A fundamental problem is the fact that the management at all levels of the direction uses such existing information only rarely/seldom. Such information is neither available in the form easily accessible to the public (presentations, expert explanations), that often leads to misinformation, misinterpretation, and panic, that also do not contribute to the optimal resolution of the problem.

To satisfy the public's interest and to increase its awareness and knowledge, reliable, precise, clear and understandable information on POPs problems is necessary. The information will be granted through the POP Centre, and also through all specialised institutions conducting research, universities, and other entities dealing with this issue – information related to the sources of POPs, their levels/quantity/amounts in the environment, human exposure, potential/possible effects and risks, uncertainties, etc.

However, it is necessary to keep in mind, due to the experience with some educational-awareness campaigns, that the public does not want to be just informed, but it also wishes to play an active role, for example in preventing (POPs) from releases to the environment.

The purpose of the programme for the education of the public is to provide both the experts and non-specialists with a comprehensive summary of information on the principle of the POPs related problems, information on existing and prepared regulations, and their connection to other valid legislation, as well as provide a sufficient information for all target groups of the population in the corresponding span/range.

The current state of information and knowledge of the POPs issue is often antagonistic/contradictory as on one hand the POPs are presented as super toxic substances and on the other hand POPs containing waste has often been handled without necessary precautionary measures in terms of the health and safety at work and environmental protection.

Those completely different approaches led to a situation where even altogether realistic ways of handling PCBs waste, that should have been validated by the probation operation, were rejected, and too rigid/rigorous/severe standards (their interpretation held that a substance with any amount of the PCBs is hazardous waste and therefore it is legal for any particular authority to prevent any activity aimed at their legalized handling) were applied. This lead to the fact that oils containing PCBs were burnt in the combustion chambers of a relevant plant despite the fact that they did not provide the sufficient PCBs decomposition. Even more toxic dioxins were produced and emitted due to such incineration from low chimneys uncontrolled/unmonitored. Moreover, short-term process tests to confirm or disconfirm whether a particular technique is suitable and reliable were often rejected.

The example of PCBs also shows that in most cases the irresponsible handling of this waste was not intended, but resulted from the public unacquaintance/ignorance, from the lack of the specific/expert/qualified information at the producers of such waste (the only possible exceptions were workers from the energetics who were well informed due to their internal regulations/rules/measures and requirements of the distribution plants.) There was insufficient knowledge of existing regulations and their interpretation of some criteria and PCBs handling standards prescribed by these documents. However, the supply of additional documents and detailed information usable for the civil servants and regional (self-governing) institutions was deemed unsatisfactory.

For this reason, the programme of the public awareness and information is an infungible/essential part of the conception is the implementation of the Stockholm Convention

An overview of monitoring programmes carried out in the Czech Republic, of laboratory capacities, and POP-related research projects under investigation are included in detail in NPOPsINV 2003 (chapters 10, 11, 17).

Overview of technical infrastructure for POP assessment, measurement, analysis, alternatives and prevention measures, management, research and development – linkage to international programmes and projects

Monitoring

Monitoring is consistently defined observation, over the time and space, of precisely determined indicators at points creating a network that represents a particular region at a given level of the probability and subsequently the whole territory of the state/country.

Monitoring serves to ensure the maximally objective evaluation of the state and changes/fluctuations/modification of the set component indicators of the environment in a given region.

Monitoring, in general, only observes or signals a state, changes, and their causes, in the components of the environment.

Monitoring outputs serve to evaluate the exposure within systems evaluating/assessing human and environmental risks, to issue the subsequent decisions, to introduce changes in the economic practice, legislation, management and strategy and to the control of the efficiency of adopted measures, funding, etc.

Monitoring programmes should be developed in accordance with the control of the requirements of the current legislation and should monitor the efficiency of the strategic documents such as international conventions and protocols or national measures with respect to the environment and its trends. These programmes are essential in identifying subsequent measures.

The crucial elements in the development and preparation of the monitoring programmes are the measurement methods and standards - a necessary condition for the effective control and monitoring mechanisms is the availability of appropriate measurement methods and the comparability of the data. Presently, methods for analyses of dioxins and dioxin-like PCBs are expensive and slow. Therefore, low-cost and faster methods have to be developed allowing the routine analysis of a larger number of samples providing quick, cheap, and reliable results confirming the presence of those compounds in the environment, feed and food products. In order to obtain comparable, consistent, reliable and high quality measurement results, it is necessary to implement high quality environmental standards at the EU level.

The control will not be effective enough until unannounced measurements are possible. Control measurements planned ahead do not reflect real operational conditions.

Research in the POPs field in the Czech Republic

Research in the area of persistent organic pollutants field has a longstanding tradition in the Czech Republic, which can be seen even in the overview of research tasks regarding this issue being dealt with in the past decade (see NPOPsINV2003).

Nevertheless, it can also be stated that in this area, conceptualisation and co-ordination at all levels is lacking for all agencies and institutions. The Grant Agency of the Czech Republic (GACR) encompasses the environmental problems to various projects in the field of natural sciences; specialisations such as environmental chemistry or ecotoxicology do not exist, in contrast to EU countries, as individual specializations are not even in the codebook of scientific fields. These fields are still understood to be purely applied sciences. Even today, many experts do not have a basic

understanding of directions of the fundamental environmental research, and consider them merely as sorts of environmental applications of classical scientific fields.

Therefore not even goal-oriented research as to the individual environmental problem exists to the necessary extent. Similarly, the scientific research policies of the Ministry of the Environment are, in this respect, far from being perfect, not to mention the problems of non-systematic and illogical enunciation of projects.

Since the Stockholm Convention, the POP Protocol to the UN ECE CLRTAP and even the EC research policy systematically demand and expect research in this field, it is necessary to pay proper attention to this issue, even under the Czech conditions. Especially considering to the fact that the National POP Inventory 2003 and other research projects archived till now have pointed out a number of domains where this environmental research should be directed to.

In the case of the Stockholm Convention, its orientation is determined by associations with the evaluation of the efficiency of the Convention's measures, and also by the evaluation of new substances that could potentially belong to the List of Pollutants of the Stockholm Convention.

The EC/EU focuses its attention in this area in relation with its “EC Strategy for dioxins and PCBs” to the research on DL PCBs, their effects, and risk assessment and on the environmental fate of the PCBs and PCDDs/Fs, toxic and ecotoxic effects, the study of transport and transfer processes, degradation mechanisms, bioaccumulation and biomagnification, and destruction. These are basically the fundamental aspects of the POPs issue that have to be studied even in the case of new pollutants types, of which our current knowledge is rather limited.

The solution of the POPs issue requires a legislative background, financial preconditions, technical possibilities and laboratory and institutional capacities.

Capacities for liquidating POPs in the Czech Republic

Possibility of the technical/technologic solutions of the elimination residues/remnants of the former POPs production, stocks of the POPs-containing products, wastes and contaminated matrices are summarised in the National POPs Inventory 2003 from the point of available technologies and biotechnologies.

A chapter dealing with the available laboratory capacities in the Czech Republic for determining POPs in abiotic and biotic components of the environment is also part of the NPOPsINV2003.

Prevailing methods for handling registered/recorded waste containing PCBs are storage (80.4 %) and combustion/burning with the use of heat (13.9 %) in the Czech Republic. Due to the fact that capacities for re-processing such wastes do not yet exist, an important tool of the waste management is the export. For now/For the time being, it can be assumed that the stored amounts will be exported, if technological capacities (of the reprocessing) are not available.

The Czech Republic has not sufficient technological capacity for the liquidation of PCBs and OCPs residues, POPs (namely PCBs)-contaminated waste and contaminated soils and sediments.

For the liquidation of wastes containing POPs, it is possible to take use the hazardous waste incinerator in Ostrava for their combustion.

The incinerator of the hazardous waste in Ostrava is currently a property of the EKOTECHNIEK-EAST Ltd company., which was a member of the Belgian Syndicate SITA. Nowadays, its operator is the SPOVO, Ltd. The incinerator was built on the premises of the Moravské Chemické Závody, Inc. for the removal of its own production waste. It is located in the northern industrial zone of Ostrava.

The incinerator is intended for the safe removal of hazardous wastes. For this purpose, it is allowed to mix the wastes. It is capable to burn liquid, mash-like, paste-like, and also solid wastes. With respect to pollutants, it is intended for the combustion of all types of hazardous wastes including highly stable organic compounds containing chlorine and high concentrations of sulphur. The concentration of chlorine in the waste charge is, for now, limited to the maximum of 12 kg of Cl2/hour (i.e. it is not possible to burn halogenated oils only; it is necessary to combine them with other wastes). Another limiting factor is the heating power of the waste.

Presently, the incinerators accept and burn condensers of 1 litre to 6 litres volume of the filling containing PCBs. They are destroyed that they are transferred to the incinerator without pre-processing (they are/were not crushed). The condensers contain several aluminium components, that may cause problems of the incinerator (namely to the electro filter); it is possible that their receipt/acceptance and destruction will be limited in the future. The latest information says that SPOVO Ostrava had already solved the technology of the combustion of condensers.

The incinerator is not equipped for the combustion of transformers. It concerns especially the pre-processing of the waste before combustion, for example demounting, crushing, grinding, etc.

The decision of the Ministry of Environment of June 29th, 2000 granted the incinerator authorisation for the collection, buyout, and removal/liquidation of the hazardous waste containing PCBs.

Presently, the possibility of the combustion/burning contaminated soils containing PCBs resulting from the Nová Huť company/enterprise site is under consideration.

Certain types of wastes containing PCBs (used oils with a limited PCBs content of up 50 mg.kg-1) may be liquidated in the cement factories..

Both in the Czech Republic and abroad, the combustion tests have been performed on substances containing PCBs since the middle of the 1980's. The basic findings are the following:

- Considering enormous hold up, high operational temperatures and the basic character of the charge, cement furnaces seem to be suitable for co-incineration of highly stable organic compounds.
- Fears are raised by the fact that low values of POP emissions (especially PCDDs/Fs) measured in the waste gas are caused by enormous dilution and that from this point of view the total PCDD/F emissions from the cement factory (expressed as milligrams TEQ/24 hours) during liquidation of equivalent amounts of hazardous waste can be higher than values reported for some hazardous waste incinerators.
- For these reasons, only limited use of cement furnaces for POP liquidation (such as oils with PCB content under 50 mg.kg-1) can be recommended. Each permit should be preceded by individual administrative procedure.

Identification of impacted populations or environments, estimated scale and magnitude of threats to public health and environmental quality

POPs occurrence in the environment in the Czech Republic

An overview of the present/up-to-date situation regarding the contamination of the particular components of the environment is given in the Annex 6 and the detailed description is a part of the National POPs Inventory, 2003 (NPOPsINV 2003), Chapter 6.

POPs content in food and selected veterinary commodities

From the POPs occurrence evaluation in the selected veterinary commodities (feeds, animal products) according to the individual fact-finding matrices and trend charts, the following conclusions can be made:

a) ***Dominant contaminants in animals were***:

- polychlorinated biphenyls (PCBs) in cattle, but also in pigs,
- Chlorinated pesticides (DDTs, lindane, HCB) and PCBs in game animals and birds of prey,
- DDTs and PCBs in freshwater fish,
- Aldrin, dieldrin, heptachlor, and α+β˜ HCHs were not very significant from the veterinary-hygienic point of view, with few solitary exceptions

b) ***Major sources of contaminants in animals were***:

- Contaminated bulky feedstock, grains and feed mixtures in the case of the cattle,

- Contaminated grains and feed mixes in the case of pigs and poultry,
- Contaminated waters in the case of freshwater fish and water poultry,
- Contaminated environment and feeding niche in the case of game animals and bioindicators.

c) ***Primary sources of the contamination of feeds, environment, or of animals directly***

- Technical raw materials containing PCBs (paints, insulating materials, hydraulic oils etc.) used in the environment of the farms with the animals,
- Contaminated environment of grinding factories, feeds stores and feedstock components after previous manipulation with pesticide compounds at the animal farms,
- Industrial accidents with PCBs releases into the drainage channels and to the water reservoirs, releases of waste from industrial production into the drainage channels and to the to the sludge ponds, consequences of the wash away/rinsing of the chlorinated pesticides contaminated soil after the heavy precipitation, wash-outs from the spoil-tips/stock-piles of the industrial waste, agrochemicals, municipal waste after/during floods, artificially formed water reservoirs in places with the previous intensive agricultural use involving the application of the agrochemicals,
- Use of chlorinated pesticide compounds at the agricultural landscape and forest environment, and thus burdening the feeding niche of wild animals, including the contaminated surface waters (pools, catch pits) used by the animals for drinking.

d) ***The following represent a persisting danger*** :

- Materials with PCBs content in the environment that were not yet harmlessly liquidated, release of PCBs from the unsafe storage with stocks containing these compounds during floods,
- The release of organochlorinated compounds from landfills of different types to the surface waters (floods, heavy precipitation), leakage to groundwater,
- The uncovering of materials containing PCBs in stables during their reconstruction and construction adjustments that had been previously only overlaid by another harmless material,
- Non-liquidated old agrochemicals containing organochlorinated compounds being temporarily deposited,
- The re-use of facilities previously used for the storage of feeds and the feedstock components that had been put out of operation/overridden/closed down due to non-removable contamination by PCBs (old bunkers/silo pits); and in the re-use of the long term non-used/unused stables where materials with a PCB content may be stored,
- The import of contaminated animals, feeds and feedstock components from abroad.

Evaluation of the contamination of the food supply in the Czech Republic

The official database of the results of the monitoring of the human dietary exposure that has been carried out by the National Institute of the Public Health (NIPH), in cooperation with the Hygienic Service since 1994, was used in the inventory of available data. The database contains over 150 thousand analytical results, where more than 110 thousands contain data on some of the above-mentioned persistent compounds. The list of compounds that are further evaluated from the viewpoint in the dietary exposure of the Czech population is summarized bellow in their contracted forms:

- Aldrin, DDTs, dieldrin, endrin, heptachlor, HCB
- PCBs
- PCDDs, PCDFs
- Polycyclic aromatic hydrocarbons, endosulphan, lindane, HCHs

The chapter contains the following data in the following structure:

- Each group of compounds is uniformly described and the basic results are documented graphically.
- Health risks are assessed on the basis of "actual and recommended food consumption".
- Each substance is for better orientation supplemented by the positive findings frequencies that are given for food products incorporated into the Eurogroups (EFG Name).
- Each substance is added by the list of the 30 highest recorded/measured real concentrations in foods in the „as it is eaten“ form.

Brief conclusions resulting from the data collection during 1994 – 2001:

The average chronic exposure dose of the population for the studied organic pollutants (polychlorinated biphenyls (PCBs), aldrin, endrin, dieldrin, methoxychlorine, endosulphan, heptachlor epoxide, hexachlorobenzene (HCB), alpha-, beta-, delta-, gamma- (lindane) isomers of hexachlorocyklohexane, isomers DDT, DDD, DDE, PAHs) in foods did not attain the values during the observational period that are connected to an unacceptable elevated probability of health damage (non-carcinogenic effect) to the consumer.

The estimated exposure of the population based on the real food consumption (RFC 1997) is the highest in the case of PCBs. The exposure to the sum of seven indicator congeners of the PCB reached an average level of 8.5 % of the tolerable daily intake (TDI) in 2001. The highest number of the positive analytical captures was observed in the case of the PCB congeners 153, 138 and 180, that are the most frequently cumulating in the food chain.

A high number of the positive analytical captures have been traditionally observed for p,p´-DDE and HCB. However, the exposure doses of these compounds were traditionally very low (<1 % ADI for "sum of DDT" = p,p´-DDT+o,p-DDT+p,p´-DDD+p,p´-DDE and < 6 % TDI for HCB). This shows that there is a continuous field contamination by these substances, but at low concentration level. Other observed compounds are present in lower frequency, and the chronic exposure dose is relatively low.

The estimated exposure dose for compounds with the so-called dioxin-like effect (TEQ 2,3,7,8 - TCDD for sum of toxic PCBs congeners, dioxins and dibenzofuranes) was estimated to the 3 pg TEQ TCCD.kg-1 b.w.day-1 in 2000 and in 2001. This value is more optimistic than those from previous years.

The exposure dose estimated for the monitored substances using the model of recommended food doses logically reaches the highest values for children between 4-6 years of age. From this point of view, it is necessary to critically evaluate even low exposure doses, especially for those substances with a dioxin-like effect and PCBs.

A detailed interpretation/analysis of the results of the evaluation/assessment of the food supply contamination is a part of the chapter 8 of the NPOPsINV2003.

Evaluation of the exposure of the Czech population to POPs

The POPs in body fluids and in human tissues have been monitored in the CR since the middle of the 1980s. They have been systematically monitored since 1994 as a part of the System monitoring the health of the population in relation to the environment (MZSO) – project 5 “Biomonitoring” in 1994-2002. Besides, some other research projects were carried out, whose results could be used for the assessment of the long term exposure of the population (details see the Chapter 9, NPOPsINV2003). Partial results of this monitoring are given in the Annex 8.

The load of the population of the Czech Republic by polychlorinated biphenyls demonstrates decreasing values from the perspective of the long term trends, however, the existence of locations with higher load of the population (for example: Uherského Hradiště, Ústí n. L., Ostravsko-Karvinsko) as well as the significant individual differences without a demonstrated cause (the influence of old environmental burdens, dietary habits, life style) can be expected. Likewise, the load of the chlorinated

pesticides is decreasing, however, this does not mean that it does not have a health significance, especially from the perspective of the effect of these substances as endocrine disruptors (in the case of the HCB), or as substances with dioxin effects in general.

Based on the exhibited results, it is possible to state that there is sufficient data on the exposure, i.e. load of the adult population based on the monitoring of the breast milk and subcutaneous fat in the CR; however, there is almost no data available regarding the concentrations of these substances in the blood plasma or serum of adults and epidemiological studies/reports on the load of various population groups in relation to potential health risks (defects in endocrine balance, neurotoxicity, immunotoxicity, enzyme induction, etc.) are also lacking.

Results of the biomonitoring in the scope of the national monitoring system on the health of the population in relation to the environment in 2002 are published in the Report 2002 of the National Health Institute, Prague, in June 2003.

The continuous slow decrease of the measured HCB concentrations and in the case of the DDT (respectively DDE) a increase was detected in 2001, however there were no noticeable changes; a problem might be the detected increase in the PCBs levels, where, similarly to the 1997, is a potential connection to the floods from the summer 2002. However, this hypothesis requires a more detailed assessment of the results of all monitored systems.

Up-to-date results of the POPs inventory (NPOPsINV2003) and results of monitoring programmes, pilot studies and research project keep, despite the clear decrease of the contamination of abiotic and biotic constituents of the environment, the high number of records on the sites/locations contaminated by POPs. However the detected quantity of such compounds in sediments and soil is not high on average, neither significantly exceeding the values from other European countries, there exist a number of locations where the detected values were high due to the previous industrial or agricultural activities, or, in the consequence of the existing long-range transfer of such compounds (highlands).

Another problem is, that not all old environmental burdens are monitored, namely - high risk and vulnerable localities, as for example the inundation zones along the large rivers etc., where a significant risk of the contaminations of large territory, in the case of the floods, may appear. This is also supported by the results of the evidence and monitoring carried out after the floods in 1997 and in 2002.

1. INTRODUCTION

1.1 Project for the preparation of the National Implementation Plan (NIP)

The national implementation plan (NIP) proposal for implementing the Stockholm Convention on Persistent Organic Pollutants („Stockholm Convention, SC“) in the Czech Republic was prepared within the framework of the project „Enabling activities to facilitate early action in the implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs) in the Czech Republic“, UNIDO Project No.: GF/CEH/01/003.

The project submitter was the United Nations Industrial Development Organisation (UNIDO) commissioned by the COUNCIL OF THE GLOBAL ENVIRONMENTAL FACILITY (GEF) in the function of executive agency for this project, with headquarters at Wagramer Strasse 5, A-1220 Vienna, Austria.

The Consortium RECETOX - TOCOEN & Associates, Kamenice 126/3, 625 00 Brno, Czech Republic was appointed as the National Implementation Agency (NIA) (Project Focal Point), represented by TOCOEN, Ltd., Kamenice 126/3, 625 00 Brno in economic, financial and organisational issues.

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Project objective:

The primary objective of the given project is to assist the Czech Republic in implementing the Stockholm Convention and to prepare and receive acceptance of its National Implementation Plan on Persistent Organic Pollutants (POPs).

Basic information:

The Czech Republic is considered to be the one of the most industrially developed countries of the new European Union member states. Simultaneously it is also a country whose industrial development in the past forty years has led to a variety of negative implications with respect to the environment.

In the period following its political changes, however, development not only led to a very extensive change in the legal sphere as a necessary basis for improving the former situation, but also to extensive changes with respect to the entry of pollutants into the environment, as well as costly and extensive measures leading to the liquidation of old burdens and environmental contamination.

The POPs problem is very significant under the current Czech conditions. In comparison to other new EU member states however, the Czech Republic is involved in a number of activities, programmes and projects, which deal with solving the problem of persistent organic pollutants in various aspects. However, there are still a number of localities highly contaminated by polychlorinated biphenyls and polychlorinated dibenzo-p-dioxins and dibenzofuranes. The Czech Republic has a very successful tradition with respect to inventories of POPs emissions and their assessment in various environmental components. On the other hand, there is a lack of broader understanding of this problem both from the part of the Ministry of

Environment as well as of other departments, state and local authorities, industry, and of the general public. These substances (POPs) are often the subjects of various rather speculative campaigns that are not always based on a serious understanding of the problem. Increasing the professional as well as public awareness of these problems was also one of the objectives of the implementation project.

Project goals:

The project had five basic goals with the following outcome:

1) Inception phase, involving the establishment of coordinating mechanisms and project organisation, managerial structure, an approved work plan - the final outcome of this phase was the organisation of the Inception Workshop – IW;
2) Conducting a POP inventory, establishment of necessary national infrastructure and the necessary capacities for its realisation - the outcome of this phase was the development of the Initial National POP Inventory - INPOPsINV;
3) Determining priorities and subjects of the implementation - the outcome was the organisation of the National Priority Validation Workshop - NPVW;
4) Formulation of the National Implementation Plan - NIP and Specific Action Plans on POPs - SAPsPOPs, including their expert evaluation;
5) Approval of the National implementation plan at the level of involved institutions and groups - organisation of the Endorsement Workshop.

A number of experts, workers from interested institutions and foreign experts took part in preparing the inventory and in preparation of the NIP.

Representatives of the involved institutions, ministries, universities, Academy of Sciences of the Czech Republic, and non-governmental organisations:

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1.2 Stockholm Convention

The Stockholm Convention on Persistent Organic Pollutants of May 22, 2001 binds its Parties to the elimination of production and use, or to the limited use of selected substances. Unlike the Protocol on Persistent Organic Pollutants to the CLRTAP Convention, which covers the UN ECE region, the Stockholm Convention is accepted globally and has specific targets even in developing countries. Lists of selected intentionally produced substances are found in Annexes A and B; Annex C lists unintentionally produced substances released during technological processes able to escape into the atmosphere as pollutants. A brief overview of the scope of the Stockholm Convention is demonstrated in Tables 1-3 below. Basic information concerning the substances included in the National POPs Inventory CR (NPOPsINV) which are components of the National Implementation Plan, are presented in Annex 1.

Table 1: Stockholm Convention, Annex A: Elimination – part I

Chemicals	Activity	Specific exception
Aldrin No. CAS: 309-00-2	Production	None
	Use	Local ectoparasiticide Insecticide
Chlordane No. CAS: 57-74-9	Production	As allowed for the parties listed in the register
	Use	Local ectoparasiticide Insecticide Termiticide Termiticide in construction and dams Termiticides in roads Additives in plywood adhesives
Dieldrin No. CAS: 60-57-1	Production	None
	Use	In agricultural operations
Endrin No. CAS: 72-20-8	Production	None
	Use	None
Heptachlor No. CAS: 76-44-8	Production	None
	Use	Termiticide Termiticide in house construction Termiticide (underground) Adjustment, processing of wood For use in underground cabled vaults
Hexachlorobenzene No. CAS: 118-74-1	Production	As allowed for the parties listed in the register
	Use	Intermediate product Solvent in pesticides In temporarily closed space-limited system
Mirex No. CAS: 2385-85-5	Production	As allowed for the parties listed in the register
	Use	Termiticide

Chemicals	Activity	Specific exception
Toxaphene	Production	None
No. CAS: 8001-35-2	Use	None
Polychlorinated biphenyls (PCB)*	Production	None
	Use	Products used in accordance with regulations of part II of this Annex

Stockholm Convention, Annex A: Elimination – part II

Polychlorinated biphenyls

Each part shall:

- Accept the provision for eliminating the use of polychlorinated biphenyls in devices (for example in transformers, condensers or other equipment containing liquid stores) by 2025[1]
- Support the provision for lowering the danger and risk during use of polychlorinated biphenyls
- Make provisions for the environmentally sound waste management of waste fluids and devices contaminated by polychlorinated biphenyls with a PCB content higher than 0,005 % as soon as possible, but not later than 2028
- Work out a report every five years on the advances in the elimination of polychlorinated biphenyls and organize a conference of parties.

Table 2: Stockholm Convention, Annex B: Limitation – part I

Chemicals	Activity	Acceptable purpose or specific exception
DDT 1,1,1-trichloro-2,2- bis (4-chlorophenyl) ethane no. CAS: 50-29-3	Production	Acceptable purpose: Used for coping with biological disease carriers in accordance with part II of this Annex Specific exceptions: Intermediate in the production of dicofol Intermediate
	Use	Acceptable purpose: Used for coping with biological disease carriers in accordance with part II of this Annex Specific exceptions: Production of dicofol Intermediate

Stockholm Convention, Annex B: Restriction – part II

DDT (1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane[2]

[1] Act No. 185/2001 Coll., on waste, imposes this obligation in §27 to the year 2010 (which is in accordance with the EU Directive 96/59/EC of September 16, 1996 on the disposal of polychlorinated biphenyls and polychlorinated terphenyls).

[2] DDT was produced in Spolana Neratovice as a raw material for the production of Neratidine, Neracaine a Pentalidol; all production terminated 1978 – 1983.

- Establishing a DDT register;
- Using DDT for coping with biological disease carriers in accordance with suggestions and guidelines of the World Health Organisation;
- Supplying the Secretariat and the World Health Organisation with information about the use of DDT every three years;
- Development of safe alternative chemicals, and non-chemical products.

Stockholm Convention, Annex C: Unintentional production

This Annex relates to the following persistent organic pollutants, which originate in, and are unintentionally released from anthropogenic sources:

Table 3: Stockholm Convention, Annex C: Unintentional production

Chemicals
Polychlorinated dibenzo-p-dioxins and dibenzofuranes (PCDDs/PCDsF)
Hexachlorobenzene (HCB) (no. CAS: 118-74-1)
Polychlorinated biphenyls (PCBs)

Source categories (Part II)

The following industrial source categories have the potential for comparatively high formation and release of the above-mentioned chemicals to the environment:

(a) Waste incinerators including co-incinerators of municipal, hazardous or medical wastes or sewage wastes;

(b) Cement kilns burning hazardous waste;

(c) Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching;

(d) The following thermal processes in metallurgy:

(i) Secondary copper production;
(ii) Sinter plants in the iron and steel industry;
(iii) Secondary aluminium production;
(iv) Secondary zinc production.

Polychlorinated dibenzo-p-dioxins and dibenzofuranes, hexachlorobenzene and polychlorinated biphenyls may also be unintentionally formed and released from the following source categories, including:

(a) Open burning of waste, including burning of landfill sites;
(b) Thermal processes in the metallurgical industry not mentioned in Part II;
(c) Residential combustion sources;
(d) Fossil fuel-fired utility and industrial boilers;
(e) Installations burning wood and other biomass fuels;
(f) Specific chemical production processes releasing unintentionally formed persistent organic pollutants, especially production of chlorophenols and chloranil;
(g) Crematoria;
(h) Motor vehicles, particularly those burning leaded gasoline;

(i) Destruction of animal carcasses;
(j) Textile and leather dyeing (by chloranil) and finishing (with alkaline extraction);
(k) Shredder plants for the treatment of end of life vehicles;
(l) Smouldering of copper cables;
(m) Waste oil refineries.

The state of use of substances falling under the international conventions on persistent organic pollutants in the Czech Republic is shown in Table 4 below.

Table 4: Overview of the POPs use in the Czech Republic

Substance (substances) / CAS	Abbrev.	Reason for inclusion in the inventory		
		List of SC	List of UNECE POPs	Production/use/origin CR
Organochlorinated pesticides				
Aldrin / 309-00-20	ALD	Yes	Yes	Not produced, not used; banned in 1980
DDT and its metabolites / 50-29-3	DDTs	Yes	Yes	Banned for use as a pesticide in 1974 in Czechoslovakia, although even after this year DDT was used in limited quantities in selected products, for example for head lice liquidation in Neratidine, Neracaine and Pentalidol products; it was phased out between 1978-1983.
Dieldrin / 60-57-1	DLD	Yes	Yes	Never registered.
Endrin / 72-20-8	END	Yes	Yes	Not produced or used, banned since 1984.
Heptachlor / 76-44-8	HPC	Yes	Yes	Not produced in the Czech Rep., its use for agricultural purposes was banned in 1989.
Hexachlorobenzene / 118-74-1	HCB	Yes	Yes	HCB is not produced in the CR; its production in Spolana Neratovice was terminated in 1968. Its use as a pesticide was banned in 1977.
Chlordane	CHL	Yes	Yes	Never produced or used in the Czech Republic; never registered.
Lindan/Hexachlorocyclohexanes	LIN (HCHs)	No	Yes	In the former Czechoslovakia γ-HCH was used in combination with DDT (products Lydikol and Gamadyn); after DDT was banned, it continued to be used for seed treatment. Currently its use in agriculture is not allowed.
Mirex / 2385-5	MIR	Yes	Yes	Never produced or used in the Czech Republic; never registered.
Toxaphen	TOX	Yes	Yes	Not produced in the Czech Republic; its use was banned in 1986. In the years 1963 – 1987, a large quantity of products containing toxaphen (Melipax) was imported into the former Czechoslovakia.
Produced chemical substances or their mixtures				
Polychlorinated biphenyls	PCBs	Yes	Yes	produced in the former Czechoslovakia in the years 1959 - 1984
Hexachlorobenzene	HCB	Yes	Yes	HCB is not produced in the Czech

				Republic; its production in Spolana Neratovice was terminated in 1968.
Unintentional by-products from combustion and technological processes				
Polychlorinated dibenzo-p-dioxins a dibenzofuranes	PCDDs/Fs	Yes	Yes	
Polycyclic aromatic hydrocarbons	PAHs	No	Yes	
Hexachlorobenzene	HCB	Yes	Yes	HCB is a side-product of the production of industrial chemicals such as tetrachloromethane, perchloroethylene, trichloroethylene or pentachlorobenzene (for ex. production at the Association for chemical and metallurgic manufacturing in Ústí nad Labem). HCB is also formed during electrolytic chlorine production together with octachlorostyrene.
Polychlorinated biphenyls	PCBs	Yes	Yes	

2. COUNTRY BASELINE

2.1 Country Profile

2.1.1 Geography and Population

The Czech Republic (CR) is an inland country lying in the centre of the temperate zone of the northern hemisphere in the central part of Europe. With an area of 78 866 km^2, it is the 21st in size amongst the countries of Europe; its population of 10 206 436 inhabitants places it in the 12th position, and its population density of 130 inhabitants per km^2 is the 13th highest in Europe. CR has state borders of 761.8 km with Poland, 810.3 km with Germany, 466.3 km with Austria and 251.8 km with Slovakia.

The main European watershed passes through CR, separating the watersheds of the North Sea, the Baltic Sea and the Black Sea. The central node of this watershed is Kralický Sněžník, 1423 m above sea level. The biggest rivers in Bohemia are the Labe (Elbe) and the Vltava (Moldau), in Moravia the Morava and the Dyje, and in Northern Moravia and Silesia they are the Odra and the Opava.

From a physical geographic point of view, CR lies along the boundary between two mountain systems, with different age and geological and geomorphologic development. The western and central parts of CR consist of the Czech uplands, formed at the end of the Palaeozoic, mostly with the character of hilly country, and the border mountains – Šumava, Český les, Krušné Mts., Krkonoše (Giant) Mts., Orlické Mts. and Jeseníky Mts. The Western Carpathians extend into the eastern part of CR; these mountains acquired their present form in the Tertiary – Beskydy Mts. The area between the two mountain systems consists of a valley zone.

2.1.2 Political and Economic Profiles

The Czech economy and politics have been undergoing a transformation since 1989. The Czech Republic is a parliamentary democracy with a market economy. In 2001 the value of the gross domestic product (GDP) of the Czech economy was 2 157.8 billion (bn) CZK at market prices and GDP at purchasers' prices 1 515.1 CZK. The value of household consumption stayed at 1141.1 bn CZK; government consumption stayed at 413.5 bn CZK, and for non-profit institutions serving households (NPISH), consumption was 16.0 bn CZK. The value of net exports reached 59.2 bn CZK. The value of the exports of goods and services stayed at 1 539.4 bn CZK and imports of goods and services equalled 1 598.6 bn CZK. The average number of people unemployed was 4 750 200 and the annual average number of unemployed persons stands at 421 000. The average number of pensioners was 2 196 800, students and children below 15 years numbered 796 700 and 1 644 600 respectively.

2.1.3 Profiles of Economic Sectors

The average number of enterprises with 20 employees or more equalled 8 134, and the average number of enterprises with up to 19 employees was 147 258. The average registered number of workers in enterprises with 20 employees or more equalled 1 209 000, and in enterprises with up to 19 employees was 319 000.

In 2001, 4.2 percent of people worked in agriculture, hunting and forestry works; 0.0 per cent in fishing, operation of fish hatcheries and fish farms and service activities incidental to fishing; 1.2 per cent worked in mining and quarrying; 29.2 per cent in manufacturing; 1.5 per cent in electricity, gas and water supply; 7.8 per cent in construction, 15.3 per cent in the wholesale and retail trade; repair of motor vehicles, motorcycles and personal household goods; 3.7 per cent worked in hotels and restaurants; 7.3 per cent in transport, storage and communications; 1.7 per cent in financial intermediation; 9.1 per cent in real estate, renting and business activities; 4.0 per cent in public administration and defence and compulsory social security; 6.2 per cent worked in education; 5,6 per cent in health and as social workers, and 3.2 per cent in other community, social and personal service activities.

The GDP at basic prices including FISIM equalled 1 985.2 bn CZK, of which agriculture, forestry, and fishing contribute a value of 82.6 bn CZK; industry 652.1 bn CZK; construction 141.9 bn CZK; trade, repairs, hotels, restaurants 337.4 bn CZK; transport, communication 162.9 bn CZK; financial intermediation services 71.5 bn CZK; business services bn 239.9 CZK; other service activities 296.9 bn CZK.

2.1.4 Environmental Overview

The Czech Republic lies on the hydrological divide of three seas – the North Sea, the Baltic Sea and the Black Sea, which divides its territory into three main river watersheds: that of the Labe (Elbe), the Odra and the Morava. There are a total of 24 393 water reservoirs and fishponds within the territory of the Czech Republic, with a total volume of 4 160 million (mil) m^3. Of this number, the number of large reservoirs in 2001 equalled 107, with a total volume of 3 521 mil. m^3.

An average of 15 bn. m^3 p.a. flows out of the network of water courses, with considerable variation from 8 to 19 bn. m^3 p.a. depending on climatic conditions. The hydrographical network of water courses consists of 76 000 km of natural (or modified) river-beds, of which 15 421.3 km are important for water management purposes.

The weather conditions in the CR are influenced by the inter-penetration and intermixing of oceanic and continental forces and are characterised by westerly winds and intense cyclonal activity, causing frequent exchanges of the air mass and relatively high precipitation. The oceanic influence is felt primarily in Bohemia, while continental weather forces predominate in Moravia and Silesia. The weather in the CR is greatly affected by its altitude and the relief of its landscape. Of the total area of the country, 67 % lies at an altitude of below 500 m and 32 % between 500 and 1000 m above the sea level. Only 1 % lies at altitudes greater than 1000 m. The average altitude in CR is 430 m above the sea level.

The fauna and flora occurring within the Czech Republic reflect an inter-penetration of the directions along which fauna and flora spread in Europe. The forests are mostly coniferous and cover 33 % of the total area of the CR. The soil cover varies greatly both in the grain-size of soils and in the extent of soil types. The most common type of soil in the CR is brown soil – cambisol.

The total land area in the Czech Republic (according to the overview on the land resources) is 7 886 000 hectares. The agricultural soils take over 54% of the CR territory, i.e. 4 284 000 ha. The arable land share decreased from 75% (beginning of 1990) to 72% nowadays. Important part of the country, 2 634 000 ha, is covered by the wood lands.

2.2 Institutional, political and legislative framework

2.2.1 State Environmental and Sustainable Development Policy and General Legislative Framework

The reduction of the burden caused by organic pollutants on the environment and population is one of the objectives of the updated State Environmental Policy (SEP) approved by the Czech Government through the Government Order No. 235/2004 Coll., of April 17, 2004. The SEP acknowledges that an internationally coordinated approach is the only effective way to solve global environmental problems, among which the burden due to POPs unquestionably belongs. The Czech Republic accepts its share of responsibility for the state of the environment on planet Earth and asserts its international obligations regarding the POPs issue. The CR acts in accordance with the conclusions of the World Summit on Sustainable Development which took place in Johannesburg, South Africa in September 2004 and stressed the interdependence of economic, social and environmental policies. The Government of the Czech Republic adopted Strategy for Sustainable Development on 8 December 2004.

The Czech Republic is a contracting Party not only to the Convention but also to many other multilateral environmental agreements related to these problems: the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Dangerous Chemical Substances and Pesticides in International Trade, the Protocol on Persistent Organic Pollutants (hereinafter only referred to as the „Protocol“) under the ECE Convention on Long-Range Transboundary Air Pollution. The Czech Republic has confirmed its interest in participating in internationally-coordinated environmental protection and human health protection from the effects of persistent organic pollutants by the ratification of the Convention.

2.2.2 Roles and Responsibilities of Ministries, Agencies and Other Governmental Institutions Involved in POPs Management and Their Respective Resource Allocation

The Act of the Czech National Council No. 2/1969 Coll., establishing ministries and other central bodies of the state administration of the Czech Socialist Republic, in the wording of later regulations, established the Ministry of the Environment on January 1, 1990 as the central authority of the state administration and the highest national inspection authority in all environmental issues. Pursuant to this Act, the Ministry of the Environment is the central body of the state administration, among others, for the protection of natural water accumulation, protection of water sources and of the quality of surface and ground waters, air protection, waste management, environmental impact assessment of activities and their consequences, including transboundary impacts and the State Environmental Policy. The Ministry of the Environment is also the central administrative authority and carries out supreme state supervision in other areas, including the handling of chemical substances and chemical preparations and the prevention of serious accidents.

The Ministry of the Environment is responsible for providing a uniform environmental information system within the territory of the Czech Republic, including a broad-range monitoring. It is also the central body of the state administration for coordination of international co-operation in environmental issues. These tasks correspond to the internal organization of the Ministry of the Environment.

To carry out state inspection of air and water protection, waste management and forest and landscape protection, Act No. 282/1991 Coll., on the Czech Environmental Inspection and its jurisdiction in forest protection established the Czech Environmental Inspection (CEI) as a body of the state administration having its head office in Prague, which is answerable to the Ministry of the Environment. Regional inspectorates of the Czech Environmental Inspection have been established to implement state administration in regions in Prague, České Budějovice, Plzeň, Ústí nad Labem, Liberec, Hradec Králové, Havlíčkův Brod, Brno, Olomouc, and Ostrava.

The bodies of the Inspection carry out supervision to the extent specified by the laws of the Czech Republic, of abidance with legislation and decisions of administrative bodies in environmental matters, determine

inadequacies and damage to the environment, the causes thereof and persons responsible for the occurrence of such damage. They supervise the elimination of determined inadequacies and impose suitable measures for remediation. The Inspection sets fines to be imposed for damaging the environment, makes decisions on the amounts of charges for depositing waste in landfills, for air pollution caused by large and medium pollution sources, and deals with complaints from individuals and organisations. Regional authorities, municipal authorities with extended competency or municipal authorities set charges for air pollution. CEI is authorised to order the termination of production or other detrimental activities endangering the environment until the inadequacies and their causes are eliminated.

State administration in the environmental protection sector is carried out through jurisdiction delegated to the Municipal and Regional Authorities.

The National Park Administrations (Krkonoše National Park, Podyjí National Park, Šumava National Park and Protected Area, České Švýcarsko National Park) and the Nature Conservation Administrations carry out state administration within their territories in forest management, game keeping, fish-breeding, fishing, and protection of the agricultural land fund, which is otherwise the responsibility of the Municipal Authorities.

The professional aspects of the work of the Ministry of the Environment in carrying out state administration are supported and provided for by organizations receiving contributions from the state budget; such organizations provide research, development, information and monitoring in this sector.

The Czech Hydrometeorological Institute (CHMI) is active in the fields of meteorology, climatology, hydrology, and in the air protection. It establishes and operates monitoring stations and networks thereof, processes the results of measurements, draws up and provides forecasts of meteorological conditions, and operates the state meteorological service.

The Czech Environmental Information Agency (hereinafter referred to as CENIA) processes and provides documents for the execution of the state administration, develops the Integrated Environmental Information System and provides the information service on environment. CENIA is the administrator of the Integrated Pollution Register (hereinafter referred to as IPR) and functions as a national notifier. The Agency for Integrated Prevention (hereinafter referred to as AIP) is a part of CENIA. The purpose of AIP is to provide the state administration with professional support in the area of integrated prevention in accordance with the Act No. 76/2002 Coll., on IPPC.

The T. G. Masaryk Water Management Research Institute (T.G.M. WMRI) carries out complex studies on the subject of water as a component of the environment, and provides a professional basis for water management in this sector. The Centre for Waste Management is a part of the TGM WMRI, and provides professional support to the Waste Department of the Ministry of the Environment.

The Czech Geological Survey (CGS) (former Czech Geological Institute) operates the state geological service in the Czech Republic. It collects, processes and assesses data on the geological composition of the state territory and provides it to the authorities for political, administrative and ecological decisions. It provides regional geological information to all concerned. It develops methods for geological research and related laboratory practice. The Czech Geological Survey - Geofund, is the information and study centre of the state geological service.

The Administration of Protected Landscape Areas of the Czech Republic (APLA CR) deals with protected landscape areas within the territory of the CR, ensures the running of state administration in keeping with the law, and manages the individual Protected Landscape Area administrations; it directs the professional activities of the individual administrations and provides professional, methodological, documentary, and informative work for the administration of the Protected Landscape Areas.

The Agency for Nature Conservation and Landscape Protection of the Czech Republic was established to provide for the maintenance of records of the central fund for nature conservation and landscape protection in specially protected areas, to issue viewpoints and expert reports for the state administrative bodies and other legal and personal entities, to provide inventories of investigations, and plans for care of protected territories, to carry out professional scientific research and expert work with regard to environmental

protection, to collect documents, to co-ordinate landscaping programs, and to implement measures for the protection of nature, the landscape and natural heritage.

The Ministry of Health of the Czech Republic (hereinafter only referred to as the MoH) is a guarantor of Act No. 258/2000 Coll., on Public Health Protection, as amended. It constantly assesses health risks and the effectiveness of measures proposed by the NIP related to health protection. Regional hygienic stations and health institutions are also involved in these tasks. The National Reference Laboratory, including the National Reference Laboratory for POP Analysis is involved in this area too. It also provides tasks in the field of health protection provided by Act No. 86/2002 Coll., on Air Protection, as amended, and Act No. 185/2001 Coll., on Waste, as amended.

The National Institute of Public Health (NIPH) through the Centre for the System of monitoring the environmental impact on population health provides objective information on population exposure and health burdens as well as the environmental health risks of selected POPs in individual subsystems. The data obtained within this monitoring system provides important information for the Health Impact Assessment (HIA). The Health Risk Assessment forms an integral part of the complex monitoring studies. It will implement epidemiological studies of selected population groups within the framework of basic research and applied research in cooperation with professionals from both home and abroad.

The Ministry of Agriculture of the Czech Republic (MoA) is the central authority of state administration for agriculture and food processing with regard to POPs. Monitoring and reduction of POPs in the agricultural sector mainly involves the handling of pesticides controlled by the State Phytosanitary Administration (SPA) of the Czech Republic. The Central Institute for Supervising and Testing in Agriculture (CISTA) monitors the occurrence of pollutants in soils and fertilizers in the agricultural sector. The SPA is mainly focused on legislation, international relations, protection of the country from harmful organisms extremely dangerous to plants in international trade as well as domestically, the diagnostics of such organisms, registration of preparations for plant protection and post-registration control and monitoring of their placement on the market and usage (in compliance with the Directive 91/414/EEC), including application technologies and registration thereof, control of the compliance with phytosanitary regulations, monitoring pests and aetiological agents in the territory of the Czech Republic, and, furthermore, in the building of information systems, collection of important phytosanitary data and numerous other activities.

2.2.3 International Commitments and Obligations

On the 1 May,2004 the Czech Republic became a member of the European Union.

The preparation of the Czech Republic for accession to the European Union represented the priority in the international relations of the Czech Republic, including the environmental sector. Since March 1999, when the Department of European Integration was created at the Ministry of the Environment, the agenda associated with this process had been divided into: (1) screening preparation and negotiations (Unit for Negotiation with the European Union) and (2) other activities in the field of information, project and bilateral co-operation (Unit for European Co-operation). In 2001 the Czech Republic became a member of the European Environment Agency – EEA (the process started in March 2000). The proposal for the participation of the Czech Republic in EEA activities was approved by the Parliament of the Czech Republic on October 24, 2001, the ratification process was finished on November 23, 2001, and the Czech Republic became a member of the EEA on January 1, 2002.

The Czech Republic is a member state of the Economic Commission for Europe (UN ECE). In 2001 the Czech Republic was re-elected member of the Bureau of the Committee on Environmental Policy. The Czech Republic is a Party to the majority of environmental conventions in the framework of the UN ECE: the ECE Convention on Long-range Transboundary Air Pollution (a representative of the Czech Republic was elected to the EMEP Steering Committee), the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention), the Convention on the Protection and Use of Transboundary Watercourses and International Lakes, the Convention on the Transboundary Effects of Industrial Accidents and the Convention on Access to Information and Public Participation in Environmental Decision-Making

and Access to Justice in Environmental Matters (Aarhus Convention). The Czech Republic participates in activities of three working groups established in the framework of the Aarhus Convention.

The Czech Republic has been a member state of the Organisation for Economic Co-operation and Development (OECD) since 1995. The Ministry of the Environment participates in the activity of the Environment Policy Committee (EPOC), which the CR chaired between 2001-2003. The Ministry of the Environment was also involved, for instance, in the preparation of the final text of the OECD Environmental Strategy, Guidelines for Environmentally Sustainable Transport and Key Environmental Indicators, which were adopted by environmental ministers during the EPOC Ministerial Meeting in May 2001.

In the framework of the assistance of the Annex I, the Expert Group to the countries with economies in transition, the proposal for a small case study for the Czech Republic was adopted, dealing with emission trade at both national and international levels. The Ministry of the Environment co-operated with other sectors in the first phase of the OECD Programme on Sustainable Development, through which it was charged to lead the National Working Group. Its mission was to co-ordinate at the national level the Czech Republic's contribution to the main Programme output - the so-called Policy Report, defining policy recommendations as guidelines for the member countries on how to reach the sustainable development. This Report was adopted at the OECD Council Ministerial Meeting in May 2001. The Sustainable Development was characterised as a key priority of the OECD and new sustainable development targets were defined. Activity of the National Working Group renewed in connection with the second phase of the Sustainable Development Programme. The Government of the Czech Republic adopted the Strategy for Sustainable Development on 8 December 2004.

The Czech Republic as member of the United Nations participates in the United Nations Environment Programme (UNEP). At the same time it is a party to many multilateral environmental conventions in the framework of UNEP: the Convention for the Protection of the Ozone Layer (Vienna Convention), the Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol), the Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal (Basel Convention), the Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (PIC – Rotterdam Convention) and the Stockholm Convention on Persistent Organic Pollutants, which are international conventions and programmes with relevance to the POPs issue. The Czech Republic also participates in the UN Framework Convention on Climate Change (UN FCCC) and Kyoto Protocol.

2.2.4 Existing Legislation and POPs Related Regulations Addressing Various Stages of the Life Cycle Management, Contaminated Sites, Wastes, Waste Water Discharge and Point Source Air Emissions

The Czech legislation concerning POPs can be divided into sections on the air, water, soil, waste and foods.

Legislation concerning the air:

Act No. 86/2002 Coll., on protection of the air and amending some laws (the Law on Protection of the Air), in the wording of later regulations and its implementing regulations:

Government Order No. 112/2004 Coll., on the National Program to decrease emissions of solid pollutants, sulphur dioxide and nitrogen oxides from existing extra large combustion stationary sources of air pollution

Government Order No. 350/2002 Coll. in the wording of Government regulation number 60/2004 Coll. fixing the emission limits and conditions and manner of surveillance, assessment, evaluation and management of air quality

Government Order No. 351/2002 Coll. fixing binding emission ceilings for certain air pollutants and the manner of preparation and execution of emission inventories and emission projections

Government Order No. 352/2002 Coll. fixing the emission limits and other conditions for the maintenance of stationary combustion sources

Government Order No. 353/2002 Coll. fixing the emission limits and other conditions for the maintenance of other stationary sources

Government Order No. 354/2002 Coll. laying down emission limits values and other conditions for the incineration of waste

Decree No. 356/2002 Coll. laying down the list of pollutants, general emission limit values, the manner of submitting reports and information, establishing the amount of pollutants released, the darkness of smoke, the admissible levels of nuisance regarding smell and intensity of smells, the conditions for the authorization of people, requirements on keeping operating records of pollution sources and conditions for application thereof

Decree No. 357/2002 Coll. laying down the requirements on the quality of fuels from the standpoint of air protection

Legislation concerning the soil:

- **Act No. 334/1992 Coll**., on the protection of the agricultural land fund in the wording of later regulations

Decree No. 13/1994 Coll. setting forth the details of the protection of the agricultural land fund

Legislation concerning waste management:

- **Act No. 185/2001 Coll**., on wastes and amendments to some other acts, in the wording of later regulations
- **Act No. 477/2001 Coll**., on packaging, in the wording of later regulations

Government Order No. 197/2003 Coll., on the Waste Management Plan of the Czech Republic

Decree No. 376/2001 Coll., on the evaluation of hazardous properties of wastes, in the wording of later regulations

Decree No. 381/2001 Coll. laying down the Catalogue of Wastes, the List of Hazardous Wastes and lists of wastes and countries for the purposes of export, import and transit and the procedure for granting consent to export, import and transport wastes (the Catalogue of Wastes), in the wording of Decree No. 503/2004 Coll.

Decree No. 382/2001 Coll., on conditions for the use of treated sludge on agricultural land, in the wording of Decree No 504/2004 Coll.

Decree No. 383/2001 Coll., on the details of waste management, in the wording of later regulations

Decree No. 384/2001 Coll., on management of polychlorinated biphenyls, polychlorinated terphenyls, monomethyl tetrachlorodiphenyl methane, monomethyl dichlorodiphenyl methane, monomethyl dibromodiphenyl methane and all mixtures containing any of these substances in concentrations greater than 50 $mg.kg^{-1}$ (on the management of PCBs)

Decree No. **294/2005 Coll**., on the conditions of land filling and using wastes on the surface and amending Decree No. 383/2001 Coll., on details of waste management

Decree No. 115/2002 Coll., on details of management of packaging

Decree No. 116/2002 Coll., on methods of marking returnable deposit packaging

Decree No. 641/2004 Coll., on the extent and manner of package registration and notification of data from this registry

Government Order No. 111/2002 Coll., laying down the amount of the deposit for selected kinds of returnable packaging for which a deposit is made

Decree of the Czech Mining Office No. 99/1992 Coll., on establishing, operating, safeguarding and liquidation of facilities for deposition of waste in underground spaces

Legislation concerning foods/foodstuffs:

- **Act No. 110/1997 Coll.**, on foodstuffs and tobacco products, in the wording of later regulations

Decree No. 158/2004 Coll., fixing the maximum admissible quantities for certain pesticide residues in food/foodstuffs and food materials (raw materials) in the wording of the Decree No. 68/2005 Coll.

Decree No. 304/2004 Coll., fixing the types and conditions for use of additives and additional substances in the manufacture of foodstuffs in the wording of Decree No. 152/2005 Coll.

Decree No. 305/2004 Coll., fixing the types of contaminating and toxicologically important substances and the admissible quantities thereof in foodstuffs

Decree No. 446/2004 Coll., laying down requirements for food supplements and on the fortification of foodstuffs by food supplements (repealing Decrees No. 53/2002 Coll., 233/2002 Coll. and 306/2004 Coll.)

Legislation concerning water resources:

- **Act No. 254/2001 Coll.**, on waters and amendments to some acts, in the wording of later regulations, and its implementing regulations

Government Order No. 61/2003 Coll., on the indicators and values of permissible pollution of surface waters and waste waters, the requisites of a permit for discharging waste waters into surface waters and into sewer systems, and on sensitive areas

Decree No. 252/2004 Coll., laying down the health requirements on drinkable and warm water and the frequency and extent of inspections of drinkable water in the wording of Decree No. 187/2005 Coll.

Horizontal legislation:

- **Act No. 76/2002 Coll.**, on integrated pollution prevention and control, the integrated pollution register and amendments to some acts (Act on Integrated Prevention) in the wording of later regulations

Decree No.554/2002 Coll. which establishes the model for the application form for integrated authorization, its extent and method of completion

Government Order No. 63/2003 Coll., on the means and extent of security for the information exchange system regarding the best available technique

Government Order No. 368/2003 Coll., on the integrated pollution register

- **Act No. 100/2001 Coll.,** on environmental impact assessment and amending some related acts (Act on environmental impact assessment) in the wording of Act. No. 93/2004 Coll.
- **Act No. 258/2000 Coll.** on protection of public health and amending some related acts, in the wording of later regulations

Government Order No. 178/2001 Coll., on the protection of employee health at the workplace, in the wording later regulations

Decree No. 432/2003 Coll. laying down conditions for assigning categories to individual jobs, limit values of indices from biological exposure tests, conditions for the sampling of biological materials for biological exposure tests and the particulars of the reports on work with asbestos and biological agents

2.2.5 Key Approaches and Procedures for Chemical and Pesticide Management with Relevance to POPs

The key approaches and procedures for the handling chemical substances and pesticides in relation to POPs are: classification, assessment, packaging and control of chemical substances and pesticides and a special field prevention of major accidents.

Legislation concerning handling of chemical substances:

Act No. 356/2003 Coll., on chemical substances and chemical preparations and on an amendment to certain other acts, which came into effect on the date when the Treaty of Accession of the Czech Republic to the European Union entered into force. The following implementation regulations to this act were issued:

Decree No. 164/2004 Coll., establishing the basic methods for examination of dangerous properties of chemical substances and chemical preparations from the point of view of inflammability and oxidation

Decree No. 219/2004 Coll., on the principles of good laboratory practice in the wording of the Decree No. 279/2005 Coll.

Decree No. 220/2004 Coll. establishing details for notification of dangerous chemical substances and for registration thereof

Decree No. 221/2004 Coll. establishing the lists of dangerous chemical substances and dangerous chemical preparations, placing of which on the market is prohibited or whose placing on the market, putting into circulation or use is restricted in the wording of the Decree No. 109/2005 Coll.

Decree No. 222/2004 Coll., fixing the basic methods for examination of physical-chemical properties, explosive properties and properties dangerous for the environment with regard to chemical substances and chemical preparations

Decree No. 223/2004 Coll., establishing detailed conditions for risk assessment of chemical substances dangerous for the environment

Decree No. 231/2004 Coll., setting the detailed content of the Safety Data Sheet for dangerous chemical substance and chemical preparation

Decree No. 232/2004 Coll. implementing certain provisions of the Act on chemical substances and chemical preparations and amending certain acts, as regards classification, packaging and labelling of dangerous chemical substances and chemical preparations

Decree No. 234/2004 Coll., on the possible use of an alternative or other dissimilar name for a dangerous chemical substance in the designation of dangerous chemical preparation and on conferring derogations for packaging and labelling of dangerous chemical substances and chemical preparations

Legislation focused on pesticides:

- **Act No. 326/2004 Coll**. on phytosanitary care and amendments to some related acts in the wording of Act No. 626/2004 Coll. which came into effect on May 31,2004

The following regulations implementing this act and concerning phytosanitary care preparations were issued:

Decree No. 327/2004 Coll., on protection of bees, game, water organisms and other non-target organisms in the use of plant protection preparations

Decree No. 329/2004 Coll., on preparations and other products for the protection of plants

Decree No. 333/2004 Coll., on professional qualification in the phytosanitary care sector

Act No. 156/1998 Coll. on fertilizers, supplementary soil substances, supplementary plant preparations and substrates and agrochemical testing of agricultural soils (Act on Fertilizers), in the wording of later regulations

Decree No. 275/1998 Coll. on agrochemical testing of agricultural soils and determination of the soil properties of forestland, in the wording of later regulations

Legislation on the prevention of major accidents:

Act No. **353/1999 Coll.**, on prevention of major accidents caused by selected dangerous chemical substances and chemical preparations and amending Act. No 425/1990 Coll. on district authorities, outlining their activities and some other related measures, as amended (Act on the prevention of serious accidents) in the wording of later regulations

Government Order No. 452/2004 Coll. establishing the manner of evaluating the safety program for the prevention of major accidents and for safety reports, the contents of the annual plan for controls, the procedure for carrying out a control, the content of the information and the content of the final report on a control.

