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Dioxins & PCBs:
Environmental Levels and Human Exposure in Candidate Countries

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Consortium: Environmental Levels In Candidate Countries

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BiPRO

Beratungsgesellschaft für
integrierte Problemlösungen

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Executive Summary

Background and Objectives

With the project "Dioxins & PCBs: Environmental Levels and Human Exposure in the Candidate Countries" launched by the European Commission DG Environment in January 2003 it is intended to gather available information on dioxin and PCB related issues in Accession Countries (AC) and Candidate Countries (CC) in order to develop a general overview on the current situation with respect to environmental contamination and related human exposure, legislation, enforcement, capacities and related activities in the fields of research and monitoring.

The collected information shall serve as a decision basis for the European Commission to take appropriate measures to close important data gaps and to develop a common strategy for comparable and reliable results on Community level, improved information exchange and a consistent Community response system.

To assure comparable and reliable data the information collection has been based methodologically on the four pillars internet and literature research, questionnaire to all competent ministries, personal contacts and project homepage as communication platform.

Research and Monitoring Activities

Concerning monitoring and research activities the highest level of activity can be found in the Czech Replica with countrywide monitoring in all environmental compartments and related to human exposure, in the Slovak Republic, Poland, Hungary, Slovenia and Estonia. Other countries do restrict their activities to specific compartments or only started real monitoring activities in the framework of GEF funded projects for the development of national implementation plans under the Stockholm Convention. Specific deficits exist in most countries with respect to monitoring of dioxins (PCDD/Fs) and with respect to human exposure.

An overview on Monitoring activities in AC/CCs is given in Table 0-1 and Table 0-2.

Environmental Contamination

It can be concluded that in general the contamination levels in the AC/CC do not exceed the levels in the Member States. In some countries according to the collected information they might be even significantly lower (Hungary and Bulgaria). However the situation can be different for specific "hot spots". With respect to PCBs elevated levels have been reported for different environmental compartments and human tissues in the Czech Republic, Slovakia and to some extent also Slovenia. There is some evidence that local problems might also exist in Latvia and Lithuania but so far the provided data do not allow any conclusions. For Poland some data on food might give raise to concern.

Furthermore the following limitations have to be taken into consideration: As data collected in the ongoing GEF funded projects are mostly still not available, the data base is quite small or even completely missing for many issues in the majority of countries. Besides this available data are often difficult to compare because they differ in a number of important parameters such as number of

congeners, year of data collection, location of sampling sites, analytical standard, etc. Furthermore in many cases the number of samples is so small that the results are not representative. With respect to comparison with Member State (MS) levels there is the problem that in MS recent data collection is mainly focused on dioxins and dioxin-like PCBs whereas in the AC/CC mostly information on Indicator PCBs has been collected in the corresponding period.

Furthermore it has to be stated that especially in the central European Countries with industrial background there exist extremely high contaminated "hot spots" for PCBs that urgently need remediation measures to prevent further dissemination and exposure of the local population.

With respect to dioxin emission, industrial facilities without abatement devices as well as uncontrolled burning on waste disposal sites and domestic burning seem to be the major sources for pollution

The time trends of contamination shown in a number of time series are similar to the situation in the Member States showing a strong decline over the last decade in most of the countries. On the other hand there is some evidence that the levels have reached a steady state in the last 2–4 years and in part even slightly increase.

An overview on contamination levels in AC/CCs is given in Table 0-3 and Table 0-4.

Legislation

According to the received information most of the relevant regulations of the European Commission have been transposed into national laws. Problems with implementation only seem to occur in the field of waste management, the phasing out of PCBs and with respect to the IPPC Directive. But it has to be stated that information on specific legislation, separation of permitting and control as well as information on food and feed monitoring has not been complete and problems with the level of awareness on the local administrative level and in the general population have been reported.

Administrative Structure and Capacities

Problems with laboratory capacity and with quality standards seem to exist in a number of countries. Consequently further training measures as well as reflections on an effective improvement of the capacity for dioxin analyses might be necessary.

Environmentally sound storing and destruction capacities seem to be insufficient in the majority of AC/CC so that further support will be necessary even if several projects in this field have already been started.

Priorities and Plannings

In the process of GEF funded projects all AC/CC are currently generating inventories on emission sources and stocks of POPs including PCBs and dioxins. As a consequence of this process the identification and destruction of existing stocks, the establishment or extension of data bases and monitoring systems, the implementation of existing legislation, educational measures and the cleaning up of relevant "hot spots" have been stated as priority actions for the majority of countries.

Capacity Building

In the field of capacity building measures a large number of initiatives has been started and funded by the European Union and the WHO in the last years. Furthermore the participation in international conventions and databases as well as scientific networking has provided good possibilities for knowledge exchange and know-how transfer. In the consequence the awareness at the scientific level is comparable to the level in the Member States, but the awareness in the general population and at the local administrative level has been reported to be still relatively low in certain countries so that further educational efforts may be necessary to assure a good implementation of the established regulatory framework and to reduce emissions from uncontrolled and domestic burning as well as from inadequate management and disposal of hazardous waste.

Recommendations

As a result the following recommendations are suggested:

- The number of measurements in key compartments (soil, sediments, indicator feed and food, human milk) should be increased in all countries (AC/CCs & MS) that do not dispose of a representative data base
- AC/CC should be encouraged to participate in international monitoring activities (WHO milk study, GEMS Food , EMEP, etc.) and to adopt international standards for sampling and analysis
- Support should be provided with respect to further information exchange between MS and AC/CC and within AC/CC to avoid double work and benefit from existing experience
- Structures and systems should be established that assure that research and monitoring activities are continued even if external support is decreasing
- AC/CC should be encouraged to identify further hot spots in suspicious areas
- AC/CC should be encouraged to verify inventory estimations by specific measurements
- AC/CC should be supported in the implementation of waste regulations and IPPC Directive (adequate facilities, technologies)
- AC/CC should be supported in the development of analytical capacities for dioxins and comparable quality standards
- Possibilities for regional co-operation related to analysis and destruction should be evaluated to improve quality and reduce costs
- Further training measures should be supported for awareness rising at the local administrative level and in the population
- Based on the available information there is no need for immediate action except of the decontamination of major "hot spots" and destruction of PCB containing waste and equipment.
- AC/CC should be supported in remediation of major hot spots to avoid further environmental contamination
- AC/CC should be encouraged to accelerate environmental safe disposal and destruction of PCBs

Monitoring	BG	CY	CZ	EST	HU	LT
Air	none	none	countrywide (PCBs; PCDD/Fs)	local (PCBs)	none	local (PCBs)
Water	none	countrywide (PCBs);	countrywide (PCBs)	none)	countrywide (PCBs)	countrywide (PCBs)
Sediments	no information	countrywide (PCBs)	countrywide (PCBs;)	none	countrywide (PCBs)	countrywide (PCBs)
Soils	countrywide background screening (PCBs)	none	countrywide (PCBs; PCDD/Fs)	local hot spot (PCDD/Fs)	countrywide (PCBs; PCDD/Fs)	none
Vegetation	no information	none	countrywide (PCBs; PCDD/Fs)	none	none	none
Wildlife	no information	none	countrywide fish and game (PCBs; PCDD/Fs)	marine fish (PCBs; PCDD/Fs) research seal (PCBs)	none	countrywide fish, wild game (PCBs)
Food	no information	research (PCBs)	countrywide (PCBs; PCDD/Fs)	countrywide (PCBs)	control import food (PCBs)	countrywide (PCBs)
Dietary intake	no information	none	countrywide (PCBs; PCDD/Fs)	none	local	none
Human milk	WHO study 3rd round	none	countrywide (PCBs; PCDD/Fs) WHO study 2 & 3rd round	research (PCDD/Fs)	WHO study 2 & 3rd round countrywide (PCBs)	WHO study 2nd round
Adipose tissue	no information	none	countrywide (PCBs; PCDD/Fs)	none	local (PCBs)	none
Human blood	no information	none	historical screening countrywide (PCBs)	none	none	none

Table 0-1: Overview on Monitoring Activities with respect to PCDD/Fs and PCBs in AC/CCs (Part I)

Monitoring	LV	MT	PL	RO	SK	SLO	TR
Air	research (PCBs)	none	local (PCDD/Fs; PCBs)	none	local (PCDD/Fs; PCBs)	none	none
Water	none	none	main rivers (PCBs;) research (PCDD/Fs)	none	countrywide, hot spot (PCBs)	hot spot-local (PCBs)	none
Sediments	first measurements (PCBs)	none	main rivers (PCBs;) research (PCDD/Fs	research (PCBs)	regional (PCBs)	hot spot-local (PCBs)	research (PCBs)
Soils	first measurements (PCBs)	none	local hot spots (PCBs)	research-countrywide screening (PCBs)	countrywide, regional, hot spot (PCBs)	no information about current activities	no information
Vegetation	none	none	local research (PCBs)	no information	none	research (PCBs; PCDD/Fs) Hot spot (PCBs)	no information
Wildlife	marine fish (PCDD/Fs) research (PCBs)	marine fish (PCBs; PCDD/Fs)	marine fish (PCBs; PCDD/Fs) wild game ; fresh water fish (PCBs)	research fish, aquatic biota (PCBs)	regional fish (PCBs) countrywide wild game (PCBs)	hot spot-local (PCBs)	no information
Food	marine fish (PCDD/Fs)	countrywide (PCBs; PCDD/Fs)	countrywide (PCBs)	no information	countrywide (PCBs; PCDD/Fs)	hot spot-local (PCBs)	none
Dietary intake	none	none	none	none	countrywide (PCBs; PCDD/Fs)	none	none
Human milk	none	none	local (PCBs; PCDD/Fs)	WHO study 3rd round	WHO study 2 & 3rd round countrywide (PCBs)	none	none
Adipose tissue	none	none	local (PCBs)	none	regional (PCDD/Fs)	hot spot-local (PCBs)	research (PCBs)
Human blood	research (PCBs)	none	local (PCBs)	none	regional (PCBs; PCDD/Fs)	hot spot-local (PCBs)	none

Table 0-2: Overview on Monitoring Activities with respect to PCDD/Fs and PCBs in AC/CCs (Part II)

Contamination	BG	CY	CZ	EST	HU	LT
Air PCDD/Fs	n.d.	n.d.	local winter problem	n.d.	n.d.	n.d.
Air PCBs	n.d.	n.d.	high levels	no serious contamination reported	n.d.	no serious contamination reported
Water PCDD/Fs	n.d.	n.d.	scarce data no serious contamination reported	n.d.	n.d.	n.d.
Water PCBs	n.d.	no serious contamination reported	Middle European average waste water problem	n.d.	no serious contamination reported some minor hot spots for Groundwater	low contamination reported
Sediments PCDD/Fs	n.d.	n.d.	no serious contamination reported	n.d.	n.d.	n.d.
Sediments PCBs	n.d.	hot spot problem	hot spot problem	n.d.		low contamination reported
Soils PCDD/Fs	n.d.	n.d.	no serious contamination reported;	insufficient data low contamination reported	no serious contamination reported	n.d.
Soils PCBs	low contamination reported	n.d.	no serious contamination reported	n.d.	low contamination reported	n.d.
Vegetation	n.d.	n.d.	no serious contamination reported	n.d.	n.d.	n.d.
Wildlife PCDD/Fs	n.d.	n.d.	no serious contamination reported	no serious contamination reported	n.d.	n.d.
Wildlife PCBs	n.d.	n.d.	high contamination reported	low contamination reported	n.d.	no serious contamination reported
Food PCDD/Fs	n.d.	n.d.	data not comparable	see wildlife	n.d.	n.d.
Food PCBs	n.d.	low contamination reported	no serious contamination reported	no serious contamination reported	n.d.	no serious contamination reported
Dietary intake	n.d.	n.d.	elevated intake for PCDD/Fs reported	n.d.	n.d.	n.d.
Human milk	low contamination reported	n.d.	high levels for PCBs reported	no serious contamination reported	low contamination reported	high levels for PCBs reported
Adipose tissue	n.d.	n.d.	elevated levels of PCDD/Fs PCBs		low contamination reported	
Human blood	n.d.	n.d.	no serious contamination reported	n.d.	n.d.	n.d.

Table 0-3: Overview on contamination levels reported from AC/CCs (Part I)

n.d. = no contamination data

Contamination	LV	MT	PL	RO	SK	SLO	TR
Air PCDD/Fs	n.d.	n.d.	local winter problem	n.d.	no serious contamination reported	n.d.	n.d.
Air PCBs	no serious contamination reported	n.d.	no serious contamination reported	n.d.	no serious contamination reported	hot spot problem	n.d.
Water PCDD/Fs	n.d.	n.d.	insufficient data	n.d.	n.d.	n.d.	n.d.
Water PCBs	n.d.	n.d.	no serious contamination reported	n.d.	hot spot problem surface and ground water	no serious contamination reported hot spot problem groundwater	n.d.
Sediments PCDD/Fs	n.d.	n.d.	no serious contamination reported	n.d.	no serious contamination reported	n.d.	n.d.
Sediments PCBs	hot spot problem	n.d.	moderately elevated	no serious contamination reported	hot spot problem	hot spot problem	low contamination reported
Soils PCDD/Fs	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Soils PCBs	no serious contamination reported	n.d.	no serious contamination reported	no serious contamination reported	hot spot problem	no serious contamination reported	n.d.
Vegetation	n.d.	n.d.	n.d.	n.d.	n.d.	no serious contamination reported	n.d.
Wildlife PCDD/Fs	no serious contamination reported	n.d.	no serious contamination reported	n.d.	n.d.	n.d.	n.d.
Wildlife PCBs	no serious contamination reported	no serious contamination reported	no serious contamination reported	no serious contamination reported	hot spot problem extremely high levels reported	n.d.	n.d.
Food PCDD/Fs	see wildlife	n.d.	n.d.	n.d.	no serious contamination reported	n.d.	n.d.
Food PCBs	no serious contamination reported	no serious contamination reported	high levels for poultry and vegetable oil	n.d.	hot spot problem	hot spot problem	n.d.
Dietary intake	n.d.	n.d.	no elevated intake reported	n.d.	elevated intake of PCBs reported	n.d.	n.d.
Human milk	n.d.	n.d.	no serious contamination reported	low contamination reported	high PCB levels reported	n.d.	n.d.
Adipose tissue	n.d.	n.d.	low contamination reported	n.d.	hot spot problem PCBs	n.d.	low contamination reported
Human blood	elevated levels for high fish consumers	n.d.	no serious contamination reported	n.d.	hot spot problem for PCDD/Fs and PCBs	data not comparable	n.d.

Table 0-4: Overview on contamination levels reported from AC/CCs (Part I) ; n.d. = no contamination data

1 Background & Objectives

An important background of the project is formed by the "Community Strategy for Dioxins, Furans and Polychlorinated Biphenyls" of the European Commission with the general objective to

- assess the current state of the environment and the ecosystem
- reduce human exposure to dioxins and PCBs in the short-term
- maintain human exposure at safe levels in the medium to long term
- reduce environmental effects from dioxins and PCBs.[1]

by a common approach to fill the identified gaps, to improve the link between data collection and a consistent Community response system, to develop low-cost, fast measurement methods and high quality standards for comparable and reliable results on Community level, to adjust the existing sectoral legislation in order to achieve the objectives of the 6th EAP and to promote exchange of information and experience between all Member States.

This seems to be necessary as - although substantial progress has been achieved in these fields - the problems of:

- Bioaccumulation and ongoing releases from landfills, soils or sediments
- Toxic properties of dioxins and PCBs
- Dietary exposure
- Unintended dioxin emissions
- PCB containing equipment that will reach its waste stage

still pose a possible threat for human health.

The Environment Council stressed the need for the Candidate Countries, as future Member States to be involved from an early stage on in the development of such a strategy, with special attention to the inventory of sources of dioxins, furans and PCBs and the monitoring of environmental and human exposure. [1]

Whereas in the past the Commission has launched several studies on Dioxin emissions and PCB contaminations in the Member States that provided a harmonised view on these issues across Member States[1; 2; 3; 4; 5], the Commission does not dispose of the relevant information for Candidate Countries.

Against this background there are two major objectives of the project.

- First to prepare an overview and analysis of available data on environmental levels of dioxins and PCBs as well as related human exposure in Candidate Countries which will be part of a first integral assessment on the extend of the dioxin and PCB related issues in Candidate Countries.
- Second to assess the current state and contribute to the capacity building in this region.

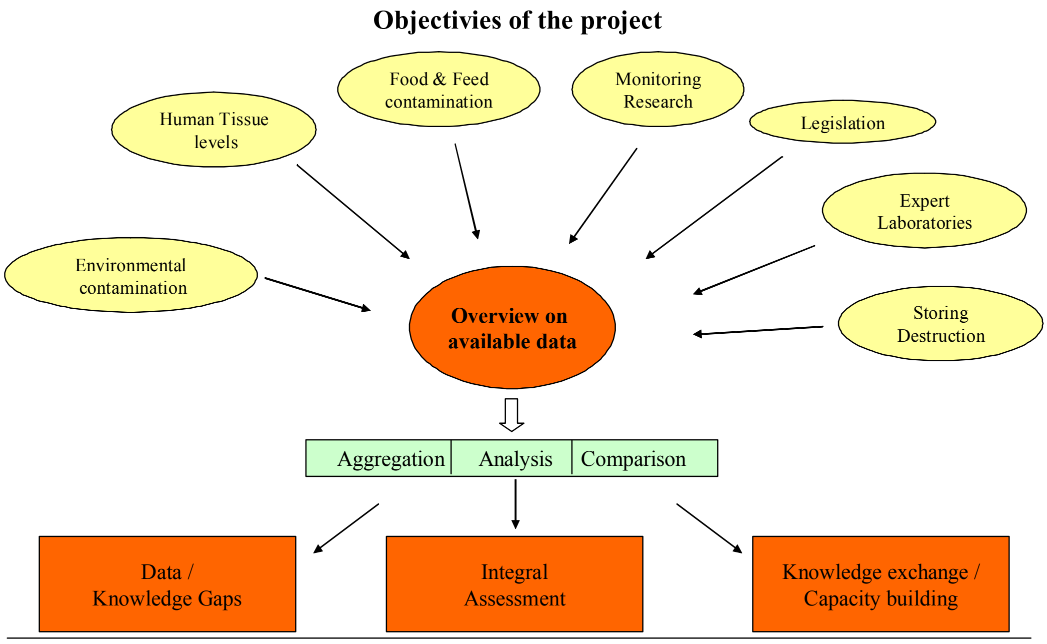


Figure 1-1: Objectives of the project

According to the objectives, the project results will

- represent available data on environmental levels of dioxins and PCBs and on human exposure to dioxins and PCBs and related issues (existing capacities, regulatory aspects, administration and enforcement, ongoing monitoring and research activities priorities and plannings), across all 13 AC/CCs, i.e. Bulgaria, Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia and Turkey
- provide an integral assessment of the current situation in the relevant fields
- contribute to capacity building by mutual know how transfer and close cooperation with experts and relevant representatives

2 Methodology

The following chapter shortly describes the methodological approach that has been chosen to achieve the project objectives.

2.1 Structuring of information

In order to be able to collect data in an efficient way and closely related to the objectives, required information had to be structured before starting data collection activities. The established structure for data collection has been approved by the responsible Commission representatives.

The basic structure is generally a matrix with all Candidate Countries on the one hand and all relevant fields of interest on the other hand.

Information is required in the following fields:

- data on environmental levels and human exposure
- regulatory aspects
- research and monitoring activities
- human and technical capacities
- national priorities and plannings

The following picture illustrates the matrix principle:

Data presentation– Environmental Levels and Human Exposure

	Bulgaria	Czech Republic	Cyprus	Estonia	Hungary	Latvia	...
Environmental levels							
Levels of air							
Levels of soil							
Levels of sediments							
Levels in vegetation							
Levels in wildlife							
Conclusions for the ecosystem as a whole							
Human exposure							
Contamination data food							
Dietary intake data							
Dietary exposure data							
Contamination data feedingstuffs							
Human contamination levels							

Figure 2-1: Data presentation

The data on environment levels and human exposure include information on hot spots and background levels and are further differentiated in levels of contamination with PCDD/Fs as well as PCBs in air, water, sediment, soil, vegetation and wildlife for environmental contamination on one hand and food & feed contamination, dietary intake and human tissue levels (breast milk, blood, adipose tissue) for the assessment of human exposure and body burdens.

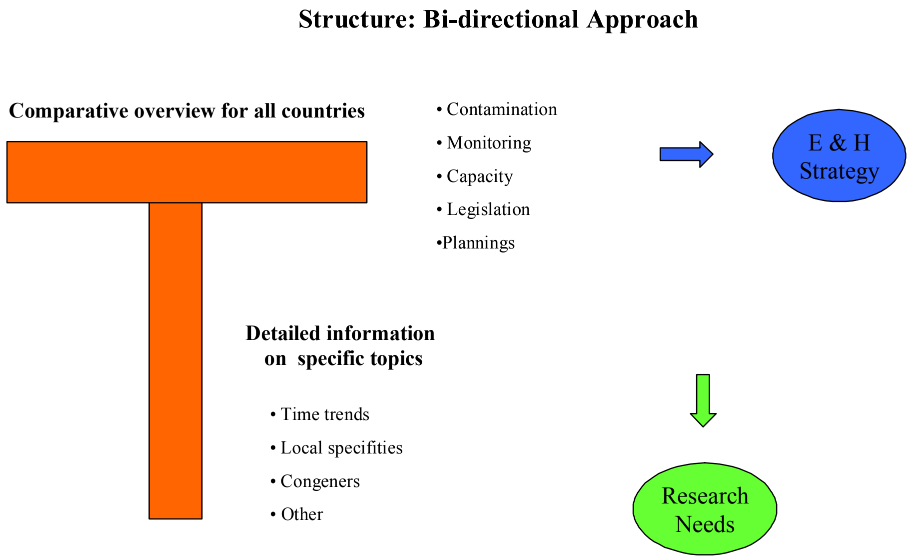
Regulatory aspects show national legislation with respect to air emission, chemicals production, use and transport, water protection, hazardous waste management, safety on working place, food- and feed control including limit, target and action values set, as well as the administrational structure for enforcement and control.