Decree of the Ministry of the Environment No. 7/2000 Coll. laying down the extent and manner of preparing the notification of a major accident and final reports on the occurrence and consequences of a major accident in the wording of Decree No.367/2004 Coll.

Decree No. 366/2004 Coll., laying down certain details for major accident prevention system

2.2.6 Legal problems connected with the preparation of the NIP

European Parliament and Council Regulation No. 850/2004/EC on Persistent Organic Pollutants amending Directive 79/117/EEC (published in the EU Official Journal on April 30, 2004) was drafted simultaneously with the preparation of the NIP. This Regulation created the conditions allowing the European Community (EC) to adopt the Convention (the document certifying adoption of the Convention by the EC was filed in the depository on November 16, 2004). This regulation also enabled the European Community to ratify the Protocol on POPs to the CLRTAP l (the EC ratification document for the Protocol was filed in the depository on April 30, 2004).

2.3 Assessment of the POPs issue in the Czech Republic

2.3.1 Assessment of chemicals pursuant to the Annex A, Part I (POPs pesticides): historical, current and projected production, use, import and export; existing policy and regulatory framework

2.3.1.1 Production

The two largest pesticide producers in the former Czechoslovakia were Spolana Neratovice and Juraj Dimitrov Chemical Manufactory (CHZJD). The history of the national production of persistent organochlorinated pesticides began in 1950 after the completion of research on the synthesis of DDT by the Scientific Institute of Agrochemical Technology in Bratislava. A year later, conditions for the mass production of technical HCH were created; since 1959 (according to some sources since 1956) only pure lindane (> 99 % γ-isomer of HCH) was used in agriculture and its use was limited to seed treatment (flax, rape). But, technical HCH remained in use in the forestry. At the beginning of the 1960s, first cases of resistance towards DDT were demonstrated (Colorado potato beetle, Leptinotarsa decemlineata), and later on in various other types of insects as well (for example, rape blossom beetle, Meligethes aeneus). After these discoveries, the production of DDT decreased and its use was substituted first with kelevan (also a chlorinated substance), and later with chlorophenvinphose and carbamates. Unused reserves were stored in the 1950's and 1960's in individual agricultural co-operatives and in Agricultural commercial and supply manufactories (ZZNZ) – not only DDT, but also other pesticides. Gradually it became necessary to start regulation of the liquidation of these unused and unusable supplies of OCPs.

Details are described in Annex 2 and in the National POPs Inventory (NPOPsINV) (Chapter 2).

2.3.1.2 Registration

At the end of the 1960's and especially in the 1970's, the usage of OCPs was gradually restricted and banned and these substances were continuously substituted by other types of effective chemical substances. The steps leading up to this were:

- The application of these substances against harmful organisms and the replacement of methods such as seed treatment or application during seeding was ceased;
- Replacement of DDT by organophosphates, carbamates, pyretroids and growth regulators;
- Regulation and ban of the use of polycyclic chlorinated insecticides such as aldrin, dieldrin and heptachlor; the use of endrin was restricted to the liquidation of field mice (field-mouse Microtus arvalis) only and was connected to the case-by-case approval;, and restriction of the large-scale use of fungicides based on HCB (hexachlorobenzene) and PCNB (pentachloronitrobenzene) for use against blight.

Table 5 summarises the production of agents for plant protection registered in the former Czechoslovakia.

Table 5: Historical profiles for chlorinated pesticides registered in the former Czechoslovakia

Active substance: Preparation (content of active substance)	Formulation / Producer	Registered from - to	Note
Aldrin			
Aldrin (not available)	P /	1962 - 1963	
DDT			

Aerosol DDT (10 %)	K / Spolana	1958 – 1973	
Aerosol DL (2.5 %)	K / Spolana	1960 – 1973	Lindan 1 %
Antrix (15 %)	EC (?) / Spolana	not evaluated, at least until 1975	Lindan 7 % in forestry
Cyclodyn (3.75 %)	P / CHZJD	1955 – 1958	Technical HCH 2.5 %
Dibovin (10 %)	P / not evaluated	Not evaluated	Disinfectant for dwellings, livestock, stables
Duaryl (69 %)	SC / not evaluated	Not evaluated	Probably only development, was not used
Dykol (50 %)	DP / Spolana	1959 – 1973	
Dynocid (5 %)	P / CHZJD	1951 – 1973	
Dynol (20 %)	DKV /Spolana	1955 – 1969	
Gamadyn (3 %)	P / CHZJD	1957 – 1973	Lindan 0.5 %
Holus (not evaluated)	In solvents non-miscible with water / not evaluated	Not evaluated, used at least until 1962	p-dichlorobenzene used in stables, textile stockrooms, workshops
Ipsotox (2.5 %)	S / Spolana	Not evaluated, used at least until 1972	HCH technical 8 % in forestry
Ipsotox Special (2.5 %)	S / Spolana	New 1972	Lindan 1 % only in forestry
Meryl N (2 %)	Not evaluated / Spolana	New 1972	Pentachlorphenol 3 %; only for impregnation of wooden surfaces
Lidykol (46 %)	DP / Spolana	1959 – 1973	Lindan 4 %
Neraditin (10%)	P / Spolana	Not evaluated, used at least until 1969	Human hygiene
Nera-emulze (30 %)	Emulsion / Spolana	Not evaluated, used at least until 1964	Human hygiene
Nerafum (40 %)	FK / Spolana	Not evaluated, used at least until 1964	Human hygiene
Nerakain (30 %)	EC / Spolana	Not evaluated, used at least until 1964	
Pararyl (not evaluated)	Not evaluated		Probably only developed, was not used
Pilusan (10 % DDT)	Not evaluated	Not evaluated	In granary; mixed with grains
Pentalidol (2 %)	S / Spolana	Not evaluated; many years prior 1972, continued at least until 1975	Pentachlorophenol 5 %, lindan 0.1 %; only for impregnation of wooden surfaces by coloured paints
Solomitol (similar to the Pentalidol)	Water soluble liquid / not evaluated	Not evaluated, used at least until 1962	Similar to Pentalidol
Tridynol (20 %)	Not evaluated	Not evaluated	In oil; in empty granaries
Dieldrin			
Alvit % (90 %)	MP	1960 – 1968	
Dieldrex B (75 %)	MP	1962 – 1968	TMTD 10 %
Coating preparation (9 %)	MP	1965 - 1968	
Endrin			

Endrin 20 (20 %)	EC	1960 - 1983	
HCH technical			
Cyclo-HCH (10 %, min. 1 % gamma)	P / Spolana, also CHZJD	1952 – 1970	
Cyclo or "Cyclo Powder" (10 %)	P / CHZJD	Not evaluated, used at least until 1972	Only in forestry
Forst-Nexen (18 %, 75 % gamma)	EC / FRG	Not evaluated, used at least until 1975	Only in forestry
Ipsotox (8 %)	See DDT	See DDT	See DDT
Cyclodyn (2.5 %)	See DDT	See DDT	See DDT
Heptachlor			
Agronex Hepta T 30 (29 %)	MP / Celamerck / (FRG)	1970 – 1985	TMTD 30 %
Chlordane			
never registered			
Hexachlorobenzene			
Agronal H (10 %)	MP	1961 – 1977	Hg 4.5 %
Hexachlorobenzene (25%)	P	Up to 1977	Soil disinfectant (very limited use in last years)
HCB (90 %)	DP	1959 – 1977	Internal, non-authorized evaluation, not confirmed
Methoxychlor			
Methoxychlor (10 %)	P / Spolana	1965 - 1972	Produced in relatively small quantities due to the low interest
Methoxychlor (25 %)	EC / not evaluated	1965 - 1972	
Methoxychlor Aerosol (15 %)	K / not evaluated	1965 - 1972	
Mirex			
never registered			
Toxaphene			
Toxaphene (10 %)	P / not evaluated	1958 - 1960	
Melipax (10 %)	P / VEB Fahlberg-List (GDR)	1961 – 1962	
Melipax 60 EC (60 %)	EC / VEB Fahlberg-List (GDR)	1961 - 1983	

Legend:
DP - dispersed powder
DKV - dispersed liquid concentrate for dilution with water
EC - emulsion concentrate
K - liquid concentrate for application without diluting
MP - dispersed powder for seed treatment
P - powder
S - solution
VT - fumigation tablets
Grey items = used in communal hygiene or for livestock disinfection

As far as produced quantities are concerned, only a small portion of the data is accessible. The estimate of the production in the former Czechoslovakia is shown in Table 6.

Table 6: Estimate of national production of plant protection agents in tons

Active substance	Product	Production years	Quantity [t]	Corresponding entry of the active substance [t]
DDT				
	Cyclodyn	1955-1958	2 325	58 125
	Dynocid	1951-1974(!)	51 765	2 588.25 (not registered after 1973)
	Gamadyn	1957-1976(!)	65 437	2 963.11 (not registered after 1973)
Technical HCH				
	HCH techn.	1954-1977	57 979	Perhaps average production (for lindane and preparations containing technical HCH isolation)
	Cyclo-Powder	1952-1970	25 310	3 543.4 Including tech. HCH ??)

The information concerning technical HCH also contains data on lindane production. In total, 3 330 t of lindane were produced, that is about 5% of the production of technical HCH, even though at the beginning of the HCH production it was less than 2% (in the year 1958, 460 t of technical HCH, and 7 t of lindane were produced), while towards the end of production, the production of lindane increased to around 10% (in 1976 2 390 t / 223 t γ-isomer). That means that the use of technical HCH in various preparations was fairly high, especially at the beginning of its production, and then it had been gradually decreasing. Also data regarding trichlorobenzene (side product after the lindane isolation process) is available, and provides a rough estimation of how much of the technical HCH was used. Figure 1 presents a slope of the development of the production of technical HCH in comparison to lindane and trichlorobenzene; the chart depicts that technical HCH remained in use even after the beginning of lindane production. Figure 2 shows the development of use of selected POP pesticides in the former Czechoslovakia.

Figure 1: Comparison of the production of technical HCH, lindane, and trichlorobenzene

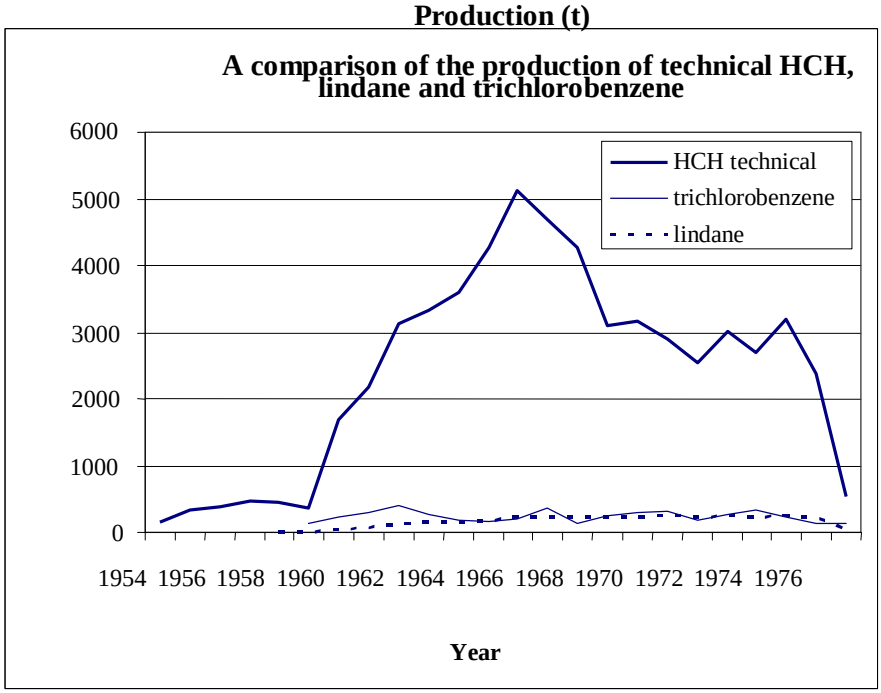
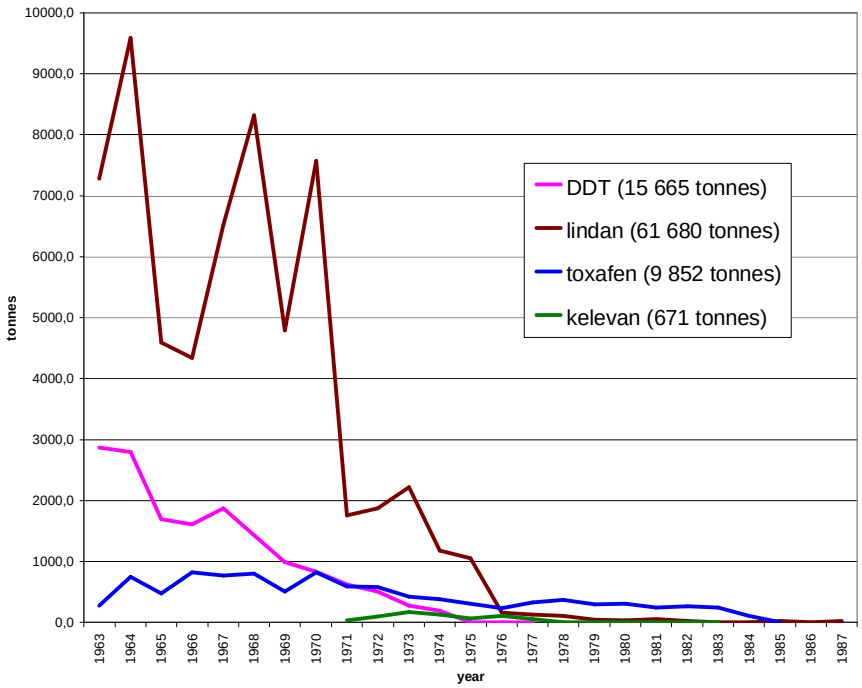


Figure 2: The use of selected POPs pesticides in the former Czechoslovakia (values after the name indicate the production figures during the production period)



2.3.1.3 Import, export

No usable data was obtained concerning the export of persistent organochlorinated pesticides. It is apparent from the available information that the need for plant protection required the import of specific substances, however, the export was very low, if any, especially at the beginning of production. The exception is the period when pilot plant for the production of DDT and HCH was established; these pesticides were exported to the North Korea during the time of the Korean War. And in the contrast to the other types of pesticides, the export of organochlorinated pesticides did not take place any time afterwards.

The assessment of imported pesticides reveals that no preparation with the organochlorinated base was imported in the 1970's [3,4]. There was no change even towards the end of the 1970's, when a range of active substances for the preparation of various pesticides had already been imported, though none of them based on the OCPs.

Therefore, it is possible to conclude, that that the most significant import concerning some of the POPs was the import of toxaphene, and its preparation Melipax from the former GDR.

2.3.1.4 Use

While speaking of the range of use of persistent organochlorinated pesticides, it is necessary to know what purposes they were used for and what doses were applied.

With the exception of hexachlorobenzene, used as a fungicide against moulds, the others (organochlorinated pesticides) were used as insecticides (endrin was also used as a rodenticide against field mice). Some of these substances were also used in the forestry for wood and wooden materials protection and also in communal hygiene. Considerable quantities of OCPs were used by the former Soviet army, and ascertain amount of the OCPs was left on the territory of the former Czechoslovakia. Main use of the OCPs based

[3] Trojan V.: Pesticides imported in 1970. In: Agrochemia (CS), **10** (6), 1970, p. 184-187

[4] Bednar K.: Supply of pesticides in agriculture in 1972 and its perspective for 1973. In: Agrochemia (CS), **13** (6), 1973, p. 165-167

products is summarized in the Table 7. Data dealing with the amounts used in communal hygiene are just rough estimates; it is difficult to judge how precise they are, and how they can be utilised for the total inventory.

Table 7: Use of products for plant protection

Preparations based on active substances	Use in agriculture	Other use
Aldrin	Against soil-dwelling pests [x)]	-
DDT	Potatoes, sugar cane, beetroot, vegetables, grains, legumes, poppy seed	Forestry, human hygiene, disinfection of dwellings, stables, granaries, impregnation of wooden surfaces
Dieldrin	Seed treatment	-
Endrin	Field mice	-
Technical HCH	Soil disinfection; since 1956 only lindane (99 % •)[xx)]	Since 1956 only in forestry
Hexachlorobenzene	Soil disinfection, later only for seed treatment	-
Methoxychlor	similar to DDT; its production was terminated earlier (than DDT); restricted use	-
Toxaphene	rape, alfalfa, red clover	-

[x)] registered; severely restricted or no/banned use, not necessary to evaluate

[xx)] being a γ-HCH, it is degraded faster and therefore it is sometimes not considered as POPs

Concerning the rate of application, it is, of course, dependent on its method. Examples are given in the Annex I. The Table 8 shows data on the size of the area where insecticides were applied. It provides a comparison of three corresponding years, in the middle of the OCPs registration period; 1973 is used as reference.

Table 8: Insecticide application on the agricultural land

Year	1965	1966	1967	1973
Area [ha]	361 643	392 602	393 766	464 000

It is therefore possible to say, that a yearly application of insecticides touched about 400 000 ha of the agricultural lands. In the case that 0,98 kg.ha-1 of active substances were used, as ranges current pesticide application3[5], we would expect that approximately 400 t of active substances was used per year. However, this figure comprises not only persistent organic substances.

2.3.1.5 Stocks, unused reserves, contaminated localities

The removal of unused pesticide stocks by combustion or by the disposal, however, often under the unsuitable conditions, was predominant in the 60's and 70's. The disposal strategy was to postpone the pesticide liquidation until a suitable liquidation method was found. Due to the fact that these unused stocks were often stored without any type of security measures, they represented a significant hazard for environmental contamination.

[5] Rousek J. Cechova J.: Pesticide Consumption and the Extent of Plant Protection Product's Treatment in the Czech Republic in 2001. State Phytosanitary Administration, Dept. of Information, Praha 2001

It wasn't until after 1989 that the appropriate technology contributed to the liquidation of these old reserves The first portion was incinerated in Ingolstadt (FRG). According to documentation, this included 1 900 tonnes of pesticides or pesticide containing wastes, of which 50 to 60 % were POP pesticides (in most cases DDT and HCH).

In 1992, a computer program named „Přípravky" ("Preparations") was used at the State Plant Protection Administration (SOR) Prague for the evidence of unusable pesticide reserves prior to their liquidation. Its database contained approximately 1 700 records. Each record comprised information on the location - region, the district; the preparation, the company, the form of preparation, the amount, the chemical substance, and the state of its wrapping. Workers at the regional and district SOR (Ministry of Agriculture) were gathering the above mentioned data.

SOR documented a total of 584 100 kg (1) of unusable pesticide residues. The figure comprised stocks declared by agricultural companies in 1991.However, the real amount was still probably higher as the database did not contain every agricultural organisation and self-employed farmers possessing such stocks.

Despite all attempts to decrease the amount of unusable stocks in 1992 (combustion in England), the actual liquidation of selected groups of unusable pesticides in reserves did not occur until the second half of 1993. This liquidation was rendered possible due to the grant of the Czech Ministry of the Environment for the export of hazardous wastes. This concerned namely pesticide residues based on DDT and HCH from agricultural entities of AGRIO Měšice. Another portion of the pesticide stocks in the powder form was exported to the incinerator at GSB Ebenhausen, Bavaria (paid for by the Czech Ministry of Agriculture) by the EKO-AQUA-QUELLE enterprise. Other unusable pesticide stocks were either liquidated in incinerators or were disposed of at disposal sites (landfills) for hazardous waste in the Czech Republic. The chemical substances eligible for liquidation were those where the Czech Ministry of Agriculture subsidies would be applied. An overview of the unusable pesticide stocks liquidated in 1993 is given in Table 9.

Table 9: An overview of the unusable pesticide stocks liquidated in 1993.

Preparation	Amount [kg, l]	Preparation	Amount [kg, l]
Cyclo	125	Hermal	5 300
Cyklodyn	71	Hexanal	404
Despirol	192	Lidenal	3 697
DDT	2 104	Lidykol	837
Dynocid	24 918	Lindan	61
Dykol	286	Melipax	12 681
Gamacid	1 451	Neraditin	33
Gamadyn	33 008	Milbol	18 699
Gesarol	300	Other	733
HCH	560	**Grand Total**	**105 479**

2.3.1.6 Chlorinated persistent pesticides in wastes

The production, import and use of persistent chlorinated pesticides OCPs were banned in the Czech Republic in 1974. It can be assumed that chlorinated persistent pesticides, named in the Stockholm Convention (2001) as persistent organic pollutants (POPs), may, besides environmental contamination, be present in existing waste. Therefore, the proposal of National plan of the hazardous wastes treatment in the Czech Republic – namely the chapter 10.11 thereof referring to agrochemicals and pesticides – was taken

into consideration, as it contains the past and present methods of dealing with wastes and as well it includes its prospect for the future[6].

However, it is necessary to note, that the above mentioned document reflects the current practice in both the Czech Republic and in the EU, but does not provide specific information related to 12 POPs listed in the Stockholm Convention according to their volume.

The proposal of the National Plan for the hazardous waste treatment indicates the division according to the catalogue numbers by course of the Act No. 185/2001 Coll. , on wastes, in the chapter 10.11 (Agrochemicals and Pesticides) as follows:

- 02 01 05 Agrochemical waste (including soiled packaging);
- 06 13 01 Inorganic pesticides, biocides and wood impregnation agents;
- 20 01 19 Pesticides.

These categories of waste are related to the 07 04 01, i.e. waste from production, processing, distribution and use of organic pesticides (except the above mentioned waste 02 01 05) – wash water.

This situation seems unclear from the point of view of the implementation of the SC and of the national inventory related to the past data and eventual concrete identification of pesticides in waste in general and the identification of pesticides included in POPs in particular.

Agrochemical waste also comprises generally soiled packaging and wrapping from the plant protection preparations and soil resources enhanceners, wrapping from the treated seeds, wash water containing contaminants etc.

Other waste categories are predominantly pesticides. The proposal of the National Plan namely states:

"it concerned i.e. chlorinated hydrocarbons of the DDT, HCH type. Such compounds are nowadays on the list of compounds their use and import is banned in CR." However, there are no facts on eventual occurrence of such compounds in wastes are mentioned.

Among others it has further been stated that the use of certain pesticides interferes in subjects outside of the plant protection, i.e. to the sphere of personal and common hygiene, deratization, disinfection, construction and other industrial sections. This broader range of preparations used to regulate harmful organisms a term "biocide" is used. Certain part of such waste falls under the heading "small hazardous waste" produced by households and by small enterprises. It is collected separately, as a part of the solid communal waste.

Characteristic document summarizing the current data and the pesticide perspective in hazardous agrochemical wastes is drafted in general terms as regards the heading "pesticides". That document is in full conformity with the law, i.e. Act No. 185/2001 Coll., (on wastes) establishing the types of hazardous wastes and corresponding catalogue numbers. However, this document does not differentiate even the basic types (as insecticides and others) and therefore the same is valid for particular insecticides or their groups falling under the Stockholm Convention. Moreover, we can assume that using the alternative and non-equivalent term "biocides" and the existence of a certain overlap in the interpretation of various kinds of agrochemical wastes (as they are laid down by the Act within their respective catalogue numbers and interpreted through the a year long reporting by the above mentioned law) leads to doubts about the reported data from the 1999.

The Document (Proposal for Plan on the hazardous waste treatment), however, states and important fact: "*It is necessary to clarify the type and the hazardousness of the stored waste. The inventory of waste pesticides took place a few years ago. Those being not applicable were removed and liquidated from the storages of agricultural enterprises and their administrative units. These pesticides were removed by incineration. In relation to the above mentioned amount of the stored wastes it is important to find out if they still occur in agricultural enterprises and how they are safeguarded in regard to their release to the environment.*" No further documents are indicated in the connection to this general information.

[6] **DHV CR, MEURS**, Czech Ecological Institute: Proposal for national plan for hazardous waste treatment, Prague 2002

Most likely, it is not possible to modify the catalogue of agrochemical hazardous waste classification, though it would desirable to introduce further detailed subdivision of pesticides according to their use (purpose). In terms of the Stockholm Convention, it has been proposed that the appropriate department of the Ministry of Agriculture responsible for plant care should verify whether, and if positive then, when and how all recorded supplies of persistent chlorinated pesticides stored in Agricultural purchasing offices (ZNZ) and agricultural companies were destroyed.

2.3.1.7 Conclusions

It is not easy to conduct an inventory of organochlorinated POPs pesticides retroactively. The necessary data regarding production, use, distribution and storage is either not available or difficult to obtain and retrogressive reconstruction only leads to (rough) estimates in some cases . Despite this fact, we succeeded to obtain general overview on production, distribution and application of OCPs.

Old unused reserves remain a problem; they may be present locally, and they were not carefully liquidated in the past years. It is, among other things, also a consequence of the relevant legislation existing in the 1950's and 1960's that did not sufficiently identify exact rules for manipulation, storage and liquidation of unused stocks of these substances and preparations.

Relatively good situation exists in the case of agricultural applications, where due to the earlier existence of a central registry, retrogressive reconstruction of the situation is possible, though some aspects are problematic. Worse situation in terms of access to information on applications exists in communal hygiene or forestry.

Organochlorinated pesticides are not produced in the Czech Republic at present; there is neither their import and nor export.

The majority of reserves were liquidated in the first half of the 1990's.

All POP pesticides are still detectable in abiotic and biotic environment, including humans due to their long-term production and application.

There is also the evidence of existing illegal deposits (landfills, stocks etc.), as proven by findings or for example, increased levels of contaminants in the environment after floods.

2.3.2 Assessment of chemicals pursuant to the Annex A, Part II Chemicals (PCBs)

2.3.2.1 Introduction

Polychlorinated biphenyls (PCBs) comprise a large group of compounds derived from biphenyl (diphenyl). PCBs represent a group of 209 isomers with a molecular formula $C_{12}H_{10-n}Cl_n$ where the number of chlorine atoms ranges one to ten. Formation of the complete set of chlorinated biphenyls during biphenyl chlorination is statistically unlikely. In accordance with this assumption, presence of some 20 congeners was not confirmed in any of the identified technical mixtures.

2.3.2.2 PCBs Production

PCBs have never been produced as independent congeners. Basic technical mixture has always contained a certain amount of other chlorinated biphenyls and admixtures of such compounds as is polychlorinated di-benzo-dioxines, dibezofuranes and polychlorinated naphtalenes. Industrial production was based on the chlorination of the biphenyl and a subsequent separation and purification of the required fractions.

Polychlorinated biphenyls are produced by the catalytic chlorination of biphenyl in the continuous or batch reactor at 150°C, catalyzed by iron chip or by ferric chloride. A mixture of chlorinated compounds is the output of the reaction and therefore it is further purified by the rafination. Chlorination does not occur in all

positions evenly, there are about 120 different compounds out of 209 congeners that are produced in more important quantities.

PCBs were first synthesised in 1881, and their commercial production started in 1929. Total existing world production of PCBs is estimated to 1,5 million tons. It is expected that 31% of this amount has already been released to the environment, 65% is still used in closed systems and than only about 4% has been liquidated in the incinerators. This group of substances has been used as plasticizers, dielectrics, hydraulic fluids, heat transfer media, substances preventing burning, and parts of printer inks, paints, and pesticides.

2.3.2.3 Use of PCBs

PCBs use can be divided into the use in open and closed systems use. Open systems are those where PCBs can escape from and whose use leads in the end to the contamination of the environment. Many countries had introduced measures to restrict and eventually ban the use of such PCBs applications between 1970-1973. All of the following can also fall under the "open systems" heading: use of PCB-based plasticizers, non-carbon copy paper, lubricants, lithographic drawing inks, impregnation materials, paints, glues, waxes, additives to cement and plasters, materials for lubricating of the casting moulds, materials for dust separators, sealing fluids, burning inhibitors, immersion oils and pesticides as "open systems".

The use of PCBs in closed systems is considered as those in cooling fluids in transformers, dielectric fluids in small and large condensers, fire resistant and heat transfer anticorrosive hydraulic fluids in mining facilities, in vacuum pumps, and in heat transfer fluids. A number of escapes into the environment from these closed systems, mainly due to the leakage, are known at present.,. Small condensers also cause a problem because they are not recyclable and thus as waste is extremely hazardous.

Processes of combustion and especially revaporization of PCBs sediments located in large water systems nowadays constitute sizable secondary sources of the environmental contamination. Such sediments result either from the atmospheric deposition or from the direct leakage of PCBs into the water in the past.

Detailed overview on the PCBs use is given in the Annex 3.

2.3.2.4 Production and use of PCBs in the former Czechoslovakia

The PCBs were produced in eastern Slovakia in CHEMKO Strážské between 1959-1984. The total production reached over 21 000 tonnes, of which about a half was exported mainly to the Eastern Europe. A detailed description of the production providing mixtures of polychlorinated biphenyls (known under the commercial names Delor, Hydelor and Deloterm), given in Table A3-1 in Annex 3. Other tables from the Annex 3 provide the review on the amounts of PCB products introduced (to the market) by the Chemko Strážske between 1959 and 1984, commercial names (Table A3-2 and the use of the Chemko Strážske products (Table A3-3).

The total sales of Chemko products reached 21 482 tonnes of PCB-based products, of which 9 869 t (46 %) were exported (especially to the former East Germany). The remainder, i.e. 11 613 t, was utilised in the former Czechoslovakia. The largest consumers of PCB-based technical compounds were Barvy a laky Prague (Delor 106/80 X), ZEZ Žamberk (Delor 103) and ČKD Prague (Delor 103, Hydelor). Delotherm was mainly supplied to various construction organisations.

The CHEMKO Strážske products used more than 200 Czechoslovak enterprises and organisations between 1959 - 1984, when the production of Delor was terminated. These former enterprises nowadays constitute an undecipherable user database. There are no documents available to help determining the amounts of products purchased and their use by the above mentioned organisations.

This abstract user database can only be combined with the central statistics that were recorded between 1988 and 1989 for the last time. The results of the statistical enquiry are presented in the NPOPsINV 2003.

Despite the fact that the production of PCBs had started in industrial countries already in 1929 and in Czechoslovakia in the 1950s, it was not until the late 1960s that polychlorinated biphenyls had been recognised as major environmental contaminants due to the description of several major accidents. Ironically, practically at the same period, there was a PCBs production growth in the former Czechoslovakia. Their production was officially terminated on 30 April 1984, however, this date is only a reference point as regards the processing of the reserves. Polychlorinated biphenyls in transformers may constitute another similar example; PCBs use in the transformers was banned in 1977, it did not concern the installations which had already been in operation.

Reports on production and diffusion of PCBs spread in the 1970s. At the same time, the dangerous properties of polychlorinated biphenyls were discovered. Estimated world production of PCBs in 1980s ranged about one million tons. Production of CHEMKO Strážské represents approximately 2%. Official production of PCBs was officially terminated in Czechoslovakia in April 1984 and this year is also considered. Czechoslovak producers declared 10 335 tons of PCBs in the industrial inventory of PCB sources for 31 March 1986. The latest inventory of PCB sources in the former Czechoslovakia was taken in 1989.

Environmental protection policy in OECD countries was directed via restrictions on PCBs emission sources in the second half of 1970s. In 1983, the use of PCBs in these countries dropped by 20% in comparison to 1973. In 1985, France was the last Western European country producing PCBs. On the other hand, Eastern Europe experienced a PCBs production growth exactly in the same period.

Current PCBs emissions are caused by their previous application in industry and they reflect the state and success of their removal (deposition on landfills or other more appropriate means depending on the particular national legislation). It implies that perfect inventory of sources is of primary importance as in relation to the PCBs lifetime (half-life) their long-term emissions to the environment remain significant.

The inventory anticipates the description of both significant and less significant sources in view to open an closed systems.

Closed systems can transform into the open ones only under exceptional circumstances or accidents. For example, hydraulic fluids can penetrate to other components of the environment, and thereby contaminate ground waters, if used in mines or in highly penetrable environment or vent to the atmosphere via mine ventilation. Many other similar ways of their intrusion into the environment could be theoretically described. The ultimate result is the PCBs accumulation in such environmental constituent that provides better conditions for such accumulation (for example, fatty tissue in mammals is significant), thereby creating the origin of their risk to humans

Evaporation from applied paints is considered to be one of the important sources of PCBs emission into the environment.

Other emission sources into the atmosphere include emissions from the polymer manufacturing industry (softeners) and eventually the open combustion. Some authors involve waste incineration, landfills, transformers and condensers leaks, various industrial production units and their waste among important sources of PCBs emissions. A very important source of environmental contamination is the land filling of smaller electronic devices, containing filled condensers, whose disposal safety is not always ecologically acceptable. There is always the risk of uncontrolled leakage of their PCBs content.

The major potential sources of the PCBs contamination of the air represent:

- PCBs evaporation from older open systems (applied paints, finishes, wood protectors, softeners, heat transfer fluids, etc.),
- Vapours from operational, liquidated or disposed (landfills) transformers, condensers, hydraulic systems and devices with high PCBs content (around 10 500 tonnes in the former Czechoslovakia in 1990),
- PCB vapours from landfills and spent gasses from the communal waste incinerators,

- PCBs vapours from the outdoor environment (from open areas), for example when using waste, PCBs contaminated, oils in the transport industry,
- Vapours from waste stored as the dry spoil-tip of the industrial wastes,
- eventually, PCB vapours from the closed systems (least likely sources of the contamination).

2.3.2.5 Polychlorinated biphenyls (PCBs) in waste

Having abandoned PCBs production and import and banning their use in 1984, we may encounter them, excluding their unused stocks, in various types of waste.

Roughly, 10-11 kt of Delor 103 could have been used in the former Czechoslovakia. If we assume that 2/3 of all installations and Delor 103 stocks remained in the Czech Republic after the split of the former Czechoslovakia, then the total amount of pure PCBs, including imports yields 7-8,5 kt of PCBs used as filling for electrotechnical, heating and hydraulic devices.

This amount was diluted partly as primary fluids (PCBs were blended with chlorobenzenes, chloroparaffins, saturated hydrocarbons etc.). Besides the primary waste (fluids, out of operation devices) a large quantity of secondary wastes formed due to leaks of liquids containing PCBs into the surrounding environment (soil, construction sites, non-secured solid waste landfills, etc). PCBs were both deliberately and unintentionally mixed with waste oils and given back when purchasing new oil. Assuming a 5% escape rate and a dilution ratio of 1:10 000 (i.e. the 100 ppm is the average PCBs concentration in the secondary waste), about 0,5 million tons of PCBs contaminated oils, construction wastes, soils etc. would be formed according to the very rough estimate. Some of the devices were sold abroad or exported with the purpose of their removal.

It is evident that even the known information on the total amount of „pure“ PCBs, likely used at the territory of the Czech Republic, cannot form the base for the estimation of the number of PCBs contaminated devices, where given their function, a manipulation with operational fluid during regular routine maintenance would occur. According to the Council Directive No. 96/59/EC, “a device containing PCBs” is every device “containing PCBs” (i.e. even the mixtures containing more than 50 ppm PCBs), then through the consistent exercise of this Council Directive a PCBs containing device becomes even a device containing mineral oil contaminated over 50 ppm PCBs.. The possibility of such installation contamination is very imminent, and it suggests that in most cases its owners and/or operators are not aware of the state of the oil fluids in terms of the PCBs contamination. That is why more precise planning should be possible on the basis of the upcoming inventory in the context of the Act on wastes implementation.

The PCBs/PCTs may be found, except out-of-operation „closed“ devices with PCB/PCT fillings, in various types of wastes contaminated by these substances. This involves a wide range of wastes, such as metal scrap, paper, plastics, soil and construction waste (concrete, masonry, wood, paintings, varnishes etc.). The means of their destruction depends on the type and on the composition of waste and its PCBs/PCTs content. Such wastes are classified as hazardous wastes, on principle; as they, due to their characteristics or, to the accumulation of their dangerous properties, present an exceptional environmental risk and they are subject to the tightened up regime. The handling fluids containing PCBs and devices containing PCBs falls under the scope of the Chemical Act no. 157/1998 Coll., on chemical substances and preparations (according to later regulations). The presented plan does not contain certain potentially POPs contaminated wastes such as ashes from incinerators and other technological units (metallurgy, paper industry, etc.), nor sludge or absorption components.

About 24 300 t of such wastes were declared in the Czech Republic between 1995-1997 (5 700 t in 1995,15 100 t in 1996 and 3500 t in 1997) were declared in the Czech Republic. The majority were decommissioned instruments and operational tools both containing PCBs (a total of 14 700 t, or 60 %). Since 1998, a new catalogue of wastes has been in effect. Based on the catalogue 11 400 t of waste containing PCBs were declared (96.5 % were electrotechnical devices, such as PCBs containing transformers and condensers). It is important to specify that these devices contain 10-30 % w/w PCBs (the rest is predominantly composed of metals, and then of plastic, paper etc.).

A basic principle of handling PCBs/PCTs containing waste is to prevent formation of secondary waste originated from the contamination of inert oils, soils, and construction materials by commercial PCBs containing fluids. What concerns the use of closed electric devices (transformers, condensers) containing PCBs, it has been fundamentally adapted by valid technical norms; EN 50 195 (*closed electrical devices containing PCBs*) and also EN 50 225 (*closed oil containing electrical devices potentially contaminated by PCBs*). These normative regulations of Euronorm character, are in line with the best available technique principle (BAT principle) for the above-mentioned devices.

PCBs/PCTs containing waste by course of the Act on Waste No. 185/2001 Coll. falls to the group of *selected products, selected wastes and selected device (by the course of the § 26 of this Act)*. Obligations arising from the § 27 of the above mentioned Act specify the handling of the PCBs, devices containing PCBs and waste with PCBs content. It is necessary to add that apart from the Act on Waste, handling these substances is also regulated by Ministry of Environment Decree no. 384/2001 Coll., on *handling polychlorinated biphenyls*.

This Decree specifies, among others:

- Labelling of PCBs containing devices subject to the registration;
- Labelling of decontaminated devices;
- Records of devices and substances containing PCBs and the method of their notification;

Two basic types of waste - hydraulic oil containing PCBs, and insulation and heat transfer fluids containing PCBs - were included to the selected wastes with PCBs content in the Proposal of the National Plan of the handling hazardous wastes.

Data on wastes were loaded with a significant error in the end of 1990s, due to the variable levels of the records and system of the procedures in the case of generators (generators of wastes) as well as in the national and regional administration and municipal authorities. Moreover, we cannot exclude (and it is more likely) that some part of this (waste) commodity had been removed inadequately and therefore it is not comprised in the registry. This fact arises from the diversity of the regional data, where the variation manifold exceeds the standard deviation elaborated according to the standard statistical routine. This diversification occurred on the special seminars dealing with particular stages of the drafting the national plan on hazardous wastes. We expect that after the next stage, i.e. the formulation of the regional plans, further data precision will take place and subsequently it enables the more precise summation of the values at the national level. However, this note is in general, relevant for both the previous and further group (of compounds).

Specification of the prospective production of wastes containing PCBs/PCTs in the future was the objective of the 2002 Inventory.

It is apparent that the production of (registered) waste will show increasing tendency due to the need of the inventory and obligation of its removal till 2010 although, in principle this will be a short-term growth. Comprehensive data will be available from the inventory of devices with PCBs content, which will be performed according to Act no. 185/2001 Coll. However, it cannot be expected that, for example, the volume of recorded hydraulic fluids should exceed 5% of the total quantity. Likely, it would be effective (due to the possible interchange during the inventory) that hydraulic fluids are balanced together with insulation and heat transfer fluids.

As indicated above, additional devices exceeding the limit (50 ppm) provided by the law will undoubtedly be discovered during the planned exhaustive inventory of devices containing PCBs and, subsequently, their owners will have to deal with their shut-down and liquidation. This is the way of introduction of additional devices to the category of the waste containing PCBs. Furthermore, it is likely that within this exhaustive inventory, additional out of service devices containing PCBs, as well as various accumulators with contaminated fluids will also be discovered.

As to the Council Directive 96/59/EC, any device containing PCBs must be put out of service operation, it can be assumed, that the amount of waste fluids with a high concentration of PCBs (10 000 ppm) -

predominantly as fluids in electrotechnical devices - destined for the liquidation may attain several tens of kilotons especially towards the end of the first decade of the 21st century.

The inaccuracy in the registration (or presently incomplete registration), the lack of awareness of owners, non-existence of the separated collecting, the possible interchange with other oil fluids, unsuitable storage and the lack of facilities for processing of electrotechnical devices, that cannot be decontaminated by incineration without previous disassembly and separation of metal parts are, among other things, the key problems of the current state of PCBs/PCTs containing waste.

2.3.2.6 PCBs Inventory carried out 2002-2005

The Czech Republic as an EU candidate country had been obliged, in accordance with the implementation plan of the Council Directive 96/59/EC on the disposal of PCBs/PCTs containing devices, to pass the provisions leading to the liquidation of PCBs and conduct the complete decontamination or liquidation of devices containing PCBs/PCTS by 2010. The first step to complete this assignment in the Czech Republic is to perform the detailed inventory of all devices with PCBs content higher than 5 litres.

The PCBs inventory will be the basis for the draft of the further strategy for the definite removal of the PCBs.

Ministry of the Environment entrusted the Water Research Institute of T. G. Masaryk – Centre for Waste Management in Prague by the mission to ensure the registration of devices containing PCBs in the Czech Republic in accordance with Act No. 185/2001 Coll., on waste(s) and with the implementation plan based on the Council Directive 96/59/EC, on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCBs/PCTs)

The legislative framework for PCBs issue stems from:

- The EU Council Directive 96/59/EC on the removal of PCBs and PCTs;
- Decree of the Ministry of the Environment No. 391/2000 Coll., repealing the Decree of the Ministry of the Environment No. 302/1998 Coll., laying down specific conditions for the competence, and the procedure of their verification, the procedure for the attestation of health competence, procedures of granting and refusing the authorisation, the index of hazardous substances and preparations whose import and export is possible only with the approval by the Ministry of Environment, the content of the form of application for import and export, and the method and details of the registration and notification of hazardous chemical substances and preparations, its Annex 9 to the Decree No. 302/1998 Coll.;
- Act No. 185/2001 Coll., on Wastes, and amendments of some other laws;
- Decree of the Ministry of (the) Environment in agreement with the Ministry of Agriculture No. 384/2001 Coll., on dealing with polychlorinated biphenyls, polychlorinated terphenyls, monomethyltetrachlorodiphenylmethane, monomethyldichloro-diphenylmethane, monomethyldibromodiphenylmethane, and various mixtures containing any of these substances in concentrations above 50 $mg.kg^{-1}$ (on handling PCBs).

An attempt to register devices with liquid filling containing or potentially containing PCBs, was made through the amendment of the Decree No. 302/1998 Coll. - implementing the Act No. 157/1998 Col on chemical substances and preparations (as repealed by the Act 356/2003 Coll., on chemicals as amended). The provision § 9a of the Decree of the Ministry of Environment No. 391/2000 Coll., introduced the registration of PCBs resulting from the devices and also laid down the PCBs definition. Registration was provided by the Reporting Sheet.

The purpose of the registry laid down by the above mentioned legislation was the establishment of the inventory for devices with the prospective content of PCBs pursuant to the Council Directive 96/59/EC. The establishment of the inventory covered the period prior to the entry into force of the new Act on Waste(s)

No. 185/2001 Coll. and its implementing regulations, as they transpose the requirements on the inventory of the PCBs containing devices more thoroughly.

In the scope of the PCBs inventory pursuant to the Decree No. 391/2000 Coll. (a total of the) 5 575 Reporting Sheets recorded a total of the 16 136 devices by 31st December 2001; out of 16 136 devices composed of 1 660 transformers, 11 228 condensers and 2 611 other devices. However, a total amount of the operational fluids containing PCBs in the registered devices – as well as other data – could not be determined precisely. The main reason of this fact was that the subjects filling the form specified in the Annex 9 of the Decree No. 302/1998 Coll. did not regard all the entries as mandatory, but only as informative; thereby they had filled only the known entries.

A proposal of the Decree was prepared and presented to the Legislative Department of the Ministry of the Environment. It covered the issue of the sample collection, analytical determination of PCBs (a selection of official analytical methods for the determination of the PCBs content in an operational fluid, quality guarantee for analytical results for registration purposes etc.), and the proposal for the Reporting Sheet. Legislative and other specialised units of the Ministry of the Environment discussed and amended the proposed text and it was subsequently discussed and approved by the Legislative Board (Legislative Committee) of the Czech Government. The Decree was issued on the 17th October 2001 and became effective on the 1st January 2002. It is to be noted that amendments presented by the Parliament and the Chamber of Deputies modified the text of the submitted proposal.

2.3.2.7 Summary of the processed information in the PCBs inventory

A complete updated overview of processed information is provided below in the Table 10 (last update 26 July, 2005). A detailed region based overview is shown in the Annex 3.

Table 10: Registration of PCBs

Total							
		Device with PCBs content: Yes			Device with PCBs content: questionable		
Device	**Code**	**Items**	**Weight of the filling [kg]**	**Weight of the filling [t]**	**Items**	**Weight of the filling [kg]**	**Weight of the filling [t]**
Power Transformer	10	125	288 331	288.331	1 398	2 302 614	2 302.614
Coil	11	4	10 541	10.541	54	65 410	65.41
Reactor	12	0		0	2	29 920	29.92
Electrofiltre Transformer (separator)	13	0		0	63	44 289	44.289
Bushing	14	0		0	0		0
Tapping switch (in the transformer)	15	0		0	2	2 000	2
Instrumental (measuring) tension transformer (PTN)	16	0		0	22	3 221	3.221
Instrumental (measuring) current transformer (PTP)	17	0		0	16	2 588	2.588
Instrumental (measuring) combined transformer (PTK) – tension + current	18	0		0	0		0
Condenser **(DZ)**	20	10 379	135 491.1	135.4911	2 715	29 543.5	29.5435
Condenser (less than 5 l)	20	10 024	44 841.07	44.84107	199	631	0.631
Condenser Battery **(MZ)**	21	0		0	0		0
Engine **(MZ)**	22	0		0	0		0

Switch-boards **(MZ) Cubicle Switchboard**	23	0		0	0		0
Switch	25	0		0	1 684	65 972.88	65.97288
Other electric devices with liquid dielectric	30	0		0	1 608	617 781.1	617.8711
Hydraulic mining device	40	0		0	1 057	244 107.5	244.1075
Vacuum pump	50	0		0	0		0
Industrial device with heating by a heat transfer fluid (duplicator, plant mixing (?) tarmacadam plant etc.)	60	2	7 000	7	2	1 000	1
Other device(s)	70	0		0	246	76 049	76.049
Container with the operational liquid containing PCBs	81	0		0	3	2 093	2.093
Tank with the operating liquid containing PCBs	82	0		0	0		0
Barrel containing operational liquid containing PCBs	83	0		0	1	200	0.2
Other means of the storage of operational liquids containing PCBs	90	0		0	0		0
Total		20 535	487 304.17	487.30417	9 072	3 487 419.98	3 487.41998

Number of subjects owing or operating certain devices and substances containing PCBs:	226
Enterprises authorised to deal with PCBs:	about 80
Enterprise entitled to remove PCBs (Incinerator of the hazardous wastes Ostrava - SPOVA – condensers, small transformers up to 80 kg, oils, sediments, cables, soils with PCBs content):	1
Laboratories analyzing PCBs in the framework of the PCBs inventory:	33
Persons authorized to collect samples of oils from electric devices:	99
Persons authorized to collect samples of oils from non-electric devices	13

2.3.2.8 Conclusions

PCBs have not been produced since 1984.

They are neither imported nor exported to the Czech Republic (banned by the Act No. 158/2001Coll.).

It is necessary to accomplish the inventory based on the Decree No. 384/2001 Coll. as soon as possible, including the inventory of contaminated sites and old environmental burdens and consistently impose sanctions on those failing to comply with the legal provisions.

Although there has been a significant decrease in the portion of wastes containing PCBs in higher concentrations, PCBs have been dispersed in the environment and the clear liability of owners of these wastes has been dispersed in the consequence of the division and privatisation of large stately owned companies as well as to the emergence of the contaminated sites and abandoned facilities that the proprietors do not claim responsibility for.

Contamination of food chains and of the human population by PCBs in CR ranges to the highest in Europe, despite its experienced significant decrease in the CR, and leads to the long-term load for the population (including the breast milk contamination), and to the risk for the ecosystems.

It is apparent that the production of (reported) wastes will show growing tendency in the near future although, in principle it will be a short-term growth. The precise data will be available from the inventory of

devices with PCBs content that will be performed according to Act no. 185/2001 Coll. However, it cannot be expected that, for example, the volume of reported hydraulic fluids should exceed 5% of the total quantity. Likely, it would be effective (due to the possible interchange during the inventory) that hydraulic fluids are balanced together with insulation and heat transfer fluids.

As indicated above, additional devices exceeding the limit (50 ppm) provided by the law will undoubtedly be discovered during the planned complex inventory of devices containing PCBs and, subsequently, their owners will have to deal with their shut-down and disposal. This is the way of entry of additional devices to the category of the waste containing PCBs. Furthermore, it is likely that within this exhaustive inventory, additional out of service devices containing PCBs, as well as various accumulators with contaminated fluids will also be discovered.

According to Council Directive 96/59/EC, any device containing PCBs must be put out of service operation, it can be assumed, that the amount of waste fluids with a high concentration of PCBs (10 000 ppm) - predominantly fluids in electrotechnical devices (condensers) - destined for the liquidation may attain several tens of kilotons especially towards the end of the first decade of the 21st century.

2.3.3 Assessment of chemicals pursuant to the Annex B (DDT)

DDT has not been produced and used at the territory of the Czech Republic since 1974. The evaluation of its production and related problems are covered in the Chapter 2.3.1., together with other OCPs.

2.3.4 Assessment of chemicals formed as undesired by-products pursuant to the Annex C Chemicals (PCDDs/Fs, HCB and PCBs)

2.3.4.1 Assessment of sources of POPs atmospheric emissions under the conditions of the Czech Republic

The existence of significant atmospheric POPs emissions in the Czech Republic is due mainly to the following two factors: (1) the Czech Republic is a country with a fairly developed industrial sector, and (2) domestic consumption of primary energy sources is consists of solid fuels by more than 50%. These two basic facts give the assumption of the existence of significant POPs emission sources and also the assumption of a fairly significant potential as to the emitted amount in comparison with countries with a different structure of the fuel consumption. It is necessary to add the unsatisfactory level of ecological awareness not only in the population but also in the management of the medium level. Consequently, current situation that does not lead to the prevention or to the limitation of the atmospheric emissions, but rather to their pointless increase.

Significant atmospheric POPs emissions are associated with the fuel combustion in the Czech Republic. In particular, it is the combustion for the energetic purposes, such as the electric energy and heat production, including household heating. Important share of the fuel consumption in the industrial processes, either to the direct heating where exists the contact of the (exhaust) fumes with the raw material(s) or with the product(s), or to the indirect heating where the fumes are released separately from the emissions resulting from the production itself. Processing of minerals and mineral raw materials, production and processing of metals, chemical industry are part of the first group, inorganic and organic chemistry are part of the second group. Another important fuel consumption is connected to the chemical-energetic use, i.e. the consumption of coke in the metallurgy.

Another not favourable situation is in the sector of household heating in the Czech Republic as the coal combustion is still significantly present despite the widespread introduction of natural gas combustion performed in the first half of the 1990's. The itching point, that is not sufficiently covered by the information is co-incineration of wastes in households (also in the industry and communal sphere), and by open fires. Since the termination of the leaded petrol distribution in 2001, emissions from personal motor vehicles have been significantly decreased.

In spite of the land filling being the prevailing mode of the disposal of the waste in the CR, operating incinerators and sources with co-incineration of waste can be considered as significant sources (of emissions).

2.3.4.2 The structure of sources of POPs atmospheric emissions

According to the Annex C of the Stockholm Convention, main emission sources to the environment are considering the following:

Annex C, Part II: Source categories – significant sources

(a) Waste incinerators, including co-incinerators of municipal, hazardous or medical wastes or sewage sludge
(b) Cement kilns firing hazardous waste
(c) Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching
(d) The following thermal processes in the metallurgical industry:
    (i) Secondary copper production;
    (ii) Sinter plants in the iron and steel industry;
    (iii) Secondary aluminium production;
    (iv) Secondary zinc production.

The Stockholm Convention states, in addition to the above mentioned significant sources, other sources as potentially significant:

Annex C, Part III: Source categories:

(a) Open burning of waste, including burning of landfill sites;
(b) Thermal processes in the metallurgical industry not mentioned in Part II;
(c) Residential combustion sources;
(d) Fossil fuel-fired utility and industrial boilers;
(e) Firing installations for wood and other biomass fuels;
(f) Specific chemical production processes releasing unintentionally formed persistent organic pollutants, especially production of chlorophenols and chloranil;
(g) Crematoria;
(h) Motor vehicles, particularly those burning leaded gasoline;
(i) Destruction of animal carcasses;
(j) Textile and leather dyeing (with chloranil) and finishing (with alkaline extraction);
(k) Shredder plants for the treatment of end of life vehicles;
(l) Smouldering of copper cables;
(m) Waste oil refineries.

There are 64 incinerators of hazardous waste, (19 of the total are not in operation), 3 incinerators of municipal waste, 5 cement works and 13 other facilities that have already received authorisation for waste co-incineration; all these sources are registered in the category stated in the Annex C, Part II. Of these sources, 4 incinerators already meet the strict emission limits of PCDDs/Fs concentration (0.1 $ng.m^{-3}$), and as well as 33 incinerators that posses authorized plan on decreasing the emissions. These planned emission limits must be met by 28 December 2004.

The Czech Republic has a long tradition in the production of paper and pulp. Two large factories with the basic production of paper and pulp and 10 plants manufacturing various types of the paper and of the cardboard and providing further processing. Atmospheric POPs emissions are minimized due to the significant restriction on the use of the chlorine or its complete exclusion.

The metallurgic industry is also very well developed in the Czech Republic. Two large-capacity sinter plants of iron ore for the production of raw iron and steel (Vysoké pece Ostrava and TŽ Třinec) are in operation. The non-ferrous metallurgy of the Czech Republic consists of a large number of technologies, because almost every company has an individual production assortment. There is no primary production from non-ferrous metal ores but only secondary production using imported raw materials (metals, alloys) and/or waste of non-ferrous metals and wastes non-ferrous alloys. Available data (as of the 2002) state that there are 5 secondary productions of copper, and 16 secondary productions of aluminium registered in the Czech Republic. Individual secondary production of zinc was not found. However, the significant portion of the POPs emissions will result from the above-mentioned large scale activities, the importance of smaller production units is significant locally.

The second group of sources included in the Annex C, Part III of the Stockholm Convention is much more diversified, and can be subdivided into two characteristic (sub)groups. The first part is composed of, like the sources shown in the Part II, „controlled " processes, as the following:

(b) Thermal processes in the metallurgy not mentioned in the Part II;
(d) Fossil fuel-fired utility and industrial boilers;
(e) Firing installations for wood and other biomass fuels (specific sources for wood and other biomass combustion);
(f) Specific chemical production processes releasing unintentionally formed persistent organic pollutants, especially production of chlorophenols and chloranil;
(g) Crematoria;
(i) Destruction of animal carcasses;
(j) Textile and leather dyeing (with chloranil) and finishing (with alkaline extraction);
(m) Waste oil refineries.

The second subgroup is composed of processes that can be characterized, due to the physical nature of the emission formation, as fugitive processes:

(a) Open burning of waste, including burning of landfill sites;
(c) Residential combustion sources;
(e) Machinery for wood and other biomass combustion;
(h) Operation of motor vehicles, especially during leaded gasoline combustion;
(k) Shredder plants for the treatment of end of life vehicles;
(l) Smouldering of copper cables.

Group of point sources falling to the first subcategory can be characterised by a detailed enumeration of used technologies and their parameters, similarly to the significant sources reported in the Part II. Sources from the second group are presented, due to their frequency or due to their uneasy identification, by the total activity data with eventual territorial differentiation, though for some subcategories a partial or complete list of individual sources could be elaborated.

2.3.4.3 Inventory of atmospheric emissions in the Czech Republic

Protecting the environment from polluting substances is established by the Act No. 86/2002 Coll., on the Atmosphere being a follow-up of the former Act No. 309/1991 Coll. in the Czech Republic. It specifies the rights and responsibilities of corporations and individuals in the protection of the external environment from the introduction of polluting substances by human activity, and methods for limiting the causes and softening the consequences of the pollution. It also specifies the rights and responsibilities of the state administration in relation to the protection of the air that are executed by the Ministry of Environment of the Czech Republic, the Czech Environmental Inspection, territorial authorities and other institutions. Besides other duties, these authorities have the responsibility of supervising the adherence to legal regulations and

rulings, and also of supervising source operators‘ documentation on emissions of polluting substances and other relevant background information. The duty of authorities protecting the atmosphere is, among other things, to ensure the collection, reporting, and archiving this information for further use, for example for the verification of the amount of calculated charges for polluting the environment, but also for the determination of the total amount of individual pollutants released (in)to the environment, i.e. for providing emission balances. Detailed technical information on combustion and technical devices and background materials for carrying out emission inventories is provided by the so-called Register of Emissions and Sources of Environmental Pollution (REZZO).

Stationary atmospheric pollution sources are divided into four basic groups regarding their size, type, and impact on the atmosphere according to the new legislation; they are currently registered in the three individual subsystems. Their classification and description according to the Law no. 309/1991 Coll. is given in the Annex 4.

The former classification derived from the basic nomenclature SNAP (Selected Nomenclature for the Air Pollution) is more appropriate for the description and evaluation of sources monitored within the Stockholm Convention. Brief characteristics of the particular main chapters with reported occurrence at the territory of the Czech Republic and the assessment of the source significance is shown in Annex 4.

A detailed description of individual categories is given in the Chapter 5 of the National POPs Inventory (NPOPsINV 2003).

2.3.4.4 Inventory of atmospheric POPs emissions in the Czech Republic

Persistent organic pollutants comprise a variety of compounds:

- chemical products, i.e. pesticides and chlorinated biphenyls (PCBs) entering the environment either during their production or application;
- by-products (of production processes); they are usually contained in the product and enter the environment as contaminants of the given product or as run-out emissions during the production process;
- unintentional products of thermal processes in the presence of chlorine and copper such as polychlorinated dibenzo-p-dioxins and dibenzofuranes (PCDDs/Fs) and polycyclic aromatic hydrocarbons (PAHs) entering the atmosphere directly with combustion gases or with end gases.

For the purpose of reporting emissions within CLRTAP, a complex emission balance for POPs and HMs was prepared in the Czech Republic, in the years 1997-1998. This inventory was based on the EMEP-CORINAIR Atmospheric Emission Inventory Guidebook and carried out with emission distinction at the level of Selected Nomenclature for Air Pollution (SNAP ‘97) – Level 1, i.e. in the ground 11 chapters. The attention was focused on the main source groups; combustion processes in industry and in households, waste incinerators, sinter plants, production and processing of metals and mineral raw materials (production of iron, steel, cast iron, cement, lime and glass), transport and several other individual processes were selected.

Processing the inventory took place in several institutions: Department of emissions and sources of the CHMI (Czech Hydro Meteorological Institute, Environmental Chemistry Department at the Faculty of Science at the Masaryk University Brno, EGÚ Prague, TESO Inc. And AXYS Varilab. The year 2000 data were reported in the preliminary structure of the NFR-Level 1, which was in accordance with the previous structure of the ground SNAP chapters. Data for the 2001 were reported in the revised NFR structure for the first time. Some values were aggregated to the summary categories, as enabled by the by the Guidelines for Estimation of and Reporting on Emissions under the Convention on Long-Range Transboundary Air Pollution.

2.3.4.5 Processing of the national inventory of POPs atmospheric emissions

The crucial source of information for producing the survey of sources and POPs emission inventory were REZZO database background documents. Values published in the PPŽP and VaV studies, prepared under

the auspices of the MoE by the processing team of this chapter directly or in the cooperation with this team, were used as another source of information, especially when choosing the emission factors. Literature research of references on the relevant information published on the websites through commercially used search engines was also employed. Furthermore, specific literature on the POPs emission issue from the libraries of the CHMI, MoE, CENIA and some of the universities were also utilized. Another important part of the information was taken from external sources (UNEP and TFEIP materials).

Processing steps are given in Annex 4, and described in detail in Chapter 5 NPOPsINV 2003.

2.3.4.6 POPs air emissions balance

This balance was created by using the average emission factors for given source categories and activity data (gas consumption including the amount of heat contained, fuel consumption and production of monitored products). The total PCBs, PAH and PCDDs/Fs emissions 1990-2001, and emission decrease compared to the year 1990 are given in the Table 11.

During 2003, existing emission factors were compared to new data resulting from the REZZO database for the year 2002 and with other information. Emission factors for less significant source categories, previously not applied, were added (to the balance) on the basis of the latest edition of the Atmospheric Emission Inventory Guidebook as well as other materials. Using these figures, emission values for 2001-4 were recalculated (see the Table 11, next page). Retrogressive recalculation of the emission balance till 1990 is expected to take place during 2006.

A detailed emission balance of POPs in terms of the transport has been prepared covering the period 2001 - 2002, and also including a prognosis of the development up to 2015.

2.3.4.7 Conclusions

It has already been stated that atmospheric POPs emissions have shown a significant decrease, including PCDDs/Fs emissions in the CR, similar to those in the EU. However, more important decrease occurred for the industrial sources, the rate of the emission decrease for non-industrial sources (combustion of fossil fuels in households, waste combustion in households, fire) was lower.

Despite the fact that the atmospheric POPs emissions inventory in the Czech Republic including unintentional products such as PCDDs/Fs and PAHs is based predominantly on the use of our own emission factors based on our own measurements of the most significant emission sources, there are a number of uncertainties.

At present, there are several possibilities for checking and preventing PCDDs/Fs and other POPs emissions. The measures to decrease the entry of PCDDs/Fs (into the atmosphere) are focused on the corresponding substitutes of raw and source materials, modifications of the technological process (including the maintenance and operational control as well as the refurnishing the existing processes). Possible measures to be taken individually or in combination include:

- Primary measures focusing on materials,
- Primary measures focusing on process,
- Measures concerning waste gases,
- Cleaning techniques of the waste gas,
- Processes to cleanse residues.

One of the ground materials for the NIP preparation is the EC Strategy for PCDDs/Fs and PCBs (Communication from the Commission to the Council, the European Parliament and the Economic and Social Committee: Community strategy for dioxins, furans and polychlorinated biphenyls (2001/C 322/02) (COM(2001) 593 final)), which has been accepted by the EU.

The existing emission inventory comprises in detail namely releases into the atmosphere, while only a minimum attention is drawn to the leaks into water, soil, products and wastes.

Table 11: Atmospheric POPs emissions 1990 – 2001

Year	PAHs		PCBs		PCDDs/Fs	
	[kg.year^{-1}]	[% of base-year 1990]	[kg.year^{-1}]	[% of base-year 1990]	[g.year^{-1}]	[% of base-year 1990]
1990						
1991						
1992						
1993						
1994						
1995						
1996						
1997						
1998						
1999						
2000						
2001						
2001	36 700		96.1		190.6	
2002	24 400		82.5		177.3	
2003	26 700		84.6		186.2	
2004	25 000		85,0		185,0	

2.3.5 Information on the state of knowledge on landfills, contaminated sites and waste with the POPs content (quantity, identification, relevant guidance, regulations, remediation measures, data on releases from such sites)

2.3.5.1 Introduction

Specific problems connected to the inventory of monitored substances include:

- Monitored substances are of miscellaneous origins or use; the majority has been regulated up to their ban for a long time in the Czech Republic.
- The predominant part of pesticides falls to the group of pesticides imported to the Czech Republic in limited quantities in the relatively distant past. Thus, it is difficult to find any records as they are not subject to the standard monitoring.
- In contrast, DDT is a substance that had been extensively used both in the agriculture and as biocide used in non-agricultural sphere. It is not subject to the standard monitoring.
- PCBs are substances which had been both produced as well as imported in large quantities. They were widely used, practically covering the whole territory of the country.
- PCDDs/Fs are quite widely spread substances produced in very small quantities in almost every combustion process. They may also be found in wastes from the production of chlorinated substances.

There is a very low accessibility of data concerning substances banned in the distant past. Statistical data on the quantity of these compounds introduced on the market has already been largely discarded. The majority of pesticides has been restricted or banned for so long that they are not individually monitored from the point of view of the existing monitoring systems. New information could be acquired rather by the incidental finding of persons who had, for a long time, worked in the functions dealing with the import and use authorizations and moreover they either kept the records or posses the reliable information. In the 1990s due to the widely spread changes in the ownership, a majority of the information on substances stored in the stores of agricultural enterprises disappeared. On the other hand, it is true that there were several actions coordinated at the national level taking place at the same time; those actions provided that the agricultural enterprises could discharge of any unnecessary stock free of charge.

The majority of the monitored substances belong to the group of substances monitored in the environment via unspecified analytical parameter AOX or EOX. However, the true amount of the monitored compounds cannot be evaluated not even with the help of the expert estimation. Possible fluctuations are so individual that any value other than the result produced by a specific analysis of substances of particular chemical structures gives required evidence or values.

With respect the time allowed to the inventory processing and considering the potentially difficult accessibility of highly specific and selective information, it has been decided to acquire the required knowledge from the following sources:

- Existing actualised national databases, mainly the Waste Information System, or eventually from the information system on the old environmental burdens.
- Central state authorities (Ministry of Environment, Ministry of Agriculture, SRS)
- Civil servants conducting field research (district environment departments, district health officers, regional environmental inspectorates)

The assessment of the accessibility and information efficiency from the national databases managed by the state authorities or accredited organisations, as well as the evaluation of information received from central authorities, are given in Annex 5.

2.3.5.2 Updating Information on Central Databases

The Central database on the registration of accidents (Czech Environmental Inspectorate, CEI) has been digitised for the Microsoft Access user interface since 2002. The database is centrally managed and completed by the CEI Prague, the regular updates are provided by the CEI regional inspectorates,

The system of the recording of the old environmental burdens (SESEZ) has been prepared on the basis of the MoE projects No. PPŽP/550/3/96 and No. PPŽP/550/3/97. Their final product is a program managing a database of environmental burdens and interconnects it to a geographical information system (GIS). Hereby, the system allows to keep the data linked to the specific places on the Earth that somehow negatively affect the environment.

The 1994 database of unusable residues of pesticide preparations (maintained by the Ministry of Agriculture) contains a detailed list of pesticides that had been recorded by that time to be destroyed on the basis of the method for liquidation of hazardous pesticide wastes. MoA has also started to provide a financial subventions to the agricultural enterprises together with the issued the method. This support is still maintained. The detailed list of the residues of pesticide preparations that are subject to this support is given in Appendix 8 of the Decree No. 84/1997 Coll.

The information from the SESEZ database has been transferred recently into the Integrated Database of Environmental Burdens, containing more than 7 000 sites. These are mainly landfills and to the less extent also contaminated sites of industrial, agricultural or military enterprises. Considering the fact that the database had not been intended for the records of environmental burdens containing POPs, it is not possible to find every site with the corresponding contamination, however, their the number increases in relation to the increase of the quantity of sites. The project is carried out within the framework of the grant VaV/730/1/01.

Current existing information on particular locations can be found in the Information Portal on the Environment (http://xeon.env.cz) as the database was updated till 10.12.2003. It is not yet possible to search according to particular chemical substances; this application will be available at the end of the stage 4 of the grant no. VaV/730/1/01 in 2004. However, it is possible to export the individual information containing data on particular POPs contaminated sites.

The database does not only contain information about activities organised by the National Property Fund (FNM), but also about on actions paid for by the fund of the Ministry of Environment (related to the accidents and contaminated sites resulting from the former locations of the Soviet Army troops), and on landfills;, it contains historical records on the landfills (ČGS database), a list of landfills closed down before the Law no. 185/2001 Coll. came into effect (INGEO Project), and information on landfills managed by the particular district authorities. SESEZ database data was also used to evaluate the impact of the 2002 disastrous floods in 2003. The database also contains data on particular sites affected by the floods in the 1997.

In relation to the mentioned above, the SESEZ database is currently one of the fundamental sources of the data, and its use is now far more better. There is no other database of such complexity for recording information on contaminated sites available in the Czech Republic. SESEZ database can therefore serve as a tool for more intensive information collection on the sites contaminated by POPS. The database is nowadays available in public at the http://sez.cemia.cz/mapmaker/sez/.

The database is currently managed by the Department of Environmental Damage at the Ministry of the Environment. Software and data are managed by the Water Research Institute (VÚV T. G. M). The database is part of the Integrated Environmental Information System, and since 9th December 2003, it has been displayed on the Environmental Information Portal in its full version. At the moment, it is still in trial period.

The important source of information on sites potentially contaminated by POPs currently is the Priority List for Removing Old Environmental Burdens that was published in 2000 at the first time; its full version,

updated in 2002, is downloadable from the MoE website. The list of the POPs contaminated sites is given in the Table 12.

Table 12: The updated version of the list of priority locations contaminated by POPs being addressed at present

Location	Details related to the burden
Hodonín u Nasavrk – landfill	Landfill for industrial waste including pesticide packaging (NEC, chlorinated pesticides, DDT, PCBs), CHKO Železné hory, CHKO Mniška (nature conservation areas), extensive contamination of ground water, penetration into the deep (water) layers
Jablonné n. Orlicí	Saturated and non-saturated zones contaminated by oil substances and PCBs, contamination of the surface water of the Tichá Orlice river
Modřec u Poličky, packaging	PCBs in the ground water and soil
Milevsko, packaging	Contamination of the mineral environment, surface and ground water by non-polar extractable compounds (NEC) and PCBs, permanent contamination of the Milevský stream and ponds
Polička	Contamination of ground waters by chlorinated hydrocarbons, polychlorinated biphenyls (PCBs); measures imposed to remove minor hot spots, origin of PCBs not proved by PS
Šebánovice u Vrchotových Janovic	Newly discovered contamination of the village wells by pesticides from the store house of the former agricultural cooperative farm ZD Vrchotovy Janovice
Milovice, incinerator	Polychlorinated biphenyls and DDT in stored soil and barrels; incinerator parameters do not meet the requirements of the CEI for the safe liquidation
Neratovice	High concentrations of 2,3,7,8 tetrachlorodibenzo-p-dioxin, by-product of the pesticide production, contamination by Hg (approx. 265 t Hg), contamination by OCPs
Velvary	Subsoil contamination by PCBs and other chemical products produced by the local plant
Holostřevy, bitumen packaging	Extensive contamination by NEC and PCBs
Velký Osek	PCBs, perchlorethylene
Brno - Křenová	Contamination by NEC, chlorinated hydrocarbons, PCBs
Staré Město u Uherského Hradiště	Contamination of ground waters and soil by heavy metals (HM), PCBs, NEC
Řež	No danger of contamination at the premises of the Institute by the radioactive radionuclides, however, the site contains a number of spoil-tips containing PCBs
Písek	Contamination of surface and ground water by NEC and PCBs, vital to add at least EA; proven contamination of the parking lot by chlorinated hydrocarbons, surface and ground waters threat
Dubno	Pesticides
Kralupy nad Vltavou	Contamination of the soil (NEC, PCBs, HMs).
Letovice	NEC, chlorinated hydrocarbons, PAHs, PCBs - surface and ground waters and soil threatened; linked to the former company Contex - J. David

Myšlín u Mnichovic	Store – oil substances, pesticides and chlorophenols exceed the C limit values
Dačice - STS, plant	Pesticides and hydrocarbons; partially decontaminated
Mutěnice	NEC, NH_4^+, PCBs in soil, NEC, NH_4^+ in ground water
Vřesová	Landfill for tars contaminated by PCBs
Horšovský Týn	Heavy contamination of the environment by pesticides and oil substances
Blansko	NEC, PCBs - surface and ground water threatened. Protected area: the Moravian Karst, the valley of the river Punkva
Luby u Klatov	Contamination by pesticides and oil substances as a result of the former Agropodnik Klatovy, monitoring the quality of ground and surface waters for NEC and pesticides - limit values for drinking water are not exceeded
Kdyně	Subsoil contamination by oil substances, chlorinated hydrocarbons and PCBs
Dešná	Oil hydrocarbons in six sub locations, pesticides in two, decontamination of a non-saturated zone has been finished, decontamination of ground waters contaminated by NEC in progress.
Prague 9 - Vysočany	Contamination by BTEX, PCBs
Sázava	Contamination by PCBs, phenols; location of an old generator station
Třebíč	NEC, PCBs - ground water and soil threatened. Possible contamination of surface water (the Stařečský stream is important in terms of water supplies). Landfill for industrial waste. Decontamination finished, verification monitoring in the progress.
Horšovský Týn	Contamination by NEC, PCBs
Jindřichův Hradec	Contamination of ground water and mineral environment by NEC and pesticides. Sanitation of non-saturated zones terminated.
Putim, plant to heat feldspar	Possibility of contamination of the mineral environment, and of surface and ground waters by NEC and PCBs, no investigation carried out, EA not submitted
Kolín	PCBs
Dolní Novosedly	Probable contamination of ground water by NEC and PCBs, returned in restitution, EA made (KZT 1998)
Žamberk	PCBs, TCE, PCE, NEC – contamination of soil and ground waters on-site and its surroundings

2.3.5.3 Conclusions

It was supposed that for a precise audit of the PCBs occurrence in installations and store rooms would be possible to use values resulting from the obligatory (set by law) reporting of the PCBs occurrence and occurrence of the materials contaminated by the PCBs at the territory of the CR at the beginning of 2003. But as mentioned above, this activity has not been satisfactorily finished in the proposed period and to prepare the NIP, information provided by the Department of Waste of the Ministry of Environment was used.

The databases of the waste information system, of the chemical substance information system and of the pollution source information system cannot be used to identify potential sources of environmental

contamination by other monitored substances because these substances are not among those stored in the above mentioned databases.

The information system on old environmental burdens (SESEZ) is currently used for the implementation of the Stockholm Convention as the essential source of information on contaminated sites in the Czech Republic.

A range of information on the contamination by PCBs was gained from other sources (see the Table and the overview of contributions by particular CEI inspectorates in the Annex 5). The inventory of devices with PCBs content and of contaminated sites is currently in progress. However, the results are not quite satisfactory; sanctions should be imposed upon those who are not fulfilling the reporting as established by the law.

Spolana Neratovice in the district of Mělník has been identified as the only site containing a significant amount of PCDDs/Fs.

The landfills belonging to the Spolek pro chemickou a hutní Ústí nad Labem in Chabařovice (no longer in operation) and in Všebořice in the district of Ústí nad Labem (in operation) have been identified as sites containing significant quantity of HCB. Contamination by HCB has been proven in the closed operational unit of Spolana Neratovice, and HCB occurrence could be expected also at the landfill of Spolana.

The monitored pesticides have polluted the disposal site of the STS Slatiňany in Hodonín, in the district of Chrudim, and former pesticide in Šebáňovice, and Václavice in the district of Benešov.

The occurrences of namely DDT are expected in several old, shut-down landfills with uncontrolled regime, and, to a lesser extent in a number of sites where pesticides had been previously disposed by spilling or emptying into the ground rills.

In case of the further interest in more precise information about the occurrences of monitored substances, it would be a good idea to support the inventory by legal act that would impose some kind of the reporting obligation on both individuals and institutions, or by internal orders in the inspection authorities and state authorities.

Potential POPs releases into the environment are problematic in the case of their release into:

a) Into the soil, and into waters:
   - Unsecured old stocks of these compounds
   - Old landfills
   - Non-reported illegal landfills

b) Into the environment:
   - Small pollution sources, especially local furnaces, run by untrained (untrainable) individuals.

In spite of the fact that old environmental burdens have received much attention and significant financial resources in the past ten years, it is definitely not possible to state that all the cases have been resolved. It is difficult to evaluate what caused the present situation; the problem is the reality that the solution is very often time consuming, complicated by the stakeholders, often non-transparent and the result is the state that is far from any solution. In addition, there are a number of „deferred“ problems in the form of the illegal landfills, stock and eventually newly formed environmental burdens (Lhenice, Pozďátky). At present, these facts are rather discovered or identified by the actions of the non-governmental organisations and of citizens. The resolution of such cases is one of the highest priority of the NIP in the Czech Republic.

2.3.6 Summary of future production, use and releases of POPs – exemption requirements

POPs listed in the SC are not anymore produced and used in the CR nor imported to the CR. However, different situation exists in the case of the unintentional, by-products of technologic or combustion processes, as the emission inventory, provided on the basis of the measurement of emission factors in the most significant sources in the CR, proves that emissions of such compounds in the CR are ranked among the most significant in Europe. Moreover, it is not possible to assume that their important decrease would occur within 5 years.

2.3.7 Existing programmes for monitoring releases into the environment, environmental and human health impacts, including findings

2.3.7.1 Introduction

Both, the Stockholm Convention and the POPs Protocol UN ECE CLRTAP, contain articles aimed at the support of research and monitoring programmes focusing on:

- Evaluating the level of emissions, long-distance transport, levels of deposition, levels of contamination of the biotic and abiotic environment;
- Inventories and pollutant pathways in representative ecosystems;
- Study of the effects of pollutants and their quantification;
- Development and application of the best available techniques (BAT);
- Collection and recycling of products and wastes;
- Formulation of methodologies for economic and social factors for evaluation of alternative strategies diminishing emissions;
- Approaches based on biological effects;
- Methods for estimation of national emissions.

The first conception of POPs monitoring in the Czech Republic - project SYMOS (System of Monitoring of Organic Substances) – was the base of the conception by the CHMI Prague and TOCOEN, Brno and is the background of the long-term monitoring of POPs at the Košetice observatory , South Bohemia.

Monitoring of POPs was also a part of the monitoring of food chains based on the Government Order 408/1992 Coll. Problem of the pollution of the environment by the POPs is monitored by the MoH. MoE and MA execute programs of well designed conceptions of the monitoring of ground waters and sediments made by the CHMI in the cooperation with WRI and ZVHS/SMS, monitoring of the alien compounds in the food chains, monitoring of soils provided by the UKZUZ and VUMOP.

Despite to the above it is possible to state that there is no long-term monitoring strategy covering also the POPs issue in the accordance with the international engagements (SC, POPs Protocol UN ECE CLRTAP); and that even at the interministerial or local level there is only a minimum effort of the interministerial coordination, optimum use of the financial investments and use and interpretation of the results. However, what concerns a quantity of the information on the contamination of abiotic and biotic components of the environment in the CR, we can say that it is well developed and even in the comparison of several EU countries.

2.3.7.2 Ministry of the Environment

The Ministry of Environment of the Czech Republic safeguards the original programme called “The Evaluation of the State of the Environment: Monitoring Xenobiotic Substances in Food Chains“ (MR/14/95), as based on the Government Order 408/1992 Coll. of the 10 June 1992. The project co-ordinated by Institute of the Chemic al Technology , Prague from 1995 to 2000 is a sequel to the stages co-ordinated by the Czech Ecological Institute in the preceding period. In terms of POPs, the program involved

the monitoring of polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and organochlorinated pesticides (OCPs). The monitoring comprises 12 PAHs (naphthalene, acenapthene, acenapthylene and fluorene were not monitored out of the 16 priority PAHs according to the US EPA), 7 indicative congeners of PCBs (28, 52, 101, 118, 138, 153, 180) and 6 organochlorinated pesticides (α-, β-, γ-HCH, HCB, DDT, DDE, and eventually other DDT metabolites). This monitoring occurred at 22 sites. When selecting monitoring localities, where the samples were collected, food chains were primarily taken into account, and so the selected spots are mainly those with agricultural production. The monitoring of typical areas in different parts of the Czech Republic was preferred to the sites with extreme environmental burdens from local sources or with significant background values from agricultural or industrial areas of the CR. Another important criterion for selecting a particular area was the accessibility of sample materials with the required bio indicative function. The presence of PAHs was examined in agricultural products (apples, wheat, oil plants, and cabbage), feeds, pollen, fish, moss, foliage and atmospheric deposition. The presence of PCBs and OCPs was monitored in wild animals (hare, deer), potatoes, pollen, fish, moss, foliage and in wet atmospheric deposition. The programme, however, did not include the soil and water monitoring as they are monitored by other institutions.

In case of international reports within the air protection field, the AE Guidebook should include planar toxic congeners IUPAC 77, 126 and 169, and if available, also substances of secondary importance, such as 118, 105, 123, 114, 156, 157, 167 and 189. However, only one of the above-mentioned congeners (118) meets the requirements. The Czech Ministry of Environment (Department of Wastes) provides the list of PCBs congeners on its website:

http://www.env.cz/www/zamest.nsf/defc72941c223d62c12564b30064fdcc/c35546c46d0231d5c1256d260035d0a9?OpenDocument

A part of the reports had been also the research on the direction of movement of organic contaminants PAHs) above the territory of the CR. Radio telecommunication stations and centres were used as sampling sites (7).

Furthermore, a number of pilot studies have been conducted aimed at the quality of samples, foliage damage from ambient air, the evaluation of the influence xenobiotics on living organisms, spreading of selected pollutants and analysis according to the species.

The integral parts of the programme have been the quality assurance and quality control.

Although originally not intended, the programme has become rather research oriented (it was therefore moved to the category “Science and Research”), and its monitoring part is characterized by the monitoring of the environmental burden by selected pollutants.

The results have been published either in yearbooks (The Evaluation of the State of the Environment: Monitoring Xenobiotic Substances in Food Chains) or on the website of the project (see website http://staff.vscht.cz/~rene/uprt/). Data received by means of the monitoring in 1995-1996 is stored in a database accessible from the http://lipa.vscht.cz/. The complex database storing data from 1995-2000 is managed by the project co-ordinator, and may be seen on request. Annual outcome from individual studies as well as the yearbook covering the evaluation summary of 1995-2000 is available at the Ministry of Environment or through the project co-ordinator (The Institute of Chemical Technology, Prague).

The project brought completely original approach to the evaluation of the large data set on environmental burdens. The data set use permits to issue a number of objectified verdicts either in fields that should be of primal interest in terms of the monitoring activities, as well as in terms of the selection of suitable matrices with a high outcome (testifying??) Collected results provide unambiguously the evidence of the suitability of use of bio indicators (including some agricultural crops) in terms of the evaluation of state of the environment.

It can be concluded at the end of this part that presented results allow to simplify and effectuate relevant monitoring activities and improve economic parameters, respectively decrease inevitable costs for providing this activity.

CHMI Prague and RECETOX - TOCOEN & Associates Brno (RECETOX MU Brno, TOCOEN Ltd.) have been conducting, in the framework of the TOCOEN (Toxic Organic Compounds in Environment) project and the above-mentioned SYMOS project, POPs monitoring using the background observatory of CHMI at Košetice. Selected POPs (PAHs, PCBs, OCPs and occasionally PCDD/Fs) are monitored in the atmosphere (once a week), in wet atmospheric deposition (every rain event), and in surface waters, sediments, soils, foliage and moss (once a year). The project is funded jointly by the two institutions. Sampling and analysis are carried out according to the EMEP methodologies.

The results are sent to the EMEP international chemical centre of co-ordination located in NILU, Norway, and published in CHMI yearbooks (Air Pollution in the Czech Republic) and on the website: http://recetox.muni.cz/.

Ambient air levels of polycyclic aromatic hydrocarbons (PAHs - 16 compounds) are measured by additional eight CHMI stations.

Based on the Ministry of the Environment Decree No. 117/1997 Coll., a single application data of significant major sources has been gained by measuring POPs emissions, other data was gained by measurements on selected sources in the scope of the VaV projects (Research and Development projects) or in the scope of PPŽP projects. For some particular sources a calculation of POPs emissions using emission factors derived from measurements at similar source types could be carried out. Data can be provided either by their primary collector (regional Czech Environmental Inspectorates) or in a summarised form by their secondary processor (CHMI Prague, http://www.chmi.cz/ - contact person: Ing. Pavel Machálek, tel.: +420 244 032 429, e-mail: machalek@chmi.cz).

Current hydrosphere monitoring was one of the main outputs of the VaV (Research and Development) grant no 650/03/00 entitled “Occurrence and transfer of hazardous substances in the hydrosphere of the CR”. Definition of the hazardous compounds and their classification as A group (their occurrence in the hydrosphere was confirmed) and B group (their occurrence in the hydrosphere had to be confirmed via pilot monitoring). Based on the pilot and standard monitoring, relevant hazardous compounds were defined and incorporated into the monitoring programme for the quality of ground and surface waters.

Final report comprised the description of the methodology for the proposal of standard and lay-out monitoring of hazardous compounds. It is composed of individual, back-to back steps that shape a special monitoring for each individual hazardous compound in a particular matrice (surface water, groundwater, silts and sediments) in the dependence on its long-term occurrence (A group compounds) and on the results of the pilot monitoring (B group compounds).

While drafting the monitoring programmes, not only the values of the imission monitoring but as well the information on emission sources, characteristics of the compound occurrence in a particular constituent of the water ecosystems, chemical properties etc were taken into consideration.

The goal of such proposed monitoring programmes should be monitoring of the long-term monitoring of the hazardous compounds concentration and proposal for the efficient “case sensitive” monitoring programme in relevant profiles and subjects of the monitoring and fulfilling of the stemming from the (Water) Framework Directive and other CR and EU legislation and the possibility of finding the possible sources of such compounds and map a contamination of the CR by hazardous compounds. Values resulting from such monitoring will be the ground material for the subsequent steps in a way that a good state of the surface and ground waters could be reached in 2015 in accordance with the (Water) Framework Directive requirements. Last but not least, such designed monitoring is the least financially demanding.

Proposal of the lay-out and operational monitoring of the hazardous compounds was composed of the following steps:

1) Characteristic value calculation for the A group and B group compounds
2) Determination of the relevance of the occurrence
3) Processing of the working maps showing the occurrence and non-occurrence
4) Tabulate and assess the occurrence in particular matrices

5) Assessment of the occurrence in relation to the use and properties of the compound
6) Field monitoring proposal
7) Distinction of the lay-out and operational monitoring
8) Processing and completion of the monitoring program tables
9) Creation of the maps of the proposal for the hazardous compounds monitoring

The monitoring of ground waters conceived as mentioned above has been initiated in 2003. Monitoring of the surface waters, silts and sediments has been inaugurated in the third quarter of the 2003 in the proposed scope.

That proposal was, in fact, based on the chemical analyses and it will be suitable to add the biological effect monitoring via biological methods, ecotoxicological tests, biomarkers etc. in the future.

2.3.7.3 Ministry of Health

The Ministry of Health monitors the state of public health based on the Government Resolution No. 369/1991 Coll. Monitoring is carried out in thirty areas (Prague, several selected district seats, and the former regional capitals; with a possibility of the area extension). It also includes quality assurance and quality management.

The subsystem called "Health Hazards and Consequences of Air Pollution" examines PAHs (12 substances) in 7 towns. Another subsystem focuses on "Health hazards and consequences of polluted drinking water". This research is carried out in 30 selected sites. POPs related monitoring, the national standard ČSN 75 71 11, "Drinking water", lists monitored POPs substances (benzo(a)pyrene, lindane, HCB, DDT, PCBs). A third subsystem, "Health Consequences for the Human Organism Caused by Heterogeneous Substances from Food Chains, Dietary Exposure", consists of two parts and is conducted in 12 towns. Its second part monitors dietary exposure, i.e., how is the population exposed to some selected chemical substances (including POPs - PCBs, aldrin, endrin, dieldrin, methoxychlorine, endosulphane, heptachlorepoxide, lindane, and other HCHs, HCB, DDTs).

The last subsystem comprising also the chemical monitoring, and is called "Health Consequences for the Human Organism Caused by Exposure to Toxic Substances from the Environment – Biological Monitoring". It monitors toxic substances and their metabolites (biomarkers, internal doses) and biological changes in the blood, urine, hair, teeth of adults, children, and women who have just delivered babies in four selected towns. In the group of POPs, indicative congeners of PCBs, and selected OCPs contained in the breast milk, placenta, and umbilical blood are examined. The mutagenic activity of the air dust particles (PM_{10} fraction) is monitored in relation to the PAHs analysis in the Subsystem AIR..

2.3.7.4 Ministry of Agriculture

The activities of the Ministry are divided into several programmes carried out by its several institutions. Ground monitoring of agricultural land is looked after by the CISTA, and it includes the PCBs and some selected OCPs (HCH, HCB, DDTs) contained in arable land as well as in the contaminated nature conservation areas (CHKO). In addition, it monitors 16 PAHs. CISTA focuses on monitoring POPs in some selected areas, i.e. Central Bohemia with several point sources of the contamination and that is linked to the area of the capital and also examines how floods affect the contamination of the land. The monitored POPs include PAHs (12), OCPs (HCB, DDTs, HCHs) and PCBs OCPs and PCBs occurrence is monitored also in fish from selected reservoirs and rivers, however, this is not a regular monitoring but rather pilot studies.

POPs monitoring is included in the activities of Povodí (river basin institutions), dealing with particular rivers – streams ranked 1 and 2, which means streams with high profiles – i.e. the combination of the control and monitoring activities. The monitoring covers the surface waters, sediments of minor streams and small water reservoirs has been carried out by the State Amelioration Authority (SMS) and includes the monitoring of PCBs, and recently included PAHs.

The data set containing basal monitoring sites of agricultural lands exists since 1992, when the first samples were taken from the basic network of 200 inspected sites. Sampling was repeated in 1995, this time using optimised methodology for fieldwork. 1996 saw the creation of the set containing 27 monitoring areas with differently contaminated soil. Main purpose of this set is to store information on the behaviour of contaminants in the soil, and ways of transfer of these contaminants into the food chains - regarding the source of contamination.

POPs contents have been monitored since 1997, using 40 monitoring areas. Of these, 35 are on agricultural land and the emphasis here is kept on the subsystem of contaminated areas. The other 5 areas are located on unspoilt land and are included in the monitoring subsystem of the nature conservation areas. The selection of areas was conducted in the sense of the potential sources of contamination and of the previous monitoring conducted in 1994-1996.

The following groups of substances are examined:

- Polycyclic aromatic hydrocarbons (PAHs); list of 16 selected or 12 individual hydrocarbons is monitored;
- Polychlorinated biphenyls (PCBs), congeners 28, 52, 101, 138, 153 and, 180;
- Persistent organochlorinated pesticides and their metabolites (DDT, DDD, DDE, HCH and HCB).

2.3.7.5 Ministry of Transport

The Ministry of Transport possesses results of the emission balances of PAHs, PCDDs, PCDFs, and PCBs covering 2001-2002 at both national and regional levels, as well as the prognosis of national emissions up to 2015. The calculations and prognoses are provided by the Centre for Transport Research (CDV) in the scope of the VaV (Research and Development) project ”Environmental Burdens Caused by the Motor Vehicle Transport”(http://www.cdv.cz).

2.3.7.6 Other activities

The POPs monitoring is also part of some multiannual research projects and pilot studies. Their results can be used for the assessment of the POPs caused ecological burdens (the air is covered by the Silesia, Teplice and Prague projects; water and sediments are covered by the Labe, Odra, TOCOEN/Morava (Chemical Time Bombs) and TOCOEN/IDRIS projects; soil and forest ecosystems - TOCOEN/Mountains, TOCOEN/Surroundings of model sources), and in VaV/520/1/97 research projects – on typical POPs emission sources.

Based on the contract concluded with the Ministry of Environment on 28 July 2000, the Czech Hydrometeorological Institute dealt with the grant VaV/650/3/00, “Occurrence and Transfer of the Hazardous Substances in the Hydrosphere of the Czech Republic”. The project lasted three years (2000-2002) with the following objectives:

- The main objective was to investigate the occurrence of hazardous substances contained in individual parts of the hydrosphere in quantities defined by Directive 76/464/EEC and by its daughter directives, the Directive 80/68/EEC and IPPC Directive 96/91/EEC, and last but not least, by the recently adopted Framework Directive. Since the Czech Republic applied for the transition period to apply directives on dangerous substances, the solution of this problem is one of the priorities for the water service. In this view, a research on the monitoring scope of the quality of surface and ground waters in the EU countries will be carried out.
- Another objective of the proposed project is the evaluation of the long term trends of the pollution by dangerous substances using the state monitoring network sites for the monitoring of the water quality, and evaluation of the monitoring in other networks (SMS, Povodí (Catchments area) enterprises and other special purpose monitoring networks). The project will also evaluate the development of the state in water pollution in regards to the quality objectives defined by the

individual EU directives. In the connection with the defined objectives, the relationship between surface water and ground water will be evaluated on an empirical and theoretical basis.

2.3.7.7 Other possible data sources

Part of the emission data cannot be accessed via CEI, since it involves trade secrets, and is owned by the submitter for whom the measurements have been carried out (especially large energy sources, incinerators of the municipal waste, important smelting plants, coke production plants and the petrochemical industry).

The atmospheric deposition required for other connection with effects on ecosystems (critical environmental burdens) is monitored only in the wet deposition, figures for the dry deposition are not available.

The monitoring carried out by the State Amelioration Authority is focused on the monitoring of the selected variable environments in administered aquatic ecosystems. Results are regularly published in the MoA or MoE summary reports on the subject, and also on the website http://www.monsms.cz/. The monitoring includes:

1. Monitoring of water quality in small streams
2. Monitoring of water quality in small reservoirs
3. Monitoring of the chemical contents of sediments in small streams
4. Monitoring of the chemical contents of sediments in small reservoirs
5. Hydro biological monitoring
6. Other related activities (GIS, flow-rate monitoring, hydrology of small streams)

Contact person: Mgr. Jan Hodovský, Hlinky 60, 603 00 Brno, tel.: +420 05/432 122 3130-32, fax: 05/43212231-31, e-mail: monsms@monsms.cz. The State Amelioration Authority was turned in to the Agricultural Water Management Authority in 2001.

A detailed description of the individual monitoring programs is a part of the National POPs Inventory 2003 (NPOPsINV2003).

2.3.8 Current level of knowledge, awareness and education among target groups

In the field of persistent organic pollutants, the Czech Republic has a long-lasting tradition in relation to their monitoring in components of the environment, in drawing up emission inventories, monitoring, research, and liquidation of these substances. Although this does not affect all POPs and all problems in the same way, the level of existing information is very high and comparable to a number of EU member states. Majority of existing information relates to PCBs and some OCPs (DDTs, HCHs, HCB) and to matrices such as waters, soils, foods, and also humans. The Czech Republic is the only country in Central and Eastern Europe that has its POPs emissions inventory based on an extensive set of emission factors measured on its own stationary emission sources. The situation is less favourable in the case of the mobile sources; due to the severe lack of measured POPs emission factors, as they do not belong to the limited components and therefore they are virtually not measured for vehicles.

Less information is available pertaining to certain types of OCPs (toxaphene, driens (aldrin, dieldrin), and chlordane) and especially to PCDDs/Fs. This is, in most cases, connected to analytical, financial, and instrumental demanding factor for the identification of these types of POPs. The situation, in terms of instrumental availability, changed significantly in 2002 when three high-resolution systems (HRGC/HRMS), suitable for the PCDDs/Fs determination in various abiotic and biotic matrices, were purchased. If the alternative methods are used, such as GC-MS/MS, the analytical process must be decisively validated.

A fundamental problem is the fact that the management at all levels of the direction uses such existing information only rarely. Such information is neither available in the form easily accessible to the public

(presentations, expert explanations), that often leads to misinformation, misinterpretation, and panic, that also do not contribute to the optimal resolution of the problem.

To satisfy the public's interest and to increase its awareness and knowledge, reliable, precise, clear and understandable information on POPs problems is necessary. The information will be granted through the POP Centre, and also through all specialised institutions conducting research, universities, and other entities dealing with this issue – information related to the sources of POPs, their quantity in the environment, human exposure, potential effects and risks, uncertainties, etc.

However, it is necessary to keep in mind, due to the experience with some educational-awareness campaigns, that the public does not want to be just informed, but it also wishes to play an active role, for example in preventing (POPs) from releases to the environment.

The purpose of the programme for the education of the public is to provide both the experts and non-specialists with a comprehensive summary of information on the principle of the POPs related problems, information on existing and prepared regulations, and their connection to other valid legislation, as well as provide a sufficient information for all target groups of the population in the corresponding range.

The current state of information and knowledge of the POPs issue is often contradicting as on one hand the POPs are presented as super toxic substances and on the other hand POPs containing waste has often been handled without necessary precautionary measures in terms of the health and safety at work and environmental protection.

Those completely different approaches led to a situation where even altogether realistic ways of handling PCBs waste, that should have been validated by the probation operation, were rejected, and too rigorous standards (their interpretation held that a substance with any amount of the PCBs is hazardous waste and therefore it is legal for any particular authority to prevent any activity aimed at their legalized handling) were applied. This lead to the fact that oils containing PCBs were burnt in the combustion chambers of a relevant plant despite the fact that they did not provide the sufficient PCBs decomposition. Even more toxic dioxins were produced and emitted due to such incineration from low chimneys uncontrolled. Moreover, short-term process tests to confirm or disconfirm whether a particular technique is suitable and reliable were often rejected.

The example of PCBs also shows that in most cases the irresponsible handling of this waste was not intended, but resulted from the public ignorance, from the lack of the qualified information at the producers of such waste (the only possible exceptions were workers from the energetics who were well informed due to their internal rules and requirements of the distribution plants). There was insufficient knowledge of existing regulations and their interpretation of some criteria and PCBs handling standards prescribed by these documents. However, the supply of additional documents and detailed information usable for the civil servants and regional (self-governing) institutions was deemed unsatisfactory.

For this reason, the programme of the public awareness and information is an essential part of the conception is the implementation of the Stockholm Convention.

2.3.9 Significant NGO activities

2.3.9.1 The Arnika Association

2.3.9.1.1 Actions of the "Toxic compounds and wastes" Programme

The information given in this part of the text consist of presentations of the actions and campaigns by the NGOs; the authors of the NIP do not identify themselves with the conclusions provided in the following text, but they consider it the background for the (potential) further research in the course of the further hearing of the NIP.

Poison-free future

The purpose of this project (campaign) was to achieve the ratification of the Stockholm Convention and the implementation of the integrated pollution register. The secondary objective is to achieve the consistent prevention of releases of toxic compounds at specific sites (see „hot spots“ below) or to solve the liquidation of old ecological burdens. The primary goal was achieved and thus the implementation of the Stockholm Convention was established as the new target. The project includes a number of activities inclusive of random POPs monitoring, which cannot be more extensive than 1 – 4 samples per hot spot, due to the limited financial resources.

An important part of this project is acquiring the information on the results of POPs measurements from both the national administration and the polluters. This data is available in the programme archive. The preparation and publication of reports (Lindane – a pesticide on the black list and a report under preparation on waste produced by incinerators) that we provided as part of the base data for NIP preparation are also part of the project. The substantial project activity are the information publications (leaflets on the Stockholm Convention entitled „Toxic 12“, „Toxic compounds“, „Spolana and the poisons by the Elbe“ and others).

The project has its own website: http://bezjedu.arnika.org/.

Cases (hot spots) in individual regions that are the subjects of the campaign

The chemical factory Spolana Neratovice – old environmental burdens, the impact of the existing operational unit on the environment.

The Spolana Neratovice case is provided in detail in other parts of the NIP. Arnika is trying to achieve the elimination of toxic compound releases from Spolana Neratovice. Therefore, at first we promote the consistent determination of the sources of organochlorinated compounds (OCPs) and heavy metals releases, resulting either from the old environmental burdens or from the current production of the chemical plant. We also push for the termination of the use of mercury for chlorine production in Spolana, which is important in relation to the issue of inclusion of mercury on the list of the Stockholm Convention, and with regard to the LRTAP Protocol on heavy metals. The following website http://spolana.arnika.org/ discusses the case in more detail.

PCBs in Ostrava

The Ostrava region is, for many reasons, one of the PCBs and PCDDs/Fs most contaminated regions of the CR. It is caused, among others, by the accumulation of the companies that used to or still do collect and dispose the PCBs-containing waste. And, also by the high concentration of the industry as such. The Arnika promotes the consistent mapping of the potential sources of PCBs releases into the environment in this area. This issue is discussed on its website at http://bezjedu.arnika.org/ostrava.

The former pesticide storage at Klatovy - Luby

Pesticides including DDT, lindane and others were stored in one of the buildings and in the yard of the farm in Klatovy – Luby since the 70s of the last century. Insecticide spray preparation from these pesticide also took place here.. Measurements submitted by the Arnika association proved, above all, the high concentrations of DDT and metabolites in samples form the sweepings and scrap of the floor of the building as well as in the eggs of hens kept in the yard. The increased PCDDs/Fs concentrations were also detected in eggs. Arnika promotes the ecologically safe decontamination of this environmental burden. This case is discussed on the website at http://klatovyluby.arnika.org/.

The former waste landfill with PCBs and DDT in Milovice and the existing illegal storage of wastes with PCBs in Mratín.

The company Alysa situated the project of the construction of the hazardous waste incinerator to the former military site of Milovice. After the company went bankrupt, a large landfill of the waste containing a range of POPs (especially POCBs and DDT) was left behind. Greenpeace also dealt with the case. Arnika did not get involved in it until the haul of the waste by the EKOBO enterprise, whose owners were interconnected with the owners of the incinerator on hazardous waste in Lysá nad Labem (REAN enterprise), and where the part of the waste from Milovice was combusted, even though the incinerator did not comply with the parameters for the POPs liquidation. The EKOBO company finally stored the reminder of the waste in two buildings in the Mratín village, even though they did not meet the requirements for the disposal of PCB-type compounds. They have also transferred several transformers containing oils with PCBs from other locations to one of the buildings. Arnika urges the safer disposal of this waste until an environmentally safe non-combustion technology becomes available.

The hazardous waste landfill at Pozd'átky

There has been disrupted insulation at the landfill due to the operator's lack of cooperation for six years. The case is not directly connected with POPs, even though their presence at the landfill cannot be excluded considering the insufficiently administered reporting. This case is outlined http://bezjedu.arnika.org/pozdatky.

Waste incinerators

A few local, regional or national activities that aim to limit the negative impact of incinerators on the environment form part of the project „Poison-free future". One of the most recent activities is the report on the handling of the waste produced by the incinerators. This report is prepared by the Arnika association not only for the Czech Republic, but also as a part of the international activities of the workgroup on dioxins, PCB and waste of the IPEN network. The website on the waste incineration is found at http://spalovny.arnika.org/.

Database of incinerators and energy blocks

This is a regularly updated database of the measurements of pollutants emitted into the atmosphere or contained in the waste resulting from the waste incinerators and energy blocks in the Czech Republic. The association obtains the data from reports collected by the national administration and from the data provided by the operators of incinerators and energy blocks. The outputs of the database are available on-line http://www.ecn.cz/dioxin/spal_map.shtml.

Hazardous waste incinerator in Lysá nad Labem

A new waste incinerator was built in place of the old former one in Lysá nad Labem. The trial operation began in 2000. Part of the waste from Milovice was also transported to this incinerator. The EKOBO enterprise that provided the repacking and storage of the PCB-containing waste from the former Milovice incinerator site, is linked to the companies operating the incinerator in Lysá nad Labem. Arnika collected one soil sample and two poultry samples in the vicinity of the incinerator from March – July 2003 and had them analyzed for PCDD/Fs and PCBs. The results showed increased levels of these compounds in poultry. Based on this result, further analysis was required by the city of Lysá nad Labem and by the regional administration of the Central Bohemian region. Besides the dioxin emissions and the incineration of the waste containing PCBs the problem of the incinerator is the insufficient protection against the leaks of toxic compounds into the ground waters and soil, and insufficient records on the handling of the waste to be incinerated. This case is discussed on the website http://bezjedu.arnika.org/lysa.

Municipal waste incinerator in Liberec

The municipal waste incinerator in Liberec is operated by the joint stock company Termizo owned by the PPF and the city of Liberec. After a trial period it obtained an operation permit in 2000. The capacity of the factory is 96 000 tons of waste per year. Its construction cost more than 1.7 billion CZK. The incinerator emitted high concentrations of dioxins into the air. A value of 8.8 ng TEQ.m^{-3} was detected in August 2000. The incinerator mixes ashes with fly ash and deposits it on the municipal waste landfill, even though there are high concentrations of dioxins in the fly ash. The company Termizo has a authorization entitled to handle the mixture of ash and fly ash as building material since August 2002. Arnika urges that the handling of the incinerator's fly ash with greater regard for the environment. The association Children of the Earth is also following the case. The case study on the issue of the Liberec incinerator will be part of a study prepared by Arnika. Older information on this case may found at http://www.ecn.cz/dioxin/libspal.

The hazardous waste incinerator in Vyškov

The hazardous waste incinerator in Vyškov has been in operation since 1991. Currently it has three combustion units and is one of the biggest sources of environmental pollution in Vyškov. The Arnika Association has followed this case in 2002. The association prepared a summary report, which is published on the Internet.

This case is discussed on the website http://vyskov.arnika.org/spalovna.shtml.

2.3.9.1.2 Activities focused on the prevention of the POPs generation

An important measure mentioned in the Annex C of the Stockholm Convention is the prevention of the POPs generation, i.e. the Best Environmental Practice (BEP).

The Annex C contains the following measures:

(c) Promotion of the reclamation and recycling of the waste and compounds used and produced in the processes;
(d) Replacement of the input substances that are persistent organic pollutants, or where exists a direct connection of the material and releases of persistent organic pollutants from the source;

Two campaigns of Arnika´s Programme on Toxic Compounds and Waste are focused on the two areas.

Health service without PVC

PVC is one of the important waste components whose combustion leads to the POPs generation. POPs releases also occur during the PVC production. Arnika calls for the replacement of the PVC by the less problematic alternatives, not only in the case of the health service tools and instruments. The Project's website is http://pvc.arnika.org/.

Waste is raw material

The prevention of the waste generation, the re-use of products, waste separation and their recycling form the basis of the „zero waste" concept that Arnika puts forward in the waste management. It is an important tool for the prevention of the POPs generation during the handling the municipal waste. The project has its own website: http://odpady.arnika.org/. One of its parts is the participation in the working groups of the Ministry of Environment in relation to the waste management plan of the Czech Republic.

2.3.9.1.3 International activities

<u>European working group of IPEN</u>

The Centre for the Citizen Support (once a part of the Children of the Earth) organized the international conference in April 2000, where the informal workgroup of the worldwide network IPEN (International POPs Elimination Network) was established. This workgroup associates over 30 nongovernmental organizations from all over Europe. The Program Toxic Compounds and waste of the Arnika association took over the direction of the working group in 2001. The workgroup has already organized four meetings, published three reports and took part in publishing of the proceedings comprising meetings organized in the CR in January 2003. Its member organizations published a number of information materials concerning POPs.

<u>Secretariat of the IPEN Workgroup for dioxins, PCB and waste</u>

Arnika has hosted the secretariat of the IPEN Workgroup on dioxins, PCB and waste since January 2002. This workgroup organized, in cooperation with the UNIDO and with its financial support, the international conference on „Non-combustion technologies for the POPs destruction" in January 2003 and also published the conference proceedings. The group also takes part in the expert group established for the BAT/BEP concepts interpretation in the framework of the Stockholm Convention.

<u>The „Incinerators" workgroup of the "Health Care Without Harm"</u>

Arnika is a member organization of the international network on Health Care Without Harm (HCWH) focused on the handling of waste, PVC and other compounds in health care services from the point of view of their impact on the environment. Based on this cooperation, the workgroup secretariat was assigned to Arnika.

Arnika published the HCWH study entitled „Non-combustion technologies for the handling of health care waste" in November 2003.

2.3.9.1.4 Centre for the Citizen Support

The work of the Centre for Citizen Support is, besides the Toxic Compounds and Waste programme, another Arnika activity related to the Stockholm Convention. The role of the Centre is to provide assistance to active citizens and civil associations in the environmental protection, including cases of the pollution by pesticides or concerning waste incinerators. It also used to publish (originally as a part of the Children of the Earth) the first summary reports on POPs in Central and Eastern Europe ("POPs – poison in the heart of Europe I and II").

2.3.9.1.5 Publications and Websites

Publications focused on the POPs issue

<u>Toxic Compounds and Wastes Programme</u>

<u>2002:</u>

- Evaluation of the health risks of dioxin compounds (Czech translation of the 1998 WHO report)
- A number of educational materials: Toxic 12, Toxic compounds, Spolana and poisons in the proximity to the Elbe, Waste Incinerators etc.

<u>2003:</u>

- International Workshop on Non-Combustion Technologies for the Destruction of POPs (Prague, January 16, 2003) - proceedings (English version)
- Lindane – pesticide for the black list
- Non-combustion technologies for the handling of health care waste (HCWH study)

- Educational materials: Dioxins, Spolana Neratovice, Incinerator at Lysá nad Labem, Incinerator at Mydlovary, Incinerator at Liberec etc.

Centre for the Citizen Support

2000:

- POPs – poison in the heart of Europe I

2001:

- POPs - poison in the heart of Europe II (English and updated Czech version)

2002:

- Pesticides in Central Europe - National Reports

Websites dealing with the POPs issue

Websites in English:

IPEN - http://www.ipen.org/

IPEN - Europe - http://pops.ecn.cz/

Health Care Without Harm - http://www.noharm.org/

Arnika in English - http://english.arnika.org/

International Workshop on Non-Combustion Technologies for the Destruction of POPs (Prague, January 16, 2003) - http://pops2003.arnika.org/

Websites in Czech:

Poison-free future - http://bezjedu.arnika.org/

Hot spots of the campaign Poison-free future:

Klatovy - Luby - http://klatovyluby.arnika.org/

Spolana Neratovice - http://spolana.arnika.org/

Lysá nad Labem – hazardous waste incinerator - http://bezjedu.arnika.org/lysa

PCBs in Ostrava - http://bezjedu.arnika.org/ostrava

Pozďátky landfill - http://bezjedu.arnika.org/pozdatky

Vyškov incinerator - http://vyskov.arnika.org/spalovna.shtml

Liberec – municipal waste incinerator (older website) - http://www.ecn.cz/dioxin/libspal/

Other websites:

PVC - http://pvc.arnika.org/

Waste incineration - http://spalovny.arnika.org/

Waste as raw material - http://odpady.arnika.org/

Centre for Citizen Support - http://cepo.arnika.org/

Arnika association: Programme on toxic compounds and waste - http://toxic.arnika.org/

Database of incinerators and energy blocks - http://www.ecn.cz/dioxin/spal_map.html

Dioxins - http://www.ecn.cz/dioxin

2.3.10 Overview of the technical infrastructure for POPs assessment, measurement, analysis, alternatives and prevention measures, management, research and development – links to the international programmes and projects

Detailed overview of the monitoring programmes carried out in the Czech Republic, of laboratory capacities, and POPs-related research projects is included in the NPOPsINV 2003 (chapters 10, 11, 17).

2.3.10.1 Monitoring

Monitoring is consistently defined observation, over the time and space, of precisely determined indicators at points creating a network that represents a particular region at a given level of the probability and subsequently the whole territory of the country.

Monitoring serves to ensure the maximally objective evaluation of the state and the modification of the set component indicators of the environment in a given region.

Monitoring, in general, only observes or signals a state, changes, and their causes, in the components of the environment.

Monitoring outputs serve to evaluate the exposure within systems assessing human and environmental risks, to issue the subsequent decisions, to introduce changes in the economic practice, legislation, management and strategy and to the control of the efficiency of adopted measures, funding, etc.

Monitoring programmes should be developed in accordance with the control of the requirements of the current legislation and should monitor the efficiency of the strategic documents such as international conventions and protocols or national measures with respect to the environment and its trends. These programmes are essential in identifying subsequent measures.

The crucial elements in the development and preparation of the monitoring programmes are the measurement methods and standards - a necessary condition for the effective control and monitoring mechanisms is the availability of appropriate measurement methods and the comparability of the data. Presently, methods for analyses of dioxins and dioxin-like PCBs are expensive and slow. Therefore, low-cost and faster methods have to be developed allowing the routine analysis of a larger number of samples providing quick, cheap, and reliable results confirming the presence of those compounds in the environment, feeds and foods. In order to obtain comparable, consistent, reliable and high quality results, it is necessary to implement high quality environmental standards at the EU level.

The control will not be effective enough until unannounced measurements are possible. Control measurements planned ahead do not reflect real operational conditions.

2.3.10.2 Research in the POPs field in the Czech Republic

Research in the persistent organic pollutants field has a longstanding tradition in the Czech Republic, which can be seen even in the overview of research tasks regarding this issue being dealt with in the past decade (see NPOPsINV2003).

Nevertheless, it can also be stated that in this area, conceptualisation and co-ordination at all levels is lacking for all agencies and institutions. The Grant Agency of the Czech Republic (GACR) encompasses the environmental problems to various projects in the field of individual natural sciences; specialisations such as environmental chemistry or ecotoxicology do not exist, in contrast to EU countries, as individual specializations and are not even in the codebook of scientific fields. These fields are still understood to be purely applied sciences. Even today, many experts do not have a basic understanding of directions of the fundamental environmental research, and consider them merely as sorts of environmental applications of classical scientific fields.

Therefore not even goal-oriented research as to the individual environmental problem exists to the necessary extent. Similarly, the scientific research policies of the Ministry of the Environment are, in this respect, far from being perfect, not to mention the problems of non-systematic and illogical enunciation of projects.

Since the Stockholm Convention, the POPs Protocol to the UN ECE CLRTAP and even the EC research policy systematically demand and expect research in this domain, it is necessary to pay proper attention to this issue, even under the Czech conditions. Especially considering to the fact that the National POPs Inventory 2003 and other research projects achieved till now have pointed out a number of domains where this environmental research should be directed to.

In the case of the Stockholm Convention, its orientation is determined by associations with the evaluation of the efficiency of the Convention's measures, and also by the evaluation of new substances that could potentially belong to the List of Pollutants of the Stockholm Convention.

The EC/EU focuses its attention in this area in relation with its “EC Strategy for dioxins and PCBs” to the research on DL PCBs, their effects, and risk assessment and on the environmental fate of the PCBs and PCDDs/Fs, toxic and ecotoxic effects, the study of transport and transfer processes, degradation mechanisms, bioaccumulation and biomagnification, and destruction. These are basically the fundamental aspects of the POPs issue that have to be studied even in the case of new pollutants types, of which our current knowledge is rather limited.

The solution of the POPs issue requires a legislative background, financial preconditions, technical possibilities and laboratory and institutional capacities.

2.3.10.3 Capacities for the POPs removal in the Czech Republic

Possibility of the technologic solutions of the elimination residues of the former POPs production, stocks of the POPs-containing products, wastes and contaminated matrices are summarised in the National POPs Inventory 2003 from the point of available technologies and biotechnologies.

A chapter dealing with the available laboratory capacities in the Czech Republic for determining POPs in abiotic and biotic components of the environment is also part of the NPOPsINV2003.

Prevailing methods for handling the reported waste containing PCBs are storage (80.4 %) and combustion with the use of heat (13.9 %) in the Czech Republic. Due to the fact that capacities for re-processing such wastes do not yet exist, an important tool of the waste management is the export. For the time being, it can be assumed that the stored amounts will be exported, if technological capacities (of the reprocessing) are not available.

The Czech Republic has not sufficient technological capacity for the liquidation of PCBs and OCPs residues, POPs (namely PCBs)-contaminated waste and contaminated soils and sediments.