Research and monitoring activities are structured according to their relation to environmental compartments or human exposure and comprise national and international projects in all above mentioned fields.

With respect to capacity aspects information about national experts working in the field, competent institutions, internationally accredited laboratories and PCB destruction equipments are of particular interest.

As to priorities and plannings information on special national problems, needs and plannings is requested and will help to co-ordinate necessary support and common actions.

This structure allows a systematic overview on the current status of facts on environmental levels and human exposure and of knowledge on legislation, science and strategic approaches in the field of dioxins and PCBs in all Candidate Countries and enables specific measures to close data gaps and adjust legal, technical and scientific standards. Furthermore the structure will provide detailed information on specific selected topics allowing to assess time trends, local characteristics and transport and fate of PCDD/Fs and PCB congeners.



igure 2-2: The bi-directional approach of the project

2.2 Collection of Information

National circumstances, activities and availability of information differ significantly across Candidate Countries. To assure reliability of the collected data and prepare an overview on available data on environmental levels of dioxins and PCBs as well as related human exposure in the Candidate Countries in close co-operation with the competent national authorities and experts the project has been based methodologically on four major pillars that are the following:

- Official questionnaire
- Internet research
- Scientific contacts
- Project home page

To assure comparable conditions for the information collection in all countries, the developed questionnaire has been sent uniformly to the ministers of environment, health and agriculture in all Candidate Countries. Enclosed was an official letter of recommendation of the DG Environment to underline the importance of a close co-operation.

The questionnaire has been divided in two parts:

Part I (questions no. 1 to 10) related to environmental levels and

Part II (questions no. 11 to 19) related to human exposure.

Each question has been followed by a short table to facilitate the answer for the responsible official. The questionnaire has been accompanied by a letter to explain its use and purpose.

The answer was possible in different categories:

- "Information attached " if the official disposed directly of the requested information.
- "Information documented at" if the requested information is already published and available (e.g. in the internet).
- "Not existing" if the requested item is not existing (e.g. corresponding law).
- "Contact for further information" if the official did not dispose directly of all requested details but knows the competent institution or expert.

The feedback proportion has been outstanding good. More than 80% of the addressed ministries responded and sent information and contact addresses for further information needs.

No information have been provided from the Ministries of Environment and Health of Bulgaria, Romania and Turkey.

Parallel published information about legislation, administrational structure, monitoring programmes and research projects has been searched and contacts with national experts have been established for information collection.

With the development of a project homepage dedicated to information-transfer and intended to work as a discussion forum for interested experts a platform for communication and knowledge-exchange had been provided for the period of the project time.

The complete structure of the homepage is documented in annex I of this report.

2.3 Capacity building and know how transfer

Capacity building and know how transfer is implicit to the project approach as experts and authorities from both, Candidate Countries and Member states have been involved throughout the whole project. In addition to this basic and European wide involvement selected features of the project approach have had a particular impact on capacity building and know how transfer:

- questionnaire and mutual know how transfer in numerous interview and discussions
- open internet web-site designed as an information exchange tool
- integration of local experts, authorities and partners of the project team in all Candidate Countries into the decentralised bilateral communication between members of the project team and local experts
- participation of the project team at various workshops and conferences such as
  - Kick-off workshop "Dioxin Emissions in Candidate Countries" March 3, 2003 (Bratislava)
  - Expert meeting on "Integrated dioxin & PCB monitoring in the Baltic Region", April 2003 (Brussels)
  - Workshop on Enabling Activities in the Central and Eastern European Region, May 2003 (Brno)
  - Workshop on Dioxins in Baltic Sea fish - Scientific basis and information needs of assessment and management, June 2003 (Helsinki)
  - International Symposium on Halogenated Environmental Organic Pollutants and POPs, August 2003 (Boston)
  - Persistent Toxic Substances Contamination of the European Region, November 2003 (Brno)
  - 2nd workshop Dioxin Emissions, February 2-3, 2004 (Bratislava)

2.4 Conclusions and recommendations

Conclusions and recommendations reflect the view of the project team and are based on available data and facts, derived results and communication with institutions and experts.

The information collected has systematically been evaluated against the overall objectives of the project. The goal of resulting recommendations is to ensure that important data gaps are closed efficiently, available data are integrated in a common data base for Member States and Candidate Countries and that cooperation and capacity building is further intensified.

3 Research & Monitoring Activities

The following chapter summarises the research and monitoring activities related to dioxins and/or PCBs which were performed or are ongoing in Candidate Countries. More detailed information can be found in the Annex II on monitoring activities. Furthermore a number of research projects are currently or have been previously carried out focusing on methodology, regional contamination assessment, risk assessment toxicology or other related issues. A compilation of research activities can be found in the Annex on research activities. It has to be stated that it was not intended neither possible in the framework of this project to give a complete compilation of every ongoing activity in AC/CCs but to give an overview on major activities and addressed environmental compartments

3.1 Air

3.1.1 Monitoring programmes and responsible institutions

Monitoring of ambient air is not common in most of the AC/CCs Only 5 of the AC/CC (CZ, EST, LV, LT, PL) have at least some monitoring data. The monitoring is realised on the basis of national, international (UN ECE/EMEP; Nordic Environment Research programmes; Swedish Baltic Programme) and local programmes (City of Gdansk; Krakow) by individual research institutions and governmental authorities. . The Czech Republic is the only country with a long tradition of air monitoring activities, participating in the EMEP reporting on POPs via the regional background observatory in Kosetiče and disposing of an established national monitoring system. Figure 3-1

3.1.2 Sample types and parameters

PCDD/Fs are monitored routinously only in the Czech Republic. Episodic measurements at the local level have been performed in Poland (Krakow) and in Slovakia (Bratislava and Kosice) in the framework of research projects.

Monitoring of PCBs is performed in ambient air as well as wet and bulk deposition. A national monitoring programme again does only exist in the Czech Republic. Monitoring activities in the Baltic countries have been performed in the framework of regional monitoring programme initiated by the Scandinavian countries. In Poland monitoring activities have been performed at local level (Gdansk) and in the Slovak Republic monitoring has been performed episodically in the framework of the European PHARE project (EU/93/AIR/22) and a pilot project "Burden of Environment in an Area contaminated with PCBs".

3.1.3 Description

Monitoring activities cover regional background monitoring at various sites as well as monitoring of air pollution at individual stations in selected cities. The spatial distribution of monitoring stations is extremely varying. Whereas in the Czech National Monitoring Programme the bulk deposition of PCBs is measured at 27 stations, data for Lithuania are restricted to one single measurement station

where data have been collected within a regional monitoring programme. The distribution of PCDD/F monitoring sites in the Czech National Monitoring Programme is illustrated in Figure 3-1. This network up to now is unique in the AC/CCs.

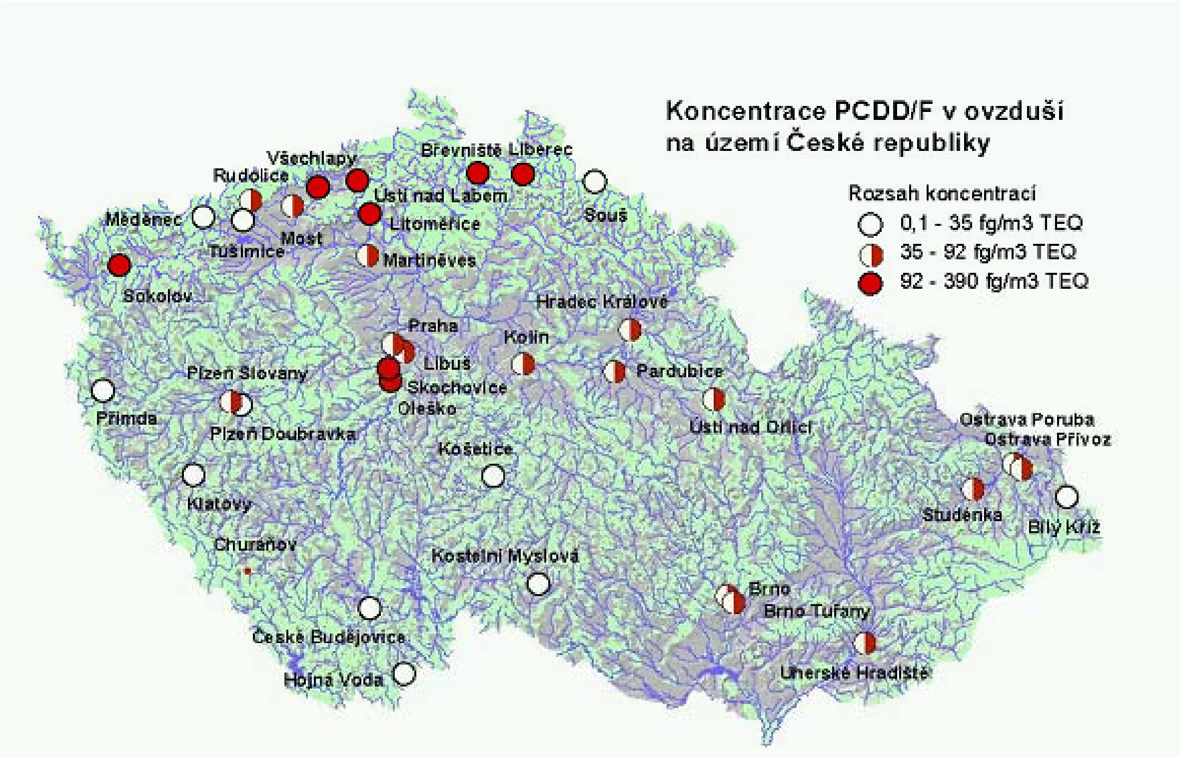


Figure 3-1: PCDD/F concentrations and distribution of corresponding monitoring sites in the Czech Republic (Holoubek et al. 2003a)

Besides this national monitoring the Czech Republic is participating in the EMEP programme via a regional background observatory located in Kosetiče in the centre of the country (see Figure 3-1).

PCDD/Fs, PCBs, Persistent organic pollutants (POPs) have been included in EMEP's monitoring programme in 1999 At the observatory Košetice in the Czech Republic POPs are measured in all environmental matrices since 1988 and are routinely reported to EMEP, OSPARCOM and HELCOM. (Vana et al., 1997, 2001). Concentrations of PCBs in ambient air were also measured as a part of the Baltic programme at some sites in Baltic AC.

3.1.4 Monitoring frequency and period

Whereas air concentration and wet deposition PCBs is measured weekly or at each precipitation event in the EMEP programme the monitoring frequency is usually monthly or once a year. Monitoring programmes in the Czech Republic are still ongoing.

3.2 Surface and Groundwater

3.2.1 Monitoring programmes and responsible institutions

Water monitoring programmes are carried through in a number of the Accession Countries (Cyprus, Czech Republic, Hungary, Lithuania, Poland, Slovak Republic, Slovenia). For Turkey and Bulgaria no information on monitoring of dioxins or PCBs in water could be obtained. In Latvia PCDD/Fs and PCBs are not included in the National Monitoring Programme because they were below detection limits during screening measurement in the centralised water supply system.. Malta has plans to establish a ground water monitoring programme in the future. Monitoring activities are carried out in either international (e.g. UN ECE/EMEP; HELCOM) or national programmes by governmental authorities.

3.2.2 Description, sample types and parameters

Monitoring of water normally aims at the assurance of appropriate water supply (monitoring of the water quality of important supply reservoirs) at national or regional level (e.g. Project Elbe, Morava, Oder or the Baltic Sea). Generally it can be stated that – monitoring for PCBs in all cases covers the majority of national waters. Measurements are often undertaken for surface and ground waters. Monitoring of PCDD/Fs in the water body is not undertaken.

3.2.3 Monitoring frequency and period

Monitoring is carried out annually or several times (2-4) a year and sometimes monthly. The first regular monitoring started during the end of the 1980ies (e.g. Cyprus and the Czech Republic). In most of the countries monitoring of PCBs in water is ongoing.

In Lithuania and Poland there is no regular monitoring of ground water up to now but monitoring of Sea water is included in the Polish monitoring programme.

Several research activities concerning to the aquatic ecosystems were realised during the last 10-20 years in the Czech Republic, Poland, Slovakia and Slovenia as well as in Estonia.

Monitoring of waste water is not widely established in AC/CCs so far. Only a few waste water treatment plants have been monitored in Poland, Czech Republic and Hungary

3.3 Sediment

3.3.1 Monitoring programmes and responsible institutions

Monitoring of sediments is more common than monitoring of water contamination but often restricted to monitoring of PCBs. For Bulgaria no information on monitoring of dioxins of PCBs in sediments

could be obtained. In Malta there is no monitoring of sediments up to now. In most cases monitoring is carried out in international (e.g. UN ECE/EMEP; HELCOM) and national programmes by governmental authorities.

3.3.2 Sample types and parameters

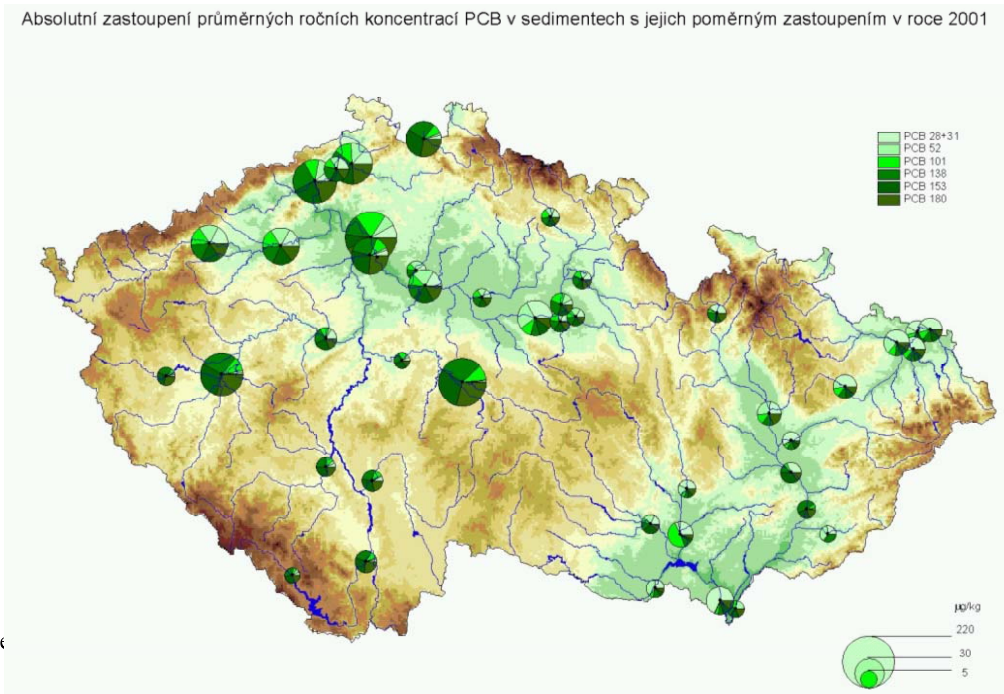
Monitoring is performed for PCBs in sediments of different kind and age and sometimes in suspended sediments. Monitoring of PCDD/Fs in sediments is restricted to the Czech and Slovak Republic.

3.3.3 Description

While a national Monitoring system covering all major waters is established in the Czech Republic, Lithuania, Cyprus, and Hungary, monitoring in other countries focused on hot spot regions (e.g. Slovakia and Slovenia). In Latvia first screening samples only have been taken in 2003 from different sites at the Daugava river system.

In Poland monitoring is focused on the two major rivers of the country and on coastal sediments from the Baltic Sea. For Romania and Turkey first samples have been taken from coastal sediments in the Black Sea and the Bosporus in the framework of a research project.

As an example for the possible extension of a national monitoring system as established in several AC/CCs (see above) the monitoring network for PCBs in sediments in the Czech Republic is illustrated in Figure 3-2.



Figur

Comparable monitoring networks for sediments covering the majority of the national water courses

have been established in Cyprus and Lithuania as well. In Poland the monitoring is restricted to the two main rivers (Oder, Vistula) presuming that contamination from other water courses will finally be reflected in those streams two. Following a similar approach (river load will culminate at estuarian sections of marine sediments measurements) first screening measurements have been focused on coastal sediments for Romania and Turkey. In the Slovak Republic and Slovenia where pollution is mainly due to single localised "hot spots", monitoring has been largely focused on local rivers and lakes. A discussion on levels and regional distribution of contamination is given in the corresponding paragraph of chapter 4.

The determination of sediment quality in the Czech Republic and Poland was/is also part of the international Elbe and Oder programme.

First monitoring activities regarding contamination of sewage sludge have been started in the Czech Republic, Poland and Hungary.

3.3.4 Monitoring frequency and period

Monitoring is carried out annually or several times a year. A monthly sampling is performed in the Czech Monitoring programme. As in water monitoring the first regular activities started during the end of the 1980ies. In most countries monitoring of sediments is ongoing.

3.4 Soil

3.4.1 Monitoring programmes and responsible institutions

Monitoring of contamination in soils is differing a lot between the AC/CCs. Monitoring for PCDD/Fs is only performed country wide in the Czech Republic and Hungary (acc. to personal communication responsible project leader) so far. Single hot spot measurements are performed in Poland (Neratovice) and Estonia (Laguja landfill). Monitoring of PCB contamination in soils has been realised in Bulgaria, Czech Republic, Hungary, Latvia, Poland, Romania, Slovakia and Slovenia.

In Cyprus, Lithuania and Turkey no soil monitoring has been performed. Monitoring activities are carried out in international (e.g. UN ECE/EMEP; EU funded sampling in Candidate Countries) and national programmes or research projects by individual research institutions or governmental authorities.

3.4.2 Sample types and parameters

Sampling is performed in agricultural and forest soils as well as in urban and contaminated (industrial) sites or sites with suspected contamination.

3.4.3 Description

In the Czech Republic three different monitoring systems have been established covering different soils in the country. The CISTA (Central Institute for Supervising and Testing in Agriculture) programme under the responsibility of the Ministry of Agriculture is performing basal soil monitoring at 40 representative agricultural sites and protected areas throughout the country. On selected monitoring plots atmospheric deposition is monitored simultaneously in one-month periods. On a special subsystem of 27 monitoring plots, designed in highly polluted areas, parameters of pollution are investigated (level of pollution, sources, translocation in soil profile, transfer to plants). Since the agricultural soil monitoring serves as a tool for risk evaluation of agricultural production contamination, samples of different crops from contaminated plots (27) and reference plots (22) are taken and analysed for risk element contents each year.

The RIASC (Research Institute for Amelioration and Soil Conservation) programme (Flumisol) under the responsibility of the Ministry of Agriculture, too is focused on agricultural soils and grasslands in the Elbe river basin assessing in special the impact of industrial sources and flooding on soil quality. The third programme is the EMEP background monitoring included in the TOCOEN project focused on model sites for background, rural, urban and industrial contamination as well as contamination of remote mountain sites.

In Estonia soil monitoring is restricted to hot spots.

In Hungary a national monitoring system covers sampling sites all over the country since 1996. Also Slovenia shall have established a soil monitoring system in recent time in the framework of a GEF funded project to prepare the country for the Implementation of the Stockholm Convention but data are not available.

Latvia has started first screening of soil samples at suspected sites in 2003. Figure 3-3 demonstrates the newly developed map of suspicious sites for contamination in Latvia. First samples have been collected and analysed from 27 different former military camps where PCB contamination could be expected. The results are discussed in chapter 4.4.2 and are compiled in detail in annex III.