For the liquidation of wastes containing POPs, it is possible to use the hazardous waste incinerator in Ostrava for their combustion.

The incinerator of the hazardous waste in Ostrava is currently a property of the EKOTECHNIEK-EAST Ltd., which was a member of the Belgian Syndicate SITA. Nowadays, its operator is the SPOVO, Ltd. The incinerator was built on the premises of the Moravské Chemické Závody, Inc. for the removal of its own production waste. It is located in the northern industrial zone of Ostrava.

The incinerator is intended for the safe removal of hazardous wastes. For this purpose, it is allowed to mix the wastes. It is capable to burn liquid, mash-like, paste-like, and also solid wastes. With respect to pollutants, it is intended for the combustion of all types of hazardous wastes including highly stable organic compounds containing chlorine and high concentrations of sulphur. The concentration of chlorine in the waste charge is, for now, limited to the maximum of 12 kg of Cl_2/hour (i.e. it is not possible to burn halogenated oils only; it is necessary to combine them with other wastes). Another limiting factor is the heating power of the waste.

Presently, the incinerators accept and burn condensers of 1 litre to 6 litres volume of the filling containing PCBs. They are destroyed that they are transferred to the incinerator without pre-processing (they were not crushed). The condensers contain several aluminium components, that may cause problems of the incinerator (namely to the electro filter); it is possible that their acceptance and destruction will be limited in the future. The latest information says that SPOVO Ostrava had already solved the technology of the combustion of condensers.

The incinerator is not equipped for the combustion of transformers. It concerns especially the pre-processing of the waste before combustion, for example demounting, crushing, grinding, etc.

The decision of the Ministry of Environment of June 29th, 2000 granted the incinerator authorisation for the collection, buyout, and removal of the hazardous waste containing PCBs.

Presently, the possibility of the combustion of contaminated soils containing PCBs resulting from the Nová Huť enterprise site is under consideration.

Certain types of wastes containing PCBs (used oils with a limited PCBs content of up 50 $mg.kg^{-1}$) may be liquidated in the cement factories.

Both in the Czech Republic and abroad the combustion tests have been performed on substances containing PCBs since the middle of the 1980's. The basic observations are the following:

- Considering enormous hold up, high operational temperatures and the alkali character of the charge, then the cement furnaces seem to be suitable installations for the co-incineration of highly stable organic compounds.
- However, fears are raised by the fact that low values of the POPs emissions (especially PCDDs/Fs) measured in the vent are the consequence of its enormous dilution and that from this point of view, the total PCDDs/Fs emissions from the cement factory (expressed in milligrams TEQ/24 hours) during liquidation of equivalent amounts of hazardous waste can be, in reality, higher than values reported for some hazardous waste incinerators.
- For these reasons, only the limited use of cement furnaces for the POPs liquidation (such as oils with the PCBs content below the 50 $mg.kg^{-1}$) can be recommended, therefore each permit should be preceded by the individual administrative procedure.

2.3.11 Identification of affected parts of the environment or of populations, estimated scope and magnitude of the impact on the public health and the quality of the environment

2.3.11.1 POPs occurrence in the environment of the Czech Republic

An overview of the up-to-date situation regarding the contamination of the particular components of the environment is given in the Annex 6 and the detailed description is a part of the National POPs Inventory, 2003 (NPOPsINV 2003), Chapter 6.

2.3.11.2 POPs content in foods and in selected veterinary commodities

From the POPs occurrence evaluation in the selected veterinary commodities (feeds, animal products) according to the individual fact-finding matrices and trend charts, the following conclusions can be made:

a) Dominant contaminants in animals were:

- polychlorinated biphenyls (PCBs) in cattle, but also in pigs,
- Chlorinated pesticides (DDTs, lindane, HCB) and PCBs in game animals and birds of prey,
- DDTs and PCBs in freshwater fish,
- Aldrin, dieldrin, heptachlor, and α+β-HCHs were not very significant from the veterinary-hygienic point of view, with few solitary exceptions

b) Major sources of contaminants in animals were:

- Contaminated bulky feeds, grains and feed mixtures in the case of the cattle,
- Contaminated grains and feed mixes in the case of pigs and poultry,
- Contaminated waters in the case of freshwater fish and water poultry,
- Contaminated environment and feeding niche in the case of game animals and bioindicators.

c) Primary sources of the contamination of feeds, environment, or of animals directly

- Technical raw materials containing PCBs (paints, insulating materials, hydraulic oils etc.) used in the environment of the farms with the animals,
- Contaminated environment of grinding factories, feeds stores and feedstock components after previous manipulation with pesticide compounds at the animal farms,
- Industrial accidents with PCBs releases into the drainage channels and to the water reservoirs, releases of waste from industrial production into the drainage channels and to the to the sludge ponds, consequences of the wash away of the chlorinated pesticides contaminated soil after the heavy precipitation, wash-outs from the spoil-tips of the industrial waste, agrochemicals, municipal waste after and during floods, artificially formed water reservoirs in places with the previous intensive agricultural use involving the application of the agrochemicals,
- Use of chlorinated pesticide compounds at the agricultural landscape and forest environment, and thus burdening the feeding niche of wild animals, including the contaminated surface waters (pools, catch pits) used by the animals for drinking.

d) The following represent a persisting danger :

- Materials with PCBs content in the environment that were not yet harmlessly liquidated, release of PCBs from the unsafe storage with stocks containing these compounds during floods,
- The release of organochlorinated compounds from landfills of different types to the surface waters (floods, heavy precipitation), leakage to groundwater,
- The uncovering of materials containing PCBs in stables during their reconstruction and construction adjustments that had been previously only topped by another harmless material,
- Non-liquidated old agrochemicals containing organochlorinated compounds being temporarily deposited,
- The re-use of facilities previously used for the storage of feeds and the feedstock components that had been put out of operation due to non-removable contamination by PCBs (old bunkers); and in the re-use of the long term unused stables where materials with a PCB content may be stored,
- The import of contaminated animals, feeds and feedstock components from abroad.

A detailed description of the problems is provided in the Annex 7 and in chapters 6.5 and 7 of the NPOPsINV2003.

2.3.11.3 Evaluation of the contamination of the food supply in the Czech Republic

The official database of the results of the monitoring of the human dietary exposure that has been carried out by the State Health Institute, in cooperation with the Hygienic Service since 1994, was used in the inventory of available data. The database contains over 150 thousands analytical results, where more than 110 thousands contain data on some of the above-mentioned persistent compounds. The list of compounds that are further evaluated in the dietary exposure of the Czech population is summarized bellow in their contracted form:

- Aldrin, DDTs, dieldrin, endrin, heptachlor, HCB
- PCBs
- PCDDs, PCDFs
- Polycyclic aromatic hydrocarbons, endosulphan, lindane, HCHs

The chapter contains the following data in the following structure:

- Each group of compounds is uniformly described and the basic results are documented graphically.
- Health risks are assessed on the basis of "actual and recommended food consumption".
- Each substance is for better orientation supplemented by the positive findings frequencies that are given for food products incorporated into the Eurogroups (EFG Name).
- Each substance is added to the list of the 30 highest measured real concentrations in foods in the „as it is eaten“ form.

Brief conclusions resulting from the data collection 1994 – 2001:

The average chronic exposure dose of the population for the studied organic pollutants (polychlorinated biphenyls (PCBs), aldrin, endrin, dieldrin, methoxychlorine, endosulphan, heptachlor epoxide, hexachlorobenzene (HCB), alpha-, beta-, delta-, gamma- (lindane) isomers of hexachlorocyklohexane, isomers DDT, DDD, DDE, PAHs) in foods did not attain, during the observation period, the values that are connected to the unacceptably elevated probability of health damage (non-carcinogenic effect) to the consumer.

The estimated exposure of the population based on the real food consumption (RFC 1997) is the highest in the case of the PCBs. The exposure to the sum of seven indicator congeners of the PCB reached an average of 8.5 % of the tolerable daily intake (TDI) in 2001. The highest number of the positive analytical captures was observed in the case of the PCB congeners 153, 138 and 180, that are the most frequently cumulating in the food chain.

A high number of the positive analytical captures have been traditionally observed for p,p´-DDE and HCB. However, the exposure doses of these compounds were traditionally very low (<1 % ADI for "sum of DDT" = p,p´-DDT+o,p-DDT+p,p´-DDD+p,p´-DDE and < 6 % TDI for HCB). This shows that there is a continuous field contamination by these substances, but at low concentration level. Other monitored compounds are occurring in lower frequency, and the chronic exposure dose is relatively low.

The estimated exposure dose for compounds with the so-called dioxin-like effect (TEQ 2,3,7,8 - TCDD for sum of toxic PCBs congeners, dioxins and dibenzofuranes) was estimated to 3 pg TEQ TCCD.kg^{-1} b.w.day^{-1}, in 2000 and 2001. This value is more optimistic than those from previous years.

The exposure dose estimated for monitored substances using the model of recommended food doses logically reaches the highest values for children between 4-6 years of age. From this point of view, it is necessary to critically evaluate even low exposure doses, especially for those substances with a dioxin-like effect and PCBs.

A detailed analysis of results of the assessment of the food supply contamination is a part of the Chapter 8 of the NPOPsINV2003.

2.3.11.4 Evaluation of the exposure of the Czech population to the POPs

The POPs in body fluids and in human tissues have been monitored in the CR since the middle of the 1980s. They have been systematically monitored since 1994 as a part of the System monitoring the health of the population in relation to the environment (MZSO) – project 5 “Biomonitoring” in 1994-2002. Besides, some other research projects were carried out, whose results could be used for the assessment of the long term exposure of the population (details see the Chapter 9, NPOPsINV2003). Partial results of this monitoring are given in the Annex 8.

The load of the population of the Czech Republic by polychlorinated biphenyls demonstrates decreasing values from the perspective of the long term trends, however, the existence of locations with higher load of the population (for example: Uherského Hradiště, Ústí n. L., Ostravsko-Karvinsko) as well as the significant individual differences without a demonstrated cause (the influence of old environmental burdens, dietary habits, life style) can be expected. Likewise, the load of the chlorinated pesticides is decreasing, however,

this does not mean that it does not have a health significance, especially from the perspective of the effect of these substances as endocrine disruptors (in the case of the HCB), or as substances with dioxin effects in general.

Based on the exhibited results, it is possible to state that there is sufficient data on the exposure, i.e. load of the adult population based on the monitoring of the breast milk and subcutaneous fat in the CR; however, there is almost no data available regarding the concentrations of these substances in the blood plasma or serum of adults and epidemiological studies on the load of various population groups in relation to potential health risks (defects in endocrine balance, neurotoxicity, immunotoxicity, enzyme induction, etc.) are also lacking.

Results of the biomonitoring in the scope of the national monitoring system on the health of the population in relation to the environment in 2002 are published in the Report 2002 of the National Health Institute, Prague, in June 2003.

The continuous slow decrease of the measured HCB concentrations and in the case of the DDT (resp. DDE) a increase was detected in 2001, however there were no noticeable changes; a problem might be the detected increase in the PCBs levels, where, similarly to the 1997, is a potential connection to the floods from the summer 2002. However, this hypothesis requires a more detailed assessment of the results of all monitored systems.

Up-to-date results of the POPs inventory (NPOPsINV2003) and results of monitoring programmes, pilot studies and research project keep, despite the clear decrease of the contamination of abiotic and biotic constituents of the environment, the high number of records on locations contaminated by POPs. However the detected quantity of such compounds in sediments and soil are not high on average, neither significantly exceeding the values from other European countries, there exist a number of locations where the detected values were high due to the previous industrial or agricultural activities, or, in the consequence of the existing long-range transfer of such compounds (highlands).

Another problem is, that not all old environmental burdens are monitored, namely - high risk and vulnerable localities, as for example the inundated zones along the large rivers etc., where a significant risk of the contaminations of large territory, in the case of the floods, may appear. This is also supported by the results of the evidence and monitoring carried out after the floods in 1997 and in 2002.

3. STRATEGIES AND ACTION PLANS OF THE NATIONAL IMPLEMENTATION PLAN

3.1 Activities, Strategies and Action Plans

Over the past decade, large legislative provisions have led directly or indirectly to a reduction of releases of persistent organic pollutants into the environment, and to an objective decrease of their levels in foods and in the human population, and thereby resulting in the significant advances in the protection of the public health and of the environment. Current exposure data show that measures introduced to control the emissions of harmful compounds have resulted in a substantial reduction of the POPs intake and its levels in humans have been decreasing since the beginning of the 1990s.

On the other hand, many unsolved POPs related problems still exist – a number of potential "hot spots" – sites with the high POPs load; a substantial portion of the produced PCBs is still used at large in the transformers, condensers and other devices; many POPs-contaminated sites still exist, and we can state (based on a relatively very precise Emission Inventory carried out within the CLRTAP activities) that the emissions of PCDDs/Fs per capita and km^2 of the country are still very high. This means that the Czech Republic produces higher emissions than other EU member states.

The main strategy objectives of the National Implementation Plan are:

- The Elimination of POPs releases into the environment and reduction of human exposure to POPs;
- Liquidation of old burdens connected with the previous production, use, distribution and disposal of POPs;
- The support of the completion of the installations to collect POPs containing waste, or of other hazardous substances, is absolutely inevitable. They will be environmentally safely collected and stored until their removal with the maximum possible use of the existing network of such installations would be available;
- Application of BAT/BEP principles (Best Available Techniques/Best Environmental Practices) in the framework of the future industry development strategy;
- Preparation of comprehensive plans for the liquidation of waste containing POPs including the impact assessment on the environment and on human health;
- Gathering additional data necessary for the objective evaluation of the POPs load in selected areas – by carrying out the inventories of entries into all components of the environment, into products and waste for all substances on the list of the SC and PAHs;
- Optimising monitoring programs of individual ministries with the aim to achieve tasks associated with the SC.

In the Czech Republic, similarly to other countries of the EU, a decreasing trend of POPs emissions into the environment was observed, including the decrease of the PCDDs/Fs emissions, however, with a fact that an important decrease was noted for the industrial sources, but what concerns the non-industrial sources (solid fuel combustion in households, household waste combustion, fires, accidents etc.) then their contribution cannot be accurately estimated.

Moreover, there exists the incomplete inventory of the POPs releases into waters, waste and products at present. Considering the requirements of the SC, it is necessary to complete or update this inventory in the shortest possible delay; and on the top of it, the inventory of the contaminated sites is neither accomplished.

Concerning the sites contaminated by organochlorinated pesticides (hereinafter referred to as only OCP), the continuity in the registration of sites contaminated by these substances has been broken (especially in the case of pesticides in agricultural constructions and in objects used by the army) and the inventory of such structures is barely possible. It is therefore important that the appropriate departments would carry out thorough inspections of their sites, and would re-exam old records on sites potentially contaminated by POPs if necessary.

Since PCBs and PCB waste, including the devices containing PCB, must be eliminated no later than 2010 (as required by the EU) and no later than 2028 (as according to the SC), it will be imperative to resolve the question of the environmentally sound manner for their destruction, and of the prevention any possible environmental contamination and human exposure.

When considering the protection of the human health and environment in the Czech Republic, it is absolutely necessary to ensure the re-collection of the waste containing POPs, or of other hazardous substances. Such compounds will be collected and stored environmentally safe way until they can be removed in an acceptable way.

3.2 Action Plan: Institutional and Regulatory Measures

3.2.1 Short-term activities (up to 3 years)

3.2.1.1 Adapt the relevant EC legislation in the connection with the SC ratification by the European Community (Council Decision no. 2004/259/EC, amending the Directive 79/117/EEC; EP and Council Regulation No 850/2004 on persistent organic pollutants and amending the Directive 79/117/EEC).

Accountability: Ministry of the Environment (MoE)
Deadline: XII/2006

3.2.1.2 Ensure the implementation and consistent monitoring of the fulfilling the requirements of the Regulation No. 850/2004 and of Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills, for instance for fly ash from incinerators which could be/are sources of POPs.

Accountability: MoE (CEI)
Deadline: continuously after the VI/2006

3.2.1.3 Use the technical guidelines concerning POPs, PCB/PCT, pesticides and limits („low POP content“) adopted at the 7th Meeting of the Conference of the Parties to the Basel Convention in Geneva (after the approval of the COP to the Stockholm Convention and (its) incorporation into the EU Regulations) for the evaluation/assessment of the POPs containing waste removal/disposal.

Accountability: MoE
Deadline: XII/2006

3.2.1.4 Amend, following the prepared EU legislation and existing occurrence values, namely the Act on wastes in relation to the handling POPs waste and, further, in particular the limit values of POPs in sludge in relation to the significant environmental risks and to the contamination of the food chains.

Accountability/Responsibility: Ministry of Agriculture, MoE
Deadline: VII/2007

Cooperation: Ministry of Health

3.2.1.5 Initiate adjustments of the waste water treatment method for those resulting from the industrial operations (for instance metallurgy or waste incinerators).

Accountability/Responsibility: Ministry of Agriculture, Ministry of the Environment
Deadline: continuously

3.2.1.6 Update the POPs limit values in soil (Decree No. 13/1994 Coll.).

Responsibility: Ministry of Agriculture, Ministry of the Environment
Deadline: 2007

3.2.1.7 Establish the National Centre for Persistent Organic Pollutants (hereinafter referred to as the National POPs Centre) composed of experts who prepared the National Inventory on Persistent Organic Pollutants in the Czech Republic (hereinafter referred to as the National POPs Inventory) and of other experts, as establish a professional advisory board of the National Contact Point for the Implementation of the SC.

Responsibility: Ministry of the Environment
Deadline: IV/2006

3.2.1.8 Develop the MoE Guideline on the taking into account the requirements of the SC in issuing the integrated authorizations, and incorporate the plans on the POPs emission reduction and the prevention of their emergence.

Responsibility: Ministry of the Environment
Deadline: IV/2007

3.2.1.9 Establish the criteria of prevention the POPs generation upon the label “Environmentally Friendly Product” and upon assignment of contracts paid from the public budgets.

Responsibility: Ministry of the Environment
Deadline: XII/2006

3.2.1.10 Evaluate the benefit of the Integrated Pollution Register (IRZ) to the POPs Inventory upon the first emission and transfer of compounds reporting by individual users into the IRZ and adapt the POPs emission ceilings to the CR conditions and to the need to gain more information resulting from the IRZ on POPs releases into the environment.

Responsibility: Ministry of the Environment
Deadline: XII/2007

3.2.1.11 Elaborate a plan for financing tasks arising from the SC requirements. Introduce economic instruments leading to the prevention of the POPs generation; apply the polluter-pays principle for existing pollution sources.

Accountability: Ministry of the Environment
Deadline: XII/2007
Cooperation: Ministry of Industry and Trade, Ministry of Finance, Ministry of Agriculture, Ministry of Transportation, Ministry of Defence

3.2.2 Long-term strategic goals

3.2.2.1 Support the SC implementation and, generally, activities related to the POPs through the improved cooperation of actions among the involved departments, namely through the Interministerial Committee for the Chemical Safety and through the National POP Centre.

Responsibility: Ministry of the Environment
Deadline: progressive
Cooperation: all national authorities being or will be members of the Interministerial Committee

3.3 Action Plan: Production, import and export, use, stocks, landfills and wastes from chemical substances listed in the Annex A, Part I of the Stockholm Convention

3. 3.1 Short-term activities (up to 3 years)

3.3.1.1 Introduce regular checks of agrochemical storage facilities through SPA and CEI inspection with reference to the POPs inventory carried out in 2004. Revise the list of facilities where OCPs were prepared and stored prior to 1989 and carry out the survey on the level of their contamination by POPs.

Responsibility: Ministry of Agriculture, Ministry of the Environment
Deadline: IX/2007

3.3.3.1.2 Elaborate a report on whether, when and how the whole stock of the persistent chlorinated pesticides was irreversibly removed by using the BAT principle, based on the information of the agricultural enterprises and agencies, in the cooperation with the Ministry of Agriculture and Ministry of the Environment. If irreversibly removed sources of the contamination by the OCPs are discovered it will be necessary to prepare a programme of their safe disposal. Decontamination of sites where OCPs were stored must be also incorporated into this program

Responsibility: Ministry of Agriculture, Ministry of the Environment
Deadline: XII/2007

3.3.2 Long-term strategic goals

3.3.2.1 OCPs must further remain a part of the monitoring programmes based on the international commitments of the Czech Republic.

Responsibility: Ministry of Agriculture, Ministry of the Environment, Ministry of Health
Deadline: continuously

3.3.2.2 Process the information on POPs sources and emissions including the waste issues (landfills and old burdens), and link them directly with activities focused on the proper monitoring and on the evaluation of the state of the environmental constituents. And supply gradually (eventually annually) the existing National POPs Inventory with such data.

Accountability: Ministry of the Environment
Deadline: continuously

3.4 Action Plan: Production, import and export, use, identification, labelling, removal, storage and disposal of PCBs and of facilities containing PCBs (Annex A, Part II)

3.4.1 Short-term activities (up to 3 years)

3.4.1.1 Complete and monitor the PCB Inventory (contaminated sites, old burdens) at the national level.

Responsibility: Ministry of the Environment
Deadline: continuously
Cooperation: all ministries

3.4.1.2 Solve the issue of waste containing PCBs in a complex manner with resulting into the establishment of a collection system ensuring safe storage until an acceptable method of the liquidation is available by using the existing collection systems.

Accountability: Ministry of the Environment
Deadline: XII/2007

3.4.1.3 Take into account the requirements of the Convention within the Waste Management Plan, particularly in the action plans and regional plans of the waste management, that will specify the list of generators as well as and the quantified information on the production of waste with PCBs. Use IRZ/IPR outputs to specify the PCBs and other POPs content in wastes.

Responsibility: Ministry of the Environment
Deadline: XII/2007

3.4.2 Long-term strategic goals

Ensure the environmentally acceptable method of the removal of waste containing POPs including the health protection measures – from temporary storage at the operator's site up to the safe transport to the waste disposal facility, as well as the safe storage prior its disposal.

3.4.2.1 Support the construction of a facility suitable for the environmentally sound disposal of POPs, of POPs-containing waste, of contaminated devices and matrices based on available BAT/BEP principles. This device would be used even for the liquidation of waste other than that containing POPs in the future.

Accountability: Ministry of the Environment
Deadline: continuously
Cooperation: Ministry of Industry and Trade

3.4.2.2. Control thoroughly the provisions of the Act on the air protection concerning the combustion of waste oils contaminated by POPs in small heating facilities (hot air heaters and boilers)

Accountability: Ministry of the Environment (CEI)
Deadline: continuously

3.4.2.3 Support environmentally acceptable methods of the decontamination of devices containing PCBs, including the verification of effectiveness of the decontamination.

Accountability: Ministry of the Environment
Deadline: continuously
Cooperation: Ministry of Industry and Trade, Ministry of Defence

3.4.2.4 Verify, within the framework of grants initiated by the Ministry of Environment or other sources, the parameters and ecological non-harmfulness and expenses of the biological decontamination of low-burdened soils given the great significance of the clearance of such contaminated soils

Accountability: Ministry of the Environment

Deadline: continuously

3.4.2.5 Identify new POPs sources.

Accountability: Ministry of the Environment
Deadline: continuous
Cooperation: all ministries

3.4.2.6. Remove PCB, PCB wastes and devices containing PCBs by course of the Act no 185/2001 Coll., and of the Directive 96/59/EC respectively.

Responsibility: Ministry of the Environment
Deadline: XII/2010
Cooperation: all ministries

3.5 Action Plan: Production, import and export, use, stocks and wastes containing DDT (Annex B) if used in the Party to the Convention

DDT is not produced in the Czech Republic; this issue is discussed together with other OCPs in the Chapter 3.3.

3.6 Action plan: Releases from the unintentional production (by-products of PCDDs/Fs, HCB and PCBs)

It can be assumed that concerning the emissions to the atmosphere that significant changes in contributions of individual emission categories to the total emissions or that more pronounced POPs emissions restrictions cannot be expected in the near future (in the next 5 years).

3.6.1 Short-term activities (up to 3 years)

3.6.1.1 Carry out the emission inventory of HCB and PCBs and complete the inventory on PAHs and PCDDs/Fs into all constituents of the environment, to the waste and products. Its findings shall be taken into account when processing other strategic documents (SEP, Waste Management Plan, BREF documents, etc.).

Accountability: Ministry of the Environment (CHMI)
Deadline: XII/2008

3.6.1.2 Draw a plan decreasing the content of chlorinated and of brominated substances in the environment, in wastes and in products referring to the processed inventory.

Accountability: Ministry of the Environment
Deadline: XII/2008

3.6.1.3 Solve problems concerning production, handling of waste HCB and risks associated with the HCB waste transport urgently.

Accountability: Ministry of the Environment
Deadline: VI/2007
Cooperation: Ministry of Industry and Trade, Ministry of Transport

3.6.2 Long-term strategic goals

Urge the change in conceptual approach in order to decrease POPs emissions into all environmental constituents, to the waste and products.

Liquid and solid wastes including the sludge should, if possible, be treated and detoxified at the place of their origin (closed water cycle, sublimation of the sludge, thermal detoxication of the fly ash, solidification and vitrification of the solid waste).

3.6.2.1 In relation to the common strategy for the limitation of POPs emissions from incinerators prepared in conjunction with the implementation of the POPs Protocol to the Convention on Long-range Transboundary Air Pollution (CLRTAP) thoroughly check adherence to the general principles of the acceptable operation of waste combustion facilities and ensure monitoring of other POPs emissions (PAHs, HCB, PCBs) as well as their content in waste produced by incinerators.

Accountability: Ministry of the Environment (CEI)
Deadline: continuously

3.6.2.2 Control the handling the fly ash resulting from combustion, thermal and pyrolytic processes.

Accountability: Ministry of the Environment (CEI)
Deadline: continuously

3.6.2.3 Focus on the decreasing POPs emissions conditioned especially by the increase of the natural gas proportion in the households by energy savings and more efficient waste management in terms of the Integrated National Emission Reduction Plan.

Accountability: Ministry of the Environment
Deadline: continuously
Cooperation: Ministry of Industry and Trade

3.6.2.4 Conduct measurements of POPs emission factors from mobile sources with the aim to refine the Emission Inventory of the off-road transport especially („off-road“– army, agriculture, forestry, etc.).

Accountability: Ministry of the Environment
Deadline: XII/2009
Cooperation: Ministry of Defence, Ministry of Transport and Ministry of Agriculture

3.6.2.5 Complete the Inventory on Liquidation of Transportation Waste (car wrecks, tyres, road reconstruction) aiming at lowering the uncertainty given by the true removal mode taking place in workplaces with different standards.

Accountability: Ministry of the Environment
Deadline: XII/2009
Cooperation: Ministry of Transportation

3.6.2.6 Complete the reporting of the occurrence of hazardous substances in road and railway transport.

Accountability: Ministry of Transportation
Deadline: 2009

3.6.2.7 Elaborate a summary report on POPs handling in facilities that fall within the cognisance of the Ministry of Defence or of the Czech Army.

Responsibility: Ministry of Defence
Deadline: 2009

3.6.2.8 Carry out the technical economic analysis of the coal combustion in households issue regarding the fact that the emission inventory indicated very significant contribution to the overall POPs emissions resulting from the local furnaces burning solid fuels.
Accountability: Ministry of the Environment, Ministry of Industry and Trade
Deadline: 2009

3.6.2.9 Elaborate a study focused on emissions from the coal, wood and biomass combustion in local furnaces and on the co-combustion of waste in the common households and use the results while drafting the local emission reduction programmes.
Accountability: Ministry of the Environment, Ministry of Industry and Trade (close cooperation of both departments)
Deadline: 2009

3.6.2.10 Identify and monitor, even with the unintentionally produced POPs emissions, further possible emission sources such as combustion of the biomass, as pentachlorophenol and creosote in the wood-working plants, fires at landfills and fires in industrial processing units and others.
Accountability: Ministry of the Environment (CHMI)
Deadline: continuously

3.6.2.11 Conduct the complete description of the territory with the immission load of all POPs, including the interconnection of the emission-imission information, aimed at the preparation of the Emission reduction policy resulting from all small sources that constitute an important contribution to the total emission flow.
Accountability: Ministry of the Environment
Deadline: 2009
Cooperation: Ministry of Health

3.6.2.12 Utilize the accessible information on the emissions from the metallurgy (thermal, combustion and pyrolytic processes) for a realistic policy limiting these emissions, and eventually initiate other necessary measurements.
Accountability: Ministry of the Environment (CHMI)
Deadline: 2009

3.6.2.13 Perform the Emission Inventory update for the pollution sources such as crematoria, veterinary combustion burning facilities, incinerators of the hospital waste, technologies in the metallurgy, paper production technologies, etc.
Accountability: Ministry of the Environment (CHMI)
Deadline: 2009

3.6.2.14 Focus the attention, in the framework of the research and development projects, on the determination of the POPs evaporated from soils, from landfills, and from water surfaces as the contribution to the total POPs emissions in the Czech Republic.
Accountability: Ministry of the Environment
Deadline: 2009

3.7 Strategy: Identification of the important stocks, commodities in use and wastes – Plan for the assessment and reduction of releases from the landfills and wastes: pesticides, DDT, PCBs and HCB (Annexes A, B and C)

3.7.1 Short-term activities (up to 3 years)

3.7.1.1 Update the inventory of old ecological burdens and of contaminated sites and report new information into the SESEZ database.

Accountability: Ministry of the Environment
Deadline: 2008

3.7.2 Long-term strategic goals

3.7.2.1 Perform the WWTP inventory in terms of the emitted POPs concentrations, arrange them to the quality categories; establish priorities of the technologies and set parameters for the detoxification; evaluate investment requirements on the technological adjustments and,

depending on the financial situation, ensure the eventual co-financing, and separate systematically the industrial waste waters from the communal ones, with the simultaneous elimination of possible POPs entering into the WWTP.
Accountability: Ministry of the Environment
Deadline: 2008

3.7.2.2 Support the research and development projects on new technologies and biotechnologies focused on the continuous liquidation of POPs waste and of POPs contaminated matrices.

Accountability: Ministry of the Environment
Deadline: continuously

3.8 Action plan: Identification and corresponding management of contaminated sites (Annexes A, B and C)

3.8.1 Short-term activities (up to 3 years)

3.8.1.1 Prepare the Proposal and the execution of the National Program if the old environmental burdens with POPs aimed at ensuring the systematic approach to the inventory regarding these issues, to the coordination in solving, and to the preparation and to the establishment the financing of the solution.

Accountability: Ministry of the Environment
Deadline: 2008

3.8.2 Long-term strategic goals

3.8.2.1 Conduct a rigorous inventory of contaminated sites with the preliminary assessment of the potential health and environmental risks; use this assessment for the future risk analyses and for the evaluation of the necessity of the resulting decontamination together with the economic assessment of such interference. This procedure may be understood as the fundamental presumption for the management of contaminated sites (old ecological burdens).

Accountability: Ministry of the Environment
Deadline: 2010
Cooperation: other departments

3.8.2.2 Support systematically the use of the on site *(in situ)* method in order to decrease the potential risk of spreading the pollutants from contaminated sites, when hydrogeological or other conditions permitting.

Accountability: Ministry of the Environment
Deadline: continuously

3.8.2.3 Ensure the prevention of the new ecological burdens generation.

Accountability: Ministry of the Environment (CEI)
Deadline: continuously

3.9 Strategy ensuring the exchange and accessibility of information

3.9.1 Short-term activities (up to 3 years)

3.9.1.1 Establish the National POPs centre (see the 3.2.1.7.)

Accountability: Ministry of the Environment
Deadline: 2006

3.9.1.2 Improve the quality and the effectiveness of the cooperation in the POPs issue among the departments concerned.

Accountability: all departments
Deadline: continuously

3.9.2 Long-term strategic goals

3.9.2.1 Create the conditions and support the contacts and the exchange of information between institutions and persons dealing with the POPs issue.

Accountability: Ministry of the Environment
Deadline: continuously
Cooperation: other departments, NPOPsCTR

3.9.2.2 Support the active participation of the CR representatives in all relevant international forums.

Accountability: All departments
Deadline: continuously

3.10 Action Plan: Public awareness, information and education

3.10.1 The NIP strategic goals in increasing public awareness, information and education

The Ministry of Education, Youth and Sports is the main referee of educational programs.

3.10.1.1 Increase the public awareness and education concerning the POPs, make use of the activities of all departments concerned, of the activities of the National POP Centre, of educational institutions at all levels, and of voluntary, non-governmental organisations.

Accountability: Ministry of the Environment, Ministry of Education
Deadline: continuously
Cooperation: other departments

3.10.1.2 Refer to the State Environmental Education and Public Awareness Programme in the Czech Republic in the education campaigns (hereinafter as "EVVO")

Accountability: Ministry of the Environment (refers to the EVVO and its Action Plan 2004 – 2006, approved by the Government Order No. 991 of the October 8, 2003 to implement the government Order No.1048 of October 23, 2000, on the State of Environmental Education and Public Awareness Programme in the Czech Republic)
Deadline: continuously

3.10.1.3 Ensure the free access to the information on POPs in an acceptable and comprehensible form for the public.

Accountability: Ministry of the Environment, Ministry of Health, Ministry of Agriculture
Deadline: continuously

3.10.1.4 The most important aspects of the educational campaigns and of programmes are considered the following:

- Priority orientation towards hazardous wastes of POPs and their environmental treatment;
- The enforcement of the preliminary concern principle for substances with the cumulative and with the synergistic effect;
- Education and enlightenment focused on the POP issues for the state administration and regional authority staff.

Accountability: Ministry of the Environment, Ministry of Education
Deadline: continuously

3.11 Action Plan: POPs Monitoring

3.11. Short-term activities (up to 3 years)

3.11.1.1 Solve the monitoring issue of the Ministry of the Environment regarding the general importance of the monitoring activities as to the international obligations and programmes conjunction as well as to the monitoring of the state of the environment and its changes at least in the following aspects:

- Create the long-term concept of the monitoring within the department, including POPs and other substances, taking into account the existing activities in other departments, as well as pending international activities - especially those of the EU;
- Re-evaluate existing activities within the department, systematically develop long-term monitoring activities, and its subsequent research and pilot studies;
- This connection must result into the clear relationship with the international monitoring programmes (EMEP, GAW, Integrated Monitoring), and with the monitoring commitments resulting from the adopted international agreements, and into the cohesion with other national activities,
- Define the supervisory structure within the department for the above mentioned purposes – a department where this activity falls into, define the cohesion with other concerned departments, and eventually establish a small, functional expert team, composed of the department employees together with the independent specialists, to carry out the POPs monitoring concept.

Accountability: Ministry of the Environment
Deadline: XII/2006

3.11.1.2 The attempt for the maximum effectivity of the use of invested finances and the establishment of the system with a high informative ability should be the fundamental starting point of the monitoring system construction. This ability is resulting from the performed POPs inventories and is serving as the background document for risk assessments and for the efficient management of the ministries and of the state in the field of the human health and of the state of the environment.

Accountability: Ministry of the Environment, Ministry of Health
Deadline: 2007
Cooperation: Ministry of Agriculture

3.11.1.3 A priority interest must be granted to the development and to the optimization of the monitoring and research programmes being the instruments for the monitoring of the efficiency of the conclusions and measures of the SC.

Accountability: Ministry of the Environment
Deadline: XII/2006
Cooperation: Ministry of Health, Ministry of Agriculture

3.11.1.4 Prepare the proposal of the complex POPs monitoring concept, using the experience gained from the international monitoring programmes. The POPs issue must be resolved together with other monitored parameters. This proposal will be submitted for discussion to the Council on Human Health and the Environment

Accountability: Ministry of the Environment
Deadline: XII/2006
Cooperation: Ministry of Health, Ministry of Agriculture, and Ministry of Transport

3.11.2 Long-term strategic goals

3.11.2.1 Implement the monitoring system in the compliance with the adopted concept.

Accountability: Ministry of the Environment, Ministry of Health, and Ministry of Agriculture
Deadline: continuously

3.12 Action Plan: Reporting

3.12.1 The NIP strategic goals in the reporting field

3.12.1.1 Reporting obligations are laid down by the Article 15 of the SC and it can be assumed that they will be further specified by the Conference of the Parties (COP).

Accountability: Ministry of the Environment
Deadline: depending on the requirements of the COP
Cooperation: Ministry of Health, Ministry of Agriculture

3.12.1.2 Process regularly the findings of the POPs inventory and the information concerning the NIP goals satisfaction. The summary findings shall be published in the Report on the Environment and on the websites of the Ministry of the Environment and of the National POP Centre.

Accountability: Ministry of the Environment
Deadline: annually
Cooperation: Ministry of Health, Ministry of Agriculture, NPOPsCTR

3.13 Research and Development Strategy

3.13.1 Long-term strategic goals

3.13.1.1 Support the research and development in the POPs field (removal, emissions, transport and handling, effects) in the framework of the state research policy in the Czech Republic for 2007 – 2013.

Accountability: Ministry of the Environment
Deadline: continuously

3.13.1.2 Focus the research in the POPs field on:

- New types of pollutants - brominated compounds such as polybrominated diphenylethers (PBDEs), short chain chlorinated paraffins (SCCPs) and others;
- The Polycyclic aromatic hydrocarbons (PAHs) – focus on the monitoring of further substances from this group exceeding the common recommendations by the US EPA;
- Study of emissions from the combustion of biomass;
- Study of co-combustion of hazardous wastes;
- Development of the methodology for the POPs determination from mobile sources.
- Support scientific-research projects of the Ministry of Industry and Trade and of the Ministry of the Environment focused on technologies for the liquidation of POPs from all constituents of the environment.
- Realisation of the epidemiological study relating the exposure of the population groups to the potential health risks.

Accountability: Ministry of the Environment
Deadline: continuously

3.13.1.3. Anticipated future research activities that could be realised with the participation of a number of institutions and as a part of the international activities associated with the POPs:

- Validation of the transport and of the distribution models, as well as for studies on atmospheric processes and deposition/re-emission flows, the determination of the POPs distribution between the gas phase and in the particles in the atmosphere, and between the water and in the precipitation particles;
- Study of the exchange processes in the gas phase including also the measuring of POPs in constituents such as water, vegetation, and soil;
- More detailed, sophisticated studies on the air-surface exchange for POPs; a key aspect of this work will be the improvement of knowledge and rafination of technologies for monitoring chiral compounds;
- More extensive studies focused on the physico-chemical POPs properties under various climatic conditions as an important basis for the studies on exchange processes like air-soil exchange and air-water exchange that are significantly dependent on the temperature;
- Inventory on a global level, and models of the global distribution;
- Studies in terms of the occurrence, bioavailability, and of the POPs dynamics in soils, sediments, and in the ground water;
- Study of the effects of POPs on humans and on the wildlife including molecular modelling of the mechanisms of biodegradation, biotransformation and of the toxicity;
- Study of the new types of pollutants (polybrominated types, chlorinated paraffins, toxaphene), super hydrophobic molecules, and more polar persistent substances;
- Development of analytical methods for the determination of the new types of POPs, metabolites, stereoisomers, and of more polar POPs;
- Development and application of new progressive sampling procedures based on the passive integral samplers;
- Study of deposition/emission processes, transformation processes, and of the POPs bioavailability in terrestrial ecosystems;
- The evaluation of the phytotoxic effects of POPs and their effects on soil microbial populations and soil fauna;
- The study of the effects of real environmental mixtures.

Accountability: Research and Development Council, Ministry of the Environment, GACR, Academy of Sciences, Ministry of Health, Ministry of Agriculture

Deadline: continuously

4. PROPOSALS OF THE FURTHER DEVELOPMENT, CAPACITY BUILDING AND PRIORITIES

4.1 The support of the rapid collection of the uncontrolled and unsecured handling of the POPs waste through the prompt construction of devices intended of the collection of waste with the POPs content and eventually other hazardous substances is the inevitable necessity. The POPs will be collected and stored in those devices in an environmentally safe manner until they can be disposed in an environmentally acceptable way. Considering the time limitations and the economic factors, it would be useful utilize completely the existing network of these facilities once their suitability has been proven.

Accountability: the Ministry of the Environment
Deadline: XII/2007

4.2 Establish the National POP Centre officially and the advisory board of the Interdepartmental Committee for the Chemical safety of POPs.

Accountability: Ministry of the Environment
Deadline: 2006
Cooperation: Ministry of Health

4.3 Ensure the sufficient technological capacity for the removal of PCBs and OCPs, of the waste with POPs and of contaminated soils and sediments based on the BAT technologies.

Accountability: Ministry of the Environment
Deadline: XII/2008
Cooperation: The Ministry of Industry and Trade (except the financial cooperation)

4.4 Propose a structure for the exploitation of existing financial mechanisms in order to ensure financial resources for the pursuance of the NIP tasks

Accountability: Ministry of the Environment
Deadline: 2007
Cooperation: all departments

5. SCHEDULE OF THE IMPLEMENTATION

- Distribution of the National Implementation Plan to all interested institutions after it had been recognized by the Government.
- Establishment of the National POP Centre and of the Committee monitoring the implementation of the SC within one year from the date of the cognizance of the National Implementation Plan.
- Fulfilment of the short-term goals specified in the National Implementation Plan within the three years from the date of its cognizance.
- Evaluation of the short-term goals satisfaction and update of the National Implementation Plan by September 2009.
- Accomplishment of long-term goals specified in the National Implementation Plan within the ten years from the date of its cognizance.

6. CONCLUSIONS FOR THE FULFILLMENT OF THE NATIONAL IMPLEMENTATION PLAN

The estimate of costs associated with the elimination of the sequels of the POPs releases into the environment in the past time has been very complicated. Many of the impacts of the POP releases into the environment have already been solved in recent decades (liquidation of the unused OCPs, decreasing emissions into the atmosphere, removal of old ecological burdens and of contaminated sites).

In terms of emissions of undesirable by-products according to the SC into the individual constituents of the environment, taking into consideration the legislative and technical measures taken after 1990, a significant decrease of emissions into the atmosphere cannot be expected in the next five years. In terms of emissions into other environmental constituents, that are associated, to the great extent, with monitoring and research, it is possible to assume the annual costs in the range of tens of millions of the Czech crowns (monitoring of the environmental constituents, monitoring of the veterinary and food-processing commodities based on the EC legislation, monitoring of the health of the population, the activity of the National POP Centre and of other institutions, enlightenment and educational activities), where the start-up costs may actually be higher (acquisition costs, additional laboratory equipment pursuant to the EC legislation and to the internationally accepted standards).

One of the fundamental problems is the necessity of the establishment the re-collection system for the POPs containing wastes and eventually of other hazardous substances; such compounds (wastes) would be accumulated and stored in an environmentally safe manner until their removal would be ensured. These recollection sites (“collecting yards”) could be established in individual regions as a part of the regional waste management plans or in the problematic localities, from the point of the occurrence of POPs and waste containing POPs. The construction and delivery costs estimates depend on the number of such establishments; however, it can range in the order of several tens million crowns. More advantageous then is the usage of the existing recollection devices.

As regards contaminated sites (old environmental burdens) caused by the former industrial and agricultural activity, the communal sphere, the army, transport and other factors, they cannot be accurately specified in the Czech Republic (as well as in all other countries of the world). It is therefore necessary to formulate estimates based on various methods. The funding the elimination of old environmental burdens is not a subject of the National Implementation Plan. The National Implementation Plan should, above all, contribute to the systemic inventory of old environmental burdens with the POPs occurrence. Regarding the

existing results of the contaminated sites, with the POPs occurrence, inventory, we believe that it is necessary that a Proposal for the Removal of Old Ecological Burdens with predominance of POPs Programme would be drafted in the sequel of the ratification of the National Implementation Plan. Removal of such compounds cannot be funded from other available sources; its aim would be to provide the finance for the removal of old environmental burdens in the case when no financial resources would be obtained from other available sources (Ministry of the Environment, State Environmental Fund of the Czech Republic, Departmental Budget, EC Funds, etc.) and to ensure the coordination of all related activities.

However, it must be emphasised that the estimated costs are not invoked from the SC ratification by the CR, but by the omission of the POPs issue in the past. On the contrary, the signature and the ratification of the SC have allowed and will facilitate the access to the financial resources for the CR; such resources will help to solve the issues identified by the NIP.

The assessment of expenses related to the removal of PCBs and PCB wastes and the assessment of expenses related to the realization of the individual points of the NIP are provided in the following text.

Reflection upon expenses associated with the removal of PCBs and of the PCBs waste

At the beginning of this reflection, it is necessary to review the relevant information available for this purpose. Nevertheless, it is accepted that the certainty of the resulting information is directly dependent on the accuracy and exactness of the starting setting, i.e. on the determination of the conditions under which the relevant result is valid and on the nature the starting information.

When considering expenses associated with the liquidation of PCBs and waste containing PCBs, the following data were taken into account:

a) Proposal of the National Plan for Hazardous Waste Handling containing data regarding their occurrence in the years 1996, 1997 and 1998;
b) Partial results of the PCB inventory prepared up to July 26, 2005 by T.G.M. WMRI in Prague (Centre for Waste Management);
c) Overviews on the average prices for the disposal of the PCBs containing waste provided by the incinerator of the hazardous waste, Ostrava, and other prices published in various studies;
d) Explanatory reports on the examination of the most appropriate methods of the removal of waste contaminated by PCBs, elaborated for the ministerial conference in 1995.

The following data from the above mentioned background material and from the NPOPsINV are relevant for the reflection upon costs associated with the removal of waste containing PCBs:

Ad a) The material stated that „In 1998, according to the new Waste Catalogue, 11.4 thousand tons of the waste with PCBs were declared, of which 96.5% were transformers or condensers. The filling containing PCBs formed 10 – 30 % of the total weight of the devices (the remainder were metals, plastic, paper, etc.);

Ad b) Upon evaluation of the PCBs production and use in the former Czechoslovakia and the Czech Republic, the following data were obtained in the course of the PCBs reporting pursuant to the Decree No. 384/2001 Coll., on dealing with the PCBs, in the period 1.1.2002 – 31.1.2005:

PCB inventory period in the Czech Republic: 1.1.2002 – 26.7.2005		
The way of delivery		**Number of companies**
Mail	Number of companies that register equipment containing PCBs	186
	Number of companies that have proven the PCBs absence in their equipment	201
	Total number of registered companies	387
Electronically	Number of companies that register equipment containing PCBs	40
	Number of companies that have proven the PCBs absence in their equipment	472
	Total number of registered companies	512
Total	Number of companies that register equipment containing PCBs	**226**
	Number of companies that have proven the PCBs absence in their equipment	**673**
	Total number of registered companies	**899**

Number of companies that performed the PCBs reporting in the Czech Republic within the mentioned period		**Equipment containing PCBs [Weight of filling in tons]**	**Equipment in which it is not yet confirmed whether the filling contains PCBs [Weight of filling in tons]**
Total:	226	487,30417	3 487,41998

The PCBs inventory performed within the above-mentioned period comprises data on the quantity of the fillings exceeding the 50 ppm content of PCBs and on the number of related devices (20 535); the majority of the cases (99% condensers) involve pure Delor, Clophen, Crophene or Pyralene, or more precisely, pure PCBs.

Subjects owning or operating the device/installation and substances with the PCBs content in the CR:	226
Enterprises authorized to deal with PCBs:	about 80
Enterprises authorized to remove PCBs (The incineration plant of the hazardous waste, Ostrava – SPOVO – condensers, small transformers, oils, sediments, cables, pastes, sludge and soils with PCBs):	1
Laboratories analyzing PCBs in the framework of the PCBs inventory:	34
Persons authorized to withdraw samples from the electric devices:	99
Persons authorized to draw oil samples from the non-electric devices:	13

Summary results of the PCBs inventory in the Czech Republic
within **1. 1. 2002 – 26. 7. 2005**

TOTAL

Subject owning of operating substances, installations and devices with the PCBs content:	226

CELKEM							
		Zařízení obsahuje PCB: Ano			Zařízení obsahuje PCB: ???		
Druh zařízení	Kód druhu zařízení	Počet kusů	Hmotnost náplně [kg]	Hmotnost náplně [t]	Počet kusů	Hmotnost náplně [kg]	Hmotnost náplně [t]
Výkonový transformátor	10	125	288331	288,331	1398	2302614	2302,614
Tlumivka	11	4	10541	10,541	54	65410	65,41
Reaktor	12	0	0	0	2	29920	29,92
Transformátor elektrofiltru (odlučovač)	13	0	0	0	63	44289	44,289
Průchodka	14	0	0	0	0	0	0
Přepínač odboček (v transformátoru)	15	0	0	0	2	2000	2
Přístrojový (měřící) transformátor napětí (PTN)	16	0	0	0	22	3221	3,221
Přístrojový (měřící) transformátor proudu (PTP)	17	0	0	0	16	2588	2,588
Přístrojový (měřící) transformátor kombinovaný (PTK) – napětí + proud	18	0	0	0	0	0	0
Kondenzátor	20	10379	135491,1	135,4911	2715	29543,5	29,5435
Kondenzátor "malý"	20	10024	44841,07	44,84107	199	631	0,631
Kondenzátorová baterie	21	0	0	0	0	0	0
Motor	22	0	0	0	0	0	0
Rozvaděčová skříň	23	0	0	0	0	0	0
Vypínač	25	0	0	0	1684	65972,88	65,97288
Ostatní elektrická zařízení s kapalným dielektrikem	30	0	0	0	1608	617781,1	617,7811
Hydraulické důlní zařízení	40	0	0	0	1057	244107,5	244,1075
Vakuové čerpadlo	50	0	0	0	0	0	0
Průmyslové zařízení s ohřevem teplonosnou kapalinou (duplikátor, obalovna drti apod.)	60	3	8100	8,1	2	1000	1
Jiné zařízení	70	0	0	0	246	76049	76,049
Nádrž s provozní kapalinou s PCB	81	0	0	0	3	2093	2,093
Cisterna s provozní kapalinou s PCB	82	0	0	0	0	0	0
Sud s provozní kapalinou s PCB	83	0	0	0	1	200	0,2
Jiný způsob uskladnění provozní kapaliny s PCB	90	0	0	0	0	0	0
	Celkem	20535	487304,17	487,30417	9072	3487419,98	3487,41998

Ad c) The above mentioned background materials state the prices in the following price intervals:

Type of waste/equipment	Price (per tonne or per piece)
Oils containing PCBs (catalogue numbers 13 01 01*, 13 03 01*) Electric devices with liquid dielectric (catalogue numbers 16 01 09*, 16 02 09*, 16 02 10*) Soils, rubble, construction and demolition wastes with the PCBs content (catalogue number 17 09 02*) Other technological devices with PCBs or waste of the PCBs	20 - 50 000CZK/t
Decontamination of transformer with the filling containing PCBs (including the delivery of the new filling and liquidation of original PCB-contaminated filling)	100 – 200 000 CZK/pc
Prices for liquidation of the above-mentioned waste in other EU countries (decontamination with subsequent combustion, including the transport to the destination country)	100 – 200 000 CZK/t

In addition to these prices for the combustion of waste in special facilities (hazardous waste incinerators) intended for this purpose, it should be stated that the waste oils (hazardous waste if PCBs content is from 20 mg/kg) with the concentration up to 50 mg/kg (ppm) may be burned at lower costs in modified and approved waste co-combusting devices (for instance cement kilns). However, neither costs nor quantity data is available for this PCB liquidation technology.

Ad d) The presented explanatory report contains, among other things, the following „Estimation of financial demand of the PCBs removal“, quotation:

„To finance the delivery transport, temporary storage, manipulation, safe disposal and other expenses associated with the inventory and other organisational steps during the estimated removal of 15 000 tons of waste contaminated by PCBs about 1 billion CZK would be needed (in 1995 prices). The above total cost was calculated from the unit price for the collection, transport and its actual disposal of 50 CZK/kg (750 million CZK in total), the rest would be destined to other operation, i.e. to the temporary storage and manipulation wort of (150 million CZK in total); and to the inventory, identification, chemical analyses and controlling activities of the consortium about 100 million CZK would be necessary (estimate from the data on costs from enterprises involved in the disposal of the hazardous waste). The total budget thus reaches the 1 billion CZK“.

Upon a closer review and a comparison of the data presented in points a) - d), it may be noted that:

1. If disposal of the whole device is expected then the inventory data must be corrected in relation of the expected content and of the weight of the filling to the total weight of the device i.e. including the corresponding metallic case. Furthermore, it is assumed that the content of the filling constitutes about 10-30% of the total weight.

2. Price of background documents related to the work associated with the PCBs and waste of PCBs disposal show a large price range that consequently means that the maximum costing variant may be even one order higher than the minimum one. Due to the fact that the prices for decontamination work are prices on agreement, then this price variability may be eliminated only by the selection procedure. The only sure fact is, however, that the costs of such work are significantly differentiated in other EU member states.

It is impossible to quantify expenses of the waste of PCBs and of the devices containing PCBs decontamination explicitly under such conditions. This will be possible when the specific technologies of their disposal or decontamination will be determined, and the provider of this work is chosen through the selection procedure. A general estimate could be in of the range up to the 10 000 000 000 CZK. However, it is important to emphasise that these expenses will be distributed over the period 2005 – 2010 (resulting from the obligations of the Czech Republic arising from the Council Directive 96/59/EC on the disposal of PCBs/PCTs), or over the period 2005 – 2025 (pursuant to the Annex A, Part II of the SC).

It is possible to define only certain simplifying assumptions, under which estimates of such expenses may be quantified at present situation. These assumptions are as follows:

- **PCBs removal concerns the entire device (except for large and medium size transformers),** not only the content of the filling, and is carried out by the simple technology, i.e. by the combustion in the inland incinerator of the hazardous waste in Ostrava (about 1000 tons of the condensers with PCBs annually);

- **Decontamination involves approx. 11 700 t of waste; this amount is in agreement with** the findings of the Inventory in 2005. It is assumed that the content of the filling constitutes up to 30% of the total device weight on average when considering a maximum quantity of the filling as found in the inventory (approx. 3 500 t), i.e. correcting the amount of the filling by the 0,7 coefficient;

- **The decontamination operations costs** are expected to vary between the middle and maximum amounts

- **The expected amount of the contaminated soils, earths and matter from redeveloped illegal dumping sites** is estimated, in accordance with the previous background data, to the 100 000 t at least.

Anticipated financial resources for the period 2006 - 2012

Institution	Variant		2006	2007	2008	2009	2010	2011	2012	Total	Units
Anticipated financial resources – state budget											
MoE			3	3	3	3	3	3	3	21	mil. CZK
MD	I	Removal of the entire large device (transformers) and condensers	1,43	1,43	1,43	1,43	1,43	1,43	1,43	10	mil. CZK
	II	Decontamination (including labels) and removal of condensers	0,27	0,27	0,27	0,27	0,27	0,27	0,27	1,9	mil. CZK
									TOTAL	**33 mil. CZK**	
A: Anticipated financial resources – private sector								best variant			
Operational costs	I	Removal of entire transformers and condensers	22,4	22,4	22,4	22,4	22,4	22,4	22,4	156,8	mil. CZK
	II	Decontamination (including labels) and removal of condensers	10	10	10	10	10	10	10	70	mil. CZK
									TOTAL	**227 mil. CZK**	
B: Anticipated financial resources – private sector								worst variant			
Operational costs	I	Removal of entire transformers and condensers	170,3	170,3	170,3	170,3	170,3	170,3	170,3	1 192	mil. CZK
	II	Decontamination (including labels) and removal of condensers	61,2	61,2	61,2	61,2	61,2	61,2	61,2	428	mil. CZK
Financial resources for the laboratory analyse of the PCBs content in the fillings where it is not yet confirmed whether they contain PCBs (identical for both A and B variant) – private sector										6,2	mil. CZK
									TOTAL	**1 626,2 mil. CZK**	
Sites contaminated by POPs (old environmental burdens, illegal tips)										**1 500 mil. CZK**	

Explanatory notes:

While processing the findings the PCBs Inventory accomplished to the 26.7.2005 in the CR and the data by the MoD up to 15.7.2003 that effectuates the PCBs inventory separately, were used.

The PCBs Inventory in the CR is still open and continuous process, however, it cannot be excluded that the resources will be significantly decreased or the contrary. The reasons are especially the devices that were not yet examined for the presence of the PCBs or the devices that were not yet reported.

A: anticipated costs to remove **PCBs** from devices where they **are demonstrably occurring**, i.e. where the laboratory analysis proved the PCBs content (we did not include the worst possible variants) for the 2006-2012 period**.**

B: anticipated costs for the 2006-2012 period to remove PCBs from devices, where **their presence is likely**, i.e. for those where a laboratory analysis will be carried out to prove whether or not the device contains the PCBs. We are assuming the worst possible variant, i.e. it is assumed that every analyzed device contains PCBs (i.e. the table shows the maximum costs to remove PCBs; in fact, these costs do not have to be attained in the reality).

There were registered 9 072 devices in the CR by the 26.7.2005, where it is not sure whether they contain PCBs. The **2 616** of them fall on the **large devices** (transformers, coils, tarmacadam plants etc.) and **6 456** devices falls on to - **smaller** devices. Therefore a laboratory analysis of those devices is necessary to prove whether or not they contain the PCBs. The condensers are usually equipped with the label saying whether they contain PCBs. Therefore no analysis is performed in the case of condensers (2914 of the total quantity of smaller devices). That means that, the laboratory analysis will take place for the **6 158** devices. As the price per analysis is 1000 CZK, then it implies that the total costs of the PCBs laboratory analysis is **6 158 000 CZK**. The total sum can, naturally, be distributed over the 2006-2012 period, i.e. about 0,89 mil. CZK each year.

Note:

Both variants, I and II, stem from the assumption that every operator of the device would use only one of both of them, i.e. e. 100% transformers would either be fully removed and they would be no longer used (variant I) and or 100% condensers would be decontaminated, the filling would be changed and then they would be used further (variant II). Condensers could only be removed, they cannot be reused, i.e. there are identical costs applied in both variants. However, the operator may decide what variant (whether to remove or to use further) to use in reality, i.e. the table provides the maximum costs for the PCBs removal and the true cost would be known only after the execution of the chosen variant.

There is no capacity for the transformer removal (combustion or incineration) in the CR at present. The possible handling of the transformers with PCBs, in relation to the wording of the paragraph 9 of the Council Directive 96/59/ES or, to the Act no.185/2001 Coll., on wastes, respectively, states the following:

- Transformers with the operational filling containing 50 – 500 mg/kg of the PCB will be decontaminated or removed only at the end of their lifetime, i.e. even after the 2010. The decontamination will take place according to the methodology being prepared by the Ministry of the Environment;
- The transformers will be transported to another member state or exported to the ESVO country in order to remove them in accordance wit the Council Directive 93/259/EEC on the oversight of the waste transportation within, into and from the EU and on their control and in accordance with the Act no.185/2001 Coll.., on wastes, or;
- Subsequently to the further identification of the presence or non-occurrence of the PCBs in transformers, their decontamination or removal resulting from the adopted POPs/PCBs Technical Guidelines to the Basel Convention, where the CR had actively participated, will take place. Moreover, there is a real possibility that the installation for such activities will be established in the CR.

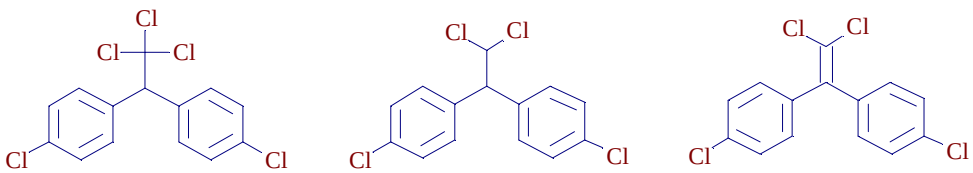
ANNEX 1

BASIC CHARACTERISTICS AND PROPERTIES OF INDIVIDUAL POPS

A1.1 DDT and its metabolites (DDTs)

DDT, or p,p´-DDT (1,1,1-trichloro-2,2-bis (p-chlorophenyl) ethane) respectively was identified as an effective insecticide in 1939. Its production and use at large began around 1944, and, the worldwide production was estimated to 2 million tonnes until the beginning of the 1970's. Developed countries began to ban the use of DDT for both the plant and agricultural products protection in the 1970's. In the Czech Republic, this prohibition came into effect in 1974; however, DDT was used in a limited amount in the selected products, such as in hair lice liquidation products even after this date. Thus there was no immediate significant decrease in the DDT occurrence in the environment after this ban, mainly due to the persistence of this substance, to its illegal „utilisation of remaining reserves", to the existence of old (ecological) burdens, as well as to the import of certain feeds from developing countries, where the use of DDT was still permitted.

In the monitoring of the DDT presence in the environment, the term „DDT" does not comprise only the p,p´-DDT being the proper active substance, but a whole group of similar substances. The isomer o,p´-DDT (its amount is dependent on the reaction conditions) is also formed in the DDT production, and reaction by-products include also isomers of dichlorodiphenyldichloroethane (p,p´-DDD and o,p´-DDD). In addition, DDT is dehydrochlorinated to the dichlorodiphenyldichloroethene (DDE) in the environment. Even these DDT metabolites are also very persistent and hazardous for health and the environment. The fact that the ratio of DDT/DDE changes over time significantly complicates the evaluation of trends resulting from the long-term monitoring programmes of DDT and its metabolites in the environment.

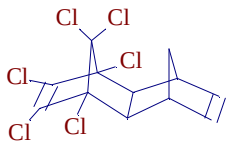


p, p´-DDT (4,4'-DDT) = 1,1,1-trichloro-2,2-bis(4-chlorophenyl) ethane
p,p´-DDD = 1,1-dichloro-2,2-bis(4-chlorophenyl)ethane - product of dechlorination
p,p´-DDE = 1,1-dichloro-2,2-bis(4-chlorophenyl)ethylene - product of dehydrochlorination

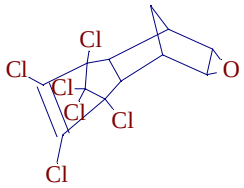
Detailed information regarding the properties of the DDT is included in the passport accompanying this substance. Generally, it can be stated, that DDT and its metabolites are very stable, low volatile substances of the lipophilic nature with the low water solubility and in the contrast, with a significant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

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

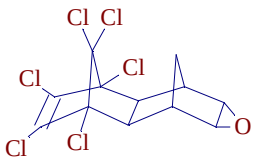
These chlorinated hydrocarbons are effective insecticides against ticks, moths, termites and other insects. To the lesser extent they were also used for seed treatment. Dieldrin is toxic for even for mammals, and it was even used as a rodenticide in the past. The production and utilisation of these substances for agricultural and food products were terminated at the end of the 1970's and at the beginning of the 1980's.



Aldrin



Dieldrin

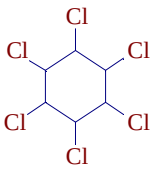


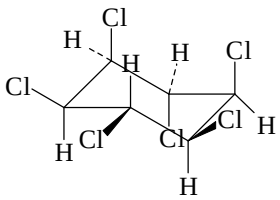
Endrin

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

A1.3 Hexachlorocyclohexanes (HCHs)

Hexachlorocyclohexane was produced due to its insecticidal effects and was used in the agriculture as preparation for the extermination of animal and human parasites as well as for the treatment of the forests and other vegetation. γ-HCH is considered to be the most efficient insecticide out of five stereoisomers formed by the chlorination of the benzene, and therefore its raw product of the reaction is purified by the fraction crystallisation to obtain the 99% γ-HCH isomer, i.e. lindane. In the former Czechoslovakia, γ-HCH was used in combination with the DDT (preparations Lydikol and Gamadyn); after the DDT ban, it was still used for the seed treatment. Currently, its use in agriculture is not permitted.





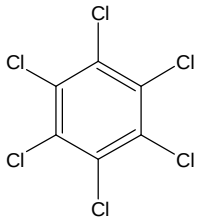
Isomers of HCH are relatively chemically stable compounds of the lipophilic nature. They are converted into the trichlorobenzenes or tetrachlorobenzenes by the gradual microbial dechlorination. Lindane is, in comparison with a number of other persistent organic pollutants (for example DDT, Aldrin, Heptachlor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

A1.4 Hexachlorobenzene

Hexachlorobenzene (HCB) is produced by the catalytic chlorination of the benzene or by the oxidation of the waste hexachlorocyclohexane (HCH) from the lindane production. HCB is not produced in the Czech Republic; its production was terminated in Spolana Neratovice in 1968. Thus, HCB is a by-product of the tetrachloromethane, perchloroethylene, trichloroethylene or pentachlorobenzene productions, important industrial chemicals (produced, for example, by the Association for Chemical

and Metallurgic Production, Ústí nad Labem). HCB is also formed by the electrolysis – production of the chlorine - together with octachlorostyrene.

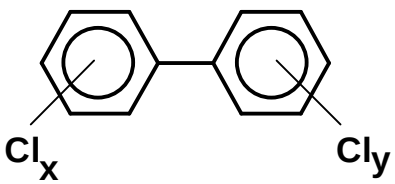
HCB is used as a fungicide, disinfectant and as a raw material or a by-product in the production of several chemicals (pentachlorophenol, several chlorinated aromatic hydrocarbons. It is used, as the industrial chemical, in the production of pyrotechnics, synthetic rubber and aluminium. Its fungicidal properties are utilised in the wheat, onion, and seed treatments.

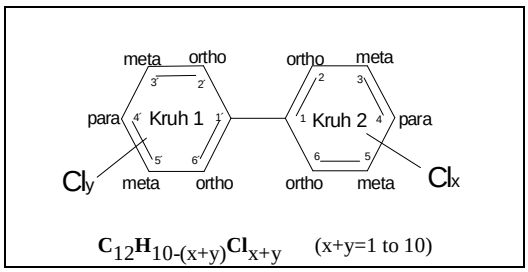


HCB is a very stable, low volatile substance of the lipophilic nature with low water solubility and, on the contrary, with a significant ability to accumulate in the fatty tissues of organisms and to adsorb on the surface of solid particles. It decomposes very slowly in the environment; chlorinated phenols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

A1.5 Polychlorinated biphenyls (PCBs)

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





PCBs are oily to waxy substances with excellent technical properties, such as chemical and physical stability even under high temperatures, incombustibility, immiscibility with water and high electrical resistance. These properties made PCBs a suitable material in many technical domains and resulted into their widespread use. Due to the fact that the information regarding their toxic properties was either not known or underrated, the massive spreading of PCBs was not alleviated by the more remarkable protective measures inhibiting their penetrating into the environment. The toxic character

of PCBs even in very low concentrations was not definitely proven until the 1970's, moreover, it was also verified that the danger of the PCBs presence in the environment and in food chains is multiplied by the PCBs capability to accumulate especially in the fatty tissue of organisms. The production and use of PCBs in many countries of the world was then significantly limited and gradually completely terminated. However, a completely different development took place in the former Czechoslovakia where PCB production began in 1959,. Ignoring the alarming and generally available information on the PCBs hazard, their production had just increased in 1972 and reached its peak around the 1980 without any control of their use from the point of the health and environmental hazards. It wasn't until a massive contamination of, for example, beef, milk, butter and fish was certified that the production of PCBs was terminated in 1984 even in Czechoslovakia.

PCBs fall into the group of persistent organic pollutants with a strong lipophilic nature creating a significant bioaccumulation. This fact multiplies their hazardous toxic properties, as they can accumulate in the fatty tissues and organs of humans and animals. A higher PCBs content is often accompanied by the presence of polychlorinated dibenzo-p-dioxins and dibenzofuranes, i.e. substances that are several orders more toxically hazardous than PCBs alone.

,PCBs are deposited in significant amounts in aquatic environments - in river sediments, where a significantly higher PCB contents can be found in the so-called mud types of sediments with a higher proportion of the total organic matter than in sediments with the prevalence of the sand. PCBs of the ground sediments (in river beds), are decomposed very slowly under the anaerobic conditions, slow photochemical and biological degradation takes place with a half-life of several years range. UV radiation is a significant fastener of these processes, as under such conditions the benzene ring breaks. PCBs from water and water sediments are bioaccumulated by algae and by the plankton and thereby enter the food chains. The distribution coefficients between water and fats are so different high for many PCB congeners that fish living under the experimental conditions in water contaminated with trace concentrations of PCBs for extended periods of time, have increased the concentration of these substances in their bodies up to a thousand times. However, the PCBs distribution in the fish body is not uniform. For example carps have PCBs stored mainly in fatty tissues, in the head, in the central nervous system, gallbladder and in other internal organs, whereas their concentration in blood and smooth muscle are significantly lower.

The PCBs water solubility is very low and decreases with the increasing degree of the chlorination. For example, 2-chlorobiphenyl shows a solubility of 5.9 $mg.l^{-1}$ at 20º C, whereas decachlorobiphenyl only gives 0.015 $mg.l^{-1}$. Under real conditions of the hydrosphere, the PCBs solubility in water can be significantly altered by the presence of the surface-active substances, of inorganic salts or high-molecular natural substances of the humic acid type.

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

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

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

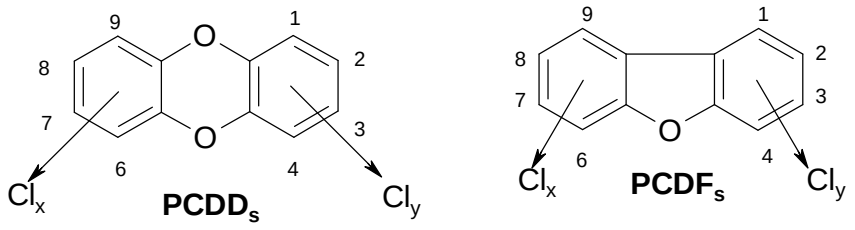


Chart of the structure of polychlorinated dibenzo-p-dioxins and dibenzofuranes (PCDDs/Fs)

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

PCDDs/Fs are classified as typical POPs due to their physical and chemical properties. They have a very low solubility in water (especially those more chlorinated), low volatility, they are easily adsorbed to the surface of solid particles (high K_{oc} coefficient), and they only slowly undergo the decomposition. These properties predetermine that PCDDs/Fs, are found, of components of the hydrosphere, mainly in soil, silts and sediments, and, in a very limited amount, they are also found dissolved in the surface or other waters. Due to the high Kow distribution coefficients, they are able to bioaccumulate in the fatty tissue of animals and of humans.

PCDDs/Fs enter human food products via the food chains, where the primary path leads via aquatic ecosystems to the fish meat and fats that serve either as the nutrition directly, or as a feeds additive for the livestock, where they get into their meat and milk. Another route for the PCDDs/Fs entry into foods is through the pasturage of the cattle, where dioxins enter via the atmospheric deposition. The most contaminated foods and feeds are the fish meat, fats, and fish-meal from the Baltic Sea followed by those from the North Sea. The PCDDs/Fs content is in these areas up to 10x higher in comparison with the fish from the southern hemisphere and from the Pacific.

A1.7 Polycyclic aromatic hydrocarbons (PAHs)

Polycyclic aromatic hydrocarbons are organic substances formed by two or more condensed benzene rings in a linear, angular, or cluster arrangement. Their ability to persist in the environment for a long time and due to their health hazard (they exhibit carcinogenic and mutagenic effects), they are considered typical representatives of priority persistent organic pollutants (POPs).

Under standard conditions, they are usually colourless, white, or yellow solids, with relatively high melting and boiling points, depending on the number of the benzene rings and on the structure of the molecule. PAHs solubility in real surface and other natural waters is low and it decreases with the increasing number of benzene rings. PAHs solubility may significantly differ from the tabled values due to the different content of salts and of organic compounds. Waste waters containing a large amount of the surfactants, may increase the solubility of certain PAHs up to several orders; sea water, on the contrary, lowers the PAHs solubility due to the inorganic salt content. Temperature is also a significant factor regarding the solubility of these compounds, for example, the solubility of the anthracene increases five-fold with a temperature increase from 5 °C to 30 °C. PAHs are much more soluble in organic solvents, compared to water, in both aliphatic non-polar (pentane, hexane) or polar (methanol, dichloromethane) ones, as well as in aromatic solvents (benzene, toluene). PAHs have a significant capability to adsorb at the surface of solid particles. Due to this fact, they are both the atmosphere and the hydrosphere, adsorbed in significant amounts to the airborne or suspended small solid particles whom they travel with through the environment. This fact is more significant for PAHs

with a higher molecular weight, because adsorption on solid, or aerosol, particles is indirectly proportional to the partial vapour pressure, that decreases in PAHs with the increasing molecular weight.

For the description of the PAHs behaviour in the constituents of the environment and their accumulation in living organisms, it is necessary to know the values of the coefficients K_{ow} (distribution coefficient for octanol/water) and K_{oc} (coefficient of adsorption on organic matter). The values log K_{ow} and log K_{oc} increase with the increasing number of benzene rings. For example, for naphtalene, the published values are K_{ow} 3,37 and K_{oc} 2,38 – 5,00, for benzo(ghi)perylene, the published values are K_{ow} 6,5 a K_{oc} 6,20 – 6,26. A significant physical PAHs property is the large diversity of their spectra in the ultraviolet and visible light ranges, and the fact, that the individual PAHs have their specific UV/VIS spectra. Due to the large amount of π - electrons, also PAHs exhibit a significant fluorescence, or even phosphorescence for some compounds. The above mentioned spectral properties are successfully utilised for both qualitative and quantitative PAH analysis.

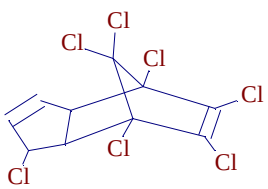
A significant chemical property of PAHs is the ability to form derivatives. Nitroderivatives are formed in the combustion at the presence of nitrogen oxides, sulphoderivatives at the presence of the sulphur dioxide, and chloroderivatives are formed during chlorination of PAHs. Some derivatives have exhibited stronger carcinogenic effects than PAHs alone.

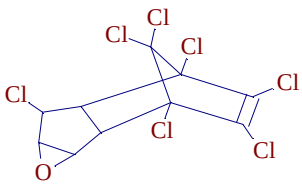
A1.8 Heptachlor

Heptachlor is an organochlorinated insecticide used primarily for the extermination of soil pests and ants. It was also partly used for the extermination of insects found in households, agricultural and seed treatment areas. It is usually applied directly into the soil, sometimes even onto the leaves. Its insecticidal effects were described at the beginning of the 1950's, after its isolation from the technical chlordane. It was commercially produced by Velsicol Chemical Corp. above all. It is not produced in the Czech Republic, and its use for agricultural purposes was banned in the 1989.

Detailed information on the heptachlor properties is provided in the passport accompanying the substance. Generally speaking, heptachlor is a stable, low volatile compound of the lipophilic nature with a low solubility in water and, on the contrary, with the ability to cumulate in fatty tissue of organisms and to adsorb onto the surface of solid particles. These properties predetermine heptachlor to a certain persistence in the environment, and to the penetration into the food chains. Its decomposition half-life in the soil is estimated to 9 to 10 months (The Pesticide Manual); a relatively quick hydrolysis to 1-hydroxy-chlordene occurs in the aqueous environments, followed by the subsequent epoxidation processes under the influence of microbial action.

Experiments on mice and rats proved certain carcinogenic effects of heptachlorine.

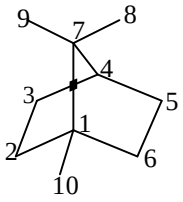




A1.9 Toxaphene

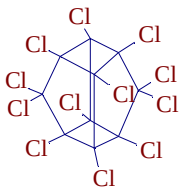
Toxaphene is a mixture of several hundred of individual compounds, that significantly complicates its identification and quantification. It is a pesticide which had been used in the treatment of the cotton.

It is not produced in the Czech Republic and its use was banned in 1986. According to some sources, however, large amounts of the preparations containing toxaphene (Melipax) were imported into the former Czechoslovakia during 1963-1987.



A1.10 Mirex

Insecticide used for exterminating ants and insects feeding on the green parts of agricultural plants. It is also used as an additive into several materials. It has never been produced or used in the Czech Republic.

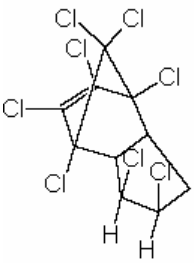


A1.11 Chlordane

The chlordane is, by its chemical composition, the 1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene and occurs in the form of two stereoisomers.

It is a contact insecticide with a broad spectrum of use. It was commercially produced primarily by the Velsicol Chemical Corp. It was never produced or used in the Czech Republic.

Chlordane also occurs in several stereoisomers. Its behaviour and fate is determined by its chemical and physical properties that are similar to those of organochlorinated pesticides, i.e. they are capable of the high persistence in the various components of the environment.



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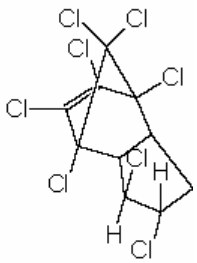

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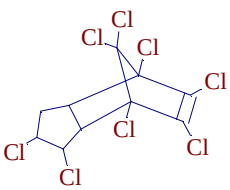


ANNEX 2

EVALUATION OF THE POPS ISSUE IN THE CZECH REPUBLIC

Assessment of chemicals pursuant to the Annex A, Part I (POPs pesticides): historical, current and planned production, use, import and export; Existing policy and regulatory framework

A2.1 Production

The two largest pesticide producers were Spolana Neratovice and Chemické závody Juraje Dimitrova (CHZJD) in the fromer Czechoslovakia. The history of the national production of the persistent organochlorinated pesticides started in 1950 when a research on the synthesis of the DDT was terminated at the Research Institute of Agrochemical technology in Bratislava. The conditions for the industrial production of the technical HCH at large were ready a year later; since 1959, (or 1956 according to other sources) only a pure lindane (>99 % of the γ-isomer HCH) was used in the agriculture, its use was limited only to the treatment of seeds (linen, winter rape). However, the technical HCH remained in use in the forestry. At the beginning of 1960s, the first cases of the DDT resistance were demonstrated (gold bug, Leptinotarsa decemlineata), later on other resistant insects appeared, i.e. (rape blossom beetle, Meligethes aeneus). Due to these findings the DDT production decreased and it was replaced by the lelevan (also chlorinated compound) at first, then by chlorophenvnphose and carbamates. The unused stocks were gathered in individual collective farms (JZD) and in Agricultural storage and buying plants (ZZNZ) in 1950s and 1960s – not only DDT, but also other pesticides. Subsequently, it became necessary to control the removal of such unused and unusable OCPs stocks.

Production of hexachlorocyclohexanes by light catalysed addition to a benzene ring began in Spolana Neratovice in 1961. The product formed contained a mixture of spatial isomers α, β, γ, δ, ε-1,2,3,4,5,6,-hexachlorocyclohexanes, hepta- and octachlorocyclohexanes and other substances. The most efficient insecticide of the mixture was the γ-isomer (lindane) that was formed by the reaction in approximately 13% of the total yield.

Hexachlorocyclohexane (hereafter HCH) was used as a raw material for the production of trichlorobenzene and other various pesticide preparations. It was also used for the development of preparations for the protection of forest growth against animal nibbling, of insecticide preparations, anthelmintic agents and also as an additive to certain paints.

HCB was used in the production of a combined fungicidal preparation for the dry seed treatment against the fungal diseases, called Agronal H. Agronal H contained 2% of the organically bound mercury and 10% hexachlorobenzene in a mixture with mineral filling agents. A part of the HCB was converted, with the help of caustic soda, into the sodium pentachlorophenolate and subsequently to the pentachlorophenol (hereafter PeCP).

Sodium pentachlorophenolate was sold dried as 7-11% water-diluted solution. However, PeCPl was sold dried and as a xylene solution with a minimum 23% PeCP content. PeCP was also used as one of the active ingredients in the combined insecticidal and fungicidal preparation PENTALIDOL for the wood treatment of all types of wood, constructions, banisters, furniture, floors and roofing against wood-damaging pests, wood-damaging fungi and various types of moulds.

Tetrachlorobenzene (hereafter TeCBz) was converted to the sodium trichlorophenolate by using NaOH; this sodium trichloropehenolate was either transformed to the trichlorophenol by acidification, or to the sodium salt of 2,4,5-trichlorophenoxyacetic acid (hereafter just 2,4,5-T) in reaction with the chloroacetic acid. The reaction of the sodium salt of 2,4,5-T with the butanol produced the buthylester of 2,4,5-T acid being the main active ingredient of arboricidal preparations ARBORICID E 50 and ARBORICID EC 50.

At the time, when the technology for the processing of ballast HCH isomers was being introduced, it was not known that side reactions of the above-mentioned syntheses produce trace amounts of substances hazardous for the human health, causing a liver necrosis and being manifested externally by the presence of chloro-acne – polychlorinated dibenzo-p-dioxins (PCDDs/Fs), and especially the most toxic congener 2,3,7,8,-tetrachlorodibenzo-p-dioxine.

Regarding the fact that for the trichlorobezene isolation a steam distillation was used and whose venting was located inside the operational space, a gradual contamination of the working environment and contamination of the whole building Ne42 (currently A1420) occurred. Moreover, the recycling of the mother liquors also contributed to the contamination, as it is the way of the TCDD gradual concentration, despite the fact that it was initially formed in trace amounts, and its release was facilitated by the steam distillation. However, when these facts were detected, the treatment of the ballast isomers in Spolana was terminated in 1968.

During the course of the 1970's, the technical practice begun to change from the commonly used trichlorethylene to the perchlorethylene, especially in sewage treatment plants, and in degreasing processes in metallurgy. This change was evoked partly by the economic, partly by the hygienic as well as toxicological reasons. Significant losses in the technological processes occurred due to the high volatility of the trichloroethylene. Moreover, its high volatility was also the cause of the air contamination in the working environment and thereby increasing the technological requirements on the maintenance of the clean working environment. Trichloroethylene is also characterised by the significantly higher acute toxicity than perchloroethylene, thus its higher toxicity combined with higher volatility generates a significantly higher risk of narcotic effects for workers and a higher occurrence of work-related diseases especially considering the hepatotoxicity.

The principal manufacturer – The Association for Chemical and Smelting Production, Ústí nad Labem – changed this commodity in the mid-1970. After the implementation of the otherwise very progressive computer-directed manufacturing process, there remained an oil-tar residue after the final distillation; it has been labelled as the "HEXA" mixture due to its undefined, semi qualitative chemical structure.

This residue (without a more detailed chemical analysis and toxicological evaluation) was temporarily filled into barrels and stored at an enclosed landfill of the company with the presumption of its liquidation by combustion as the main product in the planned company incinerator.

Therefore it was suggested to reisolate this component (HCB) of the waste product and reuse it. It was possible to gain highly pure HCB via relatively easy rafination by recrystalization and three ways of its use were proposed, i.e. export with its former agrochemical use into countries, where it is not yet banned, or as a component in the mixture for the screening smokes in the military or as an agent for the refining of aluminium and its compounds.

The largest HCB quantity was exported to the former-USSR, where HCB had been used as an herbicidal preparation for the defoliation prior to the machine (combine) harvest of cotton, especially in Uzbekistan for a longer time.

A2.2 Application

What concerns the rapidity of the application, it naturally depends on its mode. In the majority of the cases and for a majority of pesticides, the active substance dose ranged between 0,5 and 1,5 $kg.ha^{-1}$, but in some cases a dose applied could have been outside this interval. For example, the recommended dose of the Aerosol DDT were 6 $l.ha^{-1}$, corresponding to the 3,6 $kg.ha^{-1}$ of the active substance[1]; the recommended dose[2] of the Cyclo Powder was 40 $kg.ha^{-1}$, corresponding to the 6,4 $kg.ha^{-1}$ of the active substance γ-HCH, and a recommended dose of the hexachlorobenzene (used for the soil disinfection)

[1] List of Registered Plant Protection Products. Federal Ministry of Agriculture and Nutrition of the Czechoslovak Socialist Republic, 1972

[2] Hrnciar J.: Overview on Plant Protection Production CHZJD Bratislava. In: Agrochemia (CS), **12** (6), 1972, p. 180/181

was 50 kg, i.e. 12,5 kg.ha^{-1} of the HCB; On the other hand, in the Endrin 20 case a recommended dose attained 0,5 l.ha^{-1}, and correspondingly only to the 0,1 kg.ha^{-1} of the active substance, but eldrine is a very special case. Expert estimation stated that pesticide consumption per hectare of the agricultural land nowadays reaches 1 kg.ha^{-1}, however, it used to be about 4 kg.ha^{-1}, if not more, in 1960s. For example, the plant protection preparations consumption was 23 650 t in 1981; these preparations were used to protect 4 910 103 ha of the land, that means that the consumption was nearly 5 kg.ha^{-1}. However, we can assume that during the time of intensive use of the POPs pesticides, this application rate could have been much higher.

Data on application may be useful for the interpretation of the pesticide consumption, maybe to the larger extent that not-available data on production (table A2-1).

Table A2-1: Rate of application of the plant protection preparations

Active substance of the preparation	Application dose of the preparation per ha	Responses to the application of the active substance per ha or per other unit
aldrin	Very limited or no use, not necessary to evaluate	
DDT	Ranged from 1- 102 kg.ha^{-1} depending on the concentration of the preparation[3]	0,8 - 3,6 kg.ha^{-1} (Dykol, Aerosol-DDT respectively)
dieldrin	Data do not exist	
endosulphan	Maximum 2,5 l.ha^{-1} in the majority of the cases < 1,5 l.ha^{-1}	Maximum 1,1 kg.ha^{-1} majority of the cases < 0,55 kg.ha^{-1}
endrin	0,5 l.ha^{-1}	0,1 kg.ha^{-1}
HCH technical	Ranged 10 - 102 kg.ha^{-1} in the agriculture, depending on the concentration of the preparation[4]	2,5 - 9 kg.ha^{-1} (the highest values were used in the soil disinfection ; 3,5 - 5,6 kg.ha^{-1} was applied in the forestry and to the non-agricultural lands
heptachlor	Agronex hepta T 30 1,2 kg.100 kg^{-1} of seeds, for the seed treatment	400 g per 100 kg seeds
hexachlorobenzene	50 kg.ha^{-1} for the soil disinfection	12,5 kg.ha^{-1}
metoxychlorine	Limited production, not evaluated	
quintozene	Used as Brassicol-Streumittel 300-400 g.m^{-3} respectively. 30-40 g.m^{-2}	60-80 kg.ha^{-1} for the soil disinfection
toxaphene	20-30 kg.ha^{-1}, same as Melipax	2-3 kg.ha^{-1}

[3] As to Antrix see also Note 19; the corresponding rate of DDT would be about 100 g/m^3

[4] In forestry used only for protection of wood damaging insects; the application rate is expressed in l/m^3; in most cases between and 5 and 10 l/m^3 of concentration between 2 and 7 % of preparations; can concern only solutions (Forst-Nexen and both the Ipsotoxes); corresponds e.g. to 50 g/m^3 HCH technical in case of Antrix applied at 10 L/m^3 of 7 % solution as recommended

ANNEX 3

ASSESSMENT OF CHEMICAL SUBSTANCES PURSUANT TO THE ANNEX A, PART II CHEMICALS (PCB)

A3.1 Use of the PCBs

Use of the PCBs can be dividend into the use in open and closed systems. Open systems are those where PCBs releases cannot be identified and whose use leads, in the end, to the contamination of the environment. The majority of countries adopted measures limiting or abolishing such PCBs applications. Using plastifiers based on PCBs, carbon-free copy paper, lubricants, inks, impregnation materials, paints, glues, waxes, cement and plaster additives, materials for greasing moulding forms, dust separator materials, insulating liquids, fire inhibitors, immersion oils and pesticides is considered as open systems use.

Cooling fluids in transformers, dielectric fluids in small and large condensers, fireproof and heat transfer anticorrosion hydraulic liquids in mining devices and vacuum pumps, heat transfer media are considered as closed systems. A number of penetrations into the environment from such closed systems are known at present, especially due to the untightness. Another problem constitute small unrecyclable condensers that thereby become hazardous waste.

Combustion processes and namely the PCBs resublimation from the sediments of large water systems represent considerable secondary sources of the contamination nowadays. PCBs have been deposited in the sediments either by the atmospheric deposition or by the direct leaks into the water.

If stable compounds are combusted at the low temperature and (short) detention period, no destruction of organic compounds present in the air or in the fuel will not occur, therefore for example, measurement of the polychlorinated biphenyl (PCBs) content in the fumes from the coke burning boiler will show that their concentration will be alike from those from the open air. This proves that the PCBs enter into the combustion processes from the ambient air and they are not formed during the proper combustion. The review of the PCBs sources is given in the table A3-1.

Table A3-1: Sources of PCBs

Primary sources of the PCBs entrance into the environment
Closed systems
- cooling fluids in transformers
- dielectric fluids in large and small condensers
- heat transfer media
- fireproof and heat transfer anticorrosion hydraulic liquids in mining devices and vacuum pumps
- use of lubricants
Open systems
- use of plastifiers based on PCBs
- carbon-free copy paper
- lubricants
- printer paints
- impregnation materials
- paints
- glues

- waxes
- cement and plaster additives
- materials for greasing of the moulding forms
- materials used in the production of the dust separators
- insulation fluids
- combustion inhibitors
- immersion oils
- pesticides
- waste landfills
- incineration of wastes
- solid and liquid materials containing PCBs
- laminating agents
- heavy oils
- self-sealing tapes (self-adhesive)
- wrapping paper
- recycled paper
- fuel combustion
Secondary sources of the PCBs entry into the environment
- revolatilization from the sediments and soils
- vaporization from the applied paints

A3.2 Production and Use of the PCBs in the former Czechoslovakia

PCBs had been produced in the East Slovakia in Chemko Strážske in 1959-1984. The total production resulted into more than 21 000 tons; about a half was exported, predominantly to the Eastern Europe. Detailed classification of the production, that have always, as in other production units, produced the mixtures of polychlorinated biphenyls, commercially known as Delor, Hydelor and Deloterm, is shown in the table A3-2. The production period of the individual PCBs type is also evident from the table. Table A3-2 provides the PCBs amounts introduced by Chemko Strážske as products between 1959 and 1984 and the table A3-3 gives the products commercial names.

It appears from the table that the total sales of the Chemko;s PCBs based products reached 21 482 tons, the 9 869 t (46%) was exported (especially to the former German Democratic Republic) and the rest, i.e. 11 613 t was applied in the former Czechoslovakia. The largest consumer of the PCBs based technical mixtures were the Barvy a laky (Paints and Varnishes) – Delor 106/80 X, ZEZ Žamberk – Delor 103 and CKD Praha – Delor 103 and Hydelor. The Deloterm was usually consumed by various construction enterprises.

Table A3.2: Amounts of PCBs [t] introduced by the Chemko Strážske as products in 1959 - 1984 (business department, Chemko Strážske)

Year	Amounts [t]										
	Delor				Hydelor			Delotherm	CSSR	Export	CSSR+ export
	103	104	105	106	103	104	30				
1959	-	-	-	3.9	-	-	-	-	3.9	-	3.9
1960	-	-	-	-	-	-	-	-	-	-	-
1961	-	-	-	2.3	-	-	-	-	2.3	-	2.3
1962	-	-	-	1.5	-	-	-	-	1.5	-	1.5
1963	-	-	-	39.8	-	-	-	-	39.8	-	39.8
1964	-	-	-	97.0	-	-	-	-	97.0	-	97.0
1965	-	-	-	103.2	-	-	-	-	97.2	6.0	103.2
1966	-	-	-	163.2	-	-	-	-	108.2	55.0	163.2
1967	144.8	-	-	207.5	-	-	-	-	257.3	95.0	352.3
1968	120.4	-	-	204.6	-	-	-	-	275.0	50.0	325.0
1969	102.2	-	-	180.4	-	-	-	-	251.6	31.0	282.6
1970	129.3	8.2	84.4	181.8	15.0	-	-	-	399.7	19.0	418.7
1971	208.0	-	151.1	69.6	-	-	-	-	317.7	111.0	428.7
1972	311.3	33.2	5.3	162.2	-	-	-	48.8	373.8	187.0	560.8
1973	308.8	-	24.4	203.2	35.3	1.2	-	57.6	429.5	201.0	630.5
1974	919.4	-	-	218.2	-	22.2	14.9	39.9	497.6	717.0	1 214.6
1975	1 058.1	-	-	311.3	17.1	19.8	-	184.3	778.6	812.0	1 590.6
1976	1 103.3	-	-	225.3	34.7	16.7	-	267.0	677.0	970.0	1 647.0
1977	1 298.9	-	-	350.6	8.8	-	-	292.3	900.6	1 050.0	1 950.6
1978	1 263.7	-	-	301.1	19.6	-	-	405.6	1 009.0	981.0	1 990.0
1979	1 437.4	-	-	247.3	15.3	0.3	-	268.8	957.1	1 012.0	1 969.1
1980	1 408.4	-	-	320.9	23.2	2.5	-	288.2	1 079.2	964.0	2 043.2
1981	1 427.9	-	-	214.4	12.9	-	-	158.0	882.2	931.0	1 813.2
1982	1 480.8	-	-	248.5	25.0	-	-	223.3	1 166.6	811.0	1 977.6
1983	1 378.9	-	-	300.5	-	8.2	-	122.9	974.5	836.0	1 810.5
1984	38.9	-	-	22.4	-	4.6	-	-	35.9	30.0	65.9
Total	14 140.5	41.4	26.2	4 380.7	206.9	75.5	14.9	2 356.7	11 612.8	9 869.0	21 481.8
%	65.8	0.19	1.23	20.39	0.96	0.35	0.07	10.97	54.06	45.94	100.00

Table A3.3: Commercial names of final PCBs-based products by Chemko n.p. Strážské

Product	Characteristic
Delor 103	refined mixture from di- to pentachlorobiphenyls with a majority of trichlorobiphenyls
Delor 103 S	same as Delor 103, though with a lowered content of the above-mentioned chlorinated biphenyls
Delor 104	mixture of tri- to hexachlorobiphenyls with a majority of tetrachlorobiphenyls
Delotherm DH	non-refined Delor 103
Delotherm DK	based on the Delor 104
Hydelor 103	mixture of refined Delor 103, of the mineral oil, antioxidant and lubricating additives
Hydelor 104	same as Hydelor 103, though instead of the Delor 103 a Delor 104 was used
Hydelor 30	based on Delor 103
Hydelor 137	based on Delor 103
Delofet O-2	based on Delor 104
Delor 105	mixture of tetra- to octachlorobiphenyls with a majority of pentachloroderivatives
Delor 105 T	same as Delor 105, though with an addition of trichlorobenzene or toluene
Delor 106	mixture of tetra- to octachlorobiphenyls with a majority of hexachloroderivatives
Delor 106/80 X	same as Delor 106, though with a xylene addition (4:1)
Delorit	product based on polychlorinated terphenyls (PCTs were produced by the chlorination of the distillation residues from the PCBs production)

The following table A3-4 provides the list of the use of the particular products by the Chemko Strážske.

Table A3.4: The use of products by Chemko Strážské

Product	Usage
Delor 103	In the electrochemical industry as impregnation and electro-insulation fluid during production of the silo condensers, in smaller amounts as non-flammable insulator and heat transmitter for high power transformers. It was the product with the highest export (usually to the former GDR) To reach the limit level proposed by the International Electrotechnical Commission (IEC), after 1975, Chemko research department was developing a modification to the chlorination technology so as to decrease the content of penta- and more chlorinated biphenyls in electrotechnical fluids. This Delor type was labelled Delor 103 S
Delor 104	For a short period of time produced and used as a condenser filler
Delotherm DH	Heat transfer medium in rubber and wood industry facilities, in facilities producing paper, card board, asphalt material, in metallurgy and in the steel works. Used predominantly where an increased fire danger or explosion hazard existed. This product was usable up to 250 °C
Delotherm DK	Used similarly as Delotherm DH; but, up to 270 °C
Hydelor 103	For the transmission of power in various hydraulic devices (hydraulic control of generators in the pressure gas plants, dye cast machines, rolling and foundry machines, etc)
Hydelor 104	Lubrication of oxygen turbo-compressors
Hydelor 30	Developed for the controlling hydraulics of gas plants in the plant for the processing of the brown coal in Vřesová
Hydelor 137	Substitute of flammable fluids in hydraulics in coal mining machines
Delofet O-2	Lubricating fat for oxygen valves. Its total production; however, did not exceed 0.5 t
Delor 105 a 105 T	Produced in 4-year intervals as additives into the transformer fillings (later substituted by Delor 103)
Delor 106/80 X	Used as an additive in the production of synthetic paints where it constituted the adhesion increasing ingredient in paints and regulated the hardness of the varnish. Flammability of the paint was significantly reduced. The exclusive consumer was Barvy a Laky n. p. Praha (production of paints containing PCBs was provided mainly in the plant in Uherské Hradiště). Delor 106 was diluted with xylene in a 4:1 ratio to lower the viscosity prior to the delivery. Production of this product has already started in 1961, yet from the imported biphenyl, because the operation of the biphenyl production unit could not start due to the reactor problem. Biphenyl chlorination to Delor 106 parameters from its own biphenyl started only in 1963 and its production continued until the termination of chlorinated biphenyl production in 1984. Chemko tried to stop supplies of this product to Barvy a Laky enterprise already in 1980, due to the information on the low biodegradability of the above mentioned chlorinated biphenyls published in the literature. Unfortunately, due to the resistance of the consumers a lost arbitration, the supply had to continue, as no alternative product was available on the market without the foreign currency requirement.
Delorit	Additive to the fusing glues in the wood industry and also a part of flegmatizers of the fragmentation explosives. The commercial name of the glue was TRIMETO. Its production consumed about 10 t of the PCTs in the total. Flegmatiser of fragmentation explosives was only produced for special production at Chemko.

ANNEX 4

ASSESSMENT OF CHEMICALS FORMED AS UNDESIRED BY-PRODUCTS PURSUANT TO THE ANNEX C CHEMICALS (PCDDS/FS, HCB AND PCBS)

A4.1 Inventory of the atmospheric emissions in the CR

The air protection against contaminants is laid down by the Act no. 86/2002 Coll., on the air protection that is concurrent to the previous Act no. 309/1991 Coll. It regulates the rights and obligations of natural and legal persons in the protection of the open air against the introduction of the contaminants by the human activities and the way of limiting the causes and minimizing the consequences of the pollution. Likewise, it sets the rights and obligations of the national administration executed by the Ministry of the Environment, Czech environmental inspection, regional authorities and other institutions. These authorities are obliged to carry out the oversight on the fulfilment of legal provisions and regulations and among others also control the records on emissions of polluting compounds and other relevant background information of the owners of sources in addition to other activities. The aim of the air protection institutions is to ensure, among others, the collection, records and archiving of such data for further use, for example, for the verification of the above calculated fees of the air pollution, but also serving to the determination of the total amount of particular contaminants released into the atmosphere, i.e. to perform the emission balances. The detailed technical information on combustion and technological installations and background document for the carrying out the emission inventory are part of the so called Register of emissions and pollution sources – REZZO.

The stationary pollution sources are, regarding their size, type and significance of the impact on the environment, classified to the four basic groups, so far registered in the three independent subsystems, pursuant to the new legislation. Its classification and description pursuant to the Act no. 309/1991 Coll. is provided in the Table A4-1.

Table A4-1: Categorization of the stationary sources of the atmospheric pollution (REZZO 1 – 3)

Source type	**Very large and large pollution sources**	**Medium pollution sources**	**Small pollution sources**
Database	**REZZO 1**	**REZZO 2**	**REZZO 3**
Contains	Stationary devices for the fuel combustion with a thermal energy output higher than 5 MW and devices/installations of especially important technological processes	Stationary installations for the fuel combustion with a thermal energy output ranging from 0.2 to 5 MW, devices/installations of especially important technological processes, coal mines and areas with the potential combustion, soaring or release of polluting substances	Stationary installations/devices for fuel combustion with a thermal energy output lower than 0.2 MW, devices of technological processes not falling into the category of large and medium sources, areas, where a work is performed that could cause the air pollution, fuel, raw material, product and waste and captured air pollutant landfills and other constructions, facilities and activities that significantly pollute the air
Character of the Source	Point source	Point source	field source
Method of the monitoring	Individually monitored sources	Individually monitored sources	screening (field monitoring)

One individual category of the Register is the mobile sources REZZO 4 monitored continuously (road transport in locations comprised in the transport counts) and field monitoring at the regional level

(other mobile sources). POPs emissions in the field of the transport are part of the inventory of mobile sources, the calculations are carried out of the fuel consumption and of emission factors.

The previous classification according to the fundamental SNAP nomenclature is more suitable for the description and assessment of sources monitored in the framework of the SC. The brief characteristics of individual main chapters with the occurrence at the territory of the CR and their significance evaluation are given in the following text:

SNAP 1: Combustion in energy and fuel transformation industries

Public power stations and the combined production of heat and of electric energy, long-distance heating (heating power station), conversion of solid fuels to gaseous ones, petroleum refineries; The proper production of electricity and heat (only in the connection with electricity and heat selling) taking place in this sector. Other proper production of electricity and heat is not mentioned here.

There are 11 large, public electric power stations, and approximately 60 other significant heat and electric energy-producing sources that are in operation in the Czech Republic. Furthermore, the two petroleum refineries and one gas power station as well. Especially significant are SO_2, NO_x and also CO emissions; a certain proportion, due to the large amounts of combusted solid fuels, is also contributed by heavy metal and POPs emissions.

SNAP 2: Non-industrial combustion plants

Heat production in other, than industry, production and conversion of energy, sectors. Proper production of the electricity and heat (only in the connection with their sale) take place in this sector.

A large number of sources, especially for the central supply of heat for residential and communal domains are operated in the Czech Republic (approximately 18 thousand, including 800 significant ones). Approximately 3 million households heated either locally or by a house boiler with a thermal energy output below 200 kW are also included in this category. There is a lower proportion of the SO_2 and NOx emissions; thus a significant fraction is provided by the combustion of solid fuels in households - solid polluting substances, CO, VOCs, HMs as well as POPs.

SNAP 3: Combustion in manufacturing industry

The heat production and processes covering their heating requirements by the direct combustion (emissions, not resulting from the combustion, are eliminated). Combined production of heat and electricity is also included and inherent production of the electricity and of heat (only in the connection with their sale) from sources falling into the industry.

Approximately 14 thousand industrial sources (approx. 1 000 significant ones) producing heat and eventually electrical energy, and additionally a large number of sources (approx. 400 significant ones) where the fuel combustion is part of the production processes, are operated in the Czech Republic. Similarly to the SNAP 1, SO_2, NOx and especially CO emissions are the most significant, HMs and POPs emissions from the metal and mineral raw materials processing play an important role.

SNAP 4: Production processes

Non-combustion processes only. Heat requirements are covered by the non-combustion regime directly from the heat transfer fluids.

Several thousand technologies with emissions resulting from the production processes (including about 800 significant ones) are used in the Czech Republic. Besides the VOC emissions, the emissions of solid polluting substances solid persistent pollutants from mechanical processes and manipulations accompanying a number of primary and secondary productions are also significantly represented here.

SNAP 5: Extraction and distribution of fossil fuels and geothermal energy

Includes the extraction and the distribution of fossil fuels and their primary processing, as well as the distribution of fuels.

Approximately 50 million tons of the brown coal and approx. 15 million tons of the black coal are mined in the Czech Republic. In addition, approx. 260 thousand tons of petroleum and approx. 150 million m^3 of natural gas are also extracted here. CH_4 and other VOC emissions from the extraction and distribution of gaseous and liquid fuels are significantly represented; the significantly represented are also emissions from solid polluting substances from the extraction and from the primary processing of solid fuels.

SNAP 6: Solvent and other product use

The use of organic solvents in the application of product containing the solvent, as agents and in the production and use of these products.

The number of sources with the consumption of solvents and solvent containing solutions is estimated at several tens of thousands (including about 800 significant ones). This category includes, with few exceptions, only the VOC emissions; their part in the total emission is significant.

SNAP 7: Road transport

Running and parked vehicles; re-fuelling is comprised in the chapter 5. Various types of road vehicles are monitored in relation to the used fuel (petrol, gasoline, LPG, CNG) and to the equipment and to the type of the catalyst (undirected, three-way, oxidative).

There is a very significant presence of NOx and VOC emissions; HM and POPs emissions can also be important in relation to the structure of the motor vehicles. The presence of the fine dust particles PM 10 and PM 2,5 in primary and secondary emissions is very important.

SNAP 8: Other mobile sources and machinery

Operation of the air transport, diesel traction of the rail transport, boats, tractors, construction mechanisms, agricultural machines, army vehicles, and other mobile equipment.

It is similar to the SNAP 7, however a more important representation of the emission of particles and of PAHs from the operation of heavy machinery may exist.

SNAP 9: Waste treatment and disposal

Comprises waste combustion with and without the heat requirements. If a certain type of waste is considered as the appropriate fuel, then its combustion is included in the SNAP 1 to 3; the proper production of the electricity and of heat (solely for their sale) falling into this sector is included in this chapter.

There were about approx. 40 billion tons of waste produced in the CR, approximately 830 thousand tons were incinerated in 2001. There are 64 incineration plants of hazardous waste incineration and 3 large ones for the incineration of the communal waste. In 2001, 371 landfills containing about 26.8 % of the total waste produced were in operation. In this chapter, the highest attention is traditionally devoted to the POPs emissions (dioxins) and to the heavy metals emissions, less monitored pollutants as HCL and HF could be also mentioned..

SNAP 10: Agriculture

Non-energetic processes in agricultural production, animal breeding, and forestry. Comprises the impacts of anthropogenic factors on the CO_2 sources and on their diminution. Includes open-air combustion, while open-air waste combustion is excluded (see the SNAP 9).

The total area of the agricultural land is 4 284 million hectares in the Czech Republic. There were approximately 1.5 million heads of cattle, 3.4 million heads of pigs and nearly 30 million heads of the poultry registered by the 31.3.2002. The agricultural activity and the animal breeding, especially, play a significant role in the NH_3 emissions (up to 90 %) as well as in the CH_4 emissions.

SNAP 11: Other sources and sinks

Spontaneous processes without human control (metabolism, decomposition, etc). The CO_2 emissions are not included, except for volcanoes.

A detailed description of individual categories is a part of the Chapter 5 of the National POPs Inventory (NPOPsINV 2003).

A 4.2 Inventory of POPs air emissions

Persistent organic pollutants gather a wide spectrum of compounds. They are:

- Chemical products, for example pesticides and chlorinated biphenyls (PCBs) entering the environment either during the production or within their application;
- By-products of the production processes; usually contained in the product and they enter the environment as contaminants of the given product or as emissions released during the production process;
- Unintentional products of the thermal processes where a chlorine and copper are present, i.e. polychlorinated dibenzo-p-dioxins and dibenzofuranes (PCDDs/PCDFs) and polycyclic aromatic hydrocarbons (PAHs) that enter the air together with the combustion gases or with end gases.

Emission inventory of POPs and HMs was produced in 1997-98 to report emissions in the CR in the framework of the CLRTAP. It was prepared according to the EMEP-CORINAIR Atmospheric Emission Inventory Guidebook and it diversified emissions on the level 1 of the Selected Nomenclature for Air Pollution (SNAP ‘97), i.e. in the fundamental 11 chapters. The interest was given to the main groups of sources – combustion processes in industry and in households, waste incineration plants, agglomeration of iron ores, production and processing of metals and of raw materials (the production of iron, steel, cast-iron, cement, lime and glass), transport and some other individual processes.

The authors of the inventory resulted from the Source and Emission Department from the CHMI, Department of the Environmental Chemistry and of Ecotoxicology of the Faculty of Science, Masaryk University Brno, EGU Prague, Teso a.s. and AXYS Varilab. The data from 2000 were provided in the preliminary structure NFR – Level 1 that was alike the precedent structure of the main SNAP chapters. The 2001 data were adapted to the modified NFR structure for the first time. Some data was aggregated to the summary categories, as allowed by the Guidelines for Estimation of and Reporting on Emissions under the Convention on Long-Range Transboundary Air Pollution.

A4.3. Processing mode of the national POPs inventory

A4.3.1. Introduction

A determining source of information for the processing of a review on sources and the POPs emission inventory were the background materials of the REZZO (Register of Emissions and Sources of Environmental Pollution of the CR) database. This is a complex, centrally controlled database, composed of many interconnected tables. Data from the REZZO 1 and REZZO 2 (large and medium sources according to the original classification in the legislation of the Czech Republic) databases share some tables - for example code-books of sources, of fuels and of emissions and others. REZZO 3 and REZZO 4 data databases are shown in independent tables (except for the territorial identification).

Another source of information was a research for relevant links and for information given on the internet using commercial search engines. This research was focused on references on the chemical nomenclature (dioxins, PCBs, etc.) as well as on specific processes (incineration plants, metallurgic technology, paper industry, etc.) and also on companies that are associated with the POPs emissions issue and on institutions involved in the research and in collection of information in this field (such as universities, industrial unions and the Academy of Sciences of the Czech Republic).

The publications, some even directly at the disposal of the project investigator, were used as other sources of information (for example project reports PPŽP (Program of Environmental Care) and VaV (Research and Development) that were elaborated either by or in the co-operation of the authors of this chapter). Information was also drawn from the literature dealing with the POPs emission issue from the libraries of CHMI, MoE, CEcoI (Czech Ecological Institute) and from some high schools and universities. A significant part of the information was drawn from foreign literature (UNEP materials and the Task Force on Emissions and Inventory Projections (TFEIP)). The description of sources, of their operation and of the relevant legislation comprised in this text corresponds to the state of the reporting of the emissions of the 2001, i.e. prior to the amendment of the Act on the air protection and of its implementing regulations. Changes comprising, for example source categorization pursuant to the new Act no. 86/2002 Coll., on the air protection, will not be considered until in the processing of the data for the year 2002.

A 4.3.2 Structure and content of the REZZO database

Information on point sources of the REZZO 1 and 2 are updated every year in the Czech Republic. The update is done for variable data (fuel consumption, operation time of the facility, emission quantity) as well as for the permanent data (identification data of the source, technological equipment, instruments limiting emissions). The REZZO 1 and 2 database contains data from the summarized evaluation of the registration of the operation pursuant to the Decree of the MoE No. 205/1993 Coll., amended by the Decree of the MoE No. 117/1997 Coll. Data input of the REZZO 1 and 2 in 2001 were used, i.e. in the structure pursuant to the Decree No. 117/1997 Coll. The completed forms are submitted by the facility operators to the appropriate institution of national administration every year. The format of the summary evaluation is laid down by the § 18, while its content is set by the Annex no. 7 entitled „List of Permanent and Variable Data Forming the Register of the Operations“. At present, a new MoE Decree no 356/2002 Coll. is in use (data collection of the year 2002 for the first time), however, it does not change significantly the formal nor objective content of the registration of operations.

Data from the operational records can be divided into these primary sections:

- identification data on the facility and on the operator of the facility
- data on incineration plants – on boiler plants and individual boilers
- data on the monthly consumption of fuels

- data on technologies - categorization of sources, product and the fuel consumption within the technology
- data on agricultural productions - animal breeding
- data on separators
- data on emissions and on their measurements - according to the list of pollutants pursuant to the Annex to the Act No. 212/1993 Coll.

Data collection and processing are divided to the following steps:

- mailing forms to the operators of the facility with pre-printed data of the previous year
- form filling in by the operators and their submission by the 15 February of the following year
- inspection and verification of data by environmental institutions
- transformation of the data to the electronic form
- data inspection, error correction and the final storage and archiving of data
- expedition of the standard sets of the data, of text reports and of special data outputs.

P4.3.3 Source review

The following identification data are significant for the point sources enabling their classification into SNAP or NFR subcategories when compiling a review on POPs emission sources:

- Differentiation of the type of economic activity by the source operator (the source is given the OKEČ code – CZ_NACE or classification of branch of the economic activity – is derived from IČO – identification number of the organization).
- Categorisation of the production according to the technological parts of the source pursuant to the Annex 2 of the Decree of the Ministry of the Environment No. 117/1997 Coll. that sets the categories of selected pollution sources. It is often necessary to rely on other reported data on the product title and on the name of the technological line for a more accurate placement of technology into the SNAP/NFR categorization.
- Territorial localization pursuant to the municipal and regional codes.

Individual point sources and individual vents of the technological device are identified by the described method. That means that each monitored point source that is recorded in REZZO and contains the combustion unit is characterised by the SNAP code, and alike for the every recorded vent of a technological device.

A 4.3.4. Activity data

It is important to gain relevant activity data for individual sources for processing the emission inventory. It is necessary to get the relevant statistical information or the estimate of the production of all the sectors for the emission calculations if no emission data on individual sources are available. The data of individual sources or of the entire industry sectors were obtained from the REZZO database; if they were not present, then were gained from further information materials (published results of statistical investigations by the Czech Statistical Office and by relevant ministries pursuant to the Act No. 470/2002 Coll., from information of the sector associations or from the websites of enterprises) or else estimated. The background information were obtained from the national registry or within the cooperation with regional institutions (energy and fuel suppliers), in case of the field sources (household heating, operation of the vehicle fleet etc.).

A 4.3.5 Emission factors

The determination of the quantity of POPs emissions is not provided, in a majority of cases, by the direct measurements in the sources in the CR. The only exception is the regular measurement of the waste disposal plants, where are prescribed the regular measurements of PCDDs and PCDFs concentrations due to the inspection of the compliance with legal emission limit. The one-time POPs and HMs measurement was set down for a group of significant sources listed in the Decree of the

Ministry of Environment no. 119/1997 Coll., in 1997-1999. The above mentioned Decree is concurred by the new Decree No. 356/2002 Coll., which states that these pollutants require not only the one-time measurements but periodic measurements in three-year interval.

The partially recorded data on the specific production emissions of particular sources was only available in the processing of the POPs emission inventory in 1998-1999. It was necessary to use the data measured using other devices of the same category in the CR from the 1990-2000, or eventually a measurements performed abroad, for a majority of sources. The Emission Inventory Guidebook was used as important source of information as well as official materials of the UNEP Chemicals. The condition for the use of a particular corresponding emission factor (specific production emissions) was the accordance of the dimension of the emission factor unit with the dimension of the available activity data, or, at least, the background materials for the re-calculation (for example, as for the purposes of using the POPs emission factors in for the case of combustion facilities, frequently published in „g of emission per GJ of heat in the fuel“ units, it is necessary to convert the fuel consumption from the tons per year to the amount of heat in the fuel in GJ per year, that can be done by using the value on the fuel heating capacity).

The emission inventory of persistent organic compounds (PCDDs/Fs, PCBs, HCB and PAHs) of the Czech Republic is processed from the available data on emission factors (comprising the technological state of the source) and on the activity data (the amount of combusted fossil fuels and fuels, the heat contained in the fuel, production of selected products, etc.).

Such sources, where the yearly estimates of the emission quantity is in relation with the unit used in the inventory (kg per year), are considered as significant and are included in the emission balance. It is evident that exists other POPs emission sources being not included to the emission balance. However it can be assumed, that their emission quantities range in two or more orders lower quantities. These sources are not even sufficiently identified, their emission factors do not exist and they can influence the total emission inventory only minutely. This methodical approach that is due to the complete absence of the emission factor set used also abroad even for the international emission inventories.

The national inventory of the POPs atmospheric emissions for the purpose of this study was performed by using the combination of the above mentioned methods for data from 2001. Older data (1999-2000) was used in case that the data from 2001, namely the activity data, was not available. The inventory was processed by the particular sectors and the following section describes its procedure in detail including the assessment of the precision of the data and of the proportion of individual groups of sources to the total emissions.