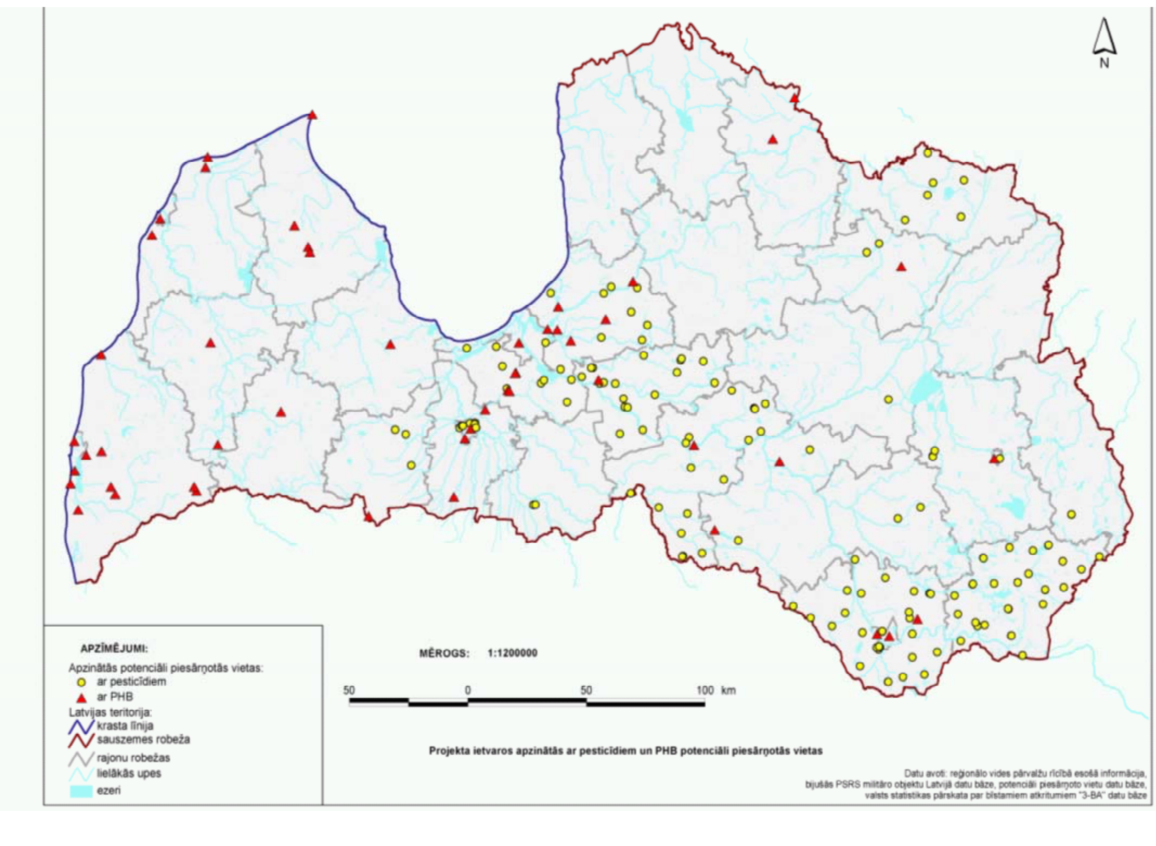


Figure 3-3: Sampling sites for first soil measurements in Latvia. PCBs (triangles); Latvian Environment Agency (LEA) 2003; bullets=sites of investigation for pesticides

In Poland soil samples were collected in 1994 from various sites in a former Soviet army base localised near the town of Swinoujscie in the north-western corner of Poland and from different soils in the area of Katowice, Krakow and Chorzow. The current national soil Monitoring Programme in Poland does not include PCBs and PCDD/Fs. As a consequence older data have to be taken for comparison.

In the Slovak Republic there is a country wide monitoring of agricultural soils in the national monitoring programme and furthermore an additional monitoring of soils in the eastern part of the country performed in the framework of the PHARE project "The burden of the Environment and Human Population in an Area Contaminated with PCBs".

Other countries (Bulgaria, Romania) have performed a screening of different types of soil in the framework of externally funded research projects in the last years.

3.4.4 Monitoring frequency and period

Monitoring is carried out once within several years or annually. First regular monitoring activities started during the end of the 1980ies. In the Czech Republic and Slovakia, monitoring of soils is ongoing. There is no information how the situation will develop in other countries.

Several research projects related to soil contamination are or have been carried out in the Czech Republic, Poland, Slovakia and Slovenia.

3.5 Vegetation

Monitoring of vegetation is rare in AC/CCs. Contamination levels in vegetation are regularly reported from the Czech Republic in the framework of the EMEP monitoring programme. Since 1995 mosses and needles are included in the basal monitoring programme of CISTA. In both programmes mosses and conifer needles are annually sampled at 8 and 27 sampling sites respectively for analyses of their PCDD/F and PCB content.

There is information about episodic monitoring of contamination levels in pine needles from the boundary mountains in Poland. (Migaszewski 1999).

In Slovenia mosses have been monitored in the Bela Krajina region (hot spot) in the beginning of the nineties after an accident resulting in heavy PCB contamination of the local environment. Recently needles in remote Slovenian mountain sites have been monitored in the framework of a joint research

project with the Austrian EPA in Vienna.

3.6 Wildlife

3.6.1 Monitoring programmes and responsible institutions

Monitoring of wildlife is much more common in AC/CCs than monitoring of vegetation especially if looking at monitoring of fish. Corresponding programmes are carried through in 9(EST, LV, PL, CZ, SK, RO, M, LT, SLO) of the AC/CCs. For Bulgaria and Turkey no information has been obtained. In Hungary and Cyprus monitoring of wildlife is not realised. In Malta and Latvia monitoring is restricted to marine fish. Monitoring activities are carried out in international (e.g. HELCOM, MEDPOL) and national programmes or research projects by individual research institutions and governmental authorities.

3.6.2 Description, sample types and parameters

Monitoring of aquatic wildlife is the most frequently undertaken due to the high impact on human exposure attributed to aquatic organisms. As a consequence major local fish species (e.g. herring, sprat, perch, cod, plaice, flounder, salmon, barbel, bream, trout) as relevant contributors to the human food chain are most frequently sampled in wildlife monitoring programmes.

Other marine wildlife such as invertebrates, seals, mussels, water birds or their eggs have been monitored in several countries episodically in order to assess the impact on the aquatic ecosystem. In a number of countries terrestrial wildlife is included in the monitoring mostly as part of the national food monitoring programmes

Monitoring for PCDD/Fs and dioxin like PCBs is restricted to marine animals from Malta, Latvia, Poland and Estonia and Czech fresh water fish. Other countries (Lithuania, Romania, Slovakia, Slovenia) up to now only perform monitoring of PCBs.

3.6.3 Monitoring frequency and period

The normal monitoring frequency is once a year. The first regular monitoring goes back to 1984. In most of the countries the monitoring of wildlife is still ongoing.

In the Czech Republic and in Poland several research projects concerning health effects and bioaccumulation have been realised.

3.7 Food & Feed contamination

3.7.1 Monitoring programmes and responsible institutions

Monitoring of food is an important part of the national monitoring in the majority of AC/CCs.

However the monitoring up to now is mostly restricted to determination of contamination with classical PCBs. Only recently some countries have started to include PCDD/Fs and dioxin like PCBs

For Bulgaria and Romania no information about food monitoring for PCBs has been obtained. In Turkey PCBs and PCDD/Fs are not included in the national food monitoring. In all other candidate countries food monitoring is carried out at least to a certain extend in national food monitoring programmes by and national Food and Veterinary Services as governmental authorities.

3.7.2 Description, sample types and parameters

Because of the important role of fish as contributor to the human dioxin and PCB uptake, fish plays an important role in food monitoring. In addition to these eggs, wildlife, milk and milk products, meat and meat products, vegetable oils and other foodstuffs are monitored.

Up to now monitoring for dioxin-like PCBs and PCDD/Fs in all kinds of food has been performed in the Czech Republic and in Slovakia only. In 2003 these substances have been included in the Maltese and - according to personal communication - also in the Slovenian food monitoring programme, too but results are not yet available. PCDD/F analysis in fish has been performed in the Baltic Sea countries. Other food of animal origin shall be included in Estonia from 2004.

Monitoring for classical PCBs is more common. However it has to be stated that national monitoring systems differ at lot with respect to food stuffs included, grouping of food and frequency of monitoring. In Cyprus monitoring of milk and meat has been only performed twice for screening purposes in the framework of GEMS/food (Information State General Laboratory). In Hungary food monitoring is still restricted to control of imported food products only. (Information from National Institute of Food Hygiene and Nutrition)

Monitoring of feedingstuff and feed water is scare. Only the Czech and Slovak Republic have reported about monitoring activities. While PCDD/Fs and PCBs are analysed in the Czech Republic only PCBs are monitored so far in the Slovak Republic.

Drinking water is monitored for PCDD/Fs and PCBs or PCBs respectively in the Czech and Slovak Republic or Hungary and Cyprus (National ground water monitoring).

Assessment of dietary intake via total diet studies is not common in AC/CCs. Information about monitoring has been provided for Czech Republic and Slovakia only. A relatively old study has been presented from Hungary. In Poland the estimated daily intake (EDI) has been calculated on the basis of food contamination data and statistical consumption data for food.

3.7.3 Monitoring frequency and period

The usual reporting frequency is annually. Some countries (Czech Republic, Malta, Slovak Republic) indicate to carry out monitoring of food according to existing EU regulations already. The first regular activities for food and feed monitoring go back to 1984.

3.8 Human exposure

3.8.1 Monitoring programmes and responsible institutions

Except from Cyprus Malta and Turkey at least some monitoring for human tissue levels of dioxins and/or PCBs has been performed in AC/CCs. An important programme is the WHO milk study which is the only activity related to these issues for some countries (e.g. Bulgaria and Romania). In addition several national programmes or research studies are carried out by individual research institutions and governmental authorities. A number of research studies concerning epidemiology or toxicology are or have been performed in Slovakia, Slovenia, Czech Republic and Poland.

3.8.2 Description, sample types and parameters

Due to the relatively easy accessibility PCDD/Fs and PCBs are most often monitored in human milk. Milk not only provides evidence of maternal exposure to contaminants but also information on the exposure of breast-fed infants. In addition to human breast milk, adipose tissue, blood cord blood and several other body tissues (placenta, liver, brain) are monitored for indicator PCBs and/or dioxin-like PCBs and/or PCDD/Fs. While human milk monitoring is monitored in the framework of national monitoring programmes with annually monitoring (Czech Republic) or systematic investigation of different regions of the country (Slovak Republic, Hungary) in one part of AC/CC, information from other countries is restricted to specific research projects consisting of a relatively small number of samples (e.g. Estonia, Latvia). In Poland several studies have been performed comparing regional differences and age effects, but a systematic investigation of all regions of the country has not been performed so far.

No monitoring of human milk has been carried out in Slovenia, Malta, Cyprus and Turkey so far.

Adipose tissue as indicator organ for total body burden of PCDD/F and PCBs has been monitored in the Czech and Slovak Republic, Poland, Hungary and recently in Turkey.

Contamination levels in blood are less often monitored because collection of this tissue is more invasive. Besides a research project in Poland investigating blood levels in volunteers from 3 cities in Poland and a local monitoring of blood levels in the hot spot region of Bela Krajina in Slovenia performed in the beginning of the nineties, there is one major monitoring project on contamination levels in blood in the Slovak Republic, launched as a 5th Framework project for health risk assessment.

This PCBRISK project (QLK4-CT-2000-00488) is designed as a pilot study for health impact assessment of elevated PCB tissue levels comprising several thousand randomly selected participants from the hot spot region of Michalovce and the control district of Stropkov.

3.8.3 Monitoring frequency and period

Monitoring of human milk is performed annually in the Czech Republic but normally data are collected episodically. In the framework of the WHO long-time project "Exposure study on the levels

of PCBs, PCDDs and PCDFs in human milk" samples are collected from participating countries in intervals of about five years.

3.9 Comparison with EU Member States

A comparison of monitoring activities in AC/CCs with the situation in Member States is difficult because there are large national differences in both AC/CCs and Member states.

Generally it can be stated that monitoring of PCDD/Fs and dioxin like PCBs is far less established and has started later than in Member States whereas information on classical PCBs is more abundant for the last years.

The average extend of monitoring activities (number of data, compartments covered) seems to be smaller than in Member States especially in the small Mediterranean and Baltic countries and the three Candidate Countries (Bulgaria, Romania, Turkey) were activities only have started recently.

Central European Countries (namely the Czech Republic) however have in part developed systematic National Monitoring Systems that can certainly be compared to Middle European or Scandinavian countries.

4 Environmental Contamination

The following chapter gives summarising information on exemplary data for contamination in different environmental compartments. It is not the intention of this chapter neither possible in the framework of this project to present a complete compilation of all data that have been collected in AC/CCs in the past years. But it provides an overview about relative contamination levels and links to sources that may be used for further in depth investigation of specific topics.

Availability of data about contamination levels in air, water, sediments, soil, vegetation and wildlife is differing a lot between different countries mainly due to different intensity of monitoring and research activities. Whereas some countries like Czech Republic, Slovakia and Poland have a high density of data for environmental contamination, the data situation is still poor for some other countries. Results include congener specific data whenever appropriate. Not all activities presented in chapter 3 are referred to in chapter 4 and chapter 5 as data have not always been made available for the mentioned monitoring activities.

The results presented and discussed in this chapter are sorted in relation to environmental levels of PCDD/Fs and PCBs in air, water, sediments, soil, vegetation and wildlife. Tables and figures in this chapter show exemplary results with respect to country levels, international comparison, time trends, spatial distribution of contamination levels, congener specific information or hot spot information. Detailed information on all data mentioned and/or discussed below from the Accession and Candidate Countries can be found in the corresponding tables in the annex. Data that are discussed under the subheading are listed in the tables under the heading "Annex –Contamination of Air", data on water under the heading "Annex – Contamination of Water" etc.

4.1 Air

Data on contamination of air including precipitation and dry deposition are quite scarce. For PCDD/Fs data have been collected only in the Czech Republic, Poland and Slovakia. With respect to PCB levels also some information from Estonia, Lithuania, Latvia and Slovenia is available in the AC/CCs. For detailed data and references see Annex III – Air contamination.

4.1.1 PCDD/F levels in ambient air

Czech Republic

Measurements in the Czech Republic started in 1993 with several research studies in different regions of the country which led to the establishment of a national air monitoring system (see Holoubek et al. 2003). The spatial distribution of mean annual contamination levels from 1996–2001 is demonstrated in Figure 4-4. Annual means in the Czech Republic show relative constant levels over the last 5 years, which however differ significantly between the 35 sampling sites included in the national monitoring. (For further details see Figure 4-4).

Data for Bohemia (number of sites=20) show the range of contamination over the period of one year. Data provided for East Bohemia/Moravia represent the variation between mean summer and mean

winter level of contamination with PCDD/Fs at 17 sites over the period of the last 3 years. Background data reported from the Kosetiče observatory (number of sites =7) present mean and min-max levels of sampling campaigns in spring and summer 1995-2000. Data reported for the Zlin region show autumn means for 2001 and 2002 and a summer mean for 2003. (see Table 4-1)

Poland

In Poland measurements of PCDD/F concentrations in ambient air have been performed at 4 different sites in the surrounding of Krakow in southern Poland (Grochowalski et al. 1995, 1997). While contamination levels in the winter season (January-March) ranged between 950-12,000 fg I-TEQ/m³ in 1995 the range reduced to 2580-5740 fg I-TEQ/m³ in 1996. A control measurement in the summer season (June 1996) showed levels with were up to 2 orders of magnitude lower. (60-120 fg I-TEQ/m³).

Slovak Republic

In the Slovak Republic analyses for PCDD/Fs in ambient air have been carried out in 1997-98 within the PHARE Project (EU/93/AIR/22) "Local studies of air quality in the cities of Bratislava and Kosice" and 5 other sites (Kocan et Stenhouse, 1999). In total 15 urban, industrial and rural sites have been monitored monthly from October to July (see Figure 4-2). The concentrations ranged from 30 fg I-TEQ/m³ in the least contaminated samples up to almost 700 fg I-TEQ/m³ in the most heavily contaminated sample, showing a significant difference between a summer mean of 55 fg I-TEQ/m³ and a mean winter contamination level of 247 fg I-TEQ/m³.

A summary of the data provided from the AC/CCs is given in Table 4-1 in comparison to corresponding data from MS.

European comparison of average levels and ranges

Country	Location	Ambient air			Year	Reference
		rural	**urban**	**industrial**		
Czech Republic	National Monitoring (35 sites)	annual means: 0.1-390			1996-2001	Holoubek et al. 2003a
	Bohemia (20 sites)		range 0.7-2,214.6		1997-98	Holoubek et al. 2003a
	East Bohemia/ Moravia (17 sites)		summer mean: 10		1999-2001	
			winter mean: 123			
	Kosetiče (7 sites)	summer median 11 (8.7-184.7)			1995-2001	
	Zlin region		autumn mean: 75-109		2001-2002	
			summer mean: 27		2003	
Slovakia	Bratislava, Kosice, 5 other sites	annual average and range: 80 (30-690) mean summer: 55 mean winter 247			1996-97	Kocan et Stenhouse, 1999
Poland	Krakow (winter)		range winter: 950-12,000		1995	Grochowalski et al. 1995
			range winter: 2,580-5,740		1996	Grochowalski et al. 1997
	Krakow (summer)		range summer: 60-120			

Austria	Steiermark		annual medians: 34.1-184.1 (min-max 16.4-324.6)		1996-2000	Buckley-Golder et al. 1999
	countrywide: rural, urban, industrial	winter mean: 48.6-353.1 summer mean: 6.9-132.4			1997-2000	Moche & Thanner 2000
Austria	remote mountain sites	winter mean: 4.4 summer mean: 2.6				Moche & Thanner 2000
Germany	Bavaria,		annual medians: 13-25		1992-93	Buckley-Golder et al. 1999
	Thuringia		annual medians: 52-83		1993-1994	
	Hesse		winter means: 68-118		1990-1995	
Germany		winter mean: 17 summer mean: 7	winter mean: 54 summer mean: 8		1995-2000	Fiedler et al. 2002
Greece		7.8 (2-178)	range 4-119		2000	Mandalakis et al., 2002
Italy		2-6	range 11-480		1998-99	Turrio-Baldassarri et al., 2001
Portugal		24-244	range 36-548		1998-99	Coutinho et al, 2001
Spain		range 5 – 125	range 13-357	range 18-954	1998-2000	Abad et al. 2002
UK		6-12			1996-97	Buckley-Golder et al. 1999
			17-72			

Table 4-1: Summary of annual average PCDD/Fs concentrations [fg I-TEQ/m³] in ambient air from Accession and Candidate Countries and selected Member States

Discussion

Comparison of data is difficult because data presentation is not homogenous.

However comparing Czech annual means (0.1-390 fg I-TEQ/m³) with Austrian levels from the same period of time (summer/winter 6.9-353 fg I-TEQ/m³) shows an approximately similar contamination level.

Comparing summer means of Czech Republic, Poland and Slovak Republic, which are far more important than winter levels with respect to their impact on the food chain, it can be stated that levels are within the range or more on the lower edge of corresponding Austrian sites and the ranges of contamination reported for other MS. Recent data from Germany appear low, but this may be due to exclusion of higher contaminated sites. Background levels reported for spring and summer campaigns from the Czech Republic are in the range of German rural levels.

If looking closer at winter contamination values which strongly reflect the influence of heating measures it can be stated on the basis of the presented data that local levels reported from southern Poland are somewhat higher than in MS. While winter means in the Southern part of the Czech Republic (Eastern Bohemia/Moravia) seem to be close to the levels in MS, it can be assumed from high annual means in northern and central parts of the country (see Figure 4-4) that high levels in winter time can be observed at certain locations. According to expert information this observation is mainly due to domestic heating using local coal and wood or even co-incinerating waste. (see also:

seasonal variations).

To conclude it can be stated that based on available data in general there does not seem to exist a problem with PCDD/F contamination levels in AC/CCs as already ambient air levels in the most highly industrialised countries Czech and Slovak Republic seem to be at a comparable levels as in Member States. It even may be possible that due to higher concentrations of particulate matter in ambient air, the fraction which is relevant for food chain contamination is lower. This observation could explain the relatively low PCDD/F levels that have been observed in agricultural soils and human milk from AC/CCs.

Long term time trends

Data provided from the EMEP observatory in Kosetice, from the national air monitoring programme in the Czech Republic collected from 1995-2001 (Table 4-1) do not indicate declining PCDD/F concentrations in ambient air for the last years.

In a short time series provided from the Zlin region there seems to be a certain decrease of median levels detected for PCDD/Fs as well as dioxin-like PCBs over the last 2 year. However data are not enough to draw conclusions.

Number of sites	samples per year	sampling frequency	Year	Median	Min	Max	Note
3	9	1x3 days (autumn)	2001	109	62.2	164.2	PCDD/F-I-TEQ
				6.0	3.3	7.2	PCB-TEQ
5	15	1x3 days (autumn)	2002	75	41.0	118.5	PCDD/F-I-TEQ
				3.8	2.92	6.32	PCB-TEQ
6	18	1x3 days (summer)	2003	26.22	14.05	454.1	PCDD/F-I-TEQ
				4.44	2.82	31.98	PCB-TEQ

Table 4-2 Trends in annual average minima and maxima in the Zlin region (industrial agglomeration); Holoubek et al. 2003a

Data from several EU Member States (see Baseline report -TWG Integrated monitoring of Dioxins & PCBs in the Baltic Region; 2004; Basler et al. 2002) show a clear declining trend for background and urban sites over the last decade with the decline levelling off during recent years. This general trend is illustrated by an example from the United Kingdom.

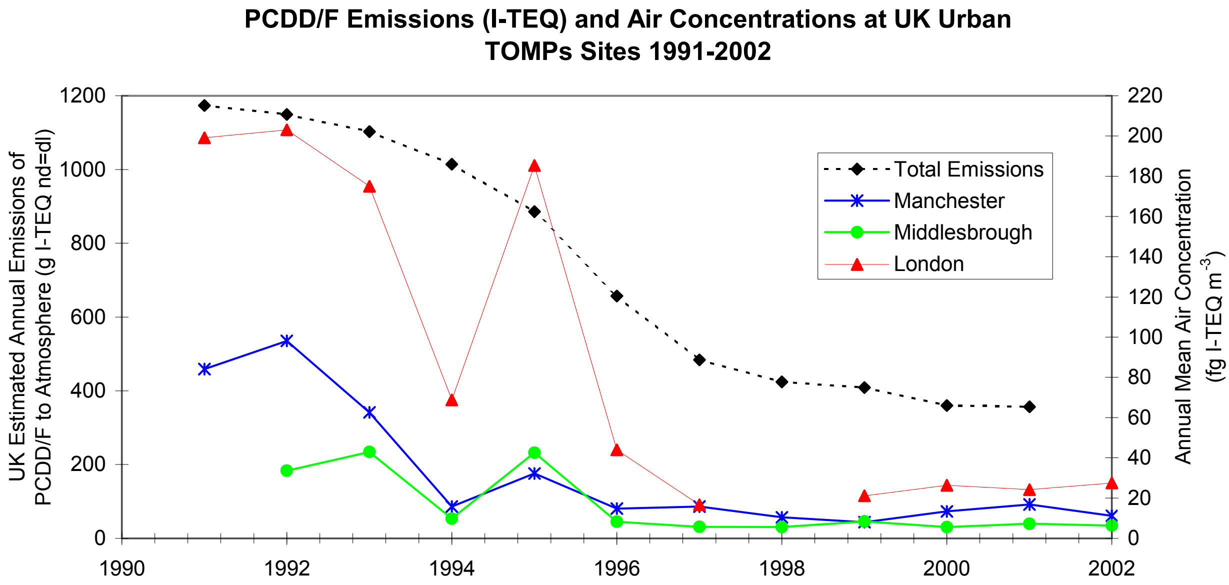


Figure 4-1 Trends of PCDD/F emissions and air concentrations in the UK over the last 12 years (Baseline Report Dioxins). Note: 1995 higher concentrations possibly due to the prevailing meteorological conditions.