The data from the protocols on the POPs measurements pursuant to the Decree of the MoE no 117/1997 Coll. and the values provided by the measurements in the framework financed predominantly by the MoE were the background values for the calculation of average emission factors. In the first case it concerns the data provided by the RI CEI for the purposes of the project and in the second case the values given in the project reports of the SPZP and R+D investigated in 1993-1999. Part of the emission factors were also drawn from the Emission Inventory Guidebook and from the materials by the UNEP Chemicals.

Emission factors for combustion sources were obtained from the data measured at selected sources. These measurements were carried out due to the commitment set out in the Decree of the MoE No. 117/1997 Coll. imposing the mandatory one-time measurement of emissions to the electric power plants, heating power stations, heating plants with furnaces with the thermal output of 50 MW and above combusting solid or liquid fuels. Measured data was provided into the processing of the emission inventory by the inspections offices of the CEI in 1997 and 1998. The measurement data provided by the ČEZ (Czech Energy Company) enterprise was also used in this processing. The protocols of measurement on the 61 boilers/furnaces out of the total 250 furnaces of the output of 50 MV and above registered in the REZZO 1 database in 1997 were gained in 1997-1998. The 57 furnaces from this number fall into the category of 50-300 MW and 4 other furnaces fall into a higher category, i.e. over 300 MW. The major part of the measurements are associated with the granular

furnace chambers burning brown and black coal (31), to the fluid furnaces/boilers (9), boilers/furnaces with powder-gas heating (7), gas-oil (6), oil (2) and other types (4).

The database of the statistically evaluated emission factors of the transport vehicles comprising also the POPs exists in the transport field. This database also contains, in addition to the emission factors, a number of parameters, i.e. the type of the vehicle, used fuel, presence and the type of the catalyst, mode and speed that are important for the emission balance calculations. The database is composed of the foreign (COPERT) and domestic (UVMV, ICT and CDV) sources.

Emission factors directly quoted directly or calculated from the measurement protocols of the sources combusting solid and liquid fuels were recalculated to a common unit that is $mg.GJ^{-1}$ of heat provided by the fuel. The sources were categorized into the specific groups based on the type of fuel, energy output and the type of furnace chamber. The minimum, maximum and average levels of PCBs, PAHs (expressed as the weight total) and PCDDs/Fs (expressed as TEQ) were determined for each category. The calculations of the average emission factors was not performed only mathematically, but the indicated measurement conditions were also taken into account and some data were removed prior to the calculations due to their non-representativeness.

Measurements of some boilers with the energy output lower than 50 MW was provided within the framework of the research projects financed mainly by the Ministry of Environment. Emission factors were recalculated for the different unit, in this case to the weight of the emission of the pollutant per the quantity of the combusted fuel ($mg.t^{-1}$).

For selected technological processes and facilities for the waste incineration, a set of POPs emission factors was obtained from the literature, from the research reports of the period 1993-1999 and from the measurement protocols. The selection of stationary sources for the verification of the POPs measurements performed in the course of some projects and for the POP emission balances was given by the categorisation pursuant to the Annex VIII to the Protocol on Persistent Organic Pollutants.

A 4.3.6 Specific source categorisation for the purposes of the inventory

Sources of solid and liquid fuel combustion were divided into the source groups according to type of fuel, heating capacity and the furnace type. The Categorisation of source groups specified according to the particular parameters is given in Tables A4-2 to A4-4. POPs (and HM) emissions from gaseous fuel consumption were not considered.

Table A4-2: Fuel codes

United codes	REZZO codes	Fuel
1	1	BC sorted (bituminous coal)
	2	BC powdered
	6	Lignite
2	3	HC sorted (hard coal)
	4	HC powdered
	5	Slate
3	7	Coke
	8	Briquettes
4	9	Wood
5	10	TTO (heavy heating oil)
	11	STO (middle heating oil)
	12	LTO (light heating oil)
	13	Diesel

Table A4-3: Codes of the capacity/output

United code	Capacity/Output (MW)
1	> 50
2	5 - 50
3	< 5

Table A4-4: Furnace codes

United code	REZZO codes	Furnace
1	5	Granular
2	1	Conveyer stoker
	2	Conveyer stoker with the overthrow rotor
	3	Shiftable reversible stoker
	11	Combined furnace powder-oil
	12	Combined furnace powder-gas
3	4	Solid stoker
4	6	Melting
	7	Cyclone
	13	Combined furnace stoker-oil
	14	Combined furnace stoker-gas
	15	Combined furnace powder-stoker
	16	Fluid
5	8	Oil
	10	Combined furnace gas-oil

Category compilation was elaborated by the merger of codes from the three presented tables and by the creation of a five- digit code for the description of the each source group as shown in the Table A4-5.

Table A4-5: Method for the code creation for the sources combusting solid and liquid fuels

Category	Fuel code	Output/Capacity code	Furnace code
10101	1	01	01
	brown coal	> 50 MW	granular stoker

The stationary technological facilities and facilities for the waste incineration are classified directly pursuant to the Annex 2 of the Decree No. 117/1997 Coll., unlike the specific categorization of the combustion facilities. The link to the SNAP categories was formed by the direct assignment or with the by using the indirect additional data. Emission factors of persistent organic pollutants were allocated to the individual categories.

A 4.3.7 Tabular overview of the emission factors

POPs emission factors used in the inventory of individual categories of the combustion sources are given in the Table A4-6, for the technological devices in the Table A4-7 and for the mobile sources in the Table A4-8.

Table A4-6: POPs emission factors for sources combusting solid and liquid fuels

Emission source	Emission factor		Emission source	Emission factor	
Category	PCBs	PCDDs/Fs	Category	PCBs	PCDDs/Fs
	REZZO 1			REZZO 1	
	[mg.GJ^{-1}]	[mg.GJ^{-1}] (TEQ)		[mg.GJ^{-1}]	[mg.GJ^{-1}] (TEQ)
10101	0.01233	0.00002	50101	0.00292	0
10101 desulphurization	0.02361	0	50102	0.02358	0
10102	0	0.00001	50104	0.00292	0
10104	0	0	50105	0.02358	0
10401	0.01233	0.00002	50401	0	0.00004
10402	0	0.00001	50402	0	0.00004
10404	0	0	50404	0	0.00004
10405	0	0.00001	50405	0	0.00004
10406	0	0.00001	50406	0	0.00004
10502	0	0.00001	50502	0	0.00004
10503	0.00001	0.00019	50503	0	0.00004
10505	0.00001	0.00019	50504	0	0.00004
10506	0.00001	0.00019	50505	0	0.00004
20101	0.03772	0.00006	50506	0	0.00004
20102	0.00000	0.00001	REZZO 2		
20104	0.04989	0		[mg.t^{-1}]	[mg.t^{-1}] (TEQ)
20401	0	0.03239	10502	1.80000	0.01725
20402	0	0.00001	10503	2.40000	0.03450
20404	0.04989	0	10504	1.80000	0.01725
20406	0.04989	0	20502	0.00010	0.00160
20502	0	0.00001	20503	0.00010	0.00315
20503	0.83387	0.00222	20504	0.00010	0.00160
20504	0.04989	0	30502	3.80000	0.00430
30502	0	0.00003	30503	3.80000	0.00430
30503	0	0.00003	30504	3.80000	0.00430
40104	0.20500	0.00010	50505	26.00000	0.00420
40402	0.90220	0.00702	40503	9.02195	0.07019
40403	0.90220	0.00702	REZZO 3		
40404	0.90220	0.00702		[mg.t^{-1}]	[mg.t^{-1}] (TEQ)
40502	0.90220	0.00702	10503	113.71084	0.12168
40503	0.90220	0.00702	20503	19.17903	0.05111
40504	0.90220	0.00702	30503	9.68986	0.00451

Table A4-7: POPs emission factors for the technological facilities and incineration plants

Emission source	SNAP	Code 117/97	Emission factor [mg.t^{-1}]		
		Technology	PAHs	PCBs	PCDDs/Fs (TEQ)
Agglomeration	30301	20100	244.39	1.18280	0.00384
Pig iron production	40203	20200	4 691.55	0.00000	0.00500
Steel production	40207	20300	17	0	0.00526
Cast iron production	30303	20404	3.38	0.13590	0.00057
Coke production	40201	10500	2 656	0	0.00023
Cement production	30311	30301	0	0	0
Lead glass production	30317	30401	0	0	0
Communal waste	90201	50101	484.25	5.8000	0.00050
Industrial waste	90202	50102	772.67	331.3050	0.10581
Hospital waste	90207	50102	20	15.0250	0.15000
Waste from waste water treatment plants	90205	50201	127	5.4000	0.02583

Table A4-8: POPs emission factors for mobile sources

Emission source Type of transport-fuel	SNAP	Emission factor [µg.t^{-1}]		
		PAHs [mg.t^{-1}]	PCBs	PCDDs/Fs (TEQ)
Personal – petrol	70100	5 940	0	0.71
Personal – diesel	70100	6 970	10 000	0.5
Cargo – diesel (incl. water and rail)	70300; 80200; 80500	6 970	10 000	17.05
Air –gasoline	90203	854	0	0.71

The methodology of the "Methodology for the calculation of emissions of pollutants from the transport in the CR" was prepared by the CDV (Centre of the Research on Transport). It divides the transport vehicles into the 23 categories depending on the type of the transport, used fuel and catalytic equipment. The fundamental principle is the distribution of the fuel consumption among the individual categories (table A 4-9).

Table A4-9: Emission factors for mobile sources, according to the CDV methodology

Category	PAHs [µg.km^{-1}]	PCDDs [pg.km^{-1}]	PCDFs [pg.km^{-1}]	PCB [pg.kg pal^{-1}]
ID.B1	131.64	10.3 (petrol) 3.0 (diesel)	21.2 (petrol) 7.9 (diesel)	126.5 (petrol)
ID.B2	260.29			
ID.B3	143.84			
ID.N	1277.44			
ND.LDV	1601.00			
ND.HDV	241.86			

ID.B1 individual transport, single-track petrol powered vehicles
ID.B2 individual transport, personal dual-track petrol powered vehicles without three-way catalysts
ID.B3 individual transport, personal dual track petrol powered vehicles with three way catalysts
ID.N individual transport, personal diesel powered vehicles
ND.LDV light transport carriers (do 3,5 t)ND.HDV large transport carriers (nad 3,5 t).

ANNEX 5
INFORMATION ON THE STATE OF KNOWLEDGE ON THE LANDFILLS, CONTAMINATED SITES AND WASTE CONTAINING POPS (IDENTIFICATION, LIKELY QUANTITY, RELEVANT REGULATIONS, GUIDANCE, REMEDIATION MEASURES, INFORMATION ON RELEASES FROM SUCH SITES)

A5.1 Introduction

Given the processing time of the inventory and regarding the low potential availability of highly specific and selective information that it was decided to get the needed knowledge from the following sources:

Existing national databases, namely Waste Information System and eventually from the Systems of Records on old environmental burdens

Consultations with the national administrative bodies (MoE, MA, SRS).

Consultations with the field workers of the national administration (regional departments of the environment, regional hygienic service, local CEI inspectorates).

A5.2 Information from the nationwide database administered by the public administration or by the accredited organizations

Waste information system

This information system is composed of the three databases - ISO1, ISO2 and Facilities and landfills

ISO 1, ISO 2 – Waste information system

The database overview on production of waste allowing the search according to the set filters: type of waste, reported year, district, waste category, mode of handling, the regime of dealing with wastes has been elaborated from the yearly reporting by the waste generators on the production and mode of treatment the waste within the periods 1994-1997 (ISO 1) and since 1997 till present (ISO 2). The database used to be managed by the CENIA, but nowadays its management is entrusted to the Water Research Institute WRI TGM, Prague to the Waste Management Centre (WMC – CeHO). It is possible to receive information on the amount of formed waste of a certain type classified according the Waste catalogue and on the mode of their disposal through an inquiry composed of the variable filters.

However it is not possible to get the selective information on the quantity of waste from compounds monitored by the SC or of wastes significantly contaminated by such compounds. The monitored compounds – pesticides – would be found in the ISO 1 database as the waste under the code 53103 – Residues of the preparations for the protection of plants and pests. And it is not possible to distinguish the individual types of pesticides.

Similarly, it is possible to find ashes as substances potentially contaminated by the PCBs or by the PCDDs/Fs, as waste chemicals (including HCB) and others. Unfortunately it is not possible to distinguish the type of organic compounds. Furthermore, it is neither possible to find out where were the formed wastes disposed, i.e. by the disposal at the landfill for example.

The possibility to use the ISO 2 database is alike. However, unlike the ISO 1 database, all wastes are introduced under the different catalogue number (code) and in the different structure of their classification into types (due to the changes of the Catalogue of wastes in 1997). The database does

not allow the differentiation of individual compounds in the group of generally labelled substances (pesticides, organic compounds etc.).

Facilities and landfills – a survey of facilities for the processing, use and removal of wastes

It is possible to search through the preset filters the type of the facility, district, technology brand name, and local name of the landfill.

Similarly to the case of the two preceding databases, this database cannot be applied to the selective and specific identification of landfills where wastes of compounds monitored by the SC or of wastes contaminated by these compounds would be disposed.

Information System on Chemicals

The ministry of the Environment prepares each year the database of dangerous substances introduced on the market of the CR in the amount larger than 10 tons per year by one producer or importer as based on the requirements stipulated in the Act no 157/1998 on chemical substances and chemical preparations. None of the monitored compounds as such, or as a part of chemical preparations, or as an impurity in the compounds or preparations is produced or introduced to the market in the amount higher than 10 tons per year.

The ministry of Health, the department of the registry of chemicals is managing a database of he safety sheets of all chemical products (substances and preparations) subject to the same Act on chemicals. Some data on products that could contain the monitored compounds as ingredients or impurities or in the imported chemical products could be contained in this database. However, the database is not currently adapted to the search according to the chemical compounds contained in the products. But this database cannot be excluded as a source of information on the types and quantities of the monitored chemical substances that could be potentially stored prior to their use.

SESEZ – System of Records on the old environmental burdens

The database is a part of the Hydro ecological information system of the WRI TGM (HEIS WRI). As based on the agreement with the National Property Fund, the authorized persons by the NPF fill this database by the data on the water composition from the all stages of the redevelopment works carried out within the financial resources by the National Property Fund.

The usability of the database could not be more specifically assessed and it was neither possible to gain the needed data from the database as immediately after its pilot accessibility (it is not publicly accessible) a flood had entered the WRI where the database server was stored.

However, after the preliminary assessment of the usability of this database for the identification of the significantly contaminated sites by the monitored compounds, even this database would be barely usable in the reality, as it does not contain the results of a sufficiently selective determination of the concentration of compounds monitored by the SC. The monitored compounds are not a standard subject to the detailed monitoring.

REZZO – Register of Air Pollution Sources

These database directed by the CHMI are elaborated from the yearly reporting on the operation of the air pollution sources. They could be potential used as a signalling source of information on the occurrence of the incineration devices or on the technological sources of emissions with the presence of monitored compounds if these compounds were individually embodied in this database. Unfortunately, the database cannot be used this way as none of the monitored compounds is recorded individually in the database.

A5.3 Information from the national public administration

Ministry of the Agriculture

The Ministry of the Agriculture has no information sources on the existing occurrence of the monitored pesticide compounds in the CR at its disposal. The majority of the old stock of these compounds was removed from the CR within 1993-1996 in the activity organized and financed by the MA. The compounds were handed over free of charge. The authorized organization centralized these compounds and then they were removed by the combustion. The more detailed information on the time of use of the monitored pesticides is in the SRS that was supervising also the actions where the unused pesticide stock was eliminated. The SRS cooperation in the inventory of the monitored compounds was provided by the direct participation of the SRS representative in the team of experts for the inventory.

Ministry of the Environment

The employee of the Department of environmental damage has provided us with the information, after the agreement of her director, on four dwellings contaminated by pesticides whose redevelopment is financed by the NPF:

- STS Jindřichův Hradec, locality Dačice production unit – contamination by NEL, MCPA, Dinoseb, Metolachlor, Prometrin, Atrazin
- STS Jindřichův Hradec, locality „Na Klaničném“ landfill – contamination by Dinoseb, Dicamba, Dichlorprop
- STS Jindřichův Hradec, locality the site of the enterprise – contamination by NEL, MCPA, Dinoseb, Prometrin, Atrazin
- MEGA Třeboň s. r. o. – pesticide storage and poison catchments

The monitored compounds did not contaminate any of the redeveloped localities, according to the available information.

A special regulation is valid in the disposal of the pollution sources in the CR since 2002, as it was by this regulation that EU legislative requirements were implemented into the Czech legal order.

The identification of all devices with the filling larger than 5 litres or with fluids with the PCBs content higher than 50 $mg.kg^{-1}$ as pursuant to the requirements of the Act no. 185/2001 Coll., on wastes and of the Decree no. 384/2001 Coll., on handling the polychlorinated biphenyls.

It concerns the largest activity, where all the owners of the device with the PCBs content must, under the threat of a sanction, to register this device at the MoE, register the amount of the filling with PCBs and fulfil the labelling of such devices and report the removal of such device or of the filling within the intervals stipulated in the Act. Despite the sanctions it was not possible to get all information on the existing devices by the stipulated date and therefore the data that are currently available cannot be considered as the complete ones. Further data has been gradually complemented.

P5.4 Information from the regional public administration

There were personal letters sent to:

- Directors of the departments of the national administration I – IX (the former regional units) MoE
- Heads of the regional CEI inspectorates
- Directors of the Department of the Environment of each regional administration office
- to the regional hygienic service

containing the invocation of the voluntary cooperation at the collection of information on the potential occurrence of the monitored compounds in the temporary storages, at the landfills or at contaminated

sites. Simultaneously with the letters sent to the regional CEI inspectorates and to the regional hygienic service other letters to the director of the CEI and to the Head of the Hygienic Service with the kind request of the eventual support.

Information received from the regional administration departments of the MoE

There were all 9 departments asked for the information. The reason of the letter directed to them was to collect the eventual information on the pollution of the privatized real estates.

The so-called Annexes to the privatization projects, i.e. reports evaluating the environmental commitments of these real estates (constructions), had to be presented for the evaluation statement to the relevant Regional administrative departments of the MoE.

However, to our demand there was only one feedback – of the Regional administration department I (Prague) – provided by the Mr. Kuklík. He had explained that mentioned evaluations statements are not the suitable material for the identification of storages of the monitored compounds as these printed Annexes were not evaluated nor further processed and their archiving nor their registration were not carried on.

The Privatization projects documentation including Annexes was sent, negotiated and archived into the National Property Fund. They are not public documents, but they could be accessed for the study on site under a special authorization. However, the time demand of this work would be enormous and the output of the needed information is unsure. However the cases when a subvention demand to the NPF was used on the basis of the documented environmental damage or an engagement still had to be evaluated by the CEI and the issuing of the authorization to provide the remediation measures. The information on the major pollution by the monitored compounds should be therefore transferred to the CEI employees.

The information received from the directorate of the CEI, waste management department

The following was received as a reply to the applications sent to the headquarters of the CEI and to the heads of regional CEI inspectorates by Mrs. Dana Sládková, head of the department of the waste management of the CEI, on the issue of the occurrence of the monitored compounds:

Regional CEI Prague

Region Kolín:	NELI a. s., Na Hraničkách 34, Vyškov (formerly Union cukr)
	Production unit: Český Brod, Krále Jiřího 214
	There are stored about 600 l oils containing PCBs.
Region Nymburk:	Milovice – the dwelling of the former incineration plant Alisa a. s.
	There are about 1 800 t of soils with the PCBs content up to 200 $\mu g.g^{-1}$ PCBs
Region Praha – East:	Mratín, storage EKOBO a. s.
	Storage of about 46 t of waste with the PCBs content
Region Mělník:	Spolana Neratovice a. s. – dioxins
Region Příbram:	Obalovny Rožmitál pod Třemšínem
	Soil contaminated by PCBs – not defined quantity, potential contamination of the basin of the Litavka stream
Municipality of Prague:	RUMPOLD s. r. o., Praha 10 stores 14,09 t of transformers with the PCBs content (Catalogue of Wastes code 16 02 01) nowadays.

Regional CEI Plzeň

The CEI carried out controls in the following domains in the first half of the 2002:

- Handling of wastes at the car wrecks landfills including the wastes with PCBs,
- Handling the wastes with the PCBs/PCTs content ascertained in the control of the titan dioxide production, at the handling of the waste oils and batteries and accumulators
- Dealing with the sludge from the WWTP

The CEI did not find the presence of monitored POPs in any of the controlled subjects.

The Waste Department of the Regional CEI Inspectorate has carried out the inspection focused on the handling the wastes with the PCBs content in 1995 and the inspection of exports and imports in 1996. And thereby the storage of waste with PCBs was observed for the following subjects:

- REO – RWE Entsorgung s. r.o. storage Hroznětín
- Karlovarské silnice a. s., obalovna Bochov – tarmacadam plant, stored about 100 m^3 of the sludge from the WWTP and of the soils with PCBs
- Vojenské lesy a statky ČR Praha, Správa služeb Mirošov – The condensers with PCBs, protective tools contaminated by PCBs and PCBs contaminated soil spot in the concrete storage,
- ZES – removal of Delor s. r. o., sklad v Tachově (condensers, transformers)

This regional inspectorate did not find any other situation with the occurrence of the monitored compounds.

Regional CEI Hradec Králové

The Regional Inspectorate has no available field information on the monitored compounds.

A larger amount of the stored condensers with the PCBs was found in the leased store of the Petřivý Company – wood production in Ostroměř.

Condensers with the PCBs content are still being discovered at the former cooperative farms.

The wastes with the PCBs content are collected also on the site of the ALIACHEM enterprise in the Synthesia plant.

POPs in the wastewaters released into the surface waters is not commonly monitored.

Regional CEI Olomouc

No sites contaminated by POPs were found in the framework of the inspection.

Regional CEI Ostrava

There were two inspections of the fulfilment of requirements connected to the dealing with PCBs since 2000.

In a relatively large volume rolling mill 14 of the Nová Huť enterprise there were discovered several tens of transformers with the PCBs content. The deadline of their replacement set by the regional hygienic service will expire in 2010.

All transformers with the PCBs content were replaced in Vítkovice a.s enterprise by the end of the year 2000.

Regional CEI Brno

It was found that the waste or devices with the PCBs content were discovered in the following enterprises within the inspection of the registration of the waste with the PCBs content:

- Hospital Valtice, s. r.o. Valtice
- Fruta Lednice a. s.
- Prakom
- Tribos
- Slévárna Kuřim (Foundry)
- Metall Brno, a. s.
- Vytex s. r. o., Svatobořice – Mistřín
- Moravský Písek – Kovoděldružstvo
- Agrostav Blansko
- Jihomoravská armaturka s. r.o. Hodonín
- (Sugar refinery) Cukrovar Hodonín
- Groz-Beckert Czech s. r. o. Lužice
- (Screw mill) Šroubárna Kajov
- Zbrojovka Brno a. s.
- Královopolská strojírna Brno, a. s.
- Roučka Slévárna a. s. Brno (Foundry)

Regional CEI Liberec

The potential sources of the POPs pollution could be the following subjects present in the Liberec region:

- VM Lineo s. r.o. Hornická 324, Stráž pod Ralskem – removal of waste with the PCBs content by their export to the GDR, storage of this enterprise
- Diamo s. p. Stráž pod Ralskem – owners of facilities with the PCBs content
- Auto závod Český Dub, spol. s r. o., Husova 58, Český Dub – owners of facilities with the PCBs content
- Skládka galvanických kalů Klinkovice (Landfill of galvanic sludge) – currently winding up
- Redeveloped landfill of the former ATESO enterprise (nowadays TENECO MONREO), Hodkovice nad Mohelkou
- Decontamination area in Pěnčín near Jablonec nad Nisou, current operator EKOLIMPIA (sludge containing HM and chlorinated hydrocarbons)

Regional CEI Havlíčkův Brod

The occurrence of the monitored compounds in the inspections pursuant to the Act on chemicals was not found.

Condensers and transformers with the PCBs content were determined in the following subjects:

- MŠLZ Velké Opatovice, Svitavy unit, Průmyslová ulice, 568 02 Svitavy
- ZD Vendolí čp. 94, 56914 Vendolí
- IPAK, s. r.o., production unit Radiměř 1871, 569 07 Radiměř
- VAS, a. s. division Jihlava, Žižkova 03, 586 29 Jihlava
- Chotěbořské strojírny služby a. s., Hermanova 520, 583 01 Chotěboř
- The former dwelling of the Kovolis Hedvikov, a. s., Hedvikov 1, 538 43 Třemošnice
- Dílo, production and commercial unit Svratouch 217, 539 49 Svratouch
- Žďas, a. s. Strojírenská 6, 691 71 Žďár nad Sázavou

When inspecting no occurrence of storage facilities where the monitored compounds could be located.

The monitored compounds are neither present in the field of the air protection.

A5.5 Information from the Environmental departments of the regional authorities and of the district hygienic service

The following text in the table (Table A5 –1) comprises the information that was confined by the authorized workers to the authors of this text. The authorized workers comprised the employees of the lowest level of the state administration, as we assumed that they could have the best knowledge on the state of the monitored issue in their region. The letter demanding the information comprised as well as the explanation why this information is needed was sent to all regional offices and regional hygienic services listed below. However, the feedback was much lower than we had anticipated. This could be caused by the fact that we have asked for the information at the beginning of the summer or by the personal repulsive approach towards our demand of the cooperation on the voluntary basis, however this cannot be evaluated.

The table has been elaborated according to the alphabetic order of the regions. The part confined to a particular region is always shared by the two contributions – by the Department of the Environment (ED) of a regional office and by the regional hygienic service (HS). The name in the brackets is of the contact person, however, not always it had been the director or the head of the regional hygienic service. But we assume that the name could be beneficial in the case of need further information. If there is no text in the source identification we did not get any answer concerning this issue from the contact persons.

Table A5-1: Overview of the collected information

Region	Identification of the site and the state of the contamination site	Comment
Benešov	DE (Mgr. Jiří Klíma): PCBs Occurrence: Danone a. s. Mydlářka a. s. Městské sportovní zařízení a. s. PCBs Benešov a. s. Sellier a Bellot a. s. Středočeská energetika a. s. RZ Benešov In all the above-mentioned enterprises were the facilities containing PCBs that were removed in the past (1995). Occurrence of the pesticide contamination: Šebáňovice near Vrchotovy Janovice Pesticide storage in ZD Vrchotovy Janovice, the CEI decision on the sanitation issued, not yet terminated. Václavice, no. 9 (operator Státní statek Benešov, nowadays Státní statek Jeneč) The contaminaton by HCH, DDE, DDT, DDD, HCB manifested – the sanitation started by the demolition of the dwelling and by the uncovering and removing of the soil HS:	Pesticides – contaminated storage
Beroun	DE: The occurrence is not expected in landfills, or in the storage sites, or in the contaminated sites. HS:	
Blansko	DE HS: No knowledge of the occurrence of the monitored compounds.	

Brno - venkov	DE (Ševelová): Oils containing PCBs used to occur in the SLO Oslavany, s. r. o. enterprise, currently winding-up And used to be a part of the commercial activities (re-collection, buy-out) of the EkHSelp – RCP s. r. o. Brno enterprise HS (MUDr. Mareček): The Regional HS referred to the prior negotiation of the Head of the HS in the CR, but no further reaction.	PCBs storage
Břeclav	DE (Ing. Vyhnálek): DE has no information on the occurrence of the studied compounds in the region. These compounds should not be present in the landfills. However the occurrence cannot be excluded due to the relatively wide use of some of the monitored compounds in the past. HS:	
Děčín	DE (Ing. Čížková): DE has no information on the occurrence of the studied POPs in the region. Kabelovna Děčín (cable works) did not se PCBs in the production of cables. The annex contains the survey of the waste with the PCBs content (transformers), produced by the companies of the region in the 2001. HS (Ing. Špalková): The HS does not possess the required information at the disposal.	
Domažlice	DE (MVDr. Císlerová): The KDYNIUM a. s. Kdyně enterprise had stored 908 kg of condensers and transformers with the PCBs content by the 31. 12. 2001. HS:	PCBs storage
Frýdek – Místek	DE (Ing. Kafková): No sites of the POPs occurrence known. HS:	
Havlíčkův Brod	DE(Skřivanová, DiS): The Havlíčkův Brod region does not operate any landfills of the hazardous waste and the monitored compounds do not occur in the storage. The enterprises operate facilities with the PCBs content: Mlýn Havlíčkův Brod a. s. a Východočeská energetika a. s. . HS:	
Hodonín	DE HS (Ing. Švarcová): The HS does not possess the required information at the disposal.	
Chrudim	DE (Ing. Brunclíková): Landfill STS Slatiňany in the Hodonín municipality – contaminated by the monitored compounds. A device with the PCBs content is present as waste in the Lihovar Chrudim a. s. and in the cooperative Dílo. The old stock of monitored compounds was removed in 2001-2002 (condenser with the PCBs content was transported to the ČKD Chrudim, operational unit Čáslav). From the Střední odborné učiliště (training college) of the engineering Třemošnice has removed the PCBs containing condenser to the CZ BIJO enterprise, operational unit Kutná Hora. All agrochemical waste (DDT sprays) was transported to the Aliachem a. s.	Pesticides - landfill PCBs storage

	OZ Synthesia Pardubice. HS:	
Jihlava	DE (Ing. Dašek): Obalovna Rancířov (tarmacadam plant) Obalovna Bílý Kámen (tarmacadam plant, new, 2001) The monitored compounds are not present in the Jihlava region not even on the former landfills or in the storage of the enterprises. HS:	
Jindřichův Hradec	DE (Ing. Starý): On the premises of the Enviro Technology Today Lhenice, s. r. o., under the wind-up, is currently stored: 50 t of hydraulic oils with the PCBs content 12 t of waste insulation and heat-transfer oils with the PCBs content 443 t transformers and condensers with the PCBs content 5 500 t soils contaminated by the PCBs (originated from the obalovna – tarmacadam plant Milevsko) HS:	PCBs storage
Kladno	DE HS (Fousek): With the use of the MA subvention a compounds dangerous for the health (organophosphates, PCB) were removed from the wind-up enterprises: Státní statek Zlonice – cooperative farm - (storage in Hospozín, Kobylníky, Tmán and Zlonice) Cooperative farm K. Žehrovice Gardening service Kladno The supervision was provided by the CISTA, the removal took place in 1993-4 and in 1996. The more detailed information is available at ISTA, nowadays National Plant Healing centre, regional department Kladno 0312-628441, and AGRIO Hovorčovice 18, p. Měšice (nowadays L.O.B. s. r. o. 02/2278301) The status of the Delor(s) removal in the region Kladno as according to the data by the HSS	
Mělník	DE HS (MUDr. Krchová): Spolana a. s. Neratovice – massive contamination of the former production dwellings, subjects and of the landfill by PCDDs/Fs, HCB and other substances – A risk analysis and the feasibility study performed, the redevelopment in preparation.	PCDDs/Fs, HCB contaminated site
Most	DE (Differenz): Polluters producing PCDDs/Fs could be: Chemopetrol a. s., entire enterprise Mostecká uhelná společnost, a. s., waste incinerator plant Technické služby města Mostu, crematorium Most Celio, V Růžodolu, Most, landfill of waste United Energy, a. s., Komořany, heating facility HS (MUDr. Nikolajenková): The monitored compounds are not present at the landfills of the region Most (skládka Celio a. s., in operation, the landfills of the Chemopetrol ale being redeveloped within the subventions by the NPF). PCBs occur in a number of mining facilities of the Mostecká uhelná společnost a. s. The out of action condensers are stored in this company	PCBs storage

	prior to their transfer to the authorized stock house. PCDDs/Fs are measured in t he exhalation by the Magnesium Electron Recycling CZ s. r. o. – and their content is low.	
Opera	DE (Ing. Albert nerve): No source of the contamination by the monitored POPs known. HS:	
Rychnov nad Kněžnou	DE (Ing. Záliš): DE posses no information on the storage of the monitored pesticides in the region or that there would be some significantly contaminated sites in he region. PCBs had been present in the tarmacadam plant in Borohrádek (currently Českomoravské obalovny a.s.) – about 80 barrels with oils, asphalt with the Delor content stored till 1998, nowadays already removed. The landfill „Dolní Rokytnice“ (established and used by the former Soviet army) –0,16 mg.l^{-1} in 1997 and 0,0182 mg.l^{-1}.in 1999 found in the quarter groundwater body below the landfill HS:	PCBs landfill ?
Sokolov	DE (Ing. Tkáčiková): PCBs occurrence: The Sokolovská uhelná a. s. – the deposit of the tar sludge with the PCBs content in Stará Chodovská, municipality of Chodov Sokolovská uhelná a. s. – transformer and hydraulic oils in the devices (transformers, large machines) České dráhy – transformers HS:	PCBs landfill PCBs storage
Svitavy	DE HS (MUDr. Havel): The regional HS station used to cooperate closely with the regional administration offices and with the CISTA employees in the authorization of the use of the monitored compounds in the region. The documentation on the use of such compounds was archived for 20 years. As the monitored compounds were used in the 1960s and 1970s, their documentation is, unfortunately already discarded. The aldrin was destined for use to the azaleas in the hot-bets and to the treatment of the amenity bush – the probability of their use in the region very low. The Endrin was used to eliminate the rodents till 1984. And it had been readily used. It has been banned in this region since 1975 due to the establishment of the Brno PHO water-conduct.. Heptachlor was a part of the Agronex, dressing for grains, used till 1985. It use in our region is low as it is not the beet planting region. Hexachlorbenzene was used as a part of the wheat and rye dressing Voronit C and Agronal H till 1977 and it had been used also in our region. More information could be obtained from the archive of Oseva Choceň. Toxaphen was contained in the Melipax preparation used to treat colza, carrot and cloves till 1984. It was used in the test of the aerial application against field mice on the 20 ha of the cooperative farm JZD Jevíčko. DDT was used till 1972 as a part of the preparations in agriculture: Aerosol DDT, Dynocid, Dikol, Gamadyn and Lidikol. However, the Dikol and Lidikol were also used in the forestry. It is not possible to exclude that the residues of these preparations could be disposed by the entrenchment to the soil. DDT was widely used also in our region. Possible ways of removal of these compounds used in our region: The residues of the preparations used to be stored on the landfills in 1970s that existed in all larger towns of the region. These landfills were usually	PCBs contaminated site

	covered by the layer of soil and they are no longer monitored. The Regional plant protection body had organized the removal of the preparations based on DDT in 1992 and all agricultural organizations of the region have took advantage of this possibility. The most famous old landfill was the tunnel in Vranová Lhota. This landfill, where DDT preparations and preparations on the basis of mercury were stored, was completely redeveloped in spring 2002. The condensers with the PCBs content were monitored since 1988 in the region. They were discovered in the following enterprises: Poličské strojírny Polička, Vigona Svitavy, SPT Telecom a. s. Svitavy, Vertex Litomyšl, TOS a. s. Svitavy, SOU strojírenské Svitavy, Prefa, závod Moravská Třebová (nowadays SOMEX s. r. o.), Tabák a. s. Svitavy, Vitka Brněnec, MŠLZ a. s. závod 02 Březina, VČE, rozvodna Svitavy. The contamination by PCBs was found in the tarmacadam plant of Modřec, not yet redeveloped. Note: Mr. Jiří Kalabus is known as expert in the use and storage of pesticides field (since 1950s). contact: HELIVO Moravská Třebová, tel 0462/531805.	
Šumperk	DE (Ing. Turková): PCBs occurrence: Siemens Mohelnice – transformers with the PCBs content, being gradually replaced Skládka Habartice – already been redeveloped Olšanské papírny Lukavice – landfill The landfill of bark and WWTP sludge near the Jindřichov plant HS:	PCBs storage
Trutnov	DE HS (MUDr. Strnadová): PCBs were used in transformers of the switching station VČE in Trutnov 3, in the Kablo and in KRPA enterprises. The pesticide storage inspected in the past – the storage ZZN, Trutnowv3 currently does not contain any of the monitored compounds (and never had).	PCBs storage
Ústí nad Labem	DE (Ing. Řehák): HCB occurrence: Skládka (Landfill) Chabařovice – the HCB, formed as the by-product in the epichlorhydrine production in Spolchemie, was deposited on this landfill till the end of 1992. The landfill is being closed down by the cover up and is continuously monitored. Skládka Všebořice – since 1992 till 1999 were deposited about 300t of the waste HCB a year. In plastic containers with the sand interlayer, covered up by the ash-cement cover at the landfill. The Waste HCB has been removed by the MEGAWASTE – EKOTERM, spol. s r. o. Prostějov enterprise since 2000. The DE has no information on the occurrence of other monitored compounds. HS:	HCB landfill
Ústí nad Orlicí	DE (Mgr. Rybárik): According to the information at the disposal of the DE it is clear that the monitored compounds are not present in significant quantities in the region, with the exception of the PCBs. They are present in the Depo kolejových vozidel, operational unit Česká Třebová (engine house of the rail vehicles). The production of electrotechnical devices with the PCBs content is no longer operational (ZEZ Silko s. r. o. Žamberk) and the non-used PCBs stocks were removed. HS:	PCBs storage

Žďár nad Sázavou	DE (Ing. Havel): The PCBs storage is recorded at the territory of the region, in the GEAM enterprise Dolní Rožínka. HS:	PCBs storage
No answer provided by the following regions:		
	Bruntál, Česká Lípa, České Budějovice, Český Krumlov, Hradec Králové, Cheb, Chomutov, Jablonec nad Nisou, Jeseník, Jičín, Karlovy Vary, Karviná, Klatovy, Kolín, Kroměříž, Kutná Hora, Liberec, Litoměřice, Louny, Náchod, Nový Jičín, Nymburk, Olomouc, Mladá Boleslav, Pardubice, Pelhřimov, Písek, Plzeň – jih, Plzeň – sever, Praha – východ, Praha – západ, Prachatice, Prostějov, Přerov, Příbram, Rakovník, Rokycany, Semily, Strakonice, Tachov, Teplice, Třebíč, Uherské Hradiště, Vsetín, Vyškov, Zlín, Znojmo	

A5.6 Update of information on central databases

The database of the national documentation of accidents (CEI) is being currently transferred to the electronic medium to the Microsoft-Access interface since 2002. The regional CEI inspectorates provide the permanent update of this database. It is centrally managed and completed by the CEI Prague.

The system of the record of the old environmental burdens (hereinafter as SESEZ) was prepared on the basis of the project of the MoE no. PPŽP/550/3/96 and PPŽP/550/3/97. Their result is a program managing the database on the loads of the environment and it interconnects the database with GIS. The system thereby permits to keep the values associated with sites on the earth, which may negatively influence the environment.

The database of unusable residues of pesticide preparations by the 1994 (MA) contains the detailed list of pesticide compounds that were registered by that date to be removed on the basis of the Guidelines on the procedure when disposing the hazardous pesticide wastes. The MA had also initiated the financial support for the agricultural enterprises together with the issue of these Guidelines. This financial support still exists. The detailed list of the residues of pesticide preparations that are subject to this financial support are listed in the Annex 8 to the Decree no. 84/1997 Coll.

ANNEX 6

POPS OCCURRENCE IN THE CONSTITUENTS OF THE ENVIRONMENT OF THE CZECH REPUBLIC

A 6.1. POPs Occurrence in the ambient air

The CHMI Prague has been providing the POPs monitoring on the regional observatory of the ground levels in Košetice in the cooperation with the research centre RECETOX. The 24hours long withdrawals of the air samples for the analysis of PAHs and of other substances (PCBs, chlorinated pesticides) take place once a week on Wednesdays at 8 a.m. The 16 priority PAHs (according to the US EPA (DDTs, HCHs, HCB, CHLs) are analyzed, both the withdrawals and analyses are ensured by the EMEP methodology.

Trends in the development of the medians of the regional ground level concentrations of the mentioned pollutants are presented in the Figure A6-1 (PAHs), A6-2 (PCBs) and A6-3-5 (DDTs, HCHs and HCB) and indicate the slightly decreasing tendency of the monitored pollutants at the regional level.

Figure A6-1: Trends in the development of medians of regional ground concentrations of PAHs, observatory Košetice, 1996-2004 [ng.m^{-3}]

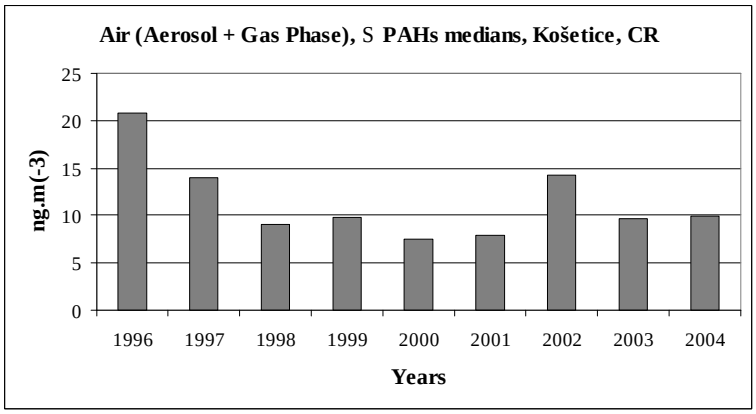


Figure A6-2: Trends in the development of medians of regional ground concentrations of PCBs, observatory Košetice, 1996-2004 [ng.m^{-3}]

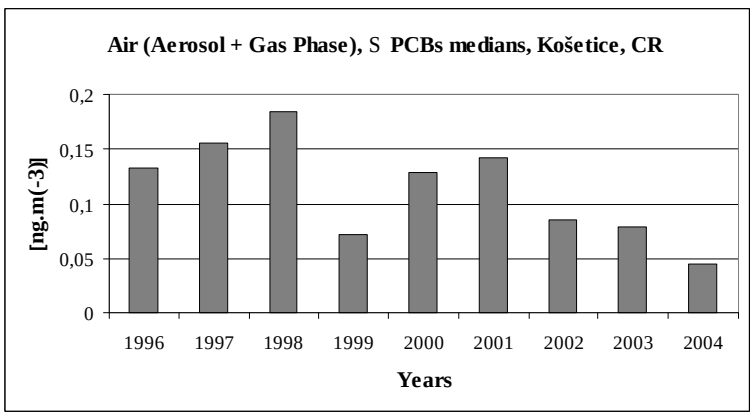


Figure A6-3: Trends in the development of medians of the regional ground concentrations of DDTs, observatory Košetice, 1996-2004 [ng.m^{-3}]

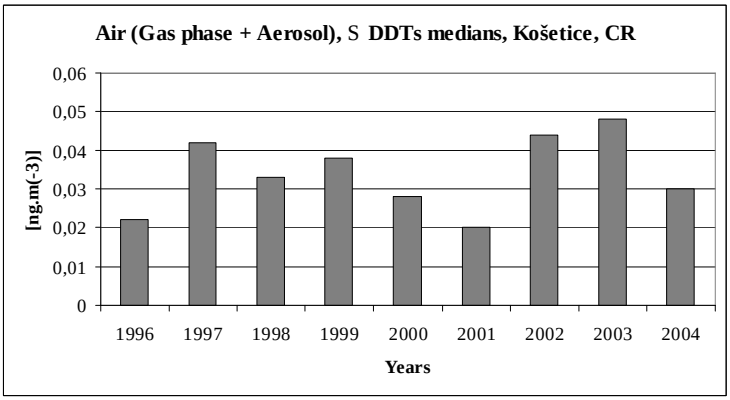


Figure A6-4: Trends in the development of medians of the regional ground concentrations of HCHs, observatory Košetice, 1996-2004 [ng.m^{-3}]

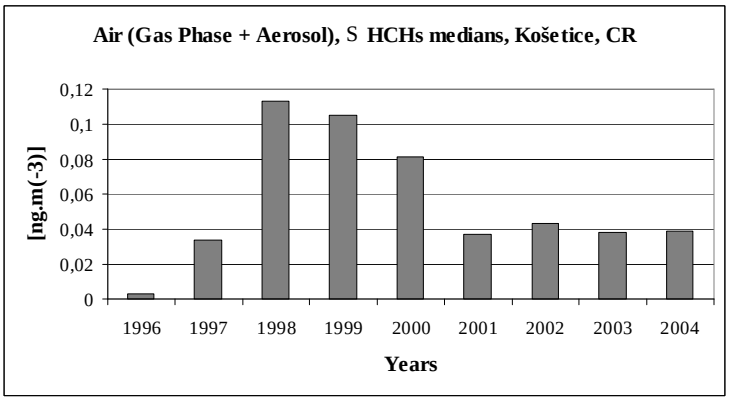
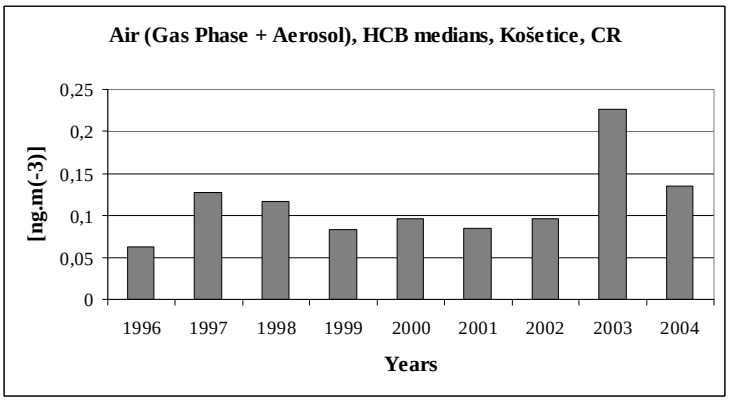


Figure A6-5: Trends in the development of medians of regional ground concentrations of HCB, observatory Košetice, 1996-2004 [ng.m^{-3}]



The Czech Ministry of Health ensures the monitoring of the PAH concentrations in ambient air concentrations as part of the monitoring system on the state of the public health in the Czech Republic pursuant to the Government Order no. 369/1991 Coll. The proper system of the quality insurance and quality control is also part of this monitoring. The proper withdrawal of air samples has been provided by the selected stations of the hygienic service (HS) since 1996. The system has been gradually

developed, the number of stations had increased, but the Benešov station had been removed in 1998. A set of 12 PAHs is monitored at 8 localities at present.

Besides that long term monitoring programmes some regular regional sampling campaigns (Zlín, Beroun, and Vřesová) or significant research and development projects (Teplice, Prague, Ostrava) were carried out within last 13 years. The results of these projects are a part of the NPOPsINV2003, or they will be gradually supplemented.

A 6-2 POPs occurrence in the hydrosphere of the CR

NPOPsINV contains information on available POPs measurements in the hydrosphere of the CR, which is in the surface and ground waters, in river and reservoir sediments and silts and in water organisms and in biological matrices of the water environment. The greatest interest was in the past years given to the organochlorinated pesticides (DDTs, HCB, HCHs), PCBs and to PAHs concerning the analysis of the presence of such compounds. Other pesticides were not monitored that often and the PCDDs/Fs have been monitored only for last 3 years. The results of important monitoring projects and of activities concerning the monitoring of the content of the DDT |and of its metabolites in surface waters indicate that the values of the analyzed content of the DDT and of its metabolites in the surface waters of the CR is generally in the range of several tenths up to units of ng.l^{-1}, relatively larger findings (up to several tens of ng.l-1) were observed in a number of profiles of the Morava river and of its inflows as well as in the Bílina river, naturally below the Spolchemie plant in Ústí n/L. The detailed description of the DDT research in the surface waters in 2001 is given in the Figure A6-6 including the proportionate representation of individual DDT metabolites; it results from the database of the national monitoring of the water quality by the CHMI.

Figure A6-6: Absolute concentration values of the DDT pesticides in water and their proportional representation in 2001

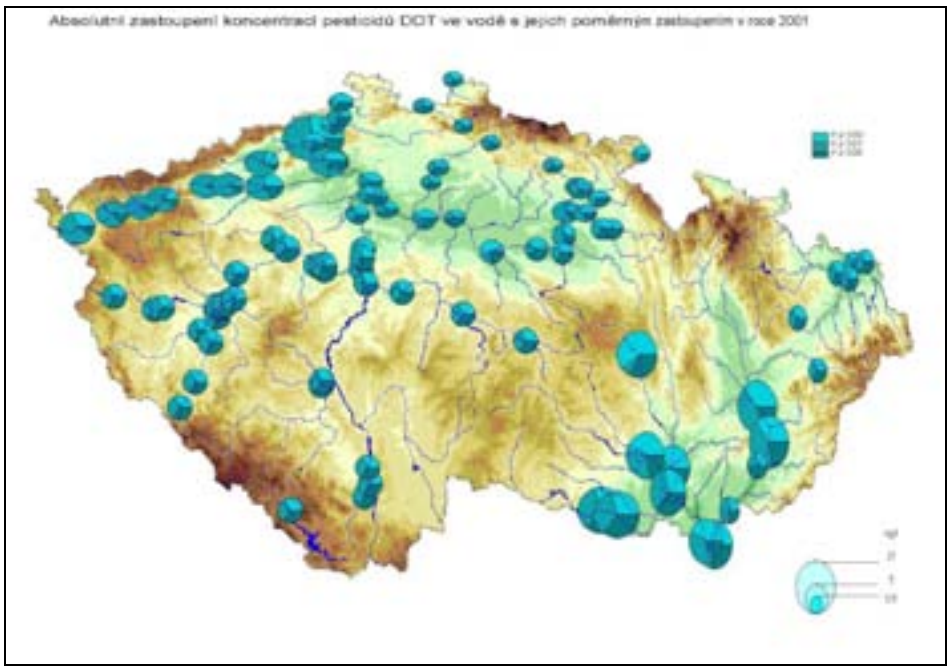
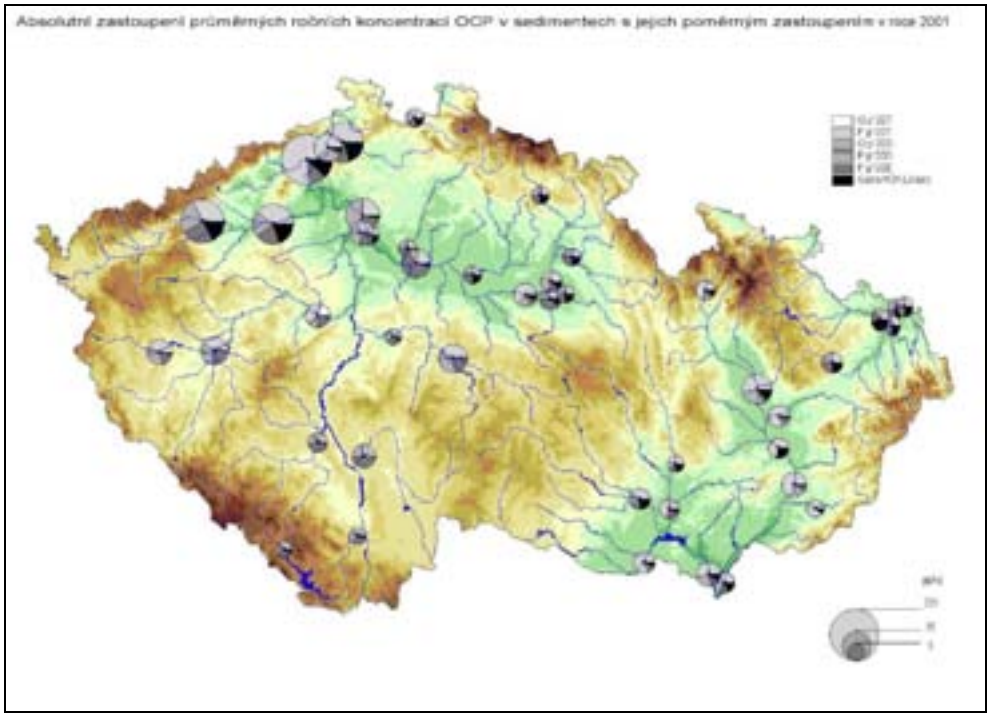


Figure A6-7: Absolute concentration values of the OCPs in sediments and their proportional representation in 2001

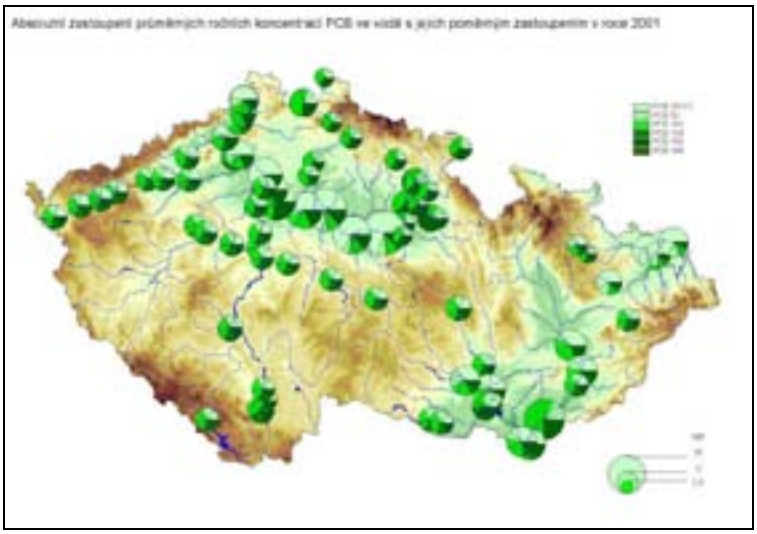


The review of the PCBs concentrations in the surface waters indicates, similarly, that the values are usually in the range of the order of several tenths up to units of the

ng.l^{-1} for the individual PCBs congeners and it does not differ significantly for the particular basins. Somehow higher values (several tens ng.l^{-1}) were observed in the surface waters below the priority pollution sources in the framework of the Morava project in 2000.

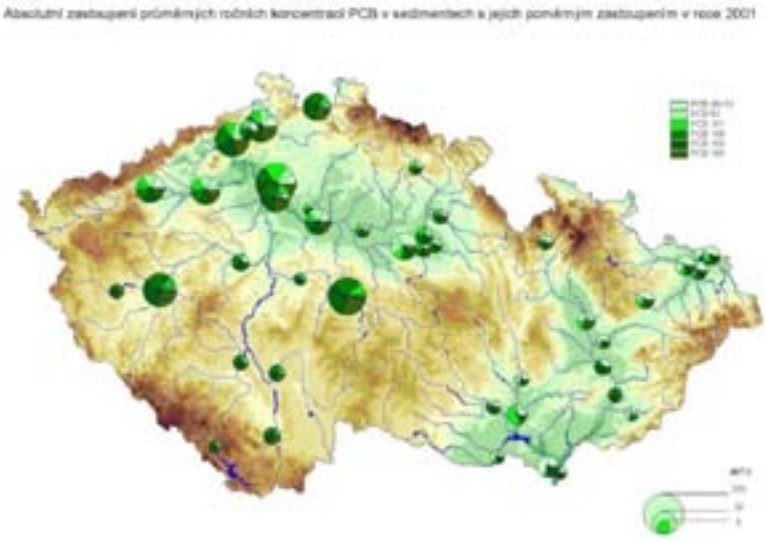
A detailed description of the PCBs occurrence in the surface waters in 2001 is, according to the database of the national monitoring of the water quality by CHMI, given in the Figure A6-8 including the proportional representation of individual PCBs congeners.

Figure A6-8: The absolute proportion of the average of yearly PCBs concentrations in water and their proportional representation in 2001



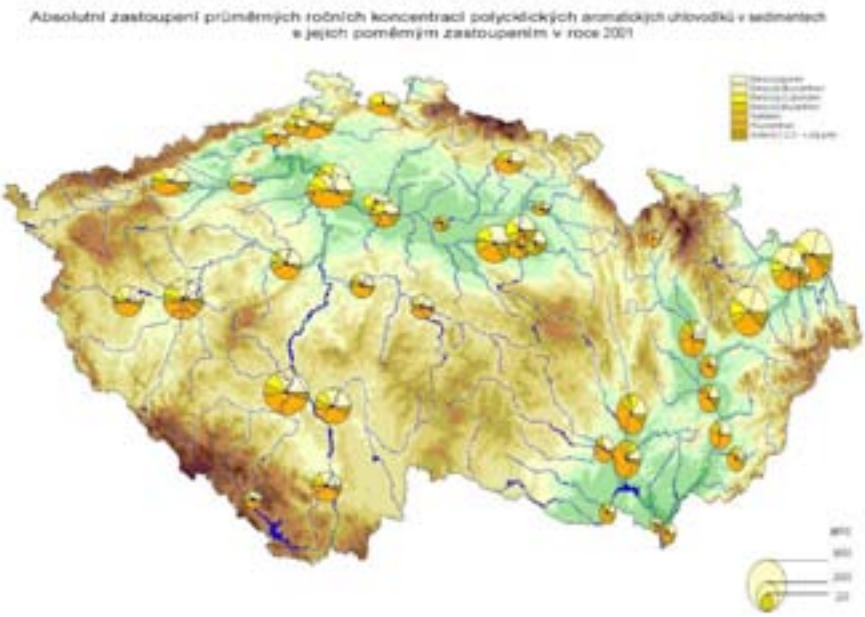
The detailed description of the PCBs occurrence in sediments in 2001 as according to the database of the national monitoring of the water quality by CHMI is provided in the Figure A6-9 including the proportional representation of the individual PCBs congeners.

Figure A6-9: Absolute proportion of the yearly PCBs concentration sediments and their proportional representation in 2001



A detailed description of the presence of PAHs in sediments in 2001 as according to the database of the national monitoring of the water quality by CHMI is provided in the Figure A6-10 including the proportional representation of the individual polycyclic aromatic hydrocarbon substances..

Figure A6-10: Absolute proportion of the average yearly concentration of PAHs in sediments and their proportional representation in 2001



A 6-3 Overall assessment of the Czech hydrosphere load by POPs and proposals for methods of their additional monitoring

Introduction

The overall assessment of the POPs occurrence in the individual constituents of the hydrosphere and the trend formulation is not an easy matter. Even though the risk of the direct penetration of POPs into the environment decreases due to the termination of the proper production and of the use of such compounds, to the construction of new waste water treatment plants and to the more thoroughly enforced environmental policy of the state, the POPs presence in the environment remains a substantial problem. Even though a certain improvement can be observed in some environmental constituents (i.e. lower POPs concentration in surface waters), the situation of the other hydrosphere components is more difficult to evaluate.

Polycyclic Aromatic Hydrocarbons (PAHs)

The most heavily loaded region by the polycyclic aromatic hydrocarbons (PAHs) is probably the Ostrava conurbation. This has been repeatedly confirmed by the results of measurements carried out in the past 10-15 years. However, the problems associated with contamination by PAHs may appear also locally, in the proximity of the industrial plants (i.e. Deza Valasske Mezirici) or of the production units where tar, creosotes or other similar products with a high content of PAHs are used. Moreover, any larger industrial or urban agglomeration is, due to the increased production of the spent gasses, more affected by PAHs. In fact, the problem of the contamination by PAHs may also arise in relatively small localities due to the incomplete combustion resulting from any local source.

Organochlorinated pesticides (OCPs)

The load of the hydrosphere by the organochlorinated pesticides, i.e. by the DDT and its metabolites, by polychlorinated cyclodienes (aldrin, endrin, dieldrin, isodrin) and by the HCH isomers is not particularly significant in the Czech Republic and is comparable to that of the surrounding countries. However, there are regions with particular partial problems. The in case of DDT and its metabolites naturally concerns the site under the influence of the Spolchemie Usti n/Labem chemical plant being the important point source of these pollutants. Furthermore, it is the site surrounding Spolana Neratovice plant, as confirmed by the increased levels of the Labe-Obříství profile. The loads are observed in some regions of central and southern Moravia (for example: Dyje-Znojmo). The most serious situation in case of the HCH isomers as their content in the sediments ranges to several tens $ng.g^{-1}$ and there are cases where it reaches hundreds of $ng.g^{-1}$. Moravian regions are more heavily loaded also by the polychlorinated cyclodienes in comparison to Bohemian ones, although the situation does not seem to be serious when comparing the absolute values.

Hexachlorobenzene (HCB)

One critical site, from the point of the contamination by hexachlorobenzene is located in the surroundings of the chemical plant Spolchemie in Usti n/Labem. The release of HCBs from this plant into the waste waters had been and most likely still is enormous and thus negatively influences all components of the hydrosphere in the end part of the Bilina river and consequently also the Labe river far up to the German territory. Significantly higher findings of the HCB concentrations are found in all surface waters of Bílina and of Labe rivers, in sediments and silts, water biofilms, water organisms and in fish, in comparison to other regions of the Czech Republic or other European countries. It is well known that the problem is being resolved on the factory side through technological adaptations and via more effective waste water treatment; however, it is still important to continuously monitor and analyse how the lower HCB emissions would influence the components of the aquatic environment. Additional significant issues regarding the contamination of the hydrosphere by HCB in the Czech Republic are currently not known.

Polychlorinated biphenyls (PCBs)

At the national level it is most likely the most problematic POPs group - the polychlorinated biphenyls (PCBs). They were produced on the territory of Slovakia of the former Czechoslovakia and were also massively used in the whole country in the first half of the 1980's. It can be noted that the whole territory of the Czech Republic is still under the impact of this increased load and that this fact is naturally present also in the PCBs occurrence in the components of the hydrosphere. The actual situation is conditioned by these facts:

- PCBs are still part of many technological facilities (i.e. as operational fluids) and of materials
- A large part of PCBs was transferred to the landfills
- There are many localities with the soil contaminated by PCBs
- PCBs may form within combustion processes of materials containing chlorine.
- PCBs resulting from the past had been accumulated in some constituents of the environment and they have been mobilized
- It is suspected that PCBs may be produced as by-products in certain existing chemical processes and therefore play the role of still alive existing sources of the environmental contamination by the polychlorinated biphenyls.

All of these are causes why the load of the hydrosphere in the CR still exists and why it is manifested by a number of findings with the increased concentration. In addition to such field load there are still sites, where due to the previous accidents in the past, the situation and PCBs findings may be still even higher. The commencing inventory of the devices and substances containing PCBs and their gradual removal should improve the situation.

Polychlorinated dibenzodioxines and furanes (PCDDs/Fs)

Some of the most toxic persistent organic pollutants are polychlorinated dibenzodioxines and furanes (PCDDs/Fs). Unfortunately, there is only rare information on their presence in the hydrosphere of the Czech Republic and therefore it is not possible to determine any total picture on their total presence. Due to the fact that these substances have significantly contaminated the site of the chemical plant Spolana Neratovice by the accident, it is necessary to examine the eventual impact of this contamination to the hydrosphere also in the surrounding localities as well as along the whole stream of the Labe. The eventual impact on the hydrosphere should be examined in the future also in the surroundings of other potential PCDDs/Fs sources, i.e. of the waste incineration plants, of some industrial products and others.

Chronological Trends

To assess the load of the components of the hydrosphere by the persistent organic pollutants should be necessary not only to evaluate the situation at a given time, but to evaluate the entire situation in the long-term time period. However, the fact that the needed quantity of the credible and comparable results of analyses is not always available causes some limitations. Nevertheless, data on some POPs can be sorted into certain chronologic sequence of findings that were gathered under comparable conditions and could predicate of the trends in the load of the hydrosphere. Several charts were prepared to illustrate these trends in the concentration of some POPs in sediments or in silts for the purposes of this research. The trends can be summarized and commented:

- PCBs and HCB were determined in the samples of Labe sediments collected in the stretch Decin-Hrensko within 1993 - 2000.
- This PCBs content in sediments of Decin-Hrensko did not exhibit any significant decrease over the monitored period and its average value still remains between 100 and 200 $ng.g^{-1}$. This is a proof that Labe is continuously contaminated by some not yet eliminated PCBs sources.

Some findings even suggest that Synthesia Padubice plant may fall into these sources, but most likely there other sources involved.

- Despite the fact that the existing trend of the decrease of HCB concentrations at the same place over the same period seems very positive, it must be noted that this contamination had been caused by the discharging of enormous quantities of HCB released from the Spolchemie Ústí n.L. plant and therefore t he decrease is most likely caused by the adaptations of the production technology and by more effective treatment of waste wasters in t his plant. Nevertheless, the HCB values in the neighbouring streams still remain significantly higher than the national average

The chronological trends based on the results of the concentrations of organic pollutants in sediment silts from the monitoring station MKOL in Labe –Hřensko in 1997-2000 are much less encouraging as they do not show any decrease of the contamination. The average yearly values are assessed. They are based on the 12 measurements of silts withdrawn each month and therefore it is evident that these values are not accidental, but the set is quite reliable. The annex provides the time trends for the PCBs, HCB, DDTs and for benzo(a)pyrene over the period 1997-2000.

Apart from the DDTs, all these chronological trends have shown either a no change or a slight increase of the contamination in silts. However, it must be accepted that the monitoring period have not been sufficiently long to draw the final conclusions.

A 6.3 POPs occurrence in the soils of the CR

In addition to the systematic monitoring there is a number of specific, short-term and targeted research that may also exhibit the monitoring properties, but they are to evaluate a concrete state of the soil contamination in a given locality, over a given time frame with regard the sources of contamination and with a proposal of remediation measures. These studies use the systematic monitoring results for the reference sets. The Research Institute of Amelioration and Soil Conservation (RIASC) provide such extensive monitoring. And the activities of the Consortium RECETOX-TOCOEN & Associates in the POPs soil monitoring are also shown in the text.

CISTA Monitoring (standard soil monitoring)

The monitoring of the organic pollutants content was provided with regards to the used pesticides and therefore localities where wheat crops were planted used to be selected for the withdrawing of samples until 1996. Thereby the set has modified each year. The monitoring of the content of organic pollutants has been exercised on the same set of the selected soil localities as to catch the dynamic of these compounds in the soil also from the point of view of their potential long range transfer (for example PAHs) since 1997. The monitoring is provided on the total of 40 sampling sites, where 5 sites from the subsystem in protected areas on the non-forest, but undisturbed, land (to get the “ground” values – within the agreement of the Agency on the Nature Conservation Areas in the Czech Republic) were selected. The remaining 35 sampling sites aware selected from the agricultural land monitoring, both from the standard subsystem and from the subsystem in contaminated areas. This selection took into consideration the potential sources of contamination as well as the previous monitoring carried out in 1994-1996.

The sampling to analyze the mentioned compounds was carried out on 40 various sampling sites resulting from the wheat production since 1994 and then on the stable set of forty monitoring sites since 1997.

The PAHs assessment

The set of results for the sum of 15 PAHs in the topsoil and subsoil of agricultural soils allow the year-on-year comparison in the period 1997-2004, when PAH concentrations were monitored using a permanent set of 35 monitoring sites. The permanent grass growing (5) and nature conservation sites (5) are excluded from the statistical processing The values of the sum of 15 PAHs fluctuate in the

range of 125 - 7 819 ng.g^{-1} in the topsoil and of 88 - 6 153 ng.g^{-1} in the subsoil. The topsoil PAH medians gradually increase, but the subsoil PAHs medians remain relatively stable The 15 PAH sum values in case of the upper horizons of soil (corresponding to the topsoil samples) in the nature conservation areas, are lower than those in agricultural soils; their medians reach 200 µg.kg^{-1} (upper horizon) and 100 µg.kg^{-1} (lower horizon). The permanent higher contents in Studniční Hora in the Krkonoše Mountains are probably caused by the a stripping effect, and so-called sub-cloud scavenging (the altitude 1550m above sea level, the total annual precipitation 1250 mm). However, a clear dependence of PAH contents on the altitude of the site has not been demonstrated.

The highest proportion of fluoroanthrene (18 % of the PAH sum total on average) and pyrene (16 %) followed by benzo[b]fluoranthene, phenanthrene and benzo[a]pyrene (9 % each), and chrysene (8 %) is found in soils. Their proportion in the agricultural lands is relatively stable.

It is evident that it is a very difficult to find the trend of change in the agricultural lands not only in the total statistics, but also in cases of the individual sites. The nature conservation areas have manifested the increase of the content and it can be assumed that is more pronounced in the exposed localities (higher altitude, the stripping effect of the forest ecosystems, larger quantity of horizontal and vertical precipitations, the long range transfer).

Conclusions

- There is a potential accumulation of PAHs in the soil of undisturbed lands at higher altitudes where the mixing of cultivations does not exist.
- The medians of the sum of 15 PAHs over the monitored period 1997-2004 range 600 - 700 µg.kg^{-1} in the topsoil upper layer) and for the subsoil (lower layer) of about 300 to 400 µg.kg^{-1} lower than in the topsoil. However, the medians of the permanent grasslands were higher than those of the arable lands.
- The PAH content manifests a moderate increase (both the median and the simple average).
- Fluoroanthrene and pyrene are the hydrocarbons with the highest representation, both substances are dangerously toxic, but not carcinogenic.

Evaluation of the PCBs

The average value of the sum of 7 congeners ranges 4.73-6.03 ng.g^{-1} for the topsoil and 3.23-4.18 ng.g^{-1} for the subsoil. In contrast to 2001, there has been slight increase of the median and of the arithmetic mean for the topsoil. The statistical characteristics of the subsoil are stable.

From 1995, the PCBs content was analysed in 554 samples where 8.9 % of the samples taken from the topsoil and 4.7 % of the samples taken from the subsoil have exceeded the limit value. In reality it concerns the 10 monitoring sites where the limit value was exceeded at least once.

It is apparent from the results that the PCBs from the undisturbed land do not exhibit a tendency to accumulate as it is in exposed locations unlike PAHs, and they are neither easily transported by the long-range transfer. .

It is possible to observe a gradual decrease of in the detected PCBs concentrations on some monitoring sites, while in others a fluctuation is observed. The behaviour could be affected for example by the cultivation interventions into the agricultural soil (for example deeper ploughing can result into a) the dilution and to the decrease of the content in case of the previous higher concentration in the topsoil, b) the increase of the PCBs content in case of contamination of the subsoil – of the lower horizon).

A point contamination may be expected for some monitoring sites, i.e. in the oils resulting from the travel of the agricultural machinery, for others is the PCBs content relatively stable. For most of these sites, the sum of 7 congeners is formed predominantly by the 138, 153, and 180 ones, i.e. by the highly chlorinated PCBs that are subject to the degradation much less than the other analyzed ones. The ratios

of the content of the low-chlorinated and highly chlorinated ones may be as high as 1:12-18 as it is in the two sites 7901 and 7902.

Conclusions

- The average of the sum of 7 PCBs congeners ranged in the proximity of the 5,5 μ $g.g^{-1}$in the topsoil of the agricultural lands in 200-2003, there was an increase to 8,43 $\mu g.g^{-1}$ in the 2004. The values in the subsoil are lower and they fluctuate in the range of the 3,23-7,63 $\mu g.g^{-1}$.The simple average of the topsoil samples ranges 4,79-7,94 $\mu g.g^{-1}$ for the 6 PCBs congeners, for the subsoil samples it ranges 2,98-7,10 $\mu g.g^{-1}$.
- The permanent grasslands contain lower average PCBs content in the topsoil (the range of 2,27-6,29 $\mu g.g^{-1}$) in the contrast to the agricultural lands (5,43-8,77 $\mu g.g^{-1}$). The medians in the both types, however, are stable.
- The limit value of 10 μg $PCBs.kg^{-1}$ laid down by the Decree no. 13/1994 Coll., was exceeded for 9 samples (6 topsoil samples and 3 subsoil samples) of the 6 sites (2905, 7045, 7901, 7902, 8019 and 8021) in 2004.
- The four monitoring sites that have exceeded the limit value of the PCB content in the soil (concerning the sum of 7 congeners) at least twice over the entire monitoring period can be divided to the sites with irregular findings of the high PCBs content (likely due to the point contamination) and to the sites with a relatively stable higher PCBs content.
- The PCBs content in the soil of the monitored set is relatively stable. However, the significant decrease of the PCBs in the soil cannot be expected due to the ratio of low and highly chlorinated PCBs.

Evaluation of OCPs

The organochlorinated pesticide contents were monitored on a variable set of the monitoring sites for four years (1994-1997). These substances were not analyzed in 1998 and 1999. The results from the three consecutive years 2000, 2001 and 2002 are available nowadays. The samples were withdrawn from the permanent set of the monitoring sites (35 sites of the arable land and 5 sites in the nature conservation areas).

However, the monitoring over the 1994-1997 and of the 2000-2002 has to be assessed separately as the monitored sets are not identical and therefore the united conclusions might be only a very rough. The comparable results are provided only over the 2000-2002 period as they were conducted on the same set of soils.

The increase in the analyzed contents of the HCB in the comparison with the preceding year was observed in 2002, the simple average have increased from 2,26 $ng.g^{-1}$ in 2000to the 7,34 $ng.g^{-1}$ in the 2002 in case of the topsoil samples. The same has been observed for the subsoil, but the contents remain low when comparing the absolute values. The increase of the content was observed for the p,p'-DDE in the subsoil (median of 2,7 $ng.g^{-1}$ increased to 7,5 $ng.g^{-1}$ and the simple average have changed from 15,4 $ng.g^{-1}$to the 26,14 $ng.g^{-1}$ in 2002). However, the significant increase was also observed for the o,p'-DDE and o,p'-DDD. That could be relatively easily explained by the occurring decomposition, but to prove this conclusion a longer monitoring period would be required. The contents of the both metabolites remain stable for all three years. This assessment is valid, similarly for the topsoil, for the subsoil with the exception that the subsoil contents are lower (both the simple average and median).

It is evident that the contents of these substances remain high in agricultural soil, but the problem is the interpretation of their risks. The permissible level of pollution (10 $ng.g^{-1}$) as laid down by the Decree. 13/1994 Coll., is exceeded in about 13 % of the topsoil samples in case of the HCB levels, however the DDT substance group does not comply with this limit in 73% of soil samples where the DDT occurrence is expected .

Conclusions

- The content of the HCB have significantly increased in the comparison with the preceding years; the simple average have increased from 2,26 ng.g^{-1} in 2000 to the 7,34 ng.g^{-1} in the 2002 in the topsoil samples. The similar observations were indicated for the subsoil samples, but the absolute values of the HCB content remain low. .
- The increase of the content was also observed for the p,p'-DDE metabolite in the subsoil samples (median have increased from the 2,7 ng.g^{-1} to 7,5 ng.g^{-1} and the simple average have changed from 15,4 ng.g^{-1} to the 26,14 ng.g^{-1} in 2002). However, the contents of the o,p'-DDE and o,p'-DDD have remained stable for three years..
- The year-to-year comparison is similar for both the topsoil and the subsoil with the exception that the subsoil contents are lower (both the simple average and median). The trespassing of the limit values, as stipulated by the Decree no. 13/1994 Coll., as well as according to the preventive limit values, has occurred in 2000 and 2001 especially in the case of the DDT contents. The number of the exceeded values pursuant to the limit stipulated in this ,was in reality the same for both the DDT (41) and the DDE (40). As according to the proposed prevention limits there were18 DDT samples "only and 24 DDE samples in 2002. However, over the period of the 3 year monitoring there was the decrease of the trespassing of the preventive limit values for the DDT (from 60 to 18), but to the increase for the DDT (from 14 in the 2000 to the 24 in 2002).
- The limit pursuant to the valid Decree was exceeded for DDT and its metabolites in the case of the 36,7 % of samples.
- However, over the entire monitoring period (1994-2002) a significant fluctuation of the values occurred and therefore a clear development cannot be determined.
- The monitoring of the persistent organochlorinated pesticides was carried out in the topsoil (upper layer) and in the subsoil (lower layer) of the permanent set of the 40 monitoring sites of the agricultural land and of 5 sites of the nature conservation areas.
- In analyses of the HCH no samples trespassed the limit value.
- No increase of the HCB content was observed in comparison of the previous years, the arithmetic mean is 4,29 μg.kg^{-1} of the dry matter (respectively of the 7,10 μg.kg^{-1} of the dry matter) in the topsoil and 4,13 μg.kg^{-1} of the dry matter (and 4,66 μg.kg^{-1} respectively) for the subsoil of the arable lands (and of the permanent grasslands). The absolute values of the content remain low.
- The decrease of the DDT content and of its metabolites was observed for both the arable lands and the permanent grasslands in 2004.
- The average content of the pp-DDT isomer have decreased from the 47,7 μg.g^{-1} of the dry matter (year 2001) to the 21,2 μg.kg^{-1}of the dry matter (2004) and in the upper layer of the permanent grasslands from the 64,9 μg.kg^{-1} (2001) to the 38,2 μg.kg^{-1} (2004) in the dry matter. However, no significant change of its content occurred in subsoil of the arable land or in the lower layer of the permanent grasslands.
- The arable lands and or permanent grasslands exhibit lower contents of the DDT and its metabolites, respectively in the lower sampling layer.
- The most frequent trespassing of the limit value stipulated in the Decree 13/1994 Coll. occurred in the case of the DDT between 2000-2004. It was exceeded in the 31 samples in 2004.
- According to the proposal of the preventive limit values there would be 12 trespassing samples of the DDT and 16 samples of the DDE in 2004. However, within the five years of the monitoring there was a decrease of the exceeding the preventive limit values by the

DDT (from 48 to 12) and, on the contrary, to the increase by the DDE (10 samples in the 2000 to the 16 in the 2004).

- The DDT and its metabolites limits of the valid Decree were exceeded in the 58,8% of samples of the topsoil and in 50,0% samples of the subsoil of arable lands. According to the proposal of the prevention limit value this limit was exceeded in 32,4 % of topsoil the samples and 29,4% of the subsoil samples of the arable lands.

The PCDDs/Fs assessment

The monitoring was performed solely at the samples of the 38 monitoring sites from the year 2001. Two sites of the nature conservation areas in the south Moravia region (9005 and 9004) were not analysed. The samples were analysed by the University of Lancaster, using the HR/MS method. The descriptive statistics of the set of results is given in the table A6-1.

Table A6-1: Descriptive statistics – PCDDs/Fs content in soils (38 observational areas) [pg.g^{-1}]

Parameter	Average	Minimum	Maximum	Median	10thpercentile	90th percentile
∑ PCDDs/Fs	274.1	32.8	1 136.1	118.9	49.8	797.7
∑ P(4-8)CDDs/Fs	230.7	24.7	1 082.8	91.9	33.9	706.1
∑ PCDDs/Fs TEQ	3.1	0.5	14.3	1.3	0.6	9.3

The angularity of the results distribution and thereby also a significant difference between the simple average and the median is caused by the samples with the extremely high PCDDs/Fs contents. These extreme samples are in majority of cases from the set of contaminated sites and from the both sites from the nature conservation areas. Furthermore the increased content was manifested at the two sites resulting from the industrial agglomeration of Ostrava.

Conclusions

- The PCDDs/Fs monitoring was carried out for the first time in 2001 using a set of 38 monitoring sites.
- The highest contents were found in the contaminated soils and in the soils of nature conservation areas from the higher altitude.
- The higher levels in the soils of the nature conservation areas (CHKO) are probably due to the stripping effect and to the under-cloud washing of PCDDs/Fs. Simultaneously the analyses of the mountain lands were carried out. Their content was about 3 to 8 times higher than those of the maximum concentration found in the samples of the CISTA monitoring (about 10 to 80 times higher than the median of these contents). The TEQ is the 2-10 times higher than the maximum value and about 20-100 times higher than the median.
- The cause of higher concentration levels in other cases is most likely associated either with the industrial activity (8008, 8026), with the application of the sludge from the wastewater treatment plants (7901, 7902) and with the increased contamination by the pesticides (5903). The source of the contamination is not known in other cases.
- The contaminated sites were selected on the basis of the increased content of inorganic pollutants. It is possible to associate the more complex contamination of these soils to the findings of increased contents of PCDDs/Fs in these soils.
- The content of individual congeners varies significantly in different sites and there is no observable dependence between the total PCDDs/Fs content and the TEQ value.
- Most of the PCDDs/Fs found in observed soils are composed of highly chlorinated congeners (4-8 chlorine atoms in each molecule).

Monitoring by RIASC

The POPs monitoring in agricultural soil by the by the Research Institute of Amelioration and Soil Conservation (RIASC) was initiated in 1993 in the framework of the layout monitoring (Southeast Bohemia and currently also the Central Bohemia). The concept of the soil monitoring was derived from the need to capture the state of the load:

- In the soil of environmentally burdened regions (north and west Bohemia and the northern Moravia regions)
- In the soils of regions with a standard load in Bohemia, eventually in Moravia
- In the soils of the flooding zones (fluvi-soils) along the stream of the Labe

The monitoring was carried out in 30 districts (out of the total of 77) located in 6 regions (as according to the existing regional distribution)within the 1993 to 2001-The soil samples were withdrawn from the agricultural lands, the arable land, meadows and pastures were included into the monitoring. The aim was to create the equidistant network of the withdrawal points in the largest extent possible, where a withdrawal point would cover about 25 km^2.

The monitoring of the persistent dibenzo-p-dioxins, dibenzofuranes (PCDDs/Fs), PCBs and non-ortho substituted PCBs concentration levels was initiated in 1999, when the first pilot research was carried out using the 20 soil samples. The 60 samples of the soil have been withdrawn and analysed till present; their selection was driven by the requirement to comprise the following into analyses:

- Soils from industrial sites
- Soils from sites being intensively used in the agriculture
- Soil from the closest proximity of the countryside dwellings
- Soil from sites of the higher altitude (mountain sites)
- Soil in flooded zones (fluvi-soils)
- Soil where the sludge from the waste-water treatment plant was applied

Summary of Results

The results of the monitored POPs load of the soils by individual substances can be summarised as follows:

The assessment of the PCBs load

PCBs – 6 congeners

The concentration of the 6 PCBs congeners sum in agricultural soils range 1.19 – 20.11 $ng.g^{-1}$ (the geometrical average of concentrations calculated for each district). The lowest average concentration was found in the district of Ostrava that is in reality loaded by the PAHs above average. Low average values were also detected in other two districts of the northern Moravia imission region. The highest average value was observed in the district Prague-City. The increased average concentrations were not detected in other monitored sites of the Central Bohemia region apart from the districts of Prague-East and Kladno. However, the concentrations equal about to a double of those of the Central Bohemia region are those of the North Bohemia and of the North-western imission region and thereby are ranked among the most heavily loaded regions among the monitored ones.. The highest maximum values detected locally came from the districts of Děčín (530 $ng.g^{-1}$), Prague-City (450 $ng.g^{-1}$), Kladno (218 $ng.g^{-1}$) and Karlovy Vary (140 $ng.g^{-1}$).

The evaluation of OCPs

HCB

The HCB concentration ranges about 1.00 – 8.73 $ng.g^{-1}$ in agricultural lands (geometrical means of concentrations, calculated for each district). The average concentrations in the majority of the monitored regions range on the edge of the detected minimal concentrations, higher average concentrations were indicated from the districts of the North Bohemia imission region and the highest average concentration comes from the district Ústí nad Labem. The highest local value was detected also detected there (487 $ng.g^{-1}$); other significant values were came from the districts of Litoměřice (337 $ng.g^{-1}$) and Sokolov (230 $ng.g^{-1}$).

DDT and its metabolites

The DDT concentrations in agricultural soils range 1.00 – 5.62 $ng.g^{-1}$ (geometrical means of concentrations, calculated for each district). The districts with a higher average DDT concentration are Kladno, Prague-West, Jičín, Benešov, and Karlovy Vary. Other monitored regions do not exceed the average load of the DDT of 3 $ng.g^{-1}$. The highest values were found in the district of Teplice (1 207 $ng.g^{-1}$), Ústí nad Labem (1 133 $ng.g^{-1}$), Prague-City (1 044 $ng.g^{-1}$), Karlovy Vary (398 $ng.g^{-1}$) and Jablonec nad Nisou (344 $ng.g^{-1}$).

The DDE metabolites of the DDT attain higher maximal average concentrations of the 1.00 – 9.62 $ng.g^{-1}$. The highest average value was detected in Prague-West; Kladno, Beroun, Příbram and Cheb are districts with a higher load by the DDE concentration greater than 5 $ng.g^{-1}$. The highest local values found for the Prague-City (1 054 $ng.g^{-1}$), Cheb (167 $ng.g^{-1}$), Jablonec nad Nisou and Jičín (159 $ng.g^{-1}$) and Teplice (146 $ng.g^{-1}$).

DDD concentrations in soil are a bit lower, in the interval 1.00 – 3.67 $ng.g^{-1}$. The highest average value originates from the Benešov district and the second highest average value of 2.48 $ng.g^{-1}$ was detected in the neighbouring district of Kutná Hora. The average levels in other monitored districts reach 1 $ng.g^{-1}$. The highest maximum values were detected locally in the district of Teplice (256 $ng.g^{-1}$), Karviná (49 $ng.g^{-1}$), Karlovy Vary (36 $ng.g^{-1}$) and Příbram (32.2 $ng.g^{-1}$).

The POPs load on the flooded zone of the Labe

The samples of the fluvi-soils that are present in the area of the flooded zones were withdrawn in the framework of some projects on the Labe. There was detected a significant load by the risk substances and by the POPs.

The values exceeding the reference ones were detected for all POPs in 17 withdrawn samples of the flooded soils. PAHs low load was detected only in the case of the chrysene, as its increased content was detected only in one case, i.e. corresponding to the 6% of the withdrawn samples.

On the contrary, the highest contrast was detected in the case of fluoroanthrene and naphtalene as the 10% of samples have exceeded the reference value. These are followed by the benzo(b)fluoroanthrene, benz(k)fluoranthene, benzo(a)pyrene and benzo(a)anthracene where 94% of samples exceeding the reference value were found. The indeno(cd)pyrene and benzo(ghi)perylene exceeded the reference values in 88% and anthracene in 71% of the samples. Phenanthrene showed higher levels in 47% and pyrene in 41% of the flooded soils samples.

The content of chlorinated hydrocarbons is also a significantly increased in the flooded soil samples. The sum of 6 PCBs congeners has exceeded the reference value in 82 % of the withdrawn samples and HCB in 41% of the samples.

A relatively low load by the DDT and its metabolites was detected for these fluvi-soils, as only 18% of the samples have trespassed the DDT and 12 % for the DDE.

And the high values in case of the non-polar hydrocarbons are not surprising as their increased concentration was detected in 71% of the samples.

The evaluation of PCDDs/Fs

The evaluation of the PCDDs/Fs content and of selected PCBs congeners in soils was carried out by using the recalculation of their content to the sum of the toxic equivalents (I-TEQ PCDDs/Fs, I-TEQ PCBs). The determination of the toxic equivalents occurred through the standard method, i.e. by the recalculation of the 16 individual PCDDs/Fs isomers and PCBs congeners to the sum of the toxic equivalent when their base is derived from the most toxic isomer - 2,3,7,8 TCDD - a comparison of sum of toxic equivalents and of the sum of the PCDDs/Fs and PCB content and their comparison with the sum of the polyaromatic hydrocarbons content.

It can be noted that the most loaded soils are again fluvi-soils in the inundation zone of the Labe and of Vltava on the basis of the evaluation of a set of 60 samples. The highest TEQ sums were found in the fluvisoils from the locality Kladruby nad Labem (I-TEQ = 14,1 $pg.g^{-1}$) and in Píšťany nad Labem (6.3 $pg.g^{-1}$), high load (I-TEQ = 6.2 $pg.g^{-1}$) was detected also in the flooded zone of the Vltava just in front of its opening into Prague, in the Jarov locality. On the other hand, a very low I-TEQ value comparable with the relatively not loaded districts of the Českomoravská vysočina was found in the inundation zone of the Dyje river that is not significantly loaded by the industrial waste waters

The sites more significantly exposed to the PCDDs/Fs are those in the vicinity of the industrial centres that are sources of such emissions. The highest values were detected in the industrial region of the North Moravia, Paskov locality (Ostrava district, I-TEQ= 4.8 $pg.g^{-1}$) and Horní Lištná near Třinec (I-TEQ = 4.2 $pg.g^{-1}$). However, the soils with the highest load are the agricultural soils where sludge from waste water treatment plants has been repeatedly applied – as in localities of Zlín and of Brno-Chrlice where the I-TEQ attain 2.5 $pg.g^{-1}$ value. The soils with lower intensity of the sludge from WWTP application (Klecany, Máslovice) the I-TEQ value did not exceed the value of the 0,5 $pg.g^{-1}$. However, the analyses of samples from these localities have shown the increased load by the PCDDs/Fs in sites with the sludge application.

When comparing the entire set of samples on the basis of the load origin and of its intensity we can divide the existing set according to the I-TEQ PCDDs/Fs values as follows:

- 1.4 – 1.6 – soils with a high fluvial load with a high emission load and soils with the long term repeated application of the WWT sludge;
- 1.3 – 0.5 – soils from sites with the combined loads and soils from relatively clean sites (especially those at high altitudes).
- 0.4 – 0.1 – soils from mainly clean sites, though with some districts having the industrial activity,

The value of the 2.5 $pg.g^{-1}$ was determined as the 90^{th} percentile the ground value of the I-TEQ PCDDs/Fs in the soil.

Conclusions

- The soils with the highest POPs load were classified those in the flooded zone of large rivers, flowing through large industrial cities and through conurbations (Labe, Vltava but potentially also other streams). The increased concentrations of PAHs (except for the chrysene), chlorinated hydrocarbons, and nonpolar hydrocarbons and to a lesser extent also the residues of the organochlorinated pesticides and elevated levels of dibenzodioxins and furans ere detected in soils. Their load intensity is significantly higher than in other soils and it statistically differs from the entire set of studied soils.
- A significant source of from the POPs load is the emission load present and more significant in the proximity of industrial centres and agglomerations and in the emission regions. It is manifested by the rise in the PAHs sum content and by the increase of the I-TEQ PCDDs/Fs value in soils. Significant differences were observed among individual regions regarding the load by the individual substances from the PAHs group with the increase of the

flouroanthrene in general. Higher levels of PAHs and PCDDs/Fs, especially of the highly chlorinated isomers (hexa-, hepta- and ortho- chlorinated), were detected in the localities with the occurrence of the chemical industry. No increase of the 6 PCBs congener sum was found in emission regions, as the PCBs origin in soils apparently does not depend on the intensity of the imission load and it does not exhibit the field trend of the penetration into the soils.

- The increase of some PAHs content was observed in soils withdrawn in the proximity of the countryside municipalities, as the imperfect combustion of the solid and of fossil fuels in households represents a significant source of the PAHs pollution being also shown in the soils.
- A higher PAHs and PCDDs/Fs exposure was noted in such soils that are at higher altitudes. It is especially apparent in the mountainous terrain in the proximity of the emission sources (Krušné hory (Ore Mountains), Moravskoslezské Beskydy, Jizerské hory);However, the long-distance transfer of PAHs and PCDDs/Fs was also detected in relatively clean sites (Šumava).

Despite the termination of the DDT use, some locally increased contents of its residues occur on the territory of the entire CR, namely in the districts with the intensive agricultural production.

R-T&A projects focused on the soil contamination

The POPs monitoring in soils of the Czech Republic is also a part of the TOCOEN project and of its subprojects - the TOCOEN/REGIONAL MONITORING (regional POPs background monitoring in the Košetice observatory), TOCOEN/IDRIS (the soils in the Zlín region); TOCOEN/Mountains (soil and forest ecosystems in the border mountain regions) and soils in the proximity of industrial sources (TOCOEN/Surroundings of model sources).

The regional background monitoring of PBTs (POPs) as a part of the TOCOEN (Toxic Organic COmpounds in the ENvironment) project has been carried out at the Košetice observatory since 1988. This monitoring is a part of the long-term cooperation between the CHMI with the RECETOX - TOCOEN & Associates. The TOCOEN project is a long-term environmental research project comprising a number of Czech and foreign universities and institutions.

This part of the TOCOEN project is aimed at the study of the contamination of the mountain spruce ecosystems and in this framework a contents and the distribution of POPs in soils, needles and partially also in the atmosphere were monitored. The fundamental goal of this research is the long-range transfer of such compounds above the territory of the CR, their secondary reactions in the forest soils and the monitoring of their occurrence in such ecosystems.

One of the fundamental parts of this long-term strategy of the TOCOEN project is the POPs monitoring in the proximity of selected industrial sources or in industrial regions with a high concentration of settlements and of industry (Project TOCOEN/Surroundings of model sources); the soil is the basic component of the environment that is used for this purpose.

The RECETOX MU laboratory has analysed the soil samples from the selected areas of the Czech Republic to determine further POP pesticides pursuant to the SC (toxaphene, driens) in the framework of the preparation the National POPs Inventory. Even in the case of these substances, it is possible to observe higher amounts in the mountain localities caused by the long-distance transport, the stripping effect of the forest and by the accumulation in the forest soil due to the high content of the organic carbon.

The monitored pesticides had not been in use for more than 20 years, however, there are still detected in a number of localities, namely in the mountain ecosystems, as a result of their persisting long-range transfer.

The results from the above-mentioned projects and studies are archived in the TOCOEN project archive and they are partially available at: http://recetox.chemi.muni.cz/.

.A 6.4 The POPs occurrence in the sludge

The production of the sludge from the WWTP, classified as waste, in the CR increases and it is expected to attain more than 300 000 tons of the dry matter in the future years. Similarly to other European countries, this material is considered a source of the organic matter and of nutrients, namely of the nitrogen and phosphorus. Due to the existing shortage of the supply of such elements into the soil caused by the low number of breed animals and by the decrease of the sites where the clover and feed crops are produced, the potential of the application of the sludge from the WWTP in agriculture is not only the economically suitable way of the reuse of this waste, but also one of the possibilities how to return the missing compounds to the soil. This path, however, is also the potential entry of the risk elements and compounds contained in the sludge to the soil and possibly, to other constituents of the environment. As laid down by the proposal of the EU Directive a potential risk of the following organic pollutants may result from the reuse of the sludge:

- PCBs (polychlorinated biphenyls),
- PAHs (polyaromatic hydrocarbons),
- PCDDs/Fs (Polychlorinated dibenzodioxines and dibenzofuranes),
- LAS (Linear alkylbenzensulphonates),
- DEPH (Di(2-ethylhexyl)phtalate), NPE (compounds of the nonylphenol and of nonylphenolethoxalates with one or two ethoxy groups)

The CISTA is entrusted by the Ministry of Agriculture to execute the control of the content of the risk elements and of the risk substances in the soils where the WWTP sludge was applied.

Conclusions

- The PAHs content was determined in the 35 samples of the sludge in 2004.
- The sum of the 15 PAHs ranges 1,4 – 59,1 $\mu g.g^{-1}$, the median of the set is 6,9 $\mu g.g^{-1}$ and the average value 10,4 $\mu g.g^{-1}$. In comparison with the 2003 the median of the 15 PAHs sum increased by the 0,8 $\mu g.g^{-1}$ (13 %), and the simple average values increased by the 0,3 $mg.kg^{-1}$ (3 %); however it constitutes a 16,8% decrease in the case of the simple average and the 11,5% decrease for the median when considering the year 2000 when the analyses of the PAHs in the WWTP sludge have begun. The fluoroanthrene, pyrene and phenantrene are the most readily detected PAH within the 2000-2004 period, representing 16,7, 15,2 and 9,7 per cent in the sum of the 15 PAHs respectively.
- The comparison of the PAHs contents in the sludge determined over the monitored five years period took place in those WWTPs where the PAHs were determined at least three times. This comparison suggests that there is a slightly decreasing trend for 23 WWTPs, but due to the fact that the set is relatively small and the chronological entity data is not long enough, it is not possible to consider the findings as probative evidence.
- The limit value stipulated by the proposal of the EU Directive for the sum of 11 selected PAHs exceeded 14 out of 35 analyzed samples, i.e. 40 %. The polychlorinated biphenyl content was determined in the 37 samples of the sludge in 2001. The sum of the 6 PCBs congeners fluctuates between the 80 – 1 587 ng $PCBs.g^{-1}$ the simple average reached 228 ng $PCBs.g^{-1}$ and the median was 156 ng $PCBs.g^{-1}$ in 2001.
- The main statistical parameters of the sludge samples withdrawn in 2001 are always higher than the corresponding parameters of the total set of 209 samples analyzed since 1998; i.e. by the 12% for the simple average, by 7% for the median. The 10^{th} percentile is higher by 21% and 90^{th} percentile is higher by 5%. We can say that the PCBs content in the WWTP sludge is slightly increasing.

- The limit value for the sludge application onto the agricultural land stipulated by the Decree no. 382/2001 Coll. was exceeded by 3 samples, i.e. 8% of the total amount of analyzed samples.
- The polychlorinated biphenyl content was analyzed in 35 samples of the sludge in 2004. The sum of 7 PCBs congeners is fluctuating in the range of the 46,6 to 1812,7 $ng.g^{-1}$, the simple average reached 235,0 $ng.g^{-1}$ and median is 116,6 $ng.g^{-1}$ in 2004.
- The comparison of the 2004 with the average of the 1998-2003: the simple average is higher by the 32,7 $ng.g^{-1}$, i.e. 16,2%, the median decreased by 26,7%, i.e. by the 42,4 $ng.g^{-1}$. The 10^{th} percentile is higher by 3,50 $ng.g^{-1}$ (4,7%) but the 90^{th} percentile have increased by the 115,3 $ng.g^{-1}$ (31,2 %).
- Two samples withdrawn in the 2004 exceeded the limit value (PCBs sum for the sludge application on the agricultural soils as stipulated by the Decree no. 382/2001 Coll.
- AOX were determined in the 35 sludge samples in 2004
- The median of AOX content of the sample set from 2004 is 214 $\mu g.g^{-1}$, the simple average 237 $\mu g.g^{-1}$. In this year the AOX content in the WWTP sludge decreased by the 18 $\mu g.g^{-1}$ (7,1 %) in the case of the simple average and by the 17 $\mu g.g^{-1}$ (7,4 %) in case of the median.
- Limit value 500 $\mu g.g^{-1}$ was not trespassed by any sample in the 2004.

A6.5 Active CISTA biomonitoring

The verification of the methodology of the active biomonitoring for the monitoring of the background load of the locality was carried out at the selected sites between 1997-1999. The measurement at both relatively low loaded and significantly loaded localities was performed within the method verification. The continuous monitoring of the localities with low background load was started to gain sufficiently relevant values of the real background in the particular locality when the method verification was terminated. The rye-grass with a monthly withdrawal of the green matter and the black pine with one yearly or one half-a-year withdrawal of the one-year-old needles were used.

The PAHs content was also determined in addition to the monitoring of the selected elements. There are 15 individual PAHs tabled. PCDDs/Fs were also determined in the samples withdrawn in 2001. Comparing the PAHs and PCDDs/Fs contents from variously loaded sites resulted into the fact that using the active biomonitoring method is suitable for the examination of the imission load of the particular locality. The long term monitoring, that is currently at its beginning, could, after the enlargement of the monitoring sites and after the increase of the number monitored pollutants, provide the data allowing the estimation of the exposure of the agricultural production. The results are currently available in the form of the internal final reports at the CISTA Department of the Agrochemistry, soil and the plant nutrition and in some cases they are available only in the form of the measurement protocols.

The biomonitoring is using the needles, moss and eventually the earthworms (as previously used in a part of the long-term activities of the TOCOEN Project). It is carried out in the framework of the regional background POPs monitoring at the Košetice observatory, furthermore in the framework of the subproject Mountains focused on the monitoring of the long-range transfer of POPs in the mountain regions of the CR and it had been also carried out in the proximity of the selected industrial sources or in industrial regions at the beginning of the 1990s.

ANNEX 7

CONTAMINATION OF FOODS AND OF VETERINARY COMMODITIES

A7.1 POPs content in feeds and feedstuffs

The CISTA have already performed some research that should optimize the method of the PCBs determination in various matrices (feeds, feedstuffs, raw materials, mineral feeds additives etc) as well as perform the pilot research on the content of selected POPs in materials that are the most frequently monitored due to the potential contamination (bone-meal and fish-meal). Three samples of the copper oxide were analyzed in 2000 to define the content of 7 PCBs congeners due to the warning that came from abroad on its possible contamination. The results of all samples and all congeners were below the detection level of the method. Five bone-meal samples and five fish-meal samples were analyzed to determine the content of six PCBs congeners (28, 52, 101, 138, 153 and 180) in the same year. In 2002, two bone-meal samples, two fish-meal samples and one feed mixture were analyzed for the content of seven PCBs congeners (28, 52, 101, 118, 138, 153 and 180). Hexachlorobenzene and the sum of the DDT, DDE and DDD content expressed as DDT (in accordance with the legislative requirements) were analyzed in those samples. The PCDDs/Fs monitoring and analysis took place only in 2002 in four samples of the fish-meal, two premix samples and in four bonding material samples. The limit value was demonstrably exceeded only in one case – bentonite sample. The results have not yet been published, due to their limited size, not even in the form of the CISTA internal reports and they are available from the laboratory protocols deposited in RLO, Brno or in the Feeds Department, Prague.

The monitoring by RIASC, in the contrast to the CISTA monitoring, is focused on the bulk feeds that CISTA have not monitored. The RIASC data can complement also, to a certain extent, the results of the active biomonitoring of the CISTA, where a plant material was also studied. However, due to the difference in the methodology the data aggregation will most likely be not possible.

The POPs load in the plants does not show any field contamination in monitored regions by none group of the monitored compounds. Some higher POPs content spots in plants were found, outspread to the determined upper level of the background values. The existing legislative standards (the Decree no. 194/1996 Coll.) were not exceeded. It was noted that the soil and plant POPs loads are in accordance with the framework of the monitored districts and regions, however only a low dependence of those contents on the particular locations was detected. Therefore we derive the high dependence of the POPs content in plants on the atmospheric deposition, or eventually on other entries to the plants except the root system. The transfer path soil-plant was found only marginal in the case of monitored POPs.

A7.2 Assessment of the POPs occurrence in selected veterinary commodities (feeds and animal products)

The assessment of the POPs occurrence in the selected veterinary commodities (feeds, animal products) has brought the following conclusions according to the particular investigation matrices and trend charts:

a) Dominating contaminant in animals:

- polychlorinated biphenyls (PCBs) especially for the cattle but also for pigs ;
- chlorinated pesticides (DDTs, lindan, HCB) and PCBs in game and wild birds;
- DDTs and PCBs in freshwater fish;

- aldrin, dieldrin, heptachlor, α+β-HCHs were not, with the exception of the individual cases, relevant from the veterinary-hygienic point of view.

b) Main source of the contamination in animals:

- Contaminated bulk feeds, cereals and feed mixtures in the case of the cattle;
- Cereals and feed mixtures in the case of pigs and poultry;
- Contaminated waters in case of the fresh water fish and water fowls;
- Contaminated environment and the food niches in the case of the game and of the bioindicators.

c) Primary sources of the feeds, environment or directly animal contamination

- Technical raw materials containing PCBs (coating compositions, insulation materials, hydraulic oils etc.) used in the environment of animal farms;
- Contaminated environment of the shredder plants, feeds and feedstock storage rooms at the animal farms after the manipulation with pesticides;
- Industrial accidents with the PCBs leaks to the water drainage and to the water reservoirs, draw-off the waste from the industrial production into the drainage and to the sludge ponds, consequence of the wash-outs of the chlorinated pesticides contaminated soil after the heavy precipitations, wash away of the industrial waste spoil-tips of the agrochemicals, of communal waste after floods, artificially created water reservoirs on the spots with the previous intensive agricultural control and with the use of agrochemicals;
- Use of chlorinated pesticide compounds on the agricultural land and in the forest environment and thereby loading the food niches of the wildlife, including the contamination of the surface waters (pools and sumps) used to imbibe by the animals.

d) Persisting danger influences:

- not yet removed and wrongly liquidated materials containing PCBs in the environment, release of the PCBs form the unsafe storage of materials containing such compounds, especially during floods;
- Leaks of organochlorinated compounds from landfills of various characters into the surface waters (floods, heavy precipitations), leakage to the ground waters;
- Uncover of materials containing PCBs in stables (during their reconstruction and adjustment) that used to be only recovered by other harmless material;
- Not yet removed agrochemicals containing organochlorinated compounds “temporarily” stored;
- Reutilization of the device for the feeds and feed materials storage that had already been shut down due to the detected irremovable PCBs contamination (old bunkers) re-use of the long time unused stables where a materials with the PCBs content may exist;
- Import of contaminated animals, feeds and feeds components from abroad.

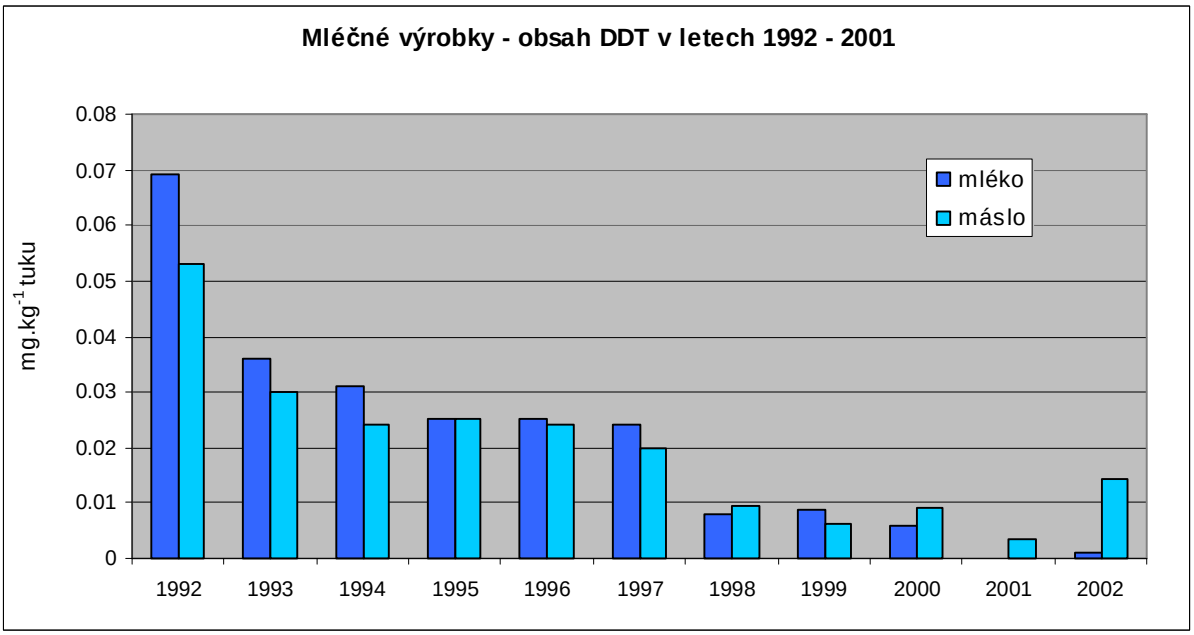
If all materials are not definitely and harmlessly removed (PCBs, chlorinated pesticides) or they are not safely deposited and or their use is not restricted exclusively to the defined closed systems (PCBs), it is not possible to exclude, however, rare, though hygienically serious cases of the feed contamination, and of the materials of the animal origin including freshwater fish and game. The inventory of all potential sources of such compounds, harmful to the environment, to animals and to humans, should contribute to reach this goal.

A7.3 Planned controls by SZPI CR of the heterogenous substances in the foods

In the framework of the planned control by the CAFI there were 22 594 analyses to determine the presence of contaminants of pesticide residues in foods of the plant or animal origin in 2001. Though there were only 48 samples out of the total amount exceeded the valid limit or value of the maximum level of residues. The unsatisfactory samples were only of the plant origin, but the value expressing the proportion of these samples is significantly lower in comparison to the previous years. No unsatisfactory sample of animal origin was found in 2001 (see the chart A7-1).

The planned control framework of heterogenous substances performed 96 756 analyses to determine the presence of contaminants or pesticide residues in foods of the plant and animal origins in 2002. There were 66 cases exceeding the limit or the maximum residual level; there were only samples of the plant origin. The value representing the proportion of the unsatisfactory samples to the total number was, in 2002, the lowest within the monitored period 1992-2002.

Chart A7-1: Dairy products - DDT content within 1992-2002, expressed in $mg_{*}kg^{-1}$ of fat (milk – dark blue, butter – turquoise)



The CAFI provides the long-lasting monitoring of the PCBs presence in milk and dairy products. The highest admissible value is laid down by the Decree no. 298/1997 Coll., in the wording of the later regulations. This hygienic limit allows the maximum of the PCBs to 0,3 $\mu g.g^{-1}$ in listed commodities. In 2001 were the average PCBs values in milk and butter (expressed as the sum of congeners) about 100 times lower than the above mentioned hygienic limit.

The percentage of the positive findings of PCBs congeners in butter, milk or cheese was relatively high, the average levels, expressed as sum of the polychlorinated biphenyls, were still well below the hygienic limit in 2002. This limit allows a maximum of 0,1 $\mu g.g^{-1}$ fat in the above mentioned commodities. The average level of the PCBs in butter ranged to 0,0082 $\mu g.g^{-1}$ fats, for milk it was 0,0153 $\mu g.g^{-1}$ fat.

The presence of polychlorinated dibenzo-p-dioxines and dibenzofuranes (PCDDs/Fs) was analyzed in 10 samples of both plant (vegetable oils) and animal origin (cheese, fish and meat conserves) in 2001. The dioxine control was performed by the screening to evaluate the levels of such compounds in selected commodities. However, the results of analyses could not be evaluated, as no valid limit had

been laid down in the Czech legal provisions, or in the EU regulations. The analyses have proven that those compounds occur in the monitored commodities. Their quantity was presented in the sum of polychlorinated biphenyls, PCDDs and PCDFs and it is expressed in pg TEQ.g-1 of the sample (note: the TEQ value is gained by the addition of individual PCDDs/Fs concentrations multiplied by the I-TEF value, i.e. international toxicity factor). Analyzed samples of vegetable oils have shown from 0,76 to 1,2 pg TEQ.g^{-1} of the sample and for foods samples of the animal origin the levels yielded to 0,98 to 5,5 pg TEQ.g^{-1} of fat.

The monitoring of heterogenous substances has used 10 fish samples to investigate the PCDDs/Fs content in 2002. The polychlorinated biphenyl levels were also studied. The sums of the PCDDs/Fs per gram of the sample were compared to the limit stemming from the EU Regulation no. 2001/466/EC laying down limits for some food contaminants. This Regulation sets the maximum limit for dioxins (expressed as the PCDDs/Fs sum) in the fish meat and in the products made from fish to 4 pg TEQ.g^{-1} of the sample. The detected values reached 0,16 to 1,0 pg TEQ.g^{-1} of the sample, i.e. the measured values of all fish samples were found to be below this limit.

ANNEX 8
POPS LOAD ON THE CZECH POPULATION

A8.1 PCBs Monitoring

The sum of the PCBs breast milk and subcutaneous fats analysis in the results published in 1980s manifested a relatively high load of the Czech population. The results of the 2nd round of the international WHO study, that the CR took part in at the beginning of the 1990s, have equally pointed out the high concentration of the PCBs indicator congeners in the sample of the loaded district - Uherské Hradiště - being substantially higher than those in the reference district (Kladno) or, than those found in the surrounding countries (Austria, Germany, Hungary). Similarly high concentrations were also found in Michalovce district, Slovakia (nearby the PCBs producing plant of Chemko Strážske) and in the Hudson Bay, Canada[1] (consumption of the contaminated fish). We can assume that the main reason of the high exposure of the Czech population was the PCBs production in the Slovak part of the former Czechoslovakia, intensive industrial use of the technical mixtures and the factor of the human failure in the manipulation and removal of such compounds.

Monitoring activities established in 1990s, namely the Health Monitoring System of the population in relation to the environment (MZSO), were aimed at the verification of the field or local exposure, i.e. to verify the exposure of the population and to monitor the long term trends. The results have confirmed the important age dependence of the PCBs values in the organism, significant results variability and a possibility of the local differences, as had already been stated in the WHO report. The PCBs concentrations in the fats of the Czech population have generally corresponded to the values found in some other industrial countries (i.e. Germany). The MZSO results demonstrated that a higher load may, except Uherské Hradiště, also exhibit the Ústí n. L region, where a significantly higher PCBs concentrations, in relation to other 3 monitoring localities, were found. Higher PCBs concentrations in the Ústí n. L district have also been confirmed by the Vav/520/6/99 study. It can be assumed that a higher load could be also detected in other, namely in industrial localities, as Ostrava-Karviná district, but where the number of analyzed samples was significantly higher. However, a positive is the fact that the results of the PCBs analysis in the breast milk samples examined in the MZSO scope since 1994 have documented the gradually decreasing trend in the concentration of the indicator congeners 138, 153 and 180 constituting the highest fraction in the total of the PCBs in the human organism. The absence of the decrease in the PCBs concentration in the 2nd and 3rd round of the WHO study (only about 4,5% decrease between the samples of the 1992 and 2000) could be related to the very low quantity of individual samples (10 and 14 respectively) used for the preparation of the combined source from a locality. It is to be noted that PCBs values in the Liberec district, included in the WHO study in 2000, are relatively low and correspond to the concentrations measured in the unburdened districts.

If it is valid that, PCBs138, 153 a 180 cover about 60 % of the total PCBs concentration and that for the PCBs sum estimation a conversion coefficient of 1,7 is used, than it can be reasoned from the comparison of the PCBs breast milk total of the 1985 with the indicator congeners in 1994 (i.e. 10 years after the PCBs production ban). Corresponding, i.e. 60% decrease of the PCBs concentration in the fats of the Czech population was observed in the samples of the breast milk monitored in the period 1994-2001. As the concentrations of 138, 153, and 180 congeners in the body liquids and tissues are closely correlated (r~0.9 and higher) and the 153 congener‘s concentration is usually the highest, it would be possible to consider only the use of the concentration of this congener to express the PCBs level in the organism.

Results of the PCBs analysis in the navel serum and placenta significantly correlated with the results of the breast milk concentrations and had confirmed the possibility of the transplacentar PCBs transfer

[1] Both WHO/ECEH, 1996

practically without barriers. Higher values of the navel serum samples from the Ústí n. L. confirm the higher load of this locality.

The use of the placental tissue and of the navel blood would be useful namely for the targeted epidemiologic studies, as the PCBs analysis in livers could bring the important information in the biotransformation and toxic-kinetic studies. And in the contrast to the other matrices the indicator PCBs congeners with lower IUPAC number, namely PCBs 52 (median was determinable in more than 50% of the samples of the liver tissue 26 $ng.g^{-1}$ lipids), 101 (median 12 $ng.g^{-1}$ lipids) and 118 (median 16 $ng.g^{-1}$ lipids). The PCBs concentration in livers is not readily available in the literature.

The determination of lower (of at least one order) PCBs concentrations in the cerebral tissues in comparison to the subcutaneous fats proves the partly hindered transmission of these compounds by the hematoencephalic barrier. The level of the indicator congeners in the subcutaneous fatty tissue of the dead was significantly correlated with age. The values for 50 years old and older were proven to be significantly higher than those in the group of younger than 50 years old. Nevertheless the exposure evaluation according to the gender or domicile is significantly influenced by the different number of people from particular localities, unbalanced proportion of men and women and also by the age differences in the individual categories and therefore the significant differences from the point of the time, domicile or the gender are hard to assess.

A8.2 Organochlorinated pesticides (OCPs)

Selected chlorinated pesticides, namely DDTs and HCB, are usually analyzed in the body fluids and tissues (the most frequently the breast milk and the subcutaneous fats) together with the PCBs sum or with the indicator PCBs congeners.