Seasonal variations

Data on PCDD/F concentrations in ambient air show clear seasonal variations in all measuring countries (AC/CCs and MS) with peak levels in the winter months and lowest levels in summer.

In Poland winter levels in Krakow have been 4 to 5 times higher as summer levels. In 1996 levels from January to March ranged between 2,580 and 5,740 fg I-TEQ/m³ while they dropped to 60–120 fg I-TEQ/m³ in June. In winter 2002 the highest levels (3,700 - 4,100 fg I-TEQ/m³) have been measured in Zakopane, a small ski resort in the Tatra Mountains supporting the suspicion that domestic heating is a major source for dioxin emissions in winter time in AC/CCs (personal communication A. Grochowalski).

The seasonal variation of contamination levels in the PHARE project performed in Slovakia in 1996-97 are illustrated in Figure 4-2. Mean contamination levels in summer are around 53 fg PCDD/F I-TEQ/m³ while they raises to around 247 fg PCDD/F-I-TEQ/m³ in winter time. There is no spatial correlation between highest summer and winter levels indicating that most of the sources do not show perennial but only seasonal emissions.

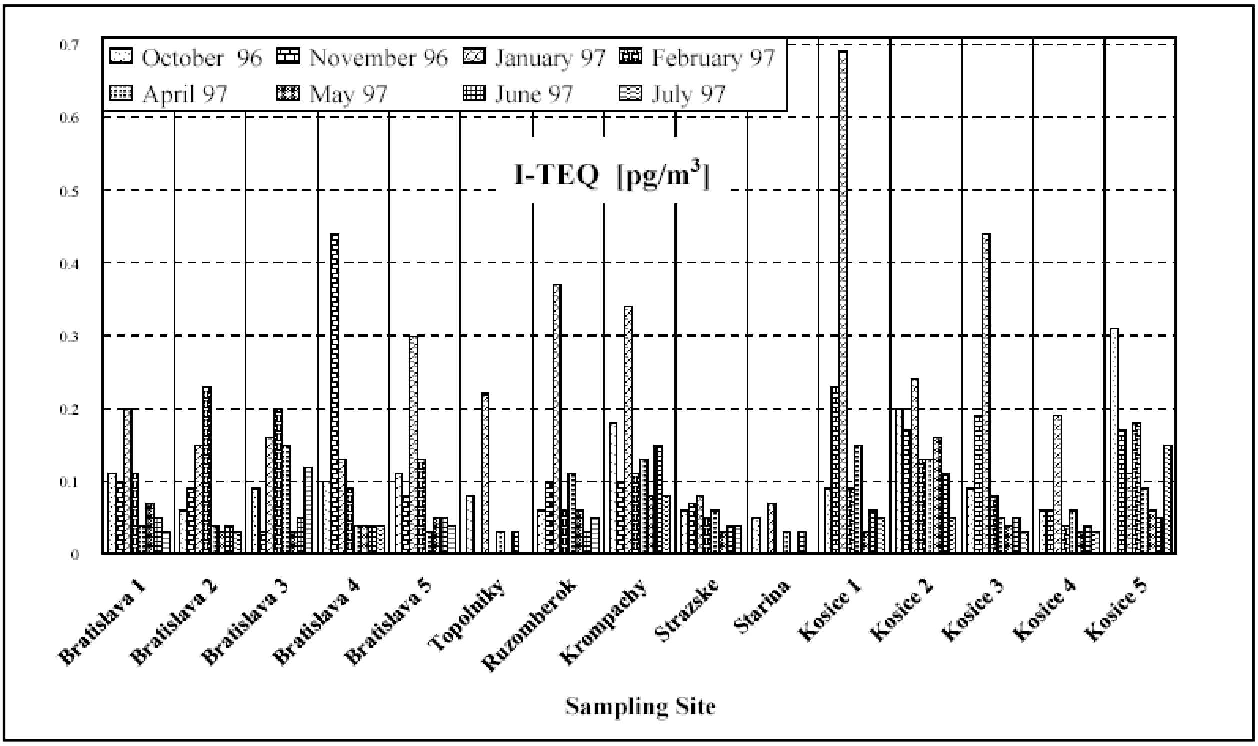


Figure 4-2: seasonal variations of PCDD/F levels (I-TEQ) in ambient air at 15 sites in Slovakia 1996-1997 (Kočan et Stenhouse 1999).

Corresponding seasonal trends in air have been observed in EU MS. Figure 4-3 demonstrates such trends for air concentrations and to a minor extent for deposition for two exemplary cases in Germany and Denmark.

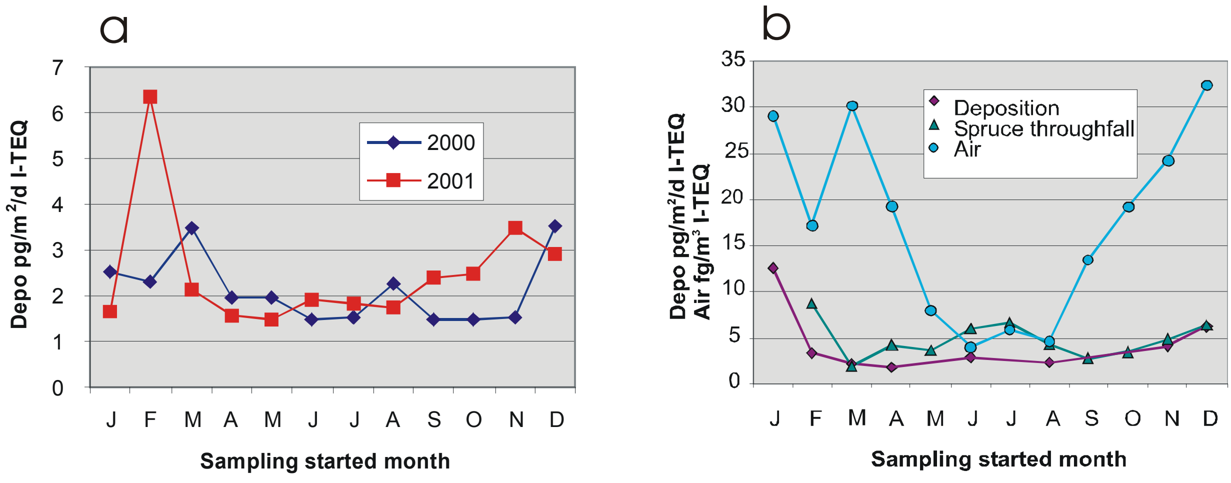


Figure 4-3: Seasonal variation in bulk deposition in Crumstadt, Germany (a) and in air, bulk deposition and throughfall in North Zealand, Denmark (b) (German data: German EPA-Hessisches Landesamt für Umwelt und Geologie, Danish data: Vikelsøe et al. 2003).

Spatial differences

Information about regional and local differences in contamination levels of ambient air is available for very few cases. The results of 5 years of national monitoring from the Czech Republic, comprising 35 different sampling sites are illustrated in Figure 4-4 the corresponding Slovak data are presented in Figure 4-2.

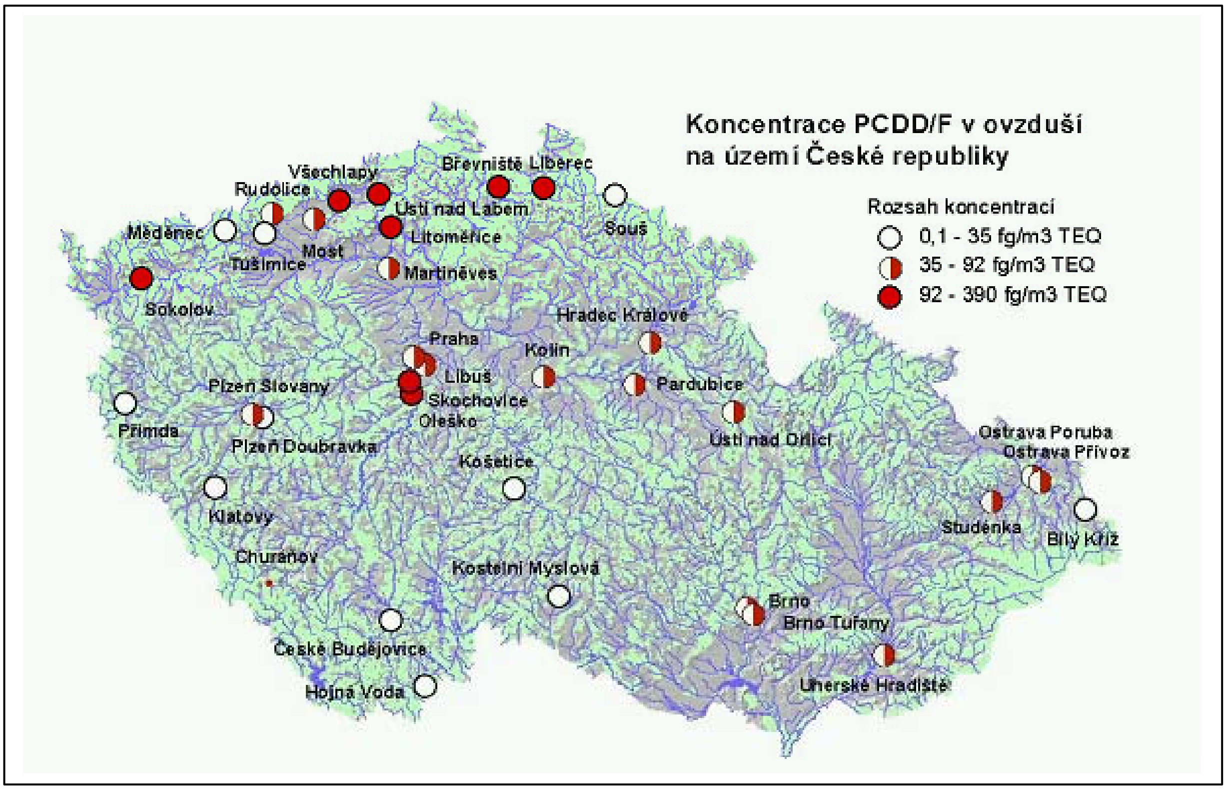


Figure 4-4 Spatial distribution of annual average high and low PCDD/F TEQ concentrations in ambient air. (Holoubek et al. 2003a)

Figure 4-4 shows an agglomeration of highly contaminated sites (filled bullets) in the central part and northern mountains with average levels of 92-390 fg PCDD/F-TEQ/m³ over a period of 5 years (1996-2001). Low contamination levels have been detected in the south west of the Czech Republic with levels ranging from 0.1-35 fg PCDD/F-TEQ/m³ (empty bullets). 16 locations show average contamination levels of 35-92 fg PCDD/F-TEQ /m³ (bi-colored bullets). In most cases high annual means are caused by winter peaks due to heating activities. Highest levels occur in poor regions and small rural dwellings, where local fuel, waste or wood treated with PCB containing preservatives is incinerated in domestic stoves.

4.1.2 Indicator PCB levels in ambient air

With respect to contamination of air with PCBs more data are available than for PCDD/Fs. Most data that have been collected in AC/CCs are related to indicator PCBs. Information on air contamination is available for the Czech Republic, Slovakia, Poland, Latvia, Estonia, Lithuania and Slovenia.

Czech Republic

In the Czech Republic a monitoring system (35 sites) has been established providing information about the spatial distribution of contamination levels throughout the country. Annual means range from 196-9,700 pg/m³ (Σ 6 PCBs) over the last five years. Furthermore the Czech Republic is providing data for the EMEP monitoring network collected in the background monitoring station of Kosetice in the southern central region of the country since 1995. The temporal development and relative high level of Czech ambient air contamination in relation to selected other European EMEP stations is shown in Figure 4-6. A local monitoring programme has been performed in the city of Prague in 1994-95 showing distinct differences between sampling sites of 79.5-3,018 pg/m³.

Slovak Republic

In the Slovak Republic contamination data have been collected within the PHARE Project (EU/93/AIR/22) "Local Studies of Air Quality in the cities of Bratislava and Kosice" cited already with respect to PCDD/F measurements in air. In total 15 urban, industrial and rural sites (5 in Bratislava, 5 in Kosetice and 5 others) that have been followed monthly over a period of 8 months (Petrik 1998, see Figure 4-5).The highest mean PCB (Σ 6 PCBs) concentration was found near a chemical plant in which PCBs were used in heat exchangers (Bratislava 3) – the highest individual value found there was 1,751 fg/m³ (Petrik 1998).

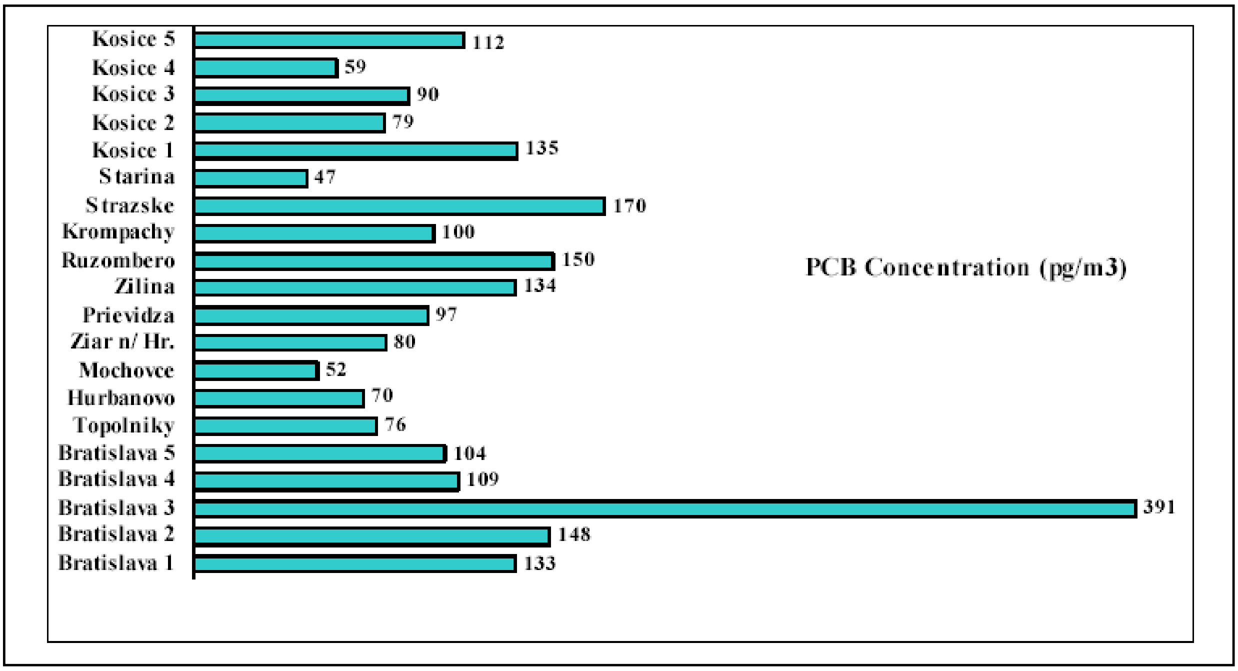


Figure 4-5: Annual average Indicator PCB concentrations (Σ 6 PCBs) in ambient air in 20 Slovak sites (geo. means from 8 measurements; 2/season), (Petrik 1998.)

Within a pilot project “The Burden of the Environment in an Area Contaminated with PCBs” started in 1997/99 PCBs were analysed in environmental samples including ambient air collected in the District of Michalovce (polluted area) and Stropkov (control area) showing higher values for the polluted area (Kocan et al 2000, 2001) (see Figure 4-10).

Poland

In Poland total PCB concentrations in ambient air have been determined in monthly intervals in samples collected in the city of Gdansk in 1991–92 (Falandysz et al. 1998). The detected median level was 270 pg/m^3 (range 120-1,100 pg/m^3).

Baltic States

In Estonia, Lithuania and Latvia total PCB levels in ambient air and deposition have been determined in the framework of a Programme of the Nordic Council of Ministers "Environmental Research in the Baltic Region in 1993-97 and 1999 and a Swedish Baltic Programme (see Annex III – Air contamination) with comparatively high values at the Latvian site Salaspils (arithmetic mean values 454 and 600 pg/m^3) (Agrell et al 2001).

Slovenia

For Slovenia only hot spot data from 1991 have been available showing extreme levels of contamination due to accidental contamination of the environment by a capacitor factory in 1983.

European comparison of average levels and ranges

A compilation of AC/CCs and MS data is given in Table 4-3.

Country	Location	Ambient air			Year		Reference
		rural	urban	industrial			
Austria	8 sampling sites	56.5-312.9 (winter) 122.3-500.6 (summer)			1997	Σ 6 PCBs	Moche and Thanner 2002
France	Paris		60-200		1986-90	Σ 7 PCBs	Granier and Chevreuil, 1991
Greece	Crete	17			2000	Σ 7 PCBs	Mandalakis et al. 2002
Sweden	11 sites southern Sweden	median 87 (min-max: 7-983)			2000	total PCBs	Backe et al. 2000
	Rörvik (background)	10-20			1996-2001	Σ 7 PCBs	Brorström-Lunden et al. 2003
Czech Republic	EMEP background station	annual median 155			1997	Σ 7 PCBs	Holoubek et al. 2003a Figure 4-9
	National Monitoring system; 35 sites	196-9,700 (annual medians)			1996-2001		
	Prague		79.5-3,018.5		1994-95	Σ 7 PCBs	AXYS unpubl.
Estonia	Vilsandi	50			1993-97	total PCBs	EEIC
		79			1991-92	total PCBs	Agrell et al 2001
Latvia	Salaspils			600	1993-97	total PCBs	EEIC
	Salaspils			454	1991-92	total PCBs	Agrell et al. 2001
	Salacgriva		210		1993-97	total PCBs	EEIC
	Sitere	100			1993-97	total PCBs	EEIC
Lithuania	Ventes	61			1991-92	total PCBs	Agrell et al. 2001
Poland	Dziwnow	55			1991-92		Agrell et al. 2001
	Swibno	69			1991-92	total PCBs	
	Gdansk		median 270 (120-1,100)		1991-92	total PCBs	Falandysz et al. 1998
Slovakia	PHARE project	52-76	59-391		1996-97	Σ 6 PCBs	Petrik et al. 1998
		annual median 100					
	Eastern Slovakia	mean: 113-159 (2 hot spot samples excluded)			Sep. 1997	total PCBs	see Figure 4-10
		hot spot: 1,500-1,700					
Slovenia	Bela Krajina (hot spot)			30 000-140 000	1991		Fazarinc et al. 1992

Table 4-3 Selected recently reported European contamination levels with PCBs pg/m³ (Background report UNEP Regional Report Europe; UNEP Mediterranean Regional Report 2002; Estonian Environmental Information Centre, other)

Discussion

The reported PCB concentrations in ambient air range from ~ 10 up to ~ 1,000 pg/m^3 in MS and from ~ 50 up to ~ 9,000 pg/m^3 in AC/CCs. Typical values amount usually up to ~ 100 pg/m^3 for background sites and up to several 100s pg/m^3 for contaminated areas. Comparing the results from the Czech national monitoring system with the EU average shows PCB levels which are significantly higher. This conclusion is confirmed by the results from the EMEP background monitoring stations, where levels from the Czech Republic are far higher than at other stations (see Figure 4-6).

Also data from Slovenia by far exceed the MS average as presented on the basis of the reported old data from the "hot spot" region. In the consequence more recent data would be urgently required to monitor the effect of time and remediation measures performed in the region since 1990.

Data from other AC/CCs (Baltic States, Poland, Slovak Republic) seem to be in the same range or even lower as data from MS.

Table 4-4 shows total PCB concentrations in ambient air, precipitation and deposition around the Baltic Sea in ACs (Latvia, Lithuania, Estonia and Poland) in relation to the EU MS Sweden.

Latitude	Station	Air (pg/m^3)	Precipitation (ng/L)	Deposition (ng/m^2 d)
54°00’	Dziwnow (PL)	55 (n=5)	1.4 (n=2)	2.3 (n=2)
54°15’	Swibno (PL)	69 (n=6)	4.4 (n=4)	5.0 (n=4)
55°25’	Ventes R. (LT)	61 (n=10)	2.0 (n=15)	3.7 (n=15)
56°14’	Öland	76 (n=21)	8.3 (n=15)	3.5 (n=15)
56°17’	Breanäs	79 (n=21)	2.8 (n=12)	2.8 (n=12)
56°50’	Salaspils (LV)	454 (n=20)	10.7 (n=15)	17.9 (n=15)
58°20’	Vilsandi (EST)	79 (n=9)	1.5 (n=9)	2.2 (n=9)
58°21’	Gotska s.	60 (n=24)	2.0 (n=15)	3.0 (n=15)
59°17’	Stockholms s.	80 (n=21)	1.3 (n=10)	2.4 (n=10)
59°30’	Lahemaa (EST)	49 (n=16)	0.8 (n=12)	1.8 (n=12)
63°02’	Vasa	32 (n=27)	0.9 (n=12)	1.2 (n=12)
63°03’	Docksta	50 (n=24)	1.8 (n=15)	2.6 (n=15)
63°32’	Norrbyn	48 (n=24)	1.8 (n=17)	3.2 (n=14)
63°36’	Holmögadd	57 (n=23)	4.9 (n=12)	5.7 (n=12)
64°31’	Bjuröklubb	38 (n=24)	2.9 (n=13)	2.2 (n=13)
65°44’	Kalix	47 (n=24)	2.4 (n=14)	1.5 (n=14)
	All stations	**57 (n=299)**	**2.3 (n=192)**	**2.7 (n=192)**

Table 4-4: Annual average total PCB concentrations in ambient air in Poland, Sweden, Latvia, Lithuania, Estonia at 16 Baltic Sea stations in 1991-92 (Agrell et al 2001).

The table shows that there is a local hot spot for air contamination in Salaspils (industrial location) south of Riga whereas all the other stations around the Baltic Sea -characterised as rural- are in a comparable range of contamination levels.

The following Table 4-3 shows recently reported contamination levels of ambient air with indicator

PCBs from EMEP stations in MS and in the Czech Republic. As illustrated the Czech levels by far exceed the levels in the other participating countries.

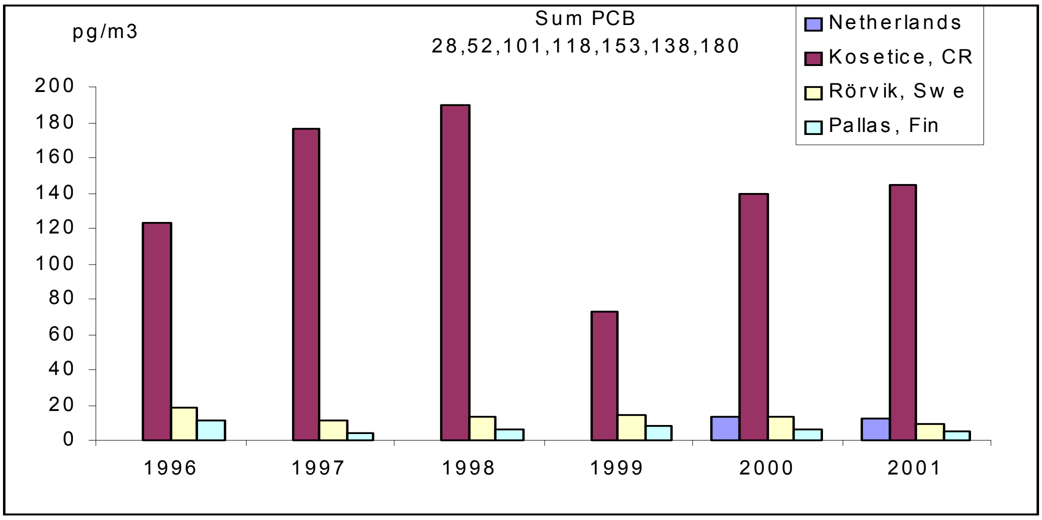


Figure 4-6 Annual average atmospheric concentrations of Σ 7 PCBs from four European EMEP stations 1996-2001 (Holoubek et al., 2003b; Munthe and Palm, 2003)

Time trends

According to recent data on PCB-congeners from Member States air levels of Indicator PCB did not decrease noticeable from 1996 to 2000 (see Figure 4-6).

So far there is no final explanation for this situation, but it seems as if a steady state has been reached between degradation and environmental cycling. Furthermore it seems to be likely that an ongoing low level input from existing equipment and contaminated material has to be observed.

At the Czech background observatory at Kosetiče even a slight increasing trend has to be observed during the last years after a sharp decline and raise between 1998 and 2000 (Holoubek et al. 2003 a,b). as shown in Figure 4-7. There is no conclusive explanation for the sharp raise and decline between 1997 and 2000 but there could be an association with the flood in 1997 mobilising PCB deposits and with special meteorological conditions. This assumption would be confirmed by the results of the EMEP monitoring programme see Figure 4-6, showing stable levels or only minimal changes in countries not affected by floods in that time period.

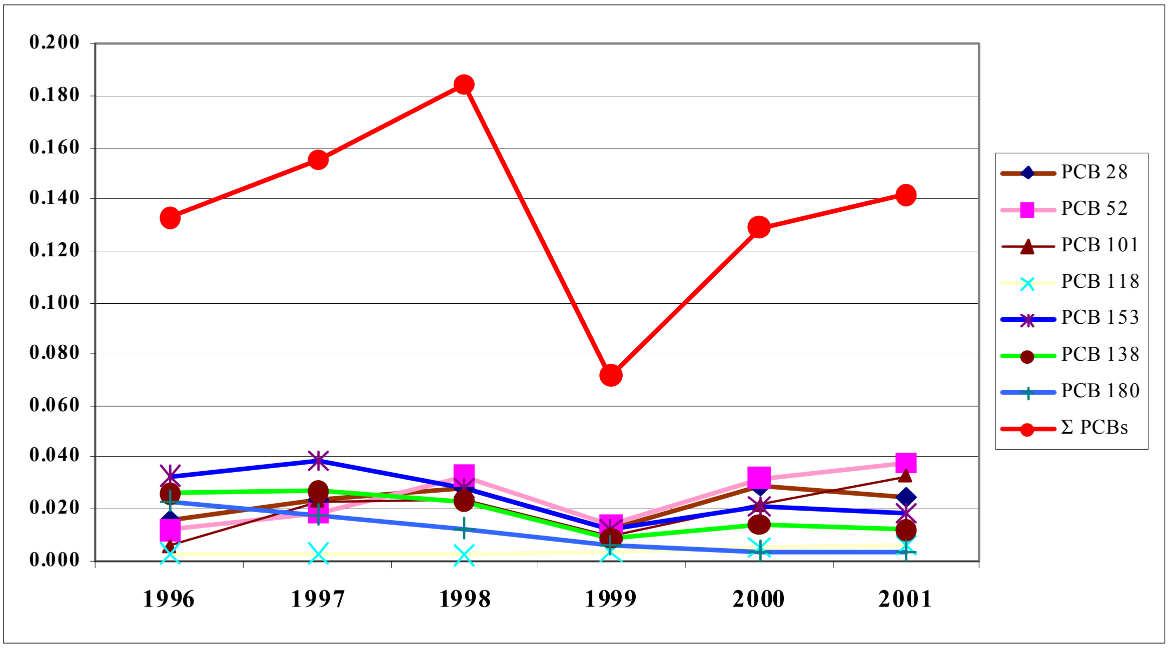


Figure 4-7 Trends of middle European regional background concentrations of Σ7 PCBs, measured at Košetice observatory (EMEP), 1996-2001 (medians) [pg.m^{-3}]

Seasonal variations

Unlike PCDD/Fs seasonal variation for PCBs shows highest concentrations during the summer months due to higher evaporation of PCBs at higher temperatures. These findings are consistent throughout the European countries and are exemplary illustrated in a recent report from Sweden (see Figure 4-8, Brorström-Lunden et al. 2003). These observations can be confirmed by the results obtained in the Czech monitoring station at Kosetiče as well as in the measurement project in Poland (Falandysz et al. 1998).

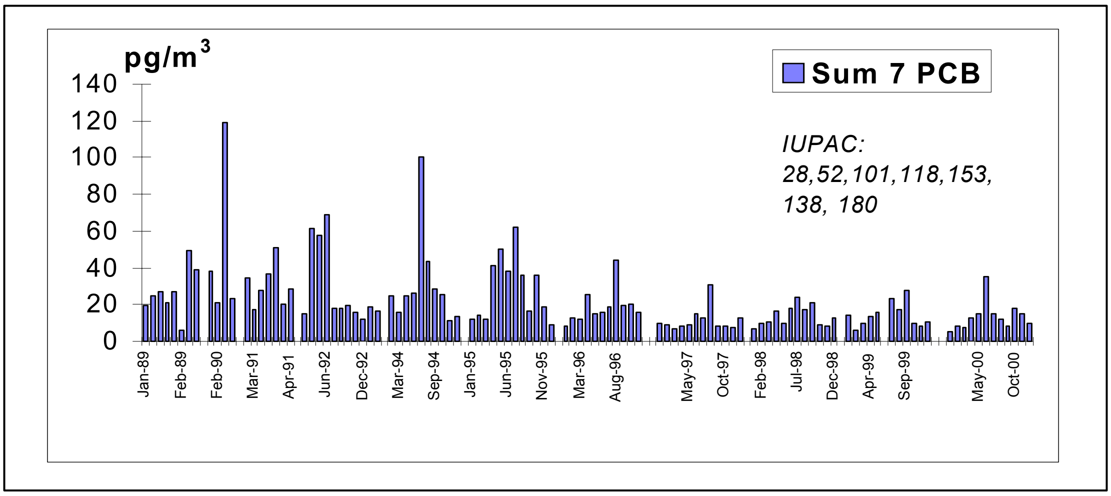


Figure 4-8: Seasonal variations and time trends of Indicator PCBs in ambient air at Rörvik, Southern Sweden (Brorström-Lunden et al. 2003).

Spatial differences

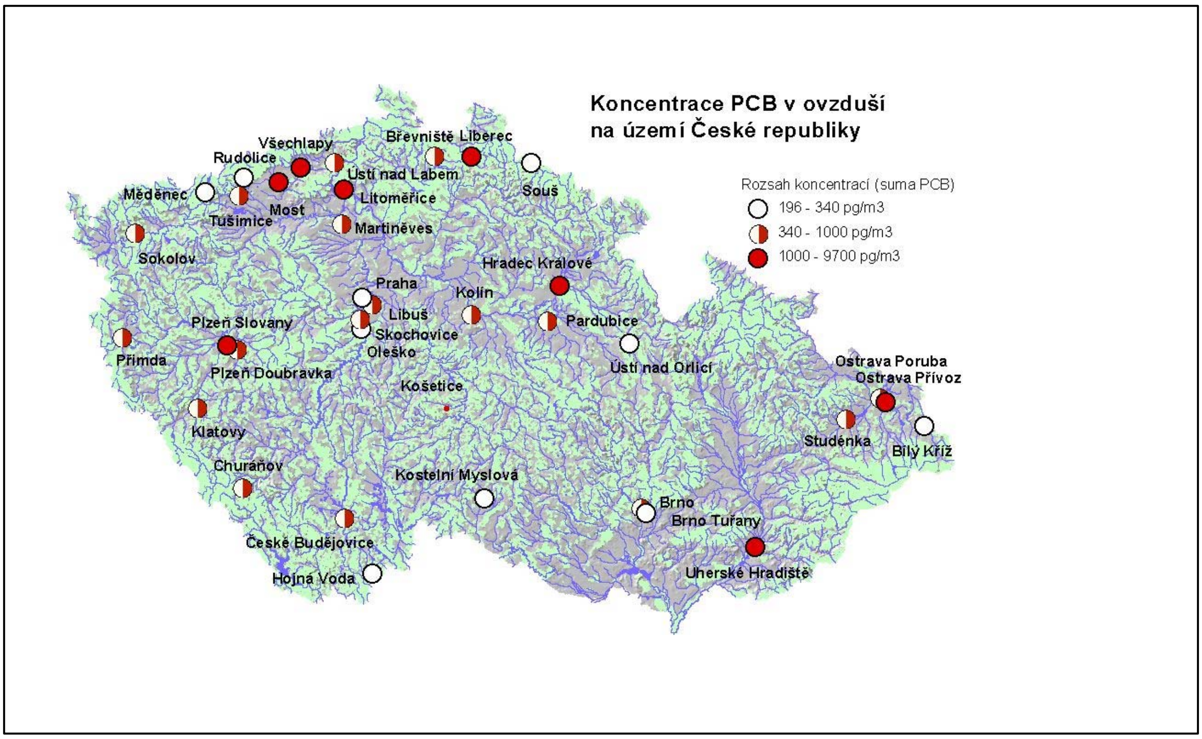


Figure 4-9: Spatial variation of pollution levels of Σ7 PCBs in the ambient air in CZ from 1996-2001 (Holoubek et al. 2003a) Averaging over 5 years is possible because a significant time trend has not been observed.

Figure 4-9 demonstrates the spatial variation of pollution levels of PCBs in the ambient air in the Czech Republic. As shown in the figure highly contaminated sites (filled bullets) are situated in the south-east, the north-west and central part of the country with average levels of (1,000 to 9,700 pg/m³). Average contamination levels for Σ7 PCBs in ambient air at the 9 low contaminated sites (empty bullets) ranged from 196 to 340 pg/m³ which differs at a factor of 30 to the high contamination levels. As pollution sources are different the distribution of contamination levels does not correspond to the contamination levels with PCDD/Fs.

In Slovakia 12 samples of 24-hr high-volume ambient air samples were collected in September 1997 at a distance of 1 to 30 km from the former PCB factory Chemko (Michalovce District) and a control area in Eastern Slovakia (Stropkov District). All samples were collected in residential areas. Extremely high contamination values were found close to the Chemko factory and its landfill and storage sites in Strazske (sampling sites Vola, Strazske) whereas the more remote sites from the Michalovce District were similar to those in the control area (see Figure 4-10).

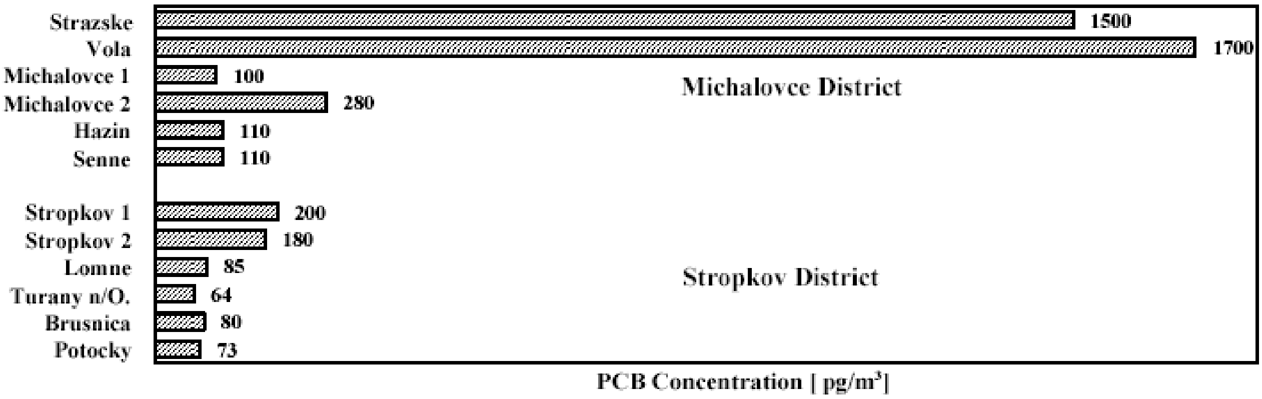


Figure 4-10: PCB concentrations (total PCBs) determined in ambient air samples collected in September 1997 in residential areas of the districts of Michalovce and Stropkov (Kocan et al. 2000,2001)

If data from the two hot spots are excluded the resulting average contamination level for these two districts in eastern Slovakia reaches 128 pg/m³ (Σ 6 PCBs) which is half of the lowest level of contamination reported from the national monitoring programme in the Czech Republic (Σ 7 PCBs) and in the same range or even lower as the levels in Austria (Σ 6 PCBs) from the same year (see Table 4-3).

Three stations in Latvia and two Estonian stations have been included in the air monitoring programme around the Gulf of Riga initiated by the Nordic Council of Ministries in 1993. The results show decreasing levels from the industrial site of Salaspils (south of Riga) to the background location of Vilsandi in Estonia which was at the same level as the corresponding background location (Hällestad) in Sweden (see Table 4-5).

Location	Salaspils (LV)	Salacgriva (LV)	Pärnu (EST)	Sitere (LV)	Vilsandi (EST)	Hällestad (SE)
PCB pg/m³	600	210	160	100	50	50

Table 4-5: Total PCB concentration in the air of the Gulf of Riga according to data from the Nordic Council of Ministers programme (Source: State of Environment in Estonia; Estonian Environment Information Centre EEIC)

As shown in the table there is a clear difference between the contamination levels of the three Latvian monitoring stations indicating the existence of a local hot spot at Salaspils south from Riga. However it has to be stated that the data for the three Baltic countries are quite old, so that it is not possible to draw conclusions for the current situation.

Congener specific information on PCBs in ambient air

Air samples collected in the different projects in Slovakia contained lower chlorinated congeners rather than higher chlorinated ones (Kocan et al. 2000, 2001). This is due to the higher volatility of the lower chlorinated congeners and corresponds to results from other European studies and to the scientific models of atmospheric transportation of PCBs.

4.2 Water

Information on contamination levels in water in the AC/CCs is almost completely restricted to data on contamination with PCBs. The only information about dioxins in water is either from the hot spot of Spolana Neratovice in the Czech Republic, collected within a study about the impacts of the Elbe flood in 2002. The other information has been reported from one river section in Poland in the context of a study tracing bioaccumulation and changes in congener patterns in the aquatic ecosystem.

For detailed data and references see Annex III – Water contamination.

4.2.1 PCDD/F levels in water

Czech Republic

Data on PCDD/F contamination of Czech watercourses are restricted to the important industrial "hot spot" of Spolana Neratovice, where samples have been taken following worries about a possible pollution of the Elbe river after the heavy flooding of the factory area in 2002. 27 water samples taken from flooded sites on the factory area showed levels from 17.9 to 1,159.2 pg PCDD/F-WHO-TEQ/l. However 4 water samples taken after the flood in the neighboring Elbe river did not show high contamination levels. Results ranged from 0.1 to 14.7 pg PCDD/F-WHO-TEQ/l only(Holoubek et al. 2003).

Poland

In Poland the Institute of Meteorology and Water Management has performed a study on levels of different PCDD/F congeners in water, sediment and local fish species from estuarian sections of Vistula and Oder, taking 5 samples from each location. The maximum level for the sum of PCDD/Fs in the water sample was below the detection limit of 1 ng/l (Niemirycz et al. NPOPsINv Poland).

European comparison of average levels and ranges

Data on PCDD/Fs in water are extremely rare so that a comparison of data can be made for single data only. A European average has not been estimated for PCDD/F contamination in water. As Sum PCDD/F levels in the Polish samples have been below the limit of detection they can not be used for comparison, so that TEQ-data from the Czech Republic are the only ones that can be compared to MS data.

Results from measurements performed for PCDD/Fs in water samples from the Venice Lagoon in 2000-2001 and data from a German investigation in the River Elbe performed after the flood in 2002 are the best source for comparison with the data obtained in the Czech Republic.

Levels at 13 sampling sites in the Venice Lagoon were comparably low and ranged from < 0.01-0.46 pg PCDD/F-I-TEQ/l (Carrer et al. 2003). Data from German sampling stations at the Elbe River investigated after the flood 2002 show levels of 4.4-15.5 pg PCDD/F-I-TEQ/l (Wittenberg), 37.0-85.9 pg PCDD/F-I-TEQ/l (Magdeburg). The higher levels at the Magdeburg station have been caused by

high dioxin levels in the Mulde River (a tributary passing the industrial "hot spot" of Bitterfeld) which ranged from 59.8-151 pg PCDD/F-I-TEQ/l. (Theile et al. 2003).

Additional data have been reported from Spain. Contamination levels determined in the Ebro river with values of 0.01-0.05 pg I-TEQ/l (Cabes et al., 1999).

Data from the Swedish Dioxin Database are summarised in Table 4-6. For all water categories minimum concentrations were close to the detection limit or far below 0.1 pg N-TEQ/l. The high concentration of 221 pg N-TEQ/l is from the cable industry.

Type	n	Minimum	Maximum	Mean
Effluent	6	0.01	27.1	10.7
Waste water treatment plant	18	0.04	89.5	14.4
Leachate	9	0.28	20.9	6.10
Pulp mill	18	0.11	133	19.1
Miscellaneous	22	0.08	221	23.5
Total	**73**	**0.01**	**221**	**16.9**

Table 4-6: PCDD/F contamination data (pg N-TEQ/L) for different categories of water from the swedish dioxin database (Buckley-Golder et al. 1999) N-TEQ = Nordic TEQ

Additional data on PCDD/F contamination of surface waters in Germany are given in Table 4-7 below. The values are difficult to compare as they are related to contamination of suspended sediment.

Year	measured value pg I-TEQ/g d.w.	river / site / source
1990	36 – 167	Elbe / Elbemeßstationen / /6-4/
1992	up to 1,500	Elbe / Hamburger Hafen / /6-3/
1992	up to 1,500	Spittelwasser /6-8, 6-9/
1994	up to 339	Elbe / Elbemessstationen /6-5/
1994	up to 57,6	Saale / GÜSA- Messstellen /6-6/
1995	up to 1,170	Bode / Unterlauf ab Staßfurt /6-7/
2001	up to 83,000	Spittelwasser /6-10/
2001	up to 113	Elbe / Hamburger Hafen /6-11/

Table 4-7: PCDD/F contamination levels (pg I-TEQ/g) in German surface waters (suspended sediment) (source: Theile et al. 2003)

Discussion

Based on the available data it can be stated that levels of PCDD/F contamination in marine and river water from Italy and Spain seem to be somewhat lower than the Czech "hot spot" results in the Elbe, while data of contaminated waters in Sweden seem to be in a similar range. On the other hand data reported from Germany in part significantly exceed the levels reported from the Czech Republic. In the consequence it could be stated that the contamination of the River Elbe at the "hot spot" site of Spolana Neratovice is relatively low in comparison to other "hot spots" along the German part of the River Elbe. However it has to be taken into account that the concentration of suspended sediments is of major importance for the detected contamination level in water. As related information is missing

the results of the different studies are difficult to compare. More comparable data would definitively be needed to draw final conclusions.

4.2.2 PCB levels in water

Information about contamination of water with PCBs has been collected by a bigger number of Accession Countries. Data have been reported for Cyprus, Czech Republic, Hungary, Lithuania, Poland, Slovakia and Slovenia. This data has often been collected annually over a number of years so that information about time trends is included and can be discussed in this chapter.

Cyprus

With presently 8 dams and 12 contributing rivers the national water monitoring in Cyprus covers 85% of the total national water capacity. When national monitoring started with 6 dams in 1988-98 after a episode of illegal import and disposal of contaminated transformer oils the maximum level was 600 ng/l. In 1992-95 it had declined to 80 ng/l. Over the last years (1996-2000) the maximum levels in Cyprus showed a further decline and ranged from 60 ng/l for the major dams to 31 ng/l for the majority of national rivers, calculated as Σ 14 PCBs. (Michailidou et al.; State General Laboratory, unpublished). However the Polemidia dam has been identified in recent tomes as persistent national "hot spot" showing a contamination level of 464 ng/l. in 2000. The " hot spot" dam (Polemidia) has not been included in the average of the other dams and has only been measured after 1995. (for further details see Annex III).

Czech Republic

In the Czech Republic 5 sites at Elbe tributaries have regularly been monitored in 1995, 1996 and 1998 for total PCBs showing median levels between 0.5 and 2.4 ng/l. 14 samples taken from Morava and Oder in 2000 though showed levels of 48-221 ng/l (Σ 6 PCBs) which are confirmed by 35 samples taken from the Oder between 1999-2001 and showing a minimum-maximum range of 18-108 ng/l (Σ 6 PCBs).

Hungary

In Hungary the concentration of total PCBs in surface water – based on hundreds of samples collected in the different monitoring programmes from 1990-2003 – was in the range of 5-60 ng/l.

Lithuania

In Lithuania the levels of Σ 7 PCBs in the national water net (13 lakes, 39 rivers) have constantly been below the detection limit of 10 ng/l for the last 6 years (Personal communication, Environmental Protection Agency, Vilnius).

Poland

In Poland mean PCB levels in surface water (Vistula and Oder rivers) are relatively low and mean values for the two rivers from 1992-2000 did not exceed 14 ng/l for Σ 7 PCBs. (Chief Environmental Protection Inspection data; NPOPsInv Poland). On the other hand samples taken from the Oder river

basin in 1998-2000 in the framework of the international Oder Project showed a min-max. range of 0.3-150 ng/l for Σ 7 PCBs, indicating that several hot spots exist along the river banks.

Slovak Republic

Within the framework of the national monitoring program for water quality more than 3,000 surface water samples taken from Slovak rivers and lakes were analysed for Σ 7 PCBs in 1989- 1997. The surface water has been investigated in the eastern part of the country comparing the results in the hot spot region of the Michalovce district with a relatively unpolluted control area (Stropkov district). Median levels of contamination in water samples, where solid particles have been filtered off before analysis were at 8.1ng/l for the control district and at 45.5ng/l (Kocan et al. 1999).

Slovenia

In Slovenia data on PCB contamination have been collected in the Krupa river a national "hot spot" as it received the leakage of the Iskra capacitor producing factory at Semič in the Bela Krajina Region. The levels for 1994 ranged between 26-35 ng/l (total PCBs) for samples taken from the mid section of the river (unpublished data; National Institute of Hydrometeorolgy, 1995).

Waste water

Waste water from WWTPs have been analysed at a representative plant in the framework of the Morava Project (Holoubek et al. 2003a) in 2000. Observed levels ranged from 14.5–200.7 ng/l (Σ 6 PCBs).

Groundwater

Ground water levels have been analysed in the Czech Republic, Hungary, Slovakia and Slovenia. Average levels in Czech Republic range between the limit of detection and 3 ng/l (total PCBs) – (Holoubek et al. 2003a) - the Slovak levels range between 10 and 636 ng/l (total PCBs) due to high levels in specific samples in the hot spot region of Michalovce (see Figure 4-12). In Hungary total PCB levels in groundwater are below the limit of detection (< 1ng/l) in most cases. PCBs have been detected in 10 out of 1476 water off take sites (wells, springs) only. The levels in these samples have been in a range of 1-50 ng/l (total PCBs). In Slovenia contamination levels of 100 ng/l (total PCBs) have been reported for Groundwater in the hot spot region of Bela Krajina in 1997 (UNEP Mediterranean Regional Report).

European comparison of average levels and ranges

Country	Location	Range	Year	Reference
Cyprus	6 dams, 12 rivers	max. levels 31-60 ng/l (Σ 14 PCBs)	2000	State General Laboratory
	Polemidia dam	max. 464 ng/l (Σ 14 PCBs)		
Czech Republic	Elbe tributaries	5 and 2.4 ng/l (total PCBs)	1995,1996 and 1998	Holoubek et al. 2003a
	Morava and Oder	48-221 ng/l (Σ 6 PCBs)	2000	
	national water monitoring system	8-25 ng/l (Σ 6 PCBs)	2001	

Hungary	national water courses	5-60 ng/l (total PCBs)	1990-2003	National Institute for Environmental Protection
Lithuania	rivers, lakes	< 10 ng/l (Σ 7 PCBs)		Environment Protection Agency
Slovenia	Krupa river	26-35 ng/l (total PCBs)	1994	National Institute of Hydrometeorology
Slovak Republic	Stropkov district (control)	8.1 ng/l (total PCBs)	1987-98	Kocan et al. 1999
	Michalovce district (hot spot) without effluent canal Chemko	45.5 ng/l (total PCBs) suspended particles filtered off		
			1987-98	Kocan et al. 1999
	Effluent canal Chemko	1,950 ng/l (total PCBs) suspended particles filtered off		
Poland	National monitoring programme Vistula & Oder	mean < 14 ng/l (Σ 7 PCBs)	1992-2000	Chief Environment Protection Inspectorate
	Oder river basin	0.3-150 ng/l (Σ 7 PCBs)	1998-2000	Falandysz et al. 2002
	Bay of Gdansk	0.8-1.3 ng/l (Σ 7 PCBs)	1992-2000	
Germany	Elbe	< LOD[1] (Σ 7 PCBs)	2002	Theile et al. 2003

Table 4-8 PCB levels in surface water in different European Countries

Discussion

Recent data on Indicator PCBs in MS are extremely rare. In the consequence the comparison of data has to be based almost completely on AC/CCs data only. Contamination levels in surface water are difficult to compare because of varying parameters and inconsistencies in data. However it can be concluded that levels detected in the Oder and Morava show a similar contamination level with a relative wide range of contamination levels pointing at the existence of local emission sources along the river banks. Levels in the national monitoring systems –which including smaller water courses as well –appear to be in the same range in all AC/CCs, that provided data. Slovenian samples taken from the Krupa river (mid river) in the hot spot region of Bela Krajina do not show elevated levels in comparison to Hungarian data. Lithuanian contamination levels appear to be low in comparison to

[1] LOD = 1.0 ng/l

other countries. Slovak data are difficult to compare because solid particles have been filtered out before analysis, however levels in the control area seem to be in the range of contamination reported from other countries.

High contamination levels have been observed in localised hot spots (Chemko effluent canal in the Slovak Republic and Polemidia dam in Cyprus.).

Recent data from Germany have been collected following the flood in 2002 the Elbe and Mulde river. Water has been analysed for indicator PCBs (28, 52, 101, 138, 153 and 180). The results showed low contamination values, usually below 1.0 ng/l. (Theile et al. 2003).

With respect to waste water (effluent WWTPs) concentrations up to 120 ng/l (Σ 7 PCBs) were found in the wastewaters of Barcelona, Marseille, Toulon and Nice in 1990-93 (ADEME, 1998) which is half of the level determined in the Czech waste water samples. Data for Paris from 1999 show average levels of 15-26 ng/l (Σ7 PCBs) (Teil et al. 2001) which are even significantly lower than in the older data. Based on this data is has to be stated that Czech WWTP emissions seem to exceed some of the levels reported from MS.

Comparison of ground water levels show alarmingly high levels in Eastern Slovakia and the Bela Krajina region in Slovenia. Average levels in Hungarian groundwater seem to be very low and do not exceed the detection limit of 1ng/l in almost all samples.

Time trends

Cyprus

Data for major dams in Cyprus have been reported from 1989 after a period of illegal import and disposal of PCB contaminated oils.. Over a period of 10 years the maximum contamination levels in those dams have declined by one order of magnitude. However one dam that has first been investigated in 1996 is still heavily polluted showing contamination levels about one order of magnitude higher than the other dams.

Poland

The data provided by the national monitoring programme of surface waters in Poland give a good illustration for the temporal developments in the two major rivers in Poland showing a the same time spatial difference probably related to local emission sources.

Year	**Vistula**			**Oder**	
	Krakow	**Warszawa**	**Kiezmark**	**Chalupki**	**Wroclaw**
1992	27.5	7.8	7.5	1.8	1.4
1993	13.8	0.3	7.2	3.7	3.9
1994	23.4	12.5	-	7.9	8.0
1995	12.9	9.0	1.1	17.1	9.7
1996	13.4	9.9	18.4	-	8.0
1997	13.7	11.0	8.8	4.0	11.4
1998	11.2	13.8	8.8	-	9.6
1999	12.7	13.6	-	-	19.8
2000	17.0	14.1	-	1.5	15.8
2001	7.8	8.2	-	9.8	15.7
Mean	**15.3**	**11.0**	**8.6**	**6.5**	**10.3**

Table 4-9 Mean annual concentrations of the Σ7 PCBs (ng/l) in the Oder and Vistula rivers between 1992-2001 (data from the State Environmental Monitoring, Institute of Meteorology and Water Management, Poland)

The data show a constant and strong decline of contamination levels at Krakow probably due to

changes in emission quantities in the southern part of Poland. Levels at Warsaw in 2001 are at the same level as the levels from 1992 with a significant raise from 1997-2000 probably due to the floods that have washed PCBs from equipment and soils to the water. Obviously this concentrating effect did not occur that much at the Kiezmark station where a singular increase has occurred in 1996. In the Oder the situation is a bit different showing peak levels in later years with the declining trend still not very clear in 2001.

The most systematic investigations about PCBs in sea water are conducted in the bay of Gdansk showing levels for Sum 7 PCBs oscillating from 0.8 to 1.3 ng/l. During the last 10 years the levels are quite stable showing only a very small falling trend (NPOPs Inv Poland).

Slovak Republic

In the Slovak hot spot region of Michalovce time series have been taken from a sampling site at the local Laborec-Lastomír river and from a number of groundwater stations in this hot spot region.. The results are illustrated in Figure 4-11 and Figure 4-12. The samples from the river have been taken at a station 30 km from the Chemko factory site. They show a slow decline of contamination levels since 1995 (see Figure 4-11), whereas contamination appears to be high in 1993 although production of PCBs has been stopped in 1984 already. It might be possible that deterioration at the abandoned factory site could be one reason for this observation.

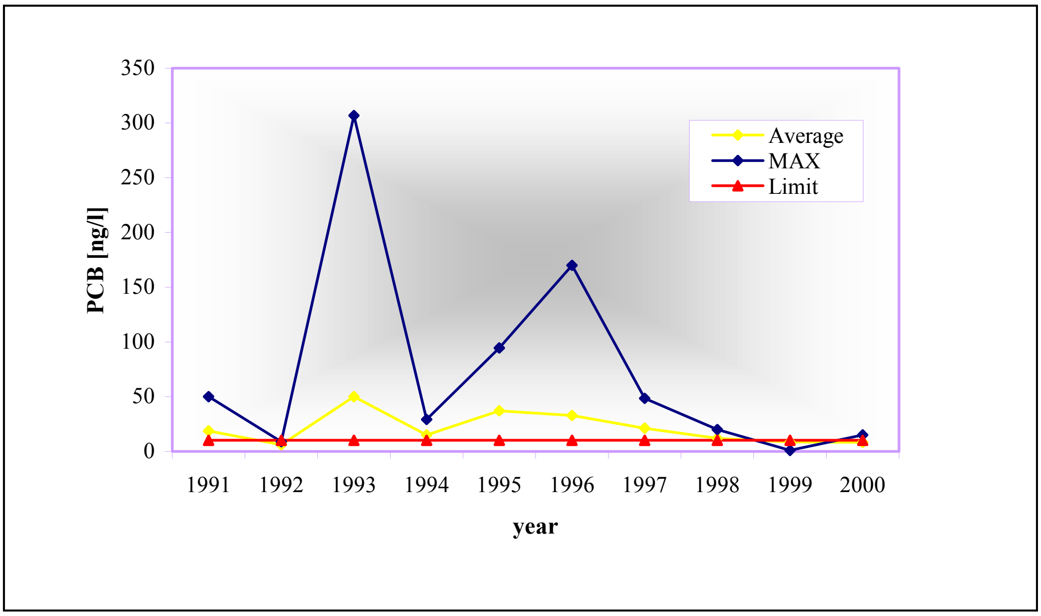


Figure 4-11: Trend of total PCB concentration in the Laborec-Lastomír river (Michalovce district-hot spot SK) over the last 10 years ; km 31from factory site (Slovak NPOPsInv)

In the contrary the ground water levels in the Michalovce region have increased significantly exceeding the national limit values for ground water in 1999 and 2001 (see Figure 4-12). This alarming increase is certainly due to a constant infiltration of PCBs from contaminated soils, dump sites and highly polluted sediments in the effluent canal of the Chemko factory where according to estimations several tonnes of PCBs are still absorbed. (see Figure 4-16).

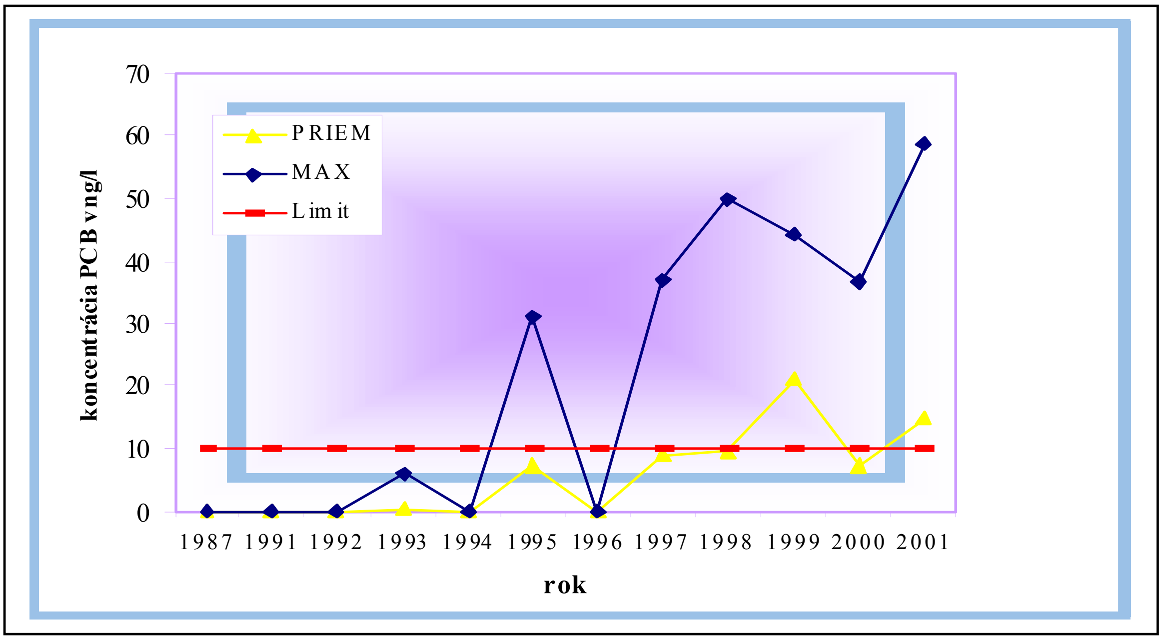


Figure 4-12: Development of Groundwater contamination with total PCBs in the Michalovce district (hot spot region SK) in the last 15 years (1987-2001) (Slovak NPOPsInv) priem line = average levels

Spatial differences

Data from Cyprus show one hot spot (Polemidia) due to illegal import and disposal of PCB containing transformer oils in the late 80-ties, which is more than one order of magnitude higher contaminated as all other water courses in the country.

As illustrated in Figure 4-13 Slovak data show extreme spatial differences in the contamination levels with PCBs due to serious pollution of the local environment from a former PCB production site. These "hot spot" levels explain the high mean levels in aggregated data on national base and stress the need for remediation of the local hot spot to prevent further pollution of the region (see also annex VI).

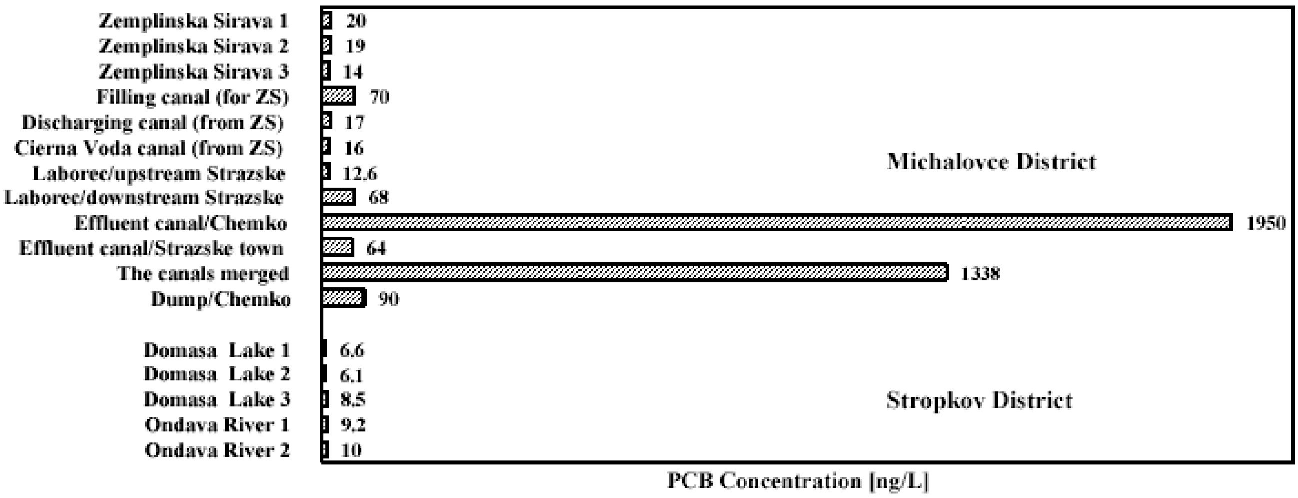


Figure 4-13: PCB levels (total PCBs) in surface water samples from the Slovak Republic (solid particles were filtered off) taken from watercourses in the districts of Michalovce (hot spot) and Stropkov (control) (Kočan et al. 1999)

The distribution of contamination in the Czech Republic does not show such clear "hot spots" as in the Slovak Republic, Cyprus or Slovenia. As illustrated in Figure 4-14 sites with low and high contamination are scattered over the country with no incidence of a specific hot spot region.

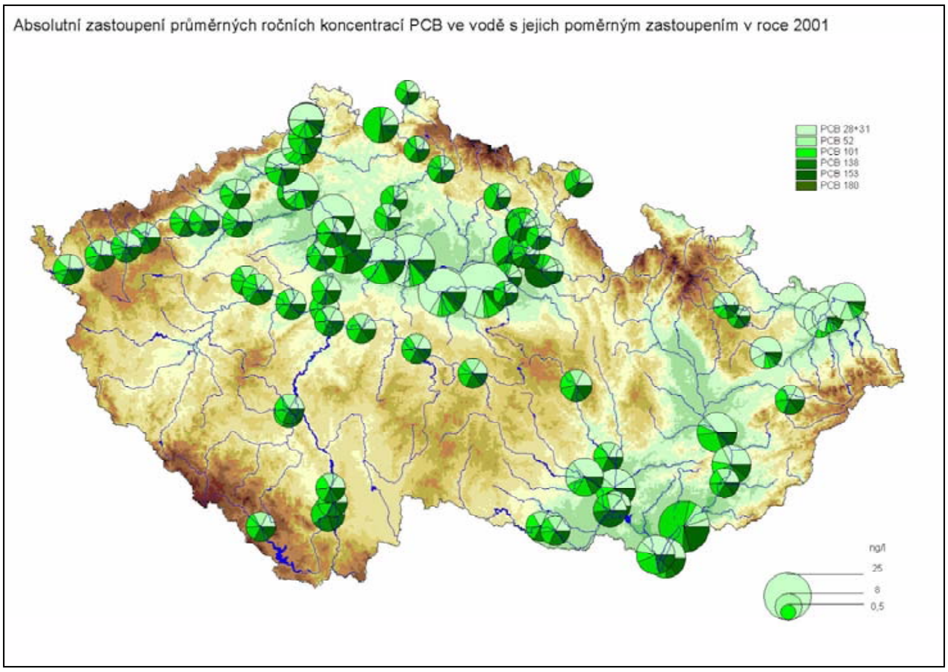


Figure 4-14: Contamination levels with Indicator PCBs in Czech surface waters in the year 2001 ranging from 8–25 ng/l for Σ 6 PCBs; (Holoubek et al 2003a)

4.3 Sediments

Information about contamination of marine and freshwater sediments has been collected in Cyprus, Czech Republic, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia, and Turkey. No data have been provided from Hungary even though a monitoring system is in place. As most data are not available with complete information about the age of the collected sediments a direct comparison is difficult and data should only be considered as guideline for possible range of contamination.

For detailed data and references see Annex III – Sediments.

4.3.1 PCDD/F and dl PCB levels in sediments

Information about dioxins and dioxin-like PCBs in sediments is restricted to the Czech and Slovak Republics and data from one river section in Poland in the context of a study tracing bioaccumulation and changes in congener patterns in the aquatic ecosystem.

Czech Republic

Median contamination data for 2001 reported from two regions with industrial agglomeration (Zlín and Beroun) were at a level of 1.64 and 1.83 pg PCDD/F-TEQ/g (max. 463.4 and 1,105 ng/g d.w for the Σ PCDD/F) respectively. Data for dioxin-like PCBs were at 0.4 and 0.69 pg PCB-TEQ/g. The contamination level at the EMEP background observatory at Kosetiče showed median contamination

levels of 1.4 pg/g TEQ (median Σ PCDD/Fs 128.41ng/g) for dioxins and 0.185 pg/g TEQ for dioxin-like PCBs over the period from 1996-2001 (Holoubek et al. 2003a).

In the surroundings of the Czech hot spot of Spolana Neratovice – due to former production of chlorinated herbicides a site of extremely high contamination with dioxins (namely 2,3,7,8-TCDD) – sediment samples from the river Elbe have been taken within a study to trace the impact of the flood in 2002 on the contamination level in the river. The results from samples analysed before the flood (0.9-518.8 pg/g TEQ) did not differ much from the results obtained in samples taken after the flood (11.5-690.8 pg/g TEQ). Corresponding measurements carried out in Germany at this flood event showed the same result that PCDD/F contamination values of sediments and soils did not significantly differ before and after the flood (Theile et al 2003).

Slovak Republic

In the Slovak Republic data on PCDD/Fs and dioxin-like PCBs have been collected during a campaign in 2002. They show contamination levels ranging from 0.75 to 603 pg TEQ/g for dioxins (Slovak NPOPsInv), 0.16–1,992 TEQ pg/g for non-ortho PCBs and 0.029–1,236 TEQ pg/g for mono-ortho PCBs. The enormous range of contamination levels for dl PCBs is due to extremely high contamination in local hot spots near to the Chemko factory. (see also Figure 4-16 for Indicator PCBs; Kocan et al. 2001).

Poland

In the Polish samples (5 each at the Oder and Vistula estuary) the maximum contamination was at (0.836 ng/g d.w.) 836 pg/g d.w. for the sum of PCDD/Fs.(Niemirycz; Institute of Meteorology and Water Management, 2002; NPOPsINv Poland).

European comparison of average levels and ranges

A compilation of contamination data from AC/CCs and MS is given in Table 4-10.

Country	Location	Range	Year	Reference
CZ	Zlin	0.9-5.6	2001	Holoubek et al. 2003a
	Beroun	0.21-11.2		
	Kosetiče	median 1.4	1996-2001	
	Spolana Neratovice	0.9-518.8	2002	
	Elbe & Tributaries	3-23	2002	Knoth et al. 2003
SK	Michalovce & Stropkov district	0.75 to 603	2002	Kocan et al. 2001
MS average		< 1 up to 200		Buckley Golder et al. 1999
Italy	Po River	1-2 to 10-11		Fattore et al. 1997
Finland	Lakes, Baltic Sea	0.7-22		Vartiainen 1997, Verta 1999, Isosaari 2002
	Kymijoki estuary	200-480		
	Kymijoki river	4,740–110,000	1997-2000	Verta et al. 2003
Germany	Elbe & tributaries	1.0-126	2002	Knoth et al. 2003

Italy	Northern Adria	0.6-17	1992-1998	Di Domenico et al. 2003
Netherlands	rivers, lakes, canals	1-10	1998	Buckley-Golder
	harbours	up to 4,000		
	estuaries, sea	8-21		
Spain	Catalan Coast	0.4-8	1988-1992	Eljarrat et al. 2001
		0.06–48.29	2001	Larrazabal et al. 2003
Portugal	surroundings of Oporto	0.54-3.39		

Table 4-10: Ranges of PCDD/F concentrations in sediments (pg PCDD/F-TEQ/g d.w.) in different European Countries

As illustrated in Table 4-11 maximum levels in Morava tributaries, Oder and Elbe tributaries are in a comparable order of magnitude. By far the highest levels reported for PCDD/Fs in sediments have been detected in the Kymijoki River in Finland due to historical pollution of the river by the paper industry.

Country	Location	Max	Year	Reference
Czech Republic	Zlin	463.4	2001	Holoubek et al. 2003a
	Beroun	1,105		
Poland	Oder estuary	836	2002	NPOPsINv Poland
Germany	Mulde, Elbe	870	2002	Knoth et al. 2003

Table 4-11 Maximum Σ PCDD/F Concentrations in Czech, German and Polish watercourses (pg /g d.w)

Discussion

Based on the compilation of EU contamination levels by Buckley-Golder et. al. 1999 typical PCDD/F contamination levels of sediments in EU MS range from < 1 up to 200 pg I-TEQ/g d.w. Compared to these values Czech and Slovak maximum levels appear high. This compilation however has to be further differentiated. As illustrated in Table 4-10 data in MS differ a lot depending on the industrial background of the location investigated and show levels in part significantly exceeding the AC/CCs maxima. To conclude it can be stated on the basis of the data available that typical levels in AC/CCs seem to be in the same range as or even lower than in MS. As contamination levels in sediments depend significantly on sampling depth and location, further data collected under harmonised conditions will be necessary to obtain results that will allow a solid comparison.

Time trends

Based on the information available from the Czech and Slovak Republic an assessment of time trends in the sediment levels from these two countries is not possible.

4.3.2 PCB levels in sediments

Cyprus

In Cyprus different samples of sediments from 10-240 cm depth have been collected in 1997-98 from the 7 major dams of the country and analysed for the sum of 14 congeners. The total concentration for

all depths per sampling location ranged from <LOD (1ng/g to 54 ng/g for 6 dams and showed a local hot spot in the Polemidia dam (158 ng/g). (Michailidou & Christodoulidou unpubl. 1998). This hot spot developed due to illegal import and disposal of PCB containing oils from electrical transformers in the late 80-ties.

Czech Republic

In the Czech Republic the Elbe river and its tributaries have been investigated in from 1995-98 showing average median levels of 47.8-123 ng/g (Sum 6 PCBs) at four sites and a local hot spot at Rozmital with median levels of 469-543 ng/g. This hot spot developed due to a serious breakdown at a PCB (Delors 103) producing factory polluting the River Skalice at the end of the 80-ties. Another study covering samples from the industrial agglomerations of Zlín and Beroun and the background location of Kosetiče showed median levels of 14.9 and 37.8 ng/g and a significantly lower level (2.6 ng/g) at the background location (Holoubek et al. 2003a).

Latvia

In Latvia first measurement for PCB contamination in sediments (Σ7 PCBs) have been carried out by the Latvian Environment Agency at 5 sites in 2003. In general the results have been < 1,000 ng/g. One hot spot down stream of Riga showed an elevated level of >20,000 ng/g. An explanation of the high contamination level has not been provided; but it seems reasonable to assume historic military and industrial activities in the harbour area, in Riga and south of Riga as a possible cause.

Lithuania

In Lithuania sediment samples (Σ7 PCBs) collected in the framework of the national water monitoring programme (13 lakes/39 rivers) have been below the limit of detection (1 ng/g d.w.) for the last 6-8 years (personal communication LEA).

Poland

In Poland the average PCBs content in the bottom sediments of the Oder River and its tributaries in 1998-2000 was 28,9 ng/g d.w. (range 1.3-189) for the Sum 7 PCBs. The maximum level of the Sum 7 PCBs in the research project at the Oder and Vistula estuary in 2002 was low in comparison 16.9 ng/g d.w.. Samples collected at the Wloclawek Reservoir in 2000 showed a mean level of 6.77 ng/g d.w. for the Sum 6 PCBs. Furthermore PCBs have been determined in recent [0-10 cm deep layers] sediments from different sites of southern Baltic Sea, including the Szczecin Lagoon, collected from May 1996 to October 1999 (Konat and Kowalewska, 2001). The Sum 7 PCBs ranged between 1-149 ng/g d.w. (mean< 40 ng/g). The highest content of PCBs was observed not in the vicinity of the most probable sources of pollution, but in areas of intensive sedimentation at the river estuaries.

Romania

In Romania superficial sediment samples have been collected in 1995 (Σ7 PCBs) from coastal sediments of the Black Sea ranging between 0.06-72 ng/d d.w. (Fillmann et al. 2002).

Slovakia

In Slovakia sediment samples have been collected in the Eastern part of the Country (Michalovce and Stropkov districts) in 1997-98. The Zemplinska Sirava Lake contaminated by the effluent canal from the Chemko factory showed contamination levels of 1,700-3,100 ng/g d.w (total PCBs). In a similar lake (Domasa) in the control district of Stropkov levels of 7-10 ng/g d.w. (total PCBs) have been observed which is a factor of 300 lower than the level in the "hot spot" region (Kocan et al. 1999). Data from 4

rivers samples collected in 2001 ranged from 1.8-3.3 ng/g d.w. and therewith were even significantly lower.

Slovenia

Samples collected in Slovenia in the hot spot region of Bela Krajina from the Krupa river in 1991 were at a level of 15 000 µg/g d.w. (total PCBs) at the spring of the river decreasing to 0.63 µg/g d.w (630 ng/g) at the river estuary.

Turkey

Turkish data collected at the Bosporus in 1995 show contamination levels of 0.4-4.7 ng/g d.w. (Σ7 PCBs) (Fillmann et al. 2002).

European comparison of averages and ranges

A compilation of data from AC/CCs and MS is given in Table 4-12.

Country/Area	Location	Year	Range	Congener	Reference
Cyprus	6 major dams	1997-98	< 1.0-54	Σ 14 PCBs	Michailidou & Christodoulidou unpubl. 1998
	Polemidia dam		158		
Czech Republic	Elbe tributaries	1995-98	47.8-123	Σ 6 PCBs	Holoubek et al. 2003a
	hot spot Rozmital		469-543	▪	
	Zlin, Beroun Region	1998-2001	14.9-37.8		
	Kosetice (background)	from 1988	2.6 (0.93-7.07)	Σ 6 PCBs	
Latvia	Daugava & tributaries	2003	< 1,000->20,000	Σ 7 PCBs	Latvian Environment Agency
Lithuania	National water net	1996-2001	< 1	Σ 7 PCBs	Lithuanian Environmental Agency
Poland	Oder & tributaries	1998-2000	1.3-189	Σ7 PCBs	Falandysz et al. 2002
	Wloclawek Reservoir (Vistula)	2000	mean 6.77	Σ7 PCBs	Institute of Meteorology and Water Management
	Southern Baltic	1996-99	1-149	Σ 7 PCBs	Konat & Kowalewska 2001
Romania	Black Sea	1995	0.06-72	Σ 7 PCBs	Fillmann et al. 2002
Slovakia	Domasa lake (Stropkov District-control)	1997-98	7-10	total PCBs	Kocan et al. 1999

	Rivers control area		1.8-3.3	total PCBs	Slovak NPOPsInv
	Zemplinska Sirava lake (hot spot region)		1,700-3,100	total PCBs	Kocan et al. 1999
	Effluent canal (hot spot)		3,000 000		
Slovenia	Krupa spring (hot spot)	1991	15,000000	total PCBs	Fazarinc et al. 1992
	Krupa estuary		630		
Turkey	Bosporus	1995	0.4-4.7	Σ 6 PCBs	Fillmann et al. 2002
Germany/ Elbe	Schmilka (km 4.1)	1993-98	36-836	total PCBs	Heimisch & Kettrup, 2001
	Magdeburg (km 474.5)	1994-99	17-403		
	Zehren (km 98.6)	1994-98	11-298		
Germany/ Saale	Grossrosenburg	1994-99	5-128		
Germany/Mulde	Dessau	1994-99	7-127		
Austria/Danube		1995	1.85-2.29	total PCBs	Chovanec et al. 1996
Portugal estuaries	Mondego	1998	0.2-5.2	total PCBs	Vale et al. 2002
	Guadiana	2001	0.04-2.4		Ferreira et al. 2002
Spain	Ebro	1995-96	median 14.1	total PCBs	Fernandez et al. 1999
	Guadalete estuary	2001	3.55-92.55		Fernandez et al 2002
Sweden	Baltic coast	1998	2-33	total PCBs	Meili et al. 2000

Table 4-12: Ranges of PCB contamination in sediments in different European countries (ng/g d.w.)

Discussion

A comparison of contamination data shows the existence of large ranges of contamination with peak levels in the Elbe river (on both sides of the German-Czech border), hot spots in the Slovak Republic (Zemplinska Sirava lake in the Michalovce district) and in Slovenia (River Krupa) and Latvia (the Daugava downstream Riga). Comparable levels are reached in Mediterranean sediments which vary from 1.3 to 7,274 ng/g (total PCBs). These high levels also correspond to localised “hot spots”, near sewage outfalls of big cities or at the mouths of large rivers (e.g. Rhone and Seine) (UNEP Mediterranean Regional report). Levels in the Oder catchment area and the Southern Baltic seem to be somewhat lower. Dramatically lower levels seem to exist in samples reported from Austria, Turkey and Lithuania. However as the comparability of data is limited it will be necessary to collect samples under similar conditions before drawing final conclusions.

Time trends

According to the information derived from the results of the Czech sediment monitoring programme PCB concentrations in sediment decrease only slightly or even stay at the same level.

High concentrations of PCBs have been determined in suspended particles. (Holoubek et al., 2003). These results are exemplary illustrated in Figure 4-15 showing the concentration trend at the Elbe monitoring station of Děčín – Hřensko. Peak levels observed in 1997 are most probably due to the heavy flood that took place in the Czech Republic in this year.

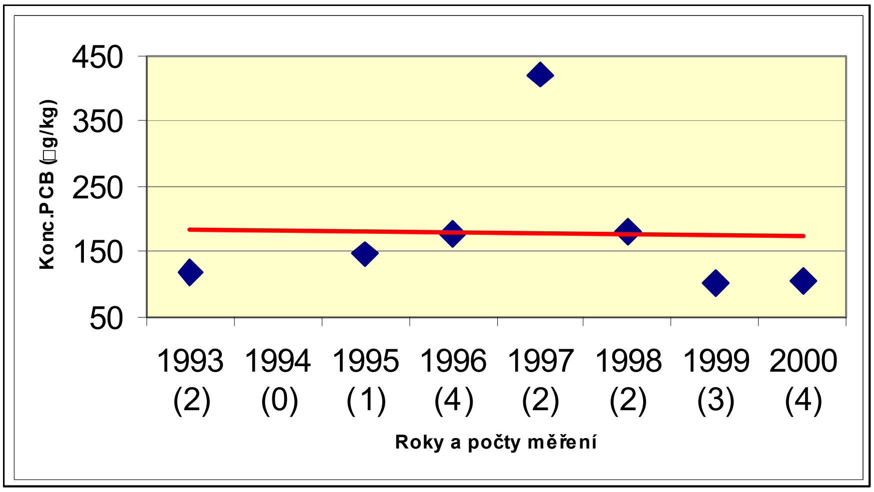


Figure 4-15: Time trend of Σ6 PCB (ng/g d.w.) concentrations in Elbe sediments (suspended particles), profile Děčín - H řensko (linear regression the results of analysis which were performed as a part of Projects Elbe

Spatial differences

Data from the Slovak Republic give an excellent example for hot spot areas that have a strong impact on the national contamination level and are a permanent source for further contamination.

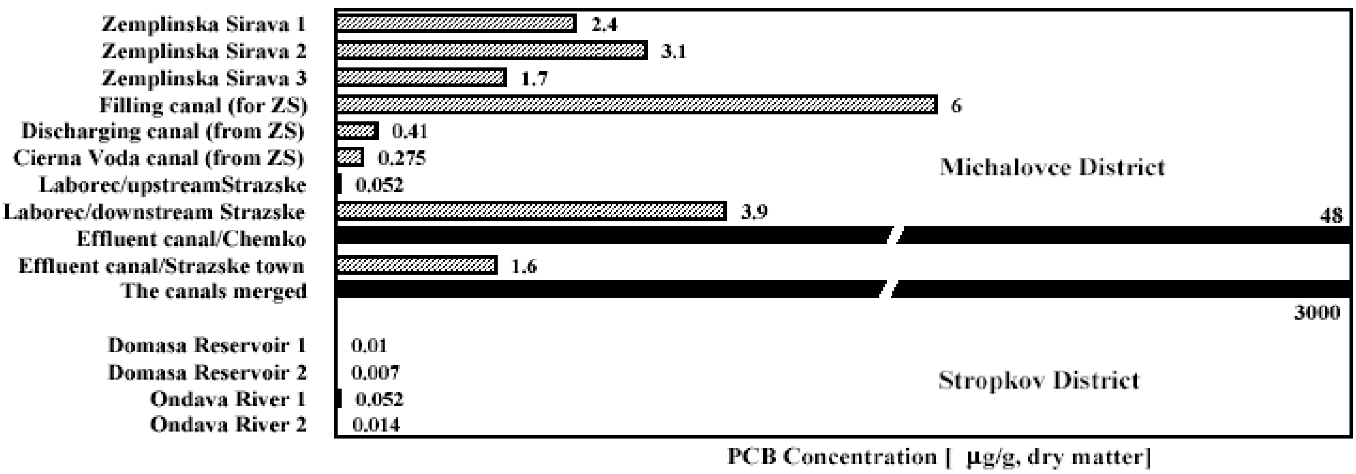
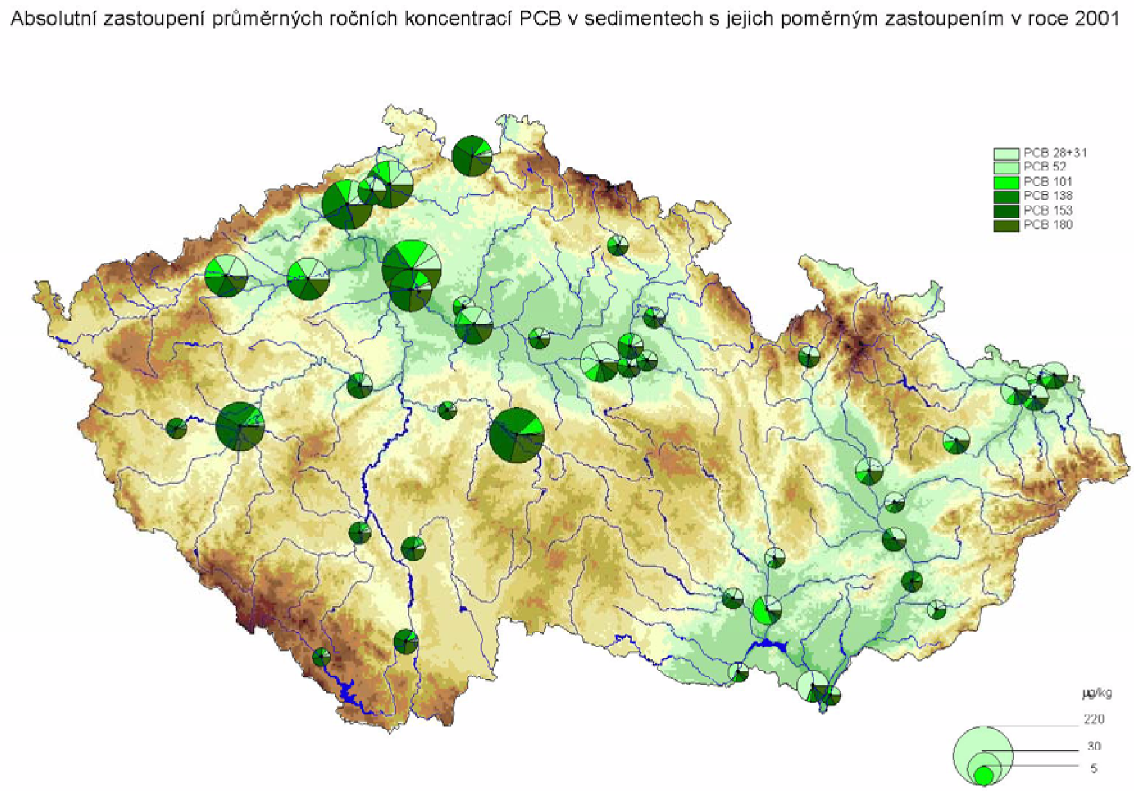


Figure 4-16 PCB levels (total PCBs) in bottom sediment samples taken from some watercourses in the districts of Michalovce and Stropkov (Kocan et al. 1999, 2001, Petrik et al. 2001b
(* Please Note!! the level for the Chemko effluent canal has to be corrected: instead of 48 it should be 4,800)

The highest PCB levels have been detected in a muddy part of the effluent canal from the Chemko factory after this has merged with the municipal sewage canal of Strazske town (see above "the canals merged". One of the samples contained even 5,000 µg/g, d.w. As the effluent canal from the factory itself contained only sandy sediment with low adsorbing effects for PCBs because the bed of the canal is concreted over, a astonishingly low value (48 µg/g) was found there (see above "effluent canal Chemko". The polluted effluent canal emptying into the Laborec River has caused its contamination as well as the one of the Zemplinska Sirava Lake.

Information about the spatial distribution of PCB contamination in the Czech Republic is summarised in Figure 4-17. As illustrated there sites of high PCB contamination with level of up to 220 ng/g for the Σ 6 PCBs are concentrated in the Elbe catchment area. Whereas the Danube and Oder tributaries in the southern and eastern part of the country appear less contaminated. Furthermore significant differences with respect to partial contribution of PCB congeners do appear which indicate the existence of different emission sources.



Figur
rivers.

Con

Relative contribution of different PCB congener in Czech sediments are shown in Figure 4-17. In samples from eastern and south eastern rivers PCB 28+31 is the prominent congener, whereas PCB 138, 153, 180 is more prominent in the samples collected from Elbe tributaries. (see also Figure 4-14

on PCB congener patterns in Czech water courses).

Congener specific analyses of PCBs in Polish studies (see Table 4-13) show a predominance of PCB 28 in all sediment samples. As PCB 28/31 has been the major compound of Delor 103 and 104 but was only contained at low level in Delor 105 and 106, the differences in congener patterns observed in the Czech Republic and Poland probably reflect difference in the historic application of commercial Delor mixtures.

Congener specific data concerning PCB distribution in different types of sediment from Poland are shown in Table 4-13 summarising results from a sampling campaign performed at the Włocławek Reservoir (Vistula) in 2000. The highest contamination levels have been detected in mud due to a higher absorbing effect in comparison to sandy sediments.

PCB Congener	Type of sediment	Minimum /Maximum [ng/g d.w..]	Average value [ng/g D.W.]
PCB 28	**mud**	**<0,01 – 9,64**	**2,95**
	sand	<0,01 – 0,81	0,07
	dusty sand	<0,01 – 2,11	0,55
PCB 52	mud	<0,01 – 2,79	0,95
	sand	<0,01 – 0,11	0,02
	dusty sand	<0,01 – 0,59	0,15
PCB 101	mud	<0,01 – 4,40	1,23
	sand	<0,01 – 0,17	0,02
	dusty sand	<0,01 – 0,29	0,08
PCB 118	mud	<0,01 – 2,43	0,76
	sand	<0,01 – 0,21	0,02
	dusty sand	<0,01 – 0,26	0,07
PCB 153	mud	<0,01 – 0,32	0,03
	sand	<0,01 – 0,02	0,01
	dusty sand	<0,01 – 0,08	0,02
PCB 138	**mud**	**<0,01 – 3,91**	**0,85**
	sand	<0,01 – 0,08	0,01
	dusty sand	<0,01 – 0,01	0,01
Total PCB	**mud**		**6,77**
	sand		**0,15**
	dusty sand		**0,88**

Table 4-13: Totoal PCB concentration in bottom sediments of the Włocławek Reservoir (2000); Chief Environment Protection Inspectorate; NPOPsInv Poland 2003)

4.4 Soil

Information about PCDD/F contamination in soils in AC/CCs has almost only been collected in the Czech Republic where there exists a monitoring of background contamination within the EMEP programme as well as a basal soil monitoring programme (CISTA) surveying all kind of agricultural and protected types of soil at permanent plots evenly distributed over the country. In the TOCOEN project different kind of model soils comprising urban, industrial and mountain sites are regularly analysed.

In Hungary PCDD/Fs have been monitored in soil in 1996. Single data from local hot spots have been

reported from Estonia and Poland.

For detailed data and references see Annex III – soil contamination

4.4.1 PCDD/F levels in soil

Czech Republic

In the Czech Republic PCDD/F levels in agricultural and protected soils have been first analysed in 2001 on 36 plots of arable soil and 2 plots from protected areas in the framework of the CISTA basal soil monitoring (see Annex-Soil contamination). The results range from 32.8–1,136.1 pg /g d.w. for Σ of PCDD/Fs with a median of 118.9 pg /g. The median WHO-TEQ level was at 1.3 pg/g d.w. (0.5-14.3).

The monitoring programme of the TOCOEN project focused on model sites for background, industrial, urban and mountainous regions (Kosetiče, Region Zlin, Beroun, Mokra and Border mountains see Annex-Soil contamination) the background level was 1.3 pg WHO-TEQ/g, the industrial median ranged from 0.8–2.42 pg WHO-TEQ/g d.w.. Highest contamination levels have been detected for the mountainous regions -affected mainly by long range air transport- where the mean contamination level was at 28.05 pg WHO-TEQ/g d.w..

Results obtained in the monitoring programme of the Research Institute of Amelioration and Soil conservation (RIASC) the Fluvisol programme conducted in 6 regions of the Elbe river basin and analysing agricultural soils, grassland and pasture in industrial, rural ,flooded and mountainous areas showed results ranging from 0.1 –14 pg WHO-TEQ/g d.w.. In this monitoring programme the following contamination categories have been identified:

- 14 – 1.6 – soils with high contamination due to flooding, industrial emissions and application of sewage sludge from WWTP
- 1.3 – 0.5 – soil from mixed contamination sources and higher altitude
- 0.4 – 0.1 – soil from rural areas with small local industrial sources.

From the complete set of 60 soil samples the 90% percentile (2.5 pg PCDD/F-WHO-TEQ/g d.w.) has been defined as national „background level“ for PCDD/F- WHO-TEQ in soil (Holoubek et al., 2003a).

Estonia

In Estonia PCDD/Fs concentrations were analysed near south-eastern Laguja landfill. PCDD/F concentrations 100 meter from the landfill in the agricultural soil were at background levels (0.64-1.53 pg WHO-TEQ /g d.w. (Roots et al., 2003).

Poland

The only information from Poland is related to a local hot spot contamination at the former pesticide production site of Neratovice. Dumping of chemical wastes around the production facility led to soil contamination with 2,3,7,8-TCDD up to 29.8 ng/g (Holoubek et al. 2000).

Hungary

In Hungary the contamination levels in soil samples collected in 1996 were low. Only 10 of 43 samples exceeded the detection limit of 0.9 pg PCDD/F-TEQ/g d.w. The average level of positive detects was 2.74 pg PCDD/F-TEQ/g d.w. In the consequence the medium bound contamination level for all types Hungarian soils can be calculated as 0.98 pg PCDD/F-TEQ/g d.w..

European comparison of average levels and ranges

A compilation of data reported from AC/CCs and EU Member States is given in Table 4-14.

Country	agricultural	hot spot	rural.	urban	Reference
Czech Republic	national background level 2.5 (0.1-14)				Holoubek et al. 2003
	1.3 (0.5-14.3).				
Estonia		0.64-1.53			Roots et al. 2003
Hungary	median bound 0.98 (<0.9-18.6)				NPOPsInv 2003
Austria			1-64		Buckley-Golder et al. 1999
Belgium		30 000	2,1-8.9		
Germany			1-30		
		median all types of soil 4			Fiedler et al. 2002
		top soils median 3			
France		2-60	0.09-1.0	0.2-17	ADEME, 1998
Greece		34-1 114	background 2		Martens et al., 1998
Ireland	various	1-13			Buckley-Golder et al. 1999
Italy	0.08-43	0.9-130		1.0-6.2	Fachetti, 1998
Luxembourg			1.8-20		Buckley-Golder et al. 1999
Netherlands			2.2-16		
Portugal			0.79-0.85	2.04-16.4	Coutinho et al. 2002
Spain			0.12-8.40		Eljarrat et al. 2001
Sweden		11 446	<1		Buckley-Golder et al. 1999
UK		1 585	< 1-87		

Table 4-14 PCDD/F contamination ranges in soil in different EU member states in pg-TEQ/g d.w. (background report-UNEP regional report-Europe; UNEP Mediterranean Report)

Discussion

A number of PCDD/F contamination data is available for MS providing a good overview on mean contamination levels in those countries. For AC/CCs representative PCDD/F data from soil are only available for the Czech Republic and Hungary. As agricultural soils are most important for a possible

contamination of the food chain they are basically used for the international comparison.

Compared to corresponding levels in MS agricultural soils in AC/CCs appear to be at the lower edge of the contamination range. These findings would very well correspond to the PCDD/F levels in human milk observed in the WHO milk study (see Figure 5-11). So it can be concluded that typical levels in the Czech Republic and Hungary are in the same range or even lower than MS levels. And as the Czech Republic is one of the most industrialised of the AC/CCs it can be even possible to assum that expect of some local hot spots in comparison to MS no problem with PCDD/F contamination in soils has to be expected in other AC/CCs.

Sewage sludge

In Poland a first assessment on the contamination of municipal sewage sludge with PCDD/Fs has been performed in 2001 and 2002 at a representative plant showing mean contamination levels (three sampling campaigns) from 12.16 in primary sludge up to 53.50 pg PCDD/F-WHO-TEQ/g d.w. in digested sludge (Dudzinska et al. 2003). According to the author higher concentrations of low chlorinated PCDDs and higher levels of furans have been observed in the digested sludges.

Typical PCDD/F contamination levels for municipal sewage sludge in EU MS have been compiled by Buckley-Golder et al (1999). As illustrated in the table below data from MS show mean levels of around 10-30 pg PCDD/F-TEQ/g d.w. what seems to be somewhat lower than the Polish result even more as time series in MS have shown that levels decline from the beginnings of the nineties to more recent years. It might be possible that the large share of PCDD/F emissions from domestic heating in AC/CC with stronger local deposition of PCDD/Fs is at least one reason for these findings. However a final conclusion is definitively not possible on the small data base that is available for Poland up to now. To enable reliable comparison a standardised approach in MS and AC/CCs would be recommended.

Data for average PCDD/F contamination of sewage sludge in MS are listed in Table 4-15

Country	Poland (2001)	Austria (1994-95)	Denmark (1996)	Germany (1992)	Sweden (1989-93)	UK (1992)
Number of samples / type of sludge	municipal	municipal n=16	municipal n= 35	municipal n=28	municipal n=12	urban
Range		8.1-38	0.7-54.7	9-63	1.44-115	
Mean	12.16-53.50	14.5	9.5 (N-TEQ)	24	19.8	33 (digested)

Table 4-15: Mean concentrations of PCDD/F in sewage sludge in different EU Member States in pg I-TEQ/g d.w.(Buckley-Golder e.a. 1999)

Time trends

With respect to information provided by Prof. Holoubek there shall be a declining trend of contamination levels in the Czech Republic over the last decade (Holoubek et al. 2003a) but based on

the provided data there is no possibility to verify this conclusion. Data available from other Accession Countries do not provide information about time trends.

Spatial differences

Czech Republic

In the CISTA monitoring highest results have been observed in samples near to industrial sources and in the two samples from protected areas in the border mountains. These results support the observations made in the TOCOEN project where relatively high average contamination levels have been found in samples from the border mountains. These results are also supported by data from Austria (Weiss (1997) showing levels from 106-2,676 pg I-TEQ/g d.w. in remote forest sites in mountainous regions and by other studies in remote mountain areas (e.g. in the Pyrenees).

There is a hypothesis that special meteorological conditions (barrier function) increase the atmospheric deposition and climatic factors (cold, poor organic activity) reduce degradation rate and evaporation. However it seems indicated to further investigate these findings.

The results from 20 stations from the RIASC monitoring network for PCDD/Fs and dioxin-like PCBs in soils in the Czech Republic are presented in Figure 4-18. It shows a range of a factor 6 for the contamination with PCDD/Fs (pg WHO-TEQ/g) and a range of a factor 3 for the contamination with dioxin-like PCBs (ng TEQ/g). It can also be stated that the relative contribution of PCBs and PCDD/Fs to the total is differing. To conclude it can be stated that there is only a small number of sites where contamination is exceeding the average significantly. A further investigation of these sites and the evaluation of the needs and possibilities for pollution reduction could be considered reasonable.

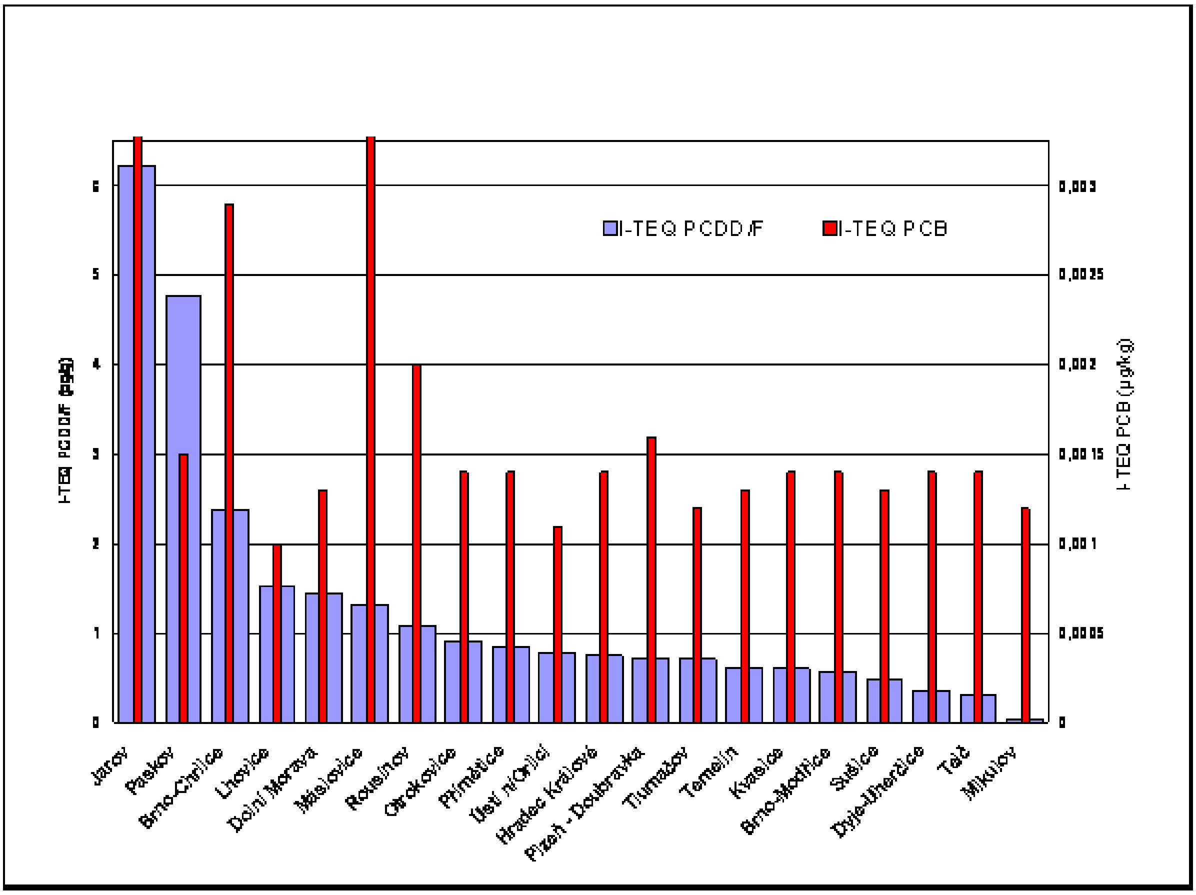


Figure 4-18: Regional differences in soil contamination with PCDD/Fs (pg WHO-TEQ/g d.w.) and dioxin-like-PCBs (ng WHO-TEQ/g d.w.). Monitoring programme 2001 CZ (Holoubek et al. 2003a)

Congener specific information on PCDD/F in soils

Based on information provided by the Czech soil monitoring system highly chlorinated PCDD/Fs (4-8 chlorinated congener) are contributing to the major part of soil contamination with PCDD/Fs. (Holoubek et al. 2003a).

4.4.2 PCB levels in soils

Information about soil contamination with Indicator PCBs is collected in a larger number of AC/CCs. A least some data are available from Bulgaria, Czech Republic, Hungary, Latvia, Poland, Romania, Slovakia and Slovenia.

Bulgaria

In Bulgaria a screening for background levels of soil contamination with PCBs has been performed in 1999 resulting in a mean level for 96 samples of 1 ng/g d.w. (Atanasov et al., 2001). These levels have been confirmed by another study covering agricultural and forest soils from different parts of the country. The results have all been below the limit of detection (< 0.5 ng/g d.w.). (Shegunova et al. 2001).

Czech Republic

In the Czech Republic a long-term monitoring programme conducted by the Central Institute of Supervising and Testing in Agriculture (CISTA) consists of 35 plots of agricultural soil and 5 plots in protected areas in the northern and southern frontier mountains. Samples are collected in the plough layer and in the deeper subsoil layer. The results of this monitoring are summarised in Table 4-18 giving a overview on the trend of soil contamination. The mean levels for 2000 were at 6.03 ng Σ 7 PCBs/g in top soil and 3.29 ng Σ 7 PCBs/g in sub soil.

Results from a country wide monitoring in 1995 (11-77 samples from 24 different regions) showed a mean contamination level of 14.25 ng/g (5-41.5) for the Σ 6 PCBs (Holoubek et al. 2003a). Regional data from the TOCOEN project showed mean levels of 35.36, 5.2 and 8.09 ng/g Σ 7 PCBs for the 3 urban/industrial regions Zlin, Mokra and Beroun; 10.06 ng/g Σ 7 PCBs for the background observatory at Kosetiče; 32.8 ng/g Σ 7 PCBs for the hot spot Spolana Neratovice in 2000; 19.94 ng/g Σ 7 PCBs for the surroundings of motorways and 31.13 ng/g Σ 7 PCBs for remote regions in the border mountains. To conclude it can be stated that mean contamination levels in the Czech Republic vary by a factor of ten.

Hungary

In Hungary average PCB contamination of 44 soil samples collected countrywide in 1997 was 1.52 ng/g (Σ 7 PCBs).

Latvia

In Latvia first measurements of suspected soils have been conducted in the framework of the GEF/UNDP funded project "Preparation of the POPs National Implementation Plan under the Stockholm Convention". Measurements in 21 former Soviet military camps resulted in Σ7 PCBs levels below the detection limit in 11 cases. For 6 of the "positive" (>1 ng /g) samples the levels were below 50 ng/g d.w.. 3 samples showed contamination levels around 100 ng/g and there was one sample which showed a peak contamination level of 822 ng/g. Additional analyses showed that the contamination was of local character- leaching from transformers, so that appropriate measures could be taken to avoid further contamination.

Poland

Information about Σ7 PCB soil contamination in Poland is relatively old dating from the mid 90ies.The mean PCBs concentration in agriculture and forest soils in Poland, collected in 1990-94 ranged from 0 – 28 ng/ g dry weight (Lulek, 2001). PCB concentrations in urban/industrial soil samples collected near their potential sources (transformer stations, spill sites) in southern Poland near Katowice 380 ng/g (range 67-870)and Krakow 53 ng/g total PCB (range 4.6-110) as well as from

former Soviet military camps in the north-western part of Poland 32-3,400 ng/g total PCB were by one to two order of magnitude higher than in the agriculture soils (Falandysz et al 1997/2000; Lulek et al 2001).

Romania

A screening of different soil samples in Romania in 1999 showed average levels for agricultural soils of 4.0 ± 2.0. ng/g d.w, urban levels one order of magnitude higher (57.3 ± 41.0 ng/g Σ 7 PCBs) and a local hot spot (722.2 ng/g d.w) at the a former organochlorine producer (OLTCHIM-Rm) in Vilcae. In general soils in the western part of Romania seem to be twice as polluted as in the southern part of the country. (Covaci et al. 2001). While the mean levels at industrial sites (23.1 ± 17.3 ng/g) have been lower than the urban levels in the study from Covaci et al., another study conducted in 2001(Dumitru et al.) showed a median level of 71.05 ng/g for industrial sites. These differences are probably to a different selection of sites with the inclusion of hot spots up to 1119.7 ng/g d.w in the latter study.

Slovakia

In Slovakia about 1,000 soil samples collected different kinds of agricultural soils and grasslands throughout the country showed an average contamination level of 0.1-0.2 ng/g for the total PCBs (NPOPsInv 2003).

As illustrated in Figure 4-19 data collected in the framework of the PHARE project in agricultural soils from the Michalovce and the Stropkov district in1997-98 showed median contamination levels of 7.72 and 6.15 ng/g for total PCBs not differing a lot between the hot spot and the control area.

On the other hand extremely high contaminated sample have been detected at specific sites in the hot spot region (see Figure 4-20). The peak level (53,000 µg/g) has been found under a heat exchanger in a asphalt/gravel mixing factory. However high contamination levels of 3,900-35,000 ng/g (total PCBs) have also been detected in agricultural and forest soils in the surroundings of these plants. Also soils collected near the Chemko waste storage and dump site showed elevated contamination levels of 400-5,800 ng/g (total PCBs). (Kocan et al. 1999, 2001) which by far exceeded the regional average.

Slovenia

The latest information on soil contamination from Slovenia is dated from 1991. Soil samples collected in the hot spot region of Bela Krajina ranged from the limit of detection 10 ng/g up to 1,530 ng/g for Total PCBs in agricultural soils.

European comparison of average levels and ranges

In general it has to be stated that PCBs in soils are quite stable and stationary so that the impact of local emission sources is of major importance for contamination levels in soil samples. In the consequence the location of sampling can strongly influence the results and peak levels obtained in direct vicinity to leaking PCB sources can not be used of averaging national contamination levels. However it is obvious on the basis of reported data that contamination levels vary significantly in different settings within the countries, and regional hot spots can be observed.

Recent data from Member States for PCB contamination in soil are scarce. An overview on contamination levels in MS and AC/CCs