The monitoring results of the HCB and S DDTs in the breast milk follow the decrease of these compounds in the fatty tissues of the Czech population observed already in the 1980s after their ban. In the course of the monitoring is apparent the decreasing trend of both analytes in the breast milk with the exception of the DDTs increase in the breast milk samples from the 2001, that could be either caused by the incidental fluctuation, by the increase of the exposure without known cause or by the change of the analytical laboratory in the 2000. The HCB level in the organism has to be considered also in the connection with the potential dioxine effect of this compound. (TEF = 0,0001).

The concentrations of other analyzed chlorinated pesticides (α, β and γ-HCH, aldrin, dieldrin, endrin and endosulphan) do not exhibit the time dependence and they are usually under the detection level of the used method. The results gained in the VAV 520/6/99 project confirm the significant individual and also local data variability. The interpretation of results is, however limited by the small number of analyzed samples in particular localities.

The values of the mentioned chlorinated pesticides in the placenta were correlated to the data found in the breast milk. The important individual variability of results, the incoherence in the number of samples among localities and also the technical demand of the withdrawals lead to the termination of the withdrawals and POPs analyses in the placenta.

The age dependency is the cause of higher chlorinated pesticide concentrations in the subcutaneous fats in comparison with the results of the breast milk, the long term trends based on the results of the analysis of the subcutaneous fats cannot be seriously estimated due to the number of the uncertainty connected with the data on deceased (age, real domicile, professional exposure, dietary behaviour etc.).

A 8.3 Monitoring PCDDs/Fs/DL PCBs

PCDDs/Fs/DLPCBs concentration in the breast milk of the Czech population, i.e. the corresponding WHO-TEQ values, is coherent to the results of the EU countries[2]. The industrial localities exhibit 10-13 pg.g-1 lipids in the breast milk as the I-TEQ level[3], when recalculated to the WHO-TEF values, they are about 1-2 pg higher. The concentration of the 2,3,7,8 TCDD in the breast milk range around the 1 $pg.g^{-1}$ of the lipids. With respect to the newly established WHO-TEF for the 1,2,3,7,8-PeCDD (WHO-TEF=1) which makes it to take the highest fraction in the PCDDs group, the 90 % fraction of the PCDFs group is taken by the 2,3,4,7,8-PeCDF congener.

PCBs with the dioxine effect contribute by more than 60% to the total WHO-TEQ value, the largest proportion is composed of the 156 and 126 PCBs. The results of the 2nd and 3rd round of the WHO study state that the WHO-TEQ value have decreased by the 27% in the breast milk samples from un-exposed locality Kladno and by 43% in the exposed locality Uherské Hradiště between 1992 and 2000. However, the results of the WHO study in the 3rd round do warn the higher PCBs and DL PCBs load of the Czech population. The WHO-TEF concentrations of the subcutaneous fats 2-3 times higher than those in the breast milk correspond to the age difference of the studied groups and to the demonstrated increase of the load with the increasing age.

[2] Summary Report, 1999

[3] WHO, 1998

ANNEX 9

EXAMPLE OF THE POTENTIAL EDUCATION AND AWARENESS PROGRAMME

Programme for education and promotion of environmental protection in the handling of PCBs (or POPs contaminated)

Main target groups

It is useful to provide enlightenment associated with the POPs issue, as well as with the waste contaminated by these compounds in general and by PCBs in particular for these groups:

a) The younger generation including school-aged children up to the university students. This target group should be considered especially significant, because it can be assumed that with the continuous systematic education, they will constitute the generation having the necessary knowledge of the context and having the corresponding emotional relations to the environmental matters;

b) Workers in facilities where PCBs were used. This primarily includes:

- electric units with transformers, condensers, storage and delivery surfaces in factories, where these devices are used or stored after the end of their operational life. These operational units are highly significant in mines, railways, etc., where such devices containing PCBs were often used;
- operations requiring hydraulic devices with oils containing a higher content of PCBs;
- workers in the units where hydraulic devices containing oils with higher PCBs content are used;
- units for the maintenance and repairs of electric devices, scrap metal companies (Kovošrot) and similar factories, where the electric devices with oil fillings that may contain PCBs are repaired and dismantled;
- waste landfills, where the waste containing PCBs, especially scrapings (sands from blasting) from the silage gutters painted by paints containing PCBs, insulation materials from transformers, emptied and incompletely concrete-re-filled condensers, etc.;
- devices where used and waste oils from the enterprise collecting network are incinerated as well as oils collected at refilling stations, at service stations, etc.;
- operators of collection points at the refilling stations where used oils are recollected, of operational units of the oil management of large corporations, where exists a factual chance of the contamination by polychlorinated biphenyls from transformers, hydraulic oils, heat-transfer fluids, etc.;
- workers in agricultural companies (namely former ACHP), where remainders of paints containing PCBs, scrapings, etc. may still be stored;

c) Similarly, workers in operational units, where OCPs were stored;

d) The management of industrial and transportation companies, specialists from the Environmental Departments, etc., who should influence the application of the regulations on PCBs in given domain. Current tasks concern not only the removal of the still existing PCBs containing waste, but also the emptied transformers and other electronic devices, where the PCBs-containing oils were released from (disabling of so-called „carcasses“, or remnants);

e) Specialised workers, dealing with the disposal of PCB-containing wastes. In spite of the fact that we expect the competition among competing enterprises and organizations will hinder the reporting the significant economic data, there are a number of common interests concerning, for example, the analytical procedures, legislative matters, information from abroad, etc. Acquaintance with these and other background material is advisable;

f) The general public, including workers in the district and municipal administrations, who must be informed about the rudimentary connections, especially regarding the accumulation of PCBs at the end of the food chain with the risk of the ground water contamination, with the risk of the PCDDs/Fs formation during the combustion of wastes containing PCBs, and whom the information about realistic procedures when dealing with these wastes, including the list of the authorized worksites for analysis, etc. must be made available to.

It is necessary to establish differentiated methods for providing the above-mentioned target groups with information and promoting the enlightenment. In the first approach, several topics can be presented:

1) Schools

For ***elementary schools*** it is appropriate to focus on an accessible explanation of the main terms and approaches for the given age level (examples of POPs and their effects on the ecosystem health and the need for their underpinning, isolation, and disposal, and finally to that what the children can do themselves).

For ***vocational schools and universities,*** it is necessary to provide information corresponding to the level of knowledge in chemistry, biology, and other subjects, but in fact, already at the level of the National POPs Inventory and of the specialised principles of the POPs issue. The best formats providing this information would be the utilisation of qualified background documents prepared at certain universities dealing with the POPs matters and whose information is available on the Internet (RECETOX of Masaryk University in Brno, Institute of Chemical Technology in Prague and University Pardubice). A valuable background documents can be obtained from the relevant environmental institutions of developed countries (Germany, Netherlands, USA), where a number of information materials in this field is published. To clarify the optimum content of such informative materials, and methods of their acquiring, it would be effective to define such program on the basis of the negotiation of the MoE with the representatives of these schools. Specific information about the state of awareness is supplied by the National POPs Centre.

2) National Administration and regional and municipal authorities

Employees of such authorities need the summary of information of the similar scope as for the vocational and secondary schools, eventually as for universities. In addition to this they need to dispose of the expert information and the interpretation of regulations that are, in much larger scope than it is provided by the Bulletin of the MoE (Zpravodaj), published by the national environmental authorities of the developed countries.

3) The programme of promotional and enlightenment activities should include:

a) The introductory phase, that would contribute to the clarification of the goals and principal objectives of the Stockholm Convention, of the POPs UN ECE Protocol and of the EU/EC Directives. To the large extent, a real information from the documents by EU countries may be used;

b) Coordinated programme for the media, in particular:

- specialised journals on the environment (Air Protection, Water Management, Wastes) as well as commercial magazines (EcoJournal and others);
- generally oriented technical and popular science magazines (Technical Weekly, T95, Space, etc.), which comprise a significant part of the technically oriented public;
- weeklies and dailies should, depending on their orientation, present relevantly balanced positive information regarding the opportunities of the qualified treatment of hazardous waste and related problems (for example the metal recycling from electro-technical devices, oil management of used and waste oils) involving danger to the ecosystems due to the POPs input etc. Simultaneously, they should present, to an appropriate extent, the information on the impact and redevelopment costs and on the causes of the POPs (PCBs) waste release into the environment;
- television journalism represents the most powerful medium having the largest impact on the population due to its clearness, and in the case of the right choice of reporters and speakers it is also the most convincing.

We recommend that television programmes employ relevant topics touching, in general, POPs, SC and its impact, POPs wastes related to some extent to used and waste oils and to the wastes of chlorine chemistry, household and animal breeding wastes, risks associated with the PCDDs/Fs, namely concerning the combustion of wastes in households.

It is possible to consider, for example:

- introductory programme indicating the opening phase of the Enlightening and Promotion Campaign associated with the SC implementation under the Czech conditions and its consequences;
- use of short clips of the type „Ecology Minutes“, for example, What are POPs; Where to Dispose the Problematic Wastes; What Can Citizens Do; What Must the Industry Do; What Must the State Administration Do; What Can Be Disposed of at the landfills; etc.;
- Discussions linked to the projections of films on POPs (OCPs, PCBs, waste containing POPs and their health impact); and in a broader context, the issue of the chlorine chemistry products and in an even broader context, provide support for the drafted legislation.

The preparation of the television programme is, in comparison to other media, significantly more expensive. Therefore, it is advisable to have prepared the intent that is using the rational forms of the TV enlightenment and promotion by a specialized company dealing with targeted publicity, commercial, enlightening and educational projects based on analyses of the advertised purpose together with the proposal of the optimum organizational and economic realisation. Due to the fact that this requires a specific knowledge of the TV work, organizational back-up when preparing the particular topics as well as the experience in verification of the efficiency of the prepared programmes, it is advisable to entrust a company that has previously cooperated with the MoE, or to prepare a public procurement. However, in both cases it is important to clarify what amount of financial resources from the resources intended to the POPs removal would be available for the enlightenment and education promotion. It would be equally suitable to determine whether other organisations, such as MoIaT or the State Fund of the Environmental Policy (SFŽP,

that in general, is able to finance these types of activities), could be involved in this Enlightenment and Promotion Education Programme.

4) Specialised preparation and publication of principal documents

The highest priority is given to the preparation of the final version of the National Implementation Plan as the Government Order.

ANNEX 10

POPS PRIORITIES IN THE CZECH REPUBLIC – BACKGROUND DOCUMENTS FOR THE PRIORITY SETTING WORKSHOP, 12 MARCH 2003, BRNO

„Top“ Priorities:

- Hot spots Inventory, inventory of old burdens - in the context of the potentiality of natural disaster effects
- Hot Spots Elimination
- PCBs/OCPs Inventory - the completion in the framework of the regional waste concepts
- „Codification “ in the NIP framework
- PAHs issue must be given a special attention
- Conducting POPs inventory – proposal of possible legislative measures
- Technical solutions of the priorities - hot spots, emissions, landfills, obsolete technologies, decontamination of the territory
- Emission inventory – continuous matter based on the reporting to UNECE; inventory of entries into other constituents of the environment
- Information and Evaluation System for the impact assessment of the SC implementation
- Establishment of the National POPs Centre
- Establishment of the permanent expert group on the POPs matters (either under the auspices of the agency or of team for the NPOPsINV)
- Monitoring system
- Targeted research

Priority Summary – based on the NPOPsINV Conclusions

- Assumption– the reporting obligations of the PCBs occurrence and of the materials contaminated by the PCBs on the territory of the CR as laid down by the legislation would be usable in the precise balance of the PCBs occurrence in the installations, devices and storage rooms (April 2003).
- It is not possible to use the database of the Information System on Wastes, nor of the Information system on chemicals, nor of the Information system on the air pollution sources **to identify sources of the potential pollution of the environment**, as the monitored substances do not fall among the substances namely listed in the above mentioned databases.

- The Spolana Neratovice in the Mělník district was identified as the locality with the significant occurrence of the PCDDs/Fs in the framework of the official reports of the regional authorities.
- The landfills of the Association for Chemical and Metallurgic Production, Ltd., Ústí nad Labem in Chabařovice (operation terminated) and in Všebořice (operational) in the district of the Ústí nad Labem were identified as localities with the significant occurrence of the HCB. Contamination by HCB was confirmed in the closed-down production unit on-site of the Spolana Neratovice, but the HCB occurrence can be expected also at the Solana's landfill.
- Monitored pesticides have contaminated the STS Slatiňany landfill, Hodonín, in the Chrudim district, and the former pesticide storage rooms in Šebáňovice and Václavice in the district of Benešov.
- The occurrence of the DDT, namely, can be expected in many old, closed down, landfills with the uncontrolled regime and to the lesser extent in a number of sites where pesticides were disposed by the once used method – by the discharging or by the emptying into the ground rills.
- Lhenice and others (CEI and MoE).
- In case of the further interest in the refining of information on the occurrence of monitored substances, it would be suitable to support the recording by a regulation, that would impose some kind of the reporting duty to the physical persons as well as to the state institutions or some internal rules in the controlling institutions and in the national administration**.**
- More information could be obtained from the inclusion of some of the monitored substances into the standard monitoring, eventually even via one-time event.
- The inaccuracy in the records (as yet incomplete registration), lack of knowledge of operators, uncontrolled separated collection, possibility to replace them by mistake with other oil fluids, unsuitable storage rooms, missing installations for the handling the electronic devices, that cannot be decontaminated by incineration without preceding dismantling and without the separation of the metallic parts are considered to be **the key problems concerning waste containing PCBs/PCTs.**
- Proposal of the National Plan <u>for Handling Hazardous Waste identified</u> the three above mentioned waste streams with PCBs content, that are closely interrelated. Therefore an integrated proposal of all three streams was proposed. The plan should include:
    1. The Inventory (the devices containing PCBs being subject to record keeping are governed by the Act No. 185/2001 on Waste, § 26; the method of the recording, including the standard registration form laid down by the Decree of the Ministry of Environment No. 384/2001 on handling PCBs.
    2. Logistics (collection, transportation, laboratory control).
    3. Estimation of the adequacy in capacities for the incineration and regeneration of oils (including the limit PCBs concentration for regeneration).
    4. Plan for dealing with the secondary wastes contaminated by PCBs arising in the removal and shutting-down the devices (not by the historical contamination).
- Proposal of the National Plan <u>for Handling Hazardous Waste contains a proposal of the technical-organisational rules of the handling the waste containing PCBs/PCTs</u>:
    1. Owners of devices containing PCBs are required to prevent the release of the fillings into the environment, to noticeably label the device, and to prohibit the access of unauthorised persons. It is recommended to adopt EN 50 195 and EN 50 225 as BAT to the prevention of the formation of the secondary waste.

2. All devices must be registered, and regularly inspected by the owner (mechanical damage, tightness). The inspection is performed visually every three months. If the wet stains on the installation or on the floor are present, an outage must be decided. Repairs comprising the refilling of the missing fillings are forbidden.
3. All waste created during the inspection, maintenance and dismantling of the device must be stored in locked areas alike the eliminated devices. Those devices and waste containing containers must be checked regularly, to prevent the release into the environment (by the evaporation, washing with the precipitations).
4. The combustion at temperatures higher than 1 200 °C (residence time of 2 s, for the removal of the PCDDs/Fs from the flue gasses) is considered as the standard technology, that may serve as the reference method.

- The proposal of the National Plan for Handling the Hazardous Waste establishes specific obligations concerning waste containing PCBs/PCTs, to the public administration:
  1. Perform inspection of owners of devices and wastes, of persons transporting devices containing PCBs and of those persons dealing with waste containing or contaminated by PCBs (regional authorities, Czech Environmental Inspectorates).
  2. Perform revision of authorisations. The appropriateness of the method used and of the facility for the given type of waste, the method of handling the secondary waste and the waste waters, emissions into the atmosphere, the fire or explosion risks (for example sodium methods) with the subsequent contamination of the environment, must be assessed (Regional offices, Ministry of Environment) for the operation of a particular facility.

- The existing background materials and information, serving as the basis for the drafting of the National Plan for the handling hazardous waste by a large working group of experts together with the multilevel commentary procedures and by the discussions with experts and stakeholders, are, in the field of the waste containing PCBs/PCTs, the important part of the of the Inventory and of the National Action Plan pursuant to the implementation of the SC
- Due to the fact that the adherence to the Act No. 185/2001, Coll. (on waste) and to the MoE Decree No. 384/2001, Coll. assumes the completion of the inventory of waste containing PCBs/PCTs, as mentioned above in the paragraph on the „National Implementation Plan for Handling Waste containing PCBs“, it is recommended that the presented information is to be supplemented and specified on the basis of the final version of the National Plan for handling the dangerous waste, in the next phase of the Inventory conduct and of the National Implementation Plan for the Implementation of the SC. The National Plan for handling the hazardous waste will be created within the help of the Regional Plans for handling the hazardous waste that will further clarify the list of generators as well as the quantified data on the production of the three main streams of waste containing PCBs/PCTs.
- It is possible to assume that more significant changes of the proportions of individual categories on the total emissions or the significant restriction of the POPs emissions cannot be expected in the short term regarding the emissions into the atmosphere.
- The decrease of the POPs emissions is conditioned especially by the increase of the share of the natural gas use in households and by the more efficient waste management. Partial restriction of the POPs emissions should follow in the enforcement of the new environmental protection legislation, namely of the Act on the air (protection) and of the ACT on the integrated prevention (on IPPC). As stemming from this new legislation, all new or reconstructed devices emitting, for example POPS, fulfil the BAT requirements.
- Regarding the emissions from the transport, the POPs are either produced or transported (with a potential risk of releases).

- The processing the Emission Inventory of emissions resulting from the fuel combustion seems to be the least problematic. Emission factors, vehicle categorisation and fuel consumption are usually known.
- Releases of transported commodities falling into the POPs category are more difficult to determine. Knowing the transported quantity and the route, it is at least possible to trace back their movement within the country. The real penetration into the environment could be most likely estimated with the help of the accident reports. Even knowing the quantity of the released fuels, their POPs content is unknown and the results would have to be estimated with a large degree of the uncertainty.
- The estimates of the POPs penetration into the environment form the various traffic routes would most likely be burdened by the uncertainty dependent on uncertainties of the time and place dependence of the POPs release from the routes.
- The processing of the Inventory of the Transport Waste Liquidation (vehicle wrecks, tyres, and roads reconstruction) will most likely be loaded by the highest uncertainty, as the proper removal takes place at workplaces with different standards, including the removal of waste by the owners of the out-of service vehicles. Furthermore, the handling the sieved ground from the railroads reconstruction is variable (landfills, used to strengthen the routes, recycling).
- POP emissions from mobile sources are negatively affected by the age of the vehicle fleet in the Czech Republic. Only the replacement by the modern vehicles, equipped with the appropriate technologies of the POPs emissions reduction will contribute to the decrease of their total formation.
- The registrations of the dangerous substances of road traffic are deemed unsatisfactory.
- Army – no information of any kind is available.
- The open air – it is possible to state the existence of the decreasing trend on the basis of the long-term regional (Central Europe) measurements of the POPs imission levels. On the other hand, the PCDDs/Fs and PAHs local occurrence can attain significantly high values.
- The risk of the direct POPs penetration into the hydrosphere decreases due the termination of the proper production and use of these substances, to the construction of new waste water treatment plants, and to the more strictly provided environmental policy of the state, however, the POPs presence in the environment remains the important problem. A certain positive trends may be observed (for example lower POPs concentration in the surface waters) in some environmental constituents, however the situation is more difficult to evaluate in case of other components of the hydrosphere.
- The most loaded region, in terms of the contamination by the polycyclic aromatic hydrocarbons (PAHs), is most likely the Ostrava agglomeration.
- However problems with the PAHs contamination can also arise locally, near some industrial plants (Deza Valašské Meziříčí) or near production units were tar, creosote or similar products with a high PAH content are used.
- Any type of larger industrial agglomeration or conurbation is more burdened, due to a larger formation of the combustion gases, by the substances of the PAHs-type
- The problem of PAH contamination may also arise in particular, relatively very small localities, if they are subject to the incomplete combustion from a local source.
- The organochlorinated pesticide burden on the hydrosphere, that is DDT and its metabolites, polychlorinated cyclodienes (aldrin, endrin, dieldrin, isodrin) and isomers of HCH, is not a dramatic issue in the Czech Republic and is similar to that of the surrounding countries.

- Nevertheless, regions with some partial problems still exist. In case of the DDT and its metabolites, the region affected is obviously the one comprising the plant Spolchemie Ústí n/L being the significant point source of such pollutants even at present.
- Another locality is in the vicinity of the Spolana Neratovice plant and an increased load is exists also in certain regions of the central and southern Moravia (for example Dyje – Znojmo).
- The most serious situation concerning the presence of the HCH isomers is clearly in certain regions of central and southern Moravia.
- Regions of Moravia are, in comparison to those of the Bohemia, more loaded also by the polychlorinated cyclodienes, although in this case, the situation does not seem to that serious when considering their absolute values.
- There is one highly critical region in the Czech Republic concerning the contamination by hexachlorobenzene, i.e. the surroundings of the Spolchemie Ústí n/L plant. The HCB releases into the waste waters of this plant clearly was, and most likely still is, indeed very massive and it negatively influences all components of the hydrosphere in the terminal part of the Bílina river flow and the subsequently of the Labe river far up to the middle of the German territory.. Increasingly higher HCB levels are measured in the surface waters of Bílina and Labe, as well as in sediments and in silts, in aquatic biofilms, aquatic organisms and fish in comparison to other regions of the Czech Republic as well as to data of other European countries.
- Other important difficulties concerning the contamination of the hydrosphere in the Czech Republic by the HCB are not known.
- The most problematic group of POPs are probably polychlorinated biphenyls (PCBs) for the CR. It can be noted that the entire territory of the Czech Republic is currently under the increased impact of the load that is resulting from the previous production and from massive use of PCBs. This fact is, naturally, manifested in the PCBs presence in the components of the hydrosphere. The current situation is determined by these facts:
    1. PCBs are still a part of many technological devices (for example, operational fluids) and of materials;
    2. A large fraction of PCBs was deposited on the landfills;
    3. A number of localities with soil is contaminated by PCBs exist;
    4. PCBs may form in combustion processes of materials containing chlorine.
    5. Over time, PCBs have been cumulated in certain constituents of the environment and they may move due to certain changes.
    6. It is suspected that PCBs may be generated as by-product within certain chemical processes even today, and thereby play a role as the „still alive“ (still existing) source of the environmental contamination by polychlorinated biphenyls.
- All the facts mentioned above are reasons of the still persisting burden of these compounds on the Czech Republic’s hydrosphere. It is manifested by the number of findings with the increased concentration. Besides such, described field load localities, other sites exist where, due to the accidents from the past, the PCBs concentrations in samples may be even higher. Improvement should appear in the context of the started recording of the devices and substances containing PCBs and to their gradual removal.
- There is very little information on the presence of the polychlorinated dibenzodioxins and furanes (PCDDs/Fs) in the Czech Republic’s hydrosphere; therefore, it is impossible to prepare a complete overview on the state of the hydrosphere in this respect.

- These substances, involved in the previous accidents, have significantly contaminated the area of the Spolana Neratovice chemical plant. The situation was investigated in detail pursuant to the consequence of the floods of the summer 2002.
- The possible impact of such contamination on the hydrosphere should be examined also on sites and in the surroundings of other potential PCDDs/Fs sources, such as waste incinerators, some industrial production facilities, etc in the future.
- PAHs content is relatively stable on (all) 36 sites of the arable land.
- A gradual accumulation of PAHs in the soils takes place on undisturbed soil at higher altitudes, where ploughing does not occur.
- The PCBs content in the set of monitored areas is relatively stable. A rapid decrease of the PCB content in soil cannot be expected due to the high proportion of highly chlorinated PCBs.
- The OCPs content in the arable lands remains high and relatively stable. The limit value of the admissible contamination (of 10 $ng.g^{-1}$) pursuant to the Decree No. 13/1994 Coll., is exceeded in approximately 11% of the topsoil samples analyzed to the HCB; DDT compounds group do not comply with the limit value in almost 75%.
- There was a significant value fluctuation and a clear trend in the development of the content cannot be determined for the whole monitored period (1994 – 2001).
- In 2001, the first monitoring of PCDDs/Fs was performed was carried out on a set of 38 monitoring sites.
- The highest contents were seen in contaminated soils and in soils from higher altitude nature conservation areas.
- The content of individual congeners varies in different locations (soils) and there is no observable dependence of the total PCDDs/Fs content and of the TEQ in the studied samples.
- Most PCDDs/Fs in the studied soils are the poly-chlorinated congeners (4-8 chlorine atoms per molecule).
- The soils with the highest POPs load were the fluvi-soils in the inundation zone of large rivers running through the industrial towns and agglomerations (Labe, Vltava, but potentially other rivers as well).
- Increased levels of polyaromatic hydrocarbons (except for the chrysene), of chlorinated hydrocarbons, of non-polar hydrocarbons, but fewer residues of organochlorinated pesticides and increased contents of dibenzodioxins and furanes were found in the soil.
- The imission load in the proximity of industrial centres and of agglomerations and in imission regions is the important source of the POPs load of the soil. It is manifested by the increase of the PAHs content or by the increase of the in the I-TEQ PCDDs/Fs value of soils.
- Increased content of some PAHs and PCDDs/Fs, primarily of highly chlorinated (hexa-, hepta-, and ortho-chlorinated) isomers was detected in localities with the existing chemical industry.
- The rise of certain PAHs compounds content was observed in soils withdrawn in the close vicinity villages in the country; the imperfect combustion of solid and fossil fuels in households is a significant source of air pollution, especially by PAHs, that is also reflected in the soil load.
- Soils at higher altitudes are subject to the increased PAHs and PCDDs/Fs exposure. This is especially evident namely in the mountainous country in the surrounding of the sources of ambient air pollution (Krušné Hory, Moravskoslezské Beskydy, Jizerské Hory), however the

long-range transfer of the PAHs and of PCDDs/Fs has been also detected in relatively clean locations (Šumava).

- Despite the termination of the DDT use, the increased concentration of its residues are locally present at the entire territory of the Czech Republic, especially in localities with the intensive agricultural production.
- The POPs burden on plants in monitored localities does not show a field contamination by any of the substances from monitored groups.
- The content of polycyclic aromatic hydrocarbons was determined in 32 silt samples in 2001. The 22 out of the 37 analyzed samples, i.e. 59%, have exceeded the limit value for the sum of 11 selected PAHs, established by the proposal of the EU directive. There was a 4% increase in the comparison to the year 2000.
- Furthermore, the polychlorinated biphenyl content was analyzed in 37 silt samples; the 3 samples, i.e. about 8%, have exceeded the limit value authorizing the silt application in 2001 as set by the Decree No. 382/2001 Coll.
- The following conclusions can be drawn from the presented assessment of the POPs occurrence in selected veterinary commodities (feeds, animal products):

Dominating contaminants in animals:

1. polychlorinated biphenyls (PCBs) especially cattle, but also in pigs,
2. chlorinated pesticides (DDTs, lindane, HCB) and PCBs in game and birds of prey,
3. DDTs and PCBs in freshwater fish,
4. aldrin, dieldrin, heptachlor and α+β–HCHs were not significant from a veterinary-hygienic perspective, apart from a few individual cases.

The main sources of the animal contamination:

1. contaminated bulk feeds, grains and feedstock mixtures in case of the cattle,
2. grains and feedstock mixtures in case of pork and poultry,
3. polluted waters in case of freshwater fish and water fowls,
4. contaminated environment and food niche in case of the game animals and of bioindicators.

Primary sources of contamination of feeds, environment, or animals directly:

1. technical raw materials containing PCBs (coating compositions, insulation materials, hydraulic oils, etc.) used in the environment of the animal farms;
2. contaminated environments of grinding mills, feeds storage and feedstock components due to previous manipulation with pesticide substances on animal farms;
3. industrial accidents with the PCBs leaks into the watercourses and water reservoirs, disposing waste from the industrial production into watercourses and into sludge ponds, the consequences of the run-offs from soils contaminated by chlorinated pesticides after heavy precipitations, wash-outs from deposits of industrial waste, of agrochemicals and of communal waste after floods, artificially created water reservoirs on locations with the former intensive agricultural activity using agrochemicals;

4. the use of chlorinated pesticides on agricultural lands and in forest environments, and thus loading the food niche of the game including contaminated surface waters (catch pits, pools) used by animals for water-feeding.

There is a persisting danger resulting from:

1. not removed materials and wastes containing PCBs in the environment, the release of PCBs from unsatisfactorily safely stored materials containing these substances, especially during floods,
2. the release of organochlorinated substances landfills of various type into the surface waters (floods, heavy rains), leaks into ground waters,
3. by the discovery (uncover) of PCBs containing materials in stables within their reconstruction and construction adjustments that used to be only covered by a layer of other harmless material in the past,
4. not yet removed old agrochemicals containing organochlorinated substances „temporarily“ deposited,
5. re-use of facilities previously used for the feeds and feed storage, that were put out of operation due to the non-removable contamination by PCBs (old silo bunkers), re-use of the long term unused stables, where a materials containing PCBs could be potentially present,
6. the import of contaminated animals, feeds and feedstock component from abroad.

- If and until all materials and wastes containing organochlorinated substances (PCBs, chlorinated pesticides) are not safely removed or safely deposited or their use is not restricted exclusively for the defined closed systems (PCBs), it is not possible to exclude the isolated hygienically serious cases of the contamination of feeds, foods and materials of animal origin including the freshwater fish and game animals.
- The inventory of all potential sources of these substances harmful to the environment, animals and people would contribute to the achievement of the above mentioned goal.
- The dietary exposure of the human population in the Czech Republic between 1994-2001 was evaluated as average chronic exposure dose of the population by monitored organic substances (polychlorinated biphenyls (PCBs), aldrin, endrin, dieldrin, methoxychlorine, endosulphane, heptachlor epoxide, hexachlorobenzene (HCB), alpha-, beta-, delta-, gamma- (lindane) isomers of hexachlorocyclohexane, isomers of DDT, DDD, DDE, PAHs).
- Values of the average chronic exposure dose of the Czech population towards monitored organic substances in food products did not reach the values associated with the unacceptable increase of the health hazard probability (non-carcinogenic effect) for the consumer within the monitored period.
- The exposure of the population estimated according to the real consumption of foods (SKP 1997) attains the highest level for the PCBs. The exposure to the sum of seven indicator congeners of the PCB has reached approximately the 8,5% of the tolerated daily intake (TDI)on average in 2001. The largest number of the positive analytical captures of the entire monitoring period was observed for the 153, 138 and 180 congeners of the PCB that are most readily accumulated in the food chain.
- A large number of analytical captures for the p,p´-DDE and HCB is observed traditionally. It indicates the persisting contamination by these substances, but at the level of low concentrations.

- DDT, DDD, and DDE did not represent a more serious health hazard for the population of the Czech Republic in terms of the higher exposition. The monitoring should be maintained for the imports and for the random inspections of domestic foods.
- Other monitored substances occur less frequently and their chronic exposure dose is relatively low.
- The estimate of the exposure doses for substances with the so-called dioxin effect (TEQ 2,3,7,8 - TCDD for a sum of toxic PCB congeners, dioxins and dibenzofuranes) reached about 3 pg TEQ TCCD.kg^{-1} t weight.day^{-1} in 2000 and 2001. This value appears more favourable in comparison to the past years.
- Recommendations for the risk management:
    1. Continue the thorough inspection of foods, especially of those with a high animal fat content.
    2. Support the decrease of the animal fat consumption by the population.
    3. Support the refinement of analytical methods, so that it is possible to evaluate health risks more accurately.
- In terms of the higher exposure to PCBs of the Czech population can be stated that its main sources were the PCBs production in the Slovak part of the former Czechoslovakia, the intensive industrial use of the technical PCB compounds and a human failure during the manipulation and removal of these substances.
- Monitoring activities initiated in the 1990's confirmed a significant age dependence of the PCBs levels in the organism, a significant individual results variability and the possibility of the local differences already suggested in the WHO report.
- The PCBs concentrations in human fats of the Czech population have generally corresponded to the values presented in other industrial countries (for example Germany).
- The MZSO results indicated that the zone of the increased load can, besides Uherské Hradiště, represent also the district of Ústí n. L., where the PCBs concentrations were significantly higher than those in other three other monitored localities. Higher PCBs concentrations of the Ústí n. L. site were also confirmed by the results of the VaV/520/6/99 study. It can be assumed that a higher load might be detected even in other, primarily industrial, localities, such as the Ostravsko-Karvinska district, where, nonetheless, the number of analysed samples is significantly lower.
- A positive sign is the fact that the results of the PCBs analysis in the samples of the breast milk investigated since 1994 in the framework of the MZSO indicate a gradual decreasing trend of the indicator congener 138,153 and 180 concentrations that contributes to the greatest extent to the total amount of PCBs in the human organism.
- Results of the HCB and Σ DDT monitoring in the breast milk associated are resulting from the decrease of these substances in the fatty tissue of the Czech population was already observed in the 1980's after their use was banned.
- The PCDDs/Fs/DLPCBs concentration in the breast milk of the Czech population and the corresponding WHO-TEQ values are in accordance with the results of other EU member states.
- The polychlorinated biphenyl load of the population of the Czech Republic exhibits the decreasing tendency, based on the long term monitoring. However, it can be expected that other localities with higher population load exist (for example Uherske Hradiste, Ústí n. L., Ostravsko-Karvinsko), as well as the existence of significant individual differences without known cause (influence of old environmental burdens, dietary habits, life style).

- Furthermore, the load of the chlorinated pesticides has indicated a decreasing trend, however, that does not mean that this load does not have a significant health implications, especially in terms of the action of these substances as endocrine disruptors, or (in the case of HCB) as substances with the dioxin effect in general.
- There is a sufficient quantity of information regarding exposure, or better the exposure of the adult population, on the basis of the breast milk and subcutaneous fatty tissues monitoring in the CR; on the other hand there is barely any data regarding the concentrations of these substances in the blood plasma or in the blood serum of adults and there is a shortage of the epidemiological studies that would provide information on the burden of the population groups in relation to certain health risks (endocrine balance disorders, neurotoxicity, immunotoxicity, enzyme induction, etc).
- The Ministry of the Environment does not posses the long-term conception of the POPs monitoring pursuant to the POPs Protocol. Even though, a more systematic approach to the monitoring issue including the pollution monitoring is applied by the Ministry of Health (including organic compounds) and by the Ministry of Agriculture, their concept still far from systematic and complete.

ANNEX NO. 11

EXAMPLE OF THE INFORMATION MATERIAL FOR THE PUBLIC

Persistent Organic Pollutants

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The material, along with other information, is available at: http://recetox.chemi.muni.cz/

POPs

What are persistent organic pollutants (POPs)?

The Protocol on Persistent Organic Pollutants (hereinafter POPs) agreed on to the Convention on Long-range Transboundary Air Pollution (CLRTAP) and signed by the CR at the 4th ministerial conference of the UN European Economic Committee "Environment for Europe" in Aarhus, Denmark, on t he 24th June 1998, and at the Stockholm Convention on Persistent Organic Pollutants, signed May 23, 2001, the both define these substances as:

Persistent organic pollutants (POPs) are organic substances that:
- demonstrate toxic properties,
- resist degradation,
- bioaccumulate,
- undergo a long range transfer in air trespassing the borders of the states and that are deposited ,
- where exist a potential harmful effect on the health or the environment

They occur as a single chemical substance or as a mixture of chemical substances, forming a specific group, as they
- have similar properties and enter the environment together,
- constitute a mixture, that is available as a particular technical preparation

The aim of international agreements on POPs is the termination of their production and use, decrease or elimination of the disposal, emissions and release of these persistent organic substances into the all constituents of the environment.

What is the toxicity ?

The ability of a substance to cause damage or death to living organisms.

POPs are toxic for various organisms.

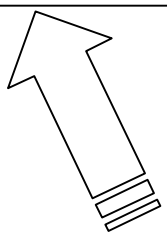
Some of them may cause cancer, others promote its course, a number of them may cause immunological, reproduction, developmental, and other defects.

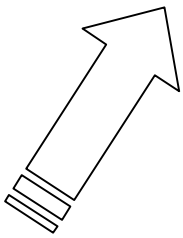
What is the persistence ?

Persistence is the ability of a substance to remain without change in the environment for a long period of time.

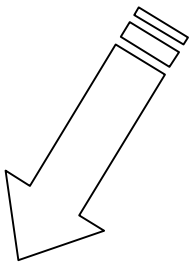
Persistent substances are resistant to chemical, photochemical, thermal and biochemical decomposition.

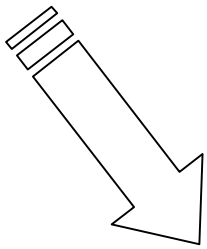
This allows their circulation in the environment and accumulation in soils, sediments and in living organisms.





POPs





What is the bioaccumulation ?

Bioaccumulation (accumulation in living organisms) is a process, during which living organisms can capture and concentrate chemical substances either directly from the environment, where they live, or indirectly from their food supply.

What is the long-range transport ?

It is the potential of this substance to travel hundreds to thousands of kilometres away from its original source, where it has never been produced or used (for example the Arctic and the Antarctic).

The Stockholm Convention on POPs lists the following 12 substances or groups of substances:

Pesticides (namely *insecticides* used for the extermination of pests or their developmental stages or *fungicides* used for the extermination of fungi and of moulds*)*	
Aldrin – insecticide used for the extermination of pests in grains, in potatoes and cotton and for the termite liquidation, It has not been produced in the former Czechoslovakia nor in the Czech Republic; its use was banned in 1980.	**Chlordane** – wide-spectrum contact insecticide for treating agricultural products such as vegetables, grains, corn, rape, tomatoes, sugar cane, sugar beet, fruit, nuts, citrus, cotton and jute. It was also used in gardening and against termites. It has not been produced in the former Czechoslovakia nor in the Czech Republic, was never even registered.
DDT – insecticide used for the treatment of agricultural crops and for the liquidation of infectious disease carriers. It is not produced or used in the Czech Republic; its use was banned in the former Czechoslovakia in 1974. It had been produced in Spolana Neratovice as a raw material for the production of Neratidin, Neracain and Pentalidol. All production was terminated in the years 1978-83.	**Dieldrin –** same as aldrin
Endrin – insecticide used primarily for the treatment of cotton and grains, it was not produced nor used in the former Czechoslovakia or the Czech Republic; was banned in 1984.	**Mirex** – stomach insecticide used for exterminating ants and termites. Was also used as an industrial additive increasing the fire resistance of plastics, rubber, and electrical devices . Was not produced or used in the former Czechoslovakia or the Czech Republic.
Heptachlor – contact insecticide used primarily for exterminating pests in soil, grasshoppers, termites and malaria carriers, was not produced or used in the former Czechoslovakia or the Czech Republic; was banned in 1989.	**Toxaphene** – mixture of over 670 substances used primarily as an insecticide for treating cotton and other grains. Was not produced or used in the former Czechoslovakia or the Czech Republic; its use as a pesticide was banned in 1977.
Hexachlorobenzene (HCB) – fungicide used for treating wheat and onion. Is also formed as an industrial by- product. Banned as a pesticide in 1977. HCB is not produced in the Czech Republic, had been produced in Spolana Neratovice but its production terminated in 1968.	

Industrial Chemicals	
Polychlorinated biphenyls (PCBs) – technical mixture of 210 congeners widely used in industry for its exceptional properties i.e. as fillings of electric transformers and of large condensers, thermal-exchange fluids, additives to paints, plastics and lubricants. Its production was banned in the former Czechoslovakia in 1984; the total production amounts to 24 000 t. They are currently used only in closed systems; significant quantities are stored and await a liquidation in an environmentally acceptable manner. Significant part of the production was probably illegally liquidated in the past years	**Hexachlorobenzene (HCB) –** industrial chemical used in pyrotechnics, in the production of the synthetic rubber and of aluminium.
Undesired by-products	
Polychlorinated dibenzo-p-dioxins (PCDDs) (dioxins) – have never been produced for commercial purposes; their practical use is not known. The group is formed by 75 congeners. They are created as by-products in the production of other substances such as pesticides, polyvinylchloride and chlorinated solvents.	**Polychlorinated dibenzofuranes (PCDFs) (furanes)** – primary admixture from the production of PCBs. By-product often accompanying dioxins. It is a group of 135 congeners with effects similar to dioxins, though weaker.
Dioxins and furanes can be formed in the combustion of communal, hospital and hazardous wastes, they can be detected in emissions from the automotive transport, and from coal, peat and wood combustion. They are all created during the combustion of organic substances in the presence of the chlorine. They are also formed in metallurgy, in the cement production, in the chlorine bleaching of the cellulose and during wildfires. They may be created by the biochemical processes in wastes from the waste water treatment plants, composts, and forest soils.	

The Protocol on POPs prepared by the administrative authorities of the Convention on Long-range Transboundary Air Pollution lists another 4 substances:

Pesticides	
Chlordekon – was not produced or used in the former Czechoslovakia nor in the Czech Republic, was never registered as a pesticide.	**Lindane –** used as an insecticide in agriculture and as a preparation for the extermination of animal and human parasites and for treatment of forest growth.
Industrial Chemicals	
Hexabromobiphenyl – used as a fire extinguisher; according to the available data, it was not produced or used in the Czech Republic.	

By-Products
Polycyclic aromatic hydrocarbons (PAHs) – a large group of organic substances containing at least two condensed benzene rings. They are formed as by-products in every routine combustion process- during the combustion of coal, oils, wood, and waste; a significant source is also from the automotive transport. The amount formed grows significantly with the combustion imperfections. They are created during smoking, roasting food at high temperatures, and during the typical meat smoking. A significant source is also the production of iron, steel, aluminium, coke, tar and soot, especially when using the obsolete technology. They are formed also during the fires in the nature.

Toxic effects of POPs

Laboratory and field experiments published in scientific literature confirm the fact that a number of persistent organic pollutants exhibit a harmful effect on human health. Many of them can harm internal organs (livers, kidneys, stomach), they can disturb the immune, nervous and respiratory systems, affect the levels of liver enzymes, cause reproductive disorders (for example damaging the foetus, cause lowering its weight, spontaneous abortions) and affect the hormonal balance. Some of them have also created malign tumours in experimental animals.

High doses of dioxins, furanes and PCBs (professional exposure, consumption of foods that are accidentally contaminated by high doses of these substances) lead to the formation of disfiguring, hard-to-treat rashes, and the so-called chloracne.

Direct proof of harm of the health of the common human population during exposure to ordinary daily doses of POPs does not exist, although there are assumptions based on the long-term studies that PCBs, DDT or its metabolite DDE may be responsible, for example, for the increasing occurrence of the breast cancer.

The fate of POPs in the environment

POPs, as is apparent from their definition, are very stable in all constituents of the environment. They enter the atmosphere from a number of industrial sources such as power stations, heating stations, incinerating plants as well as from household furnaces, transport, use of agricultural sprays, evaporation from water surfaces, soil, or from the landfills.

They can be present as vapours in the atmosphere or are bound to the surface of solid (dust) particles (particles of soil, of water sediments, of ashes). They are transferred to the ground surface from the atmosphere either by the deposition of the flying ashes (dry deposition) or by rain that absorbs substances present in the gas phase and pulls solid particles (wet deposition).

In the atmosphere, POPs undergo a slow decomposition due to of the solar radiation (photolysis) in the presence of water humidity and of other organic and inorganic substances. Their persistence in the atmosphere depends on thermal and reaction conditions of the given place. This durability in the tropical atmosphere is a maximum several days for a number of POPs, however, this can stretch up to several years for the occurrence of the same compound in the polar atmosphere. Their stability in the atmosphere results into their long-distance transport of thousands of kilometres. This allows their transport from locations, where a number of them, namely pesticides, are still in use in significant amounts (Africa, South America) to the proximity of the North Pole. This was confirmed by a number of measurements of their presence in the snow and in the ice around the North Pole, as well as in the

North Sea organisms and breast milk of the Eskimo women. As these substances have never been used in these polar areas, their presence there is a clear proof of their long-distance transport.

The solubility of most POPs in water is minimal. They are, however, easily captured on solid particles (dust, ash, soil, sediments). They are also fairly soluble in organic fluids (oils, fats, liquid fuels).

This implies that the more solid particles and polluting organic liquids present in the water, the higher the probability of their higher POPs content. The sources of access of these substances into the water system are waste waters from plants producing or using POPs, along with runoffs from fields and roads and from the atmospheric deposition. Their largest reservoirs are oceans and seas, where they gather from river sediments, by the atmospheric deposition, by disposing wastes, and by accidents. They are stored in sediments on the beds of seas, oceans, and large lakes, where they can be released from after a time and then re-enter the atmosphere.

The soil is polluted by these substances primarily as a result of the pesticide application in agriculture, followed by the dry and wet atmospheric depositions. Another soil pollution source may be also the irrigation, the use of the sludge from waste treatment plants in agriculture, releases from ash storage, of landfills etc. POPs strongly bound to the organic matter of the soil, especially all the more, if the soil is rich in humus. That is why they rarely enter the ground water through leakage of soil layers. The only exceptions are sandy soils. The half-life in the soil in the case of many pesticides is years to tens of years. The POPs degradation in soils is caused primarily by microorganisms; they are also partly carried off by the wind, they evaporate from the soil, the degradation by solar radiation can occur on the soil surface and they can be flushed away by the precipitations water and in to a low extent they can be taken by the vegetation.

Plants are not able to concentrate POPs found in soils in any significant amounts. The transfer to above-ground structures through the root system in most species is therefore not significant. The above-ground portion of plants (leaves, growth) can, however, be polluted by the soil, by the atmospheric deposition, and eventually by spraying the preparations containing POPs. As the fruits and leaves of plants have a wax surface coat, POPs from the atmosphere dissolve in it, and the above-ground structures can accumulate these substances (oily crops, needles, mosses). If the crops are found in the soil, their surface structures contain POPs, however, this pollution is not significantly higher than the POPs content in the soils.

Contamination of animals results mainly from the consumption of polluted feeds; by inhaling it is basically negligible. Slaughter animals take in POPs mainly from plant feeds from the consumption of the fish meal as well as the soil that they ingest along with feed during grazing. Similarly, the aquatic animals may accumulate POPs in their organisms previously present in water, plankton and sediment.

The gradually increasing concentration of these substances in food chains is also significant. Predators (predatory fish or birds of prey) represent the highest link in these natural relationships between organisms; they often contain a significantly higher POPs levels in their bodies than their prey had consumed.

The atmosphere is often the primary environmental constituent for the POPs entry; they can transferred to other constituents from there and thereby contaminate the food chains, including the human food chains. These substances therefore have a stable cycle that leads to the exposure of various living organisms, including humans.

How can POPs enter the human organism?

POPs enter the environment from various sources and thereby to their penetration into the food chains. We may mention the incineration of wastes as an example, where either emission into the air can take place, if the incinerators are not equipped with the proper degree of the waste purification or also to the bonding of the high POPs concentrations onto the surface of the dust particles. If the ash is not stored in special landfills, it may release POPs into the air, waters and soils and thereby enter the food chains.

The amounts of POPs entering human organism by the inhalation, food ingestion or by the contact with the skin, do not represent the immediate health hazard (acute poisoning).

It is, however, important to keep in mind that the effect of POPs is long-term and that we are unable to predict, on the basis of the content of these substances in the human organism, whether or not the individual will be sick, for example cancer, at present. It is also important note that it is not only POPs that affect the human organism, but also a whole range of other factors. Other, not less harmful compounds and factors are found in the human organism at present – the impact of the bad dietary habits takes effect as well as the imunous system state, heredity and other factors.

The line of the so called civilisation disease break out is completely specific for each individual, and no one can define it precisely at present. However, it is possible to evaluate the risk of the health damage of the population on the basis of information resulting predominantly from the long-term research on animals and from the estimated average daily dose of a particular population for some pollutants, including POPs; this value would constitute just a rough estimate providing only general information.

Another problem is the fact that we have only a minimum amount of information on the synergistic effects of a number of various POPs present in an organism side by side, or on their possible interactions with other chemical substances at present. And these substances are most often, in real environments, present in the form of complex mixtures.

However, it is certain that the less persistent organic pollutants found in our body the lower the risk of health damage.

The POPs are currently omnipresent and the exposure of living organisms to these substances is practically unavoidable. It is therefore necessary - by various methods, from international agreements to the everyday activities of each citizen - to ensure that the amount that enters the organism every day does not exceed a given, yet tolerated, limit.

The national administration must ensure the publication of legal documents determining the highest permissible levels or concentrations (limits) of these pollutants in various foods, emissions etc. It is necessary to monitor the adherence to such limits in a way that an individual consuming foods from a standard commercial network is not exposed, during the course of his entire life, to the doses of POPs that could cause health damage.

Majority of international studies confirm the fact that among the primary and significant pathways of the POPs entry into the environment are the atmospheric emissions and with the atmosphere being the transport medium. It is therefore necessary to adopt such measures that would lead to the decrease of the POPs emissions, to the improvement of the air quality, and, gradually, also to the diminution of their content in foods and in the final consequence in the human organism. However, a number of these measures is financially very demanding.

Legislative measures limiting the POPs entry into the environment

It is necessary to adjust the national legislation so that it reflects the requirements on the basis of the above mentioned international conventions and protocols on POPs. This requires a legislative definition of the term persistent organic pollutants (POPs) and of the best available technologies (BAT) principle. The presence of the POPs term and the implementation of the BAT principle must be present not only in the Act on the air protection and in its related regulations, but also in the acts on water, on soil, on the environmental impact assessment, on health of the population and with their relevant decrees.

The act on the air protection and the subsequent legal provisions must mandate the application of the BAT considering the appropriateness of expenses in the building of new or in the reconstruction of existing devices, that could be the sources of the air pollution. It must enable the government to set the pollution limits, conditions and the time necessary for their fulfilment, the list of polluting substances where limits are set to, the categorization of the pollution sources and the conditions of the emission dispersion, by the Government Order. The Act also determines the obligations of operators of the pollution sources, the control of the adherence to those obligations, the fee payment charges and the sanctioning.

Only two compounds from the POP category are part of the emission limits at present - benzo(a)pyrene and dibenzo(a,h)anthracene - falling into the class I of other polluting substances. Their total concentration including five other carcinogenic substances as well must not exceed the 0,2 $mg.m^{-3}$ at the mass flow higher than 1 $g.h^{-1}$.

Moreover, the emission limit for the PCDDs/Fs does not exist either, that is in the contrary to the limit of 0,1 TEQ (toxic equivalent) $ng.m^{-3}$ in the EU. This is a particular problem regarding the emissions from new incineration plants in Prague and in Liberec.

What concerns the obligations to measure POPs emissions, the existing legislation is less then satisfactory, the Decree no. 117/1997 Coll., comprises only the following provisions:

- § 13, paragraph 4) imposes, in case of the power plants and of heating plants with furnaces of the heating capacity 50 MW and higher, burning solid or liquid fuels, to find out by the one-time measurement of the emission of heavy metals and of POPs in the spent gasses (PCBs, PCDDs/Fs, PAHs) always after the first put into the operation, and also after the every replacement of the fuel or any significant and permanent intervention into the construction or equipment of the source, within six months of the emergence of any of the above mentioned facts. This measurement pursuant to this paragraph must have been carried out in case of the sources already in operation, by the 30th June 1998.

- §14, paragraph 2), letter d) imposes for the incinerators of special and hazardous waste, with the exception of the municipal waste, to find out by the one-time measurement always after the first put into the operation and then once in the three calendar years in case of the incineration of waste with stable total PCDDs/Fs content, where the particular components are recalculated by the toxicity equivalent according to the annex 6 to this Decree.

- §15, paragraph 2, letter d) imposes that all incinerators of communal waste must determine the total of the PCDDs/Fs content by the one-time measurement, where the particular components are recalculated by the toxicity equivalent according to the Annex 6 to this Decree, once every calendar year.

The POPs issue must be incorporated into other laws as well, as for example into the Act on waste. The problem of the ash specification and of other wastes resulting from the incineration plants containing high POPs concentrations and its classification under the category of hazardous waste along with a defined specification of their storage and the method of their handling must be solved.

The amendment and updating of the legislation will be provided in the framework of the harmonization of the Czech legislation with the EU legislation.

Economic instruments limiting the POPs entry into the environment

The air pollution charges is one of the basic economic instrument leading to the environmental protection. Its task is to force operators of pollution sources towards the decrease of this pollution. The charge is the income of the State Environmental Fund or of the municipalities and they are used to cover the environment protection activities. A 50 % mark-up to this fee is paid in the case of the non-compliance with the particular emission limit for a given source.

In addition to this charge, the entrepreneurial subject can be charged by fines in case of the violation of some provisions of relevant regulations.

Certain tax-allowances are another economic instrument leading to the decrease of emissions – lowering the value-added tax, property tax, consumer tax, income tax and travel tax.

Allowances for certain products, materials and activities, whose production or use impacts directly or indirectly the decrease of POPs emissions have already been in use - the introduction of motor vehicle catalysts, of unleaded gas, conversion to the high-quality fuels and the introduction of alternative energy sources. Financial support of the environmental protection research, of the systematic POPs monitoring content in emissions and in environment and of the development and improvement of technologies leading to the decrease of emissions of these substances are also considered the economic instruments of the state.

Economic assessment of expenses associated with the realisation of measures leading to the limitation of the POPs entry into the environment in the Czech Republic is based on the identification of the largest emission sectors for individual main POPs groups and further the identification of the best available techniques (BATs) for these sectors. The estimate of relative investment and operational costs of protective techniques recalculated to the unit of the POPs group reduction is necessary to carry out in the cooperation with their producers and their users.

The sectoral curve and national expenditure curve used as the starting information for the economic impact assessment of the set individual goals of the emission reduction and for the impacts assessment of the competitiveness of main emitting sectors will be shaped on the basis of the internationally accepted methodology on the basis of the collected available technical and economic data.

The socio-economic impacts of the POPs Protocol tasks realization especially on the employment in the sectors concerned will be analyzed together with the economic impacts.

How to protect ourselves from POPs ?

What can the state or enterprises do:

- ***Ban or restrict the production and use of POPs, or products containing POPs**:*
  Examples:
- *An effective measure for improving the situation in terms of the POPs emission decrease from the waste combustion, is the ban of the production of the plastic wrapping from plastics containing halogens and restriction of the use of chlorinated components in the production of the cardboard and of the paper.*
- *Combustion of wooden briquettes or of similar „environment friendly" products made from the wooden components must be examined in terms of the POP formation, especially of PAHs.*
- *Apply the of criteria for the POPs emissions restriction (and of heavy metals) in campaigns such as „Ecologically safe product", „Czech Made", etc. as one of the determining aspects*
- *Introduce the best available techniques for technological processes with the aim to decrease the formation of harmful by-products.*
- *Introduce the good combustion practice in power plants, heating plants, and in incineration plants of all kinds, and supply these facilities with effective devices capturing POPs.*
- *Identify POPs sources and their proportion in the environmental pollution and update the POPs limits in accordance with the POPs Protocol and with the EU legislation.*
- *Not burn materials that may represent POPs sources - plastics, unused chemicals, conserved wood, tyres, used motor oils - in a common devices or in an open fire,*
- *Increase the proportion of natural gas in the production o heat and electricity; focus on local renewable energy sources.*
- *Take into consideration the fact that the nuclear energetics is not the source of emissions of POPs, heavy metals and of other pollutants in the preparation of the concept of energetics.*
- *Provide motor vehicles with effective catalysts; perform regular inspection of the technical state of vehicles.*
- *Consider the impact of their composition on the POPs formation in the production of petrols and of lubricating oils.*
- *Prohibit the use of the salt spreadings containing halogen(s) in populated agglomerations., Restrict the burning of stubble-fields and of baulks, promote the composting of organic residues from gardens to their combustion, operate landfills as to prevent their spontaneous ignition..*
- *Decrease the risk of fires by implementing protective measures.*
- *Wastes, if they are not burned, should be deposited at proper landfills; ash and cinder from incinerators store in a way to prevent their dispersion into the atmosphere.*
- *Ensure that waste with a high POPs concentration is deposited to prevent the release of such compounds into the food chains (for example by ensuring the solidification of ashes from municipal or hazardous wastes followed by storage into underground dry space or into water-proof and into the sealed disposal sites).*
- *Ensure a useful and effective system of economic instruments for the ban of the production, use, and formation of POPs as well as for the introduction of their alternatives (charges, fines, tax-allowances).*
- *Support research in the POPs field – the research of their fate in the environment and of mechanisms of impacts on living organisms.*
- *Support the development and refining of technologies leading to the decrease of emissions.*

What can citizens do:

- *Regularly perform check-ups and tetting of the engine of their vehicle.*
- *Separate the household waste, dispose it only to the authorized landfills and separate the hazardous constituents of the municipal waste.*
- *Switch to, if possible, the natural gas heating.*
- *Avoid burning ditches and stubble-fields.*
- *Avoid burning plastics, unused paint products, old spray chemicals, used motor oils, tyres or wood saturated with various protective substances in stoves, furnaces or in open fire.*
- *Favour composting of organic residues from your own garden to their combustion.*

How can citizens protect themselves from the POPs exposure:

- *Decrease the consumption of animal fats (fatty meats, milk and milk products with high fat content, eggs from poultry consuming contaminated soil of the open-air run, fish with high fat content or fish caught in contaminated waters).*
- *Limit the consumption of smoked foods, burnt foods, and foods grilled at the open fire (wood, charcoal).*
- *Do not smoke and visit frequently the smoke-filled spaces.*
- *Choose (if possible) the workplace, residence, resting-place and place for sports as far as possible from busy roads, incinerating plants, landfills, limit ventilation in the direction of polluting sources (for example busy streets).*
- *Wash fruits and vegetables carefully prior to their consumption.*
- *Do not use chemicals and sprays of unknown origin, do not manipulate materials containing chemical substances without the proper protection of the skin and of the respiratory tract.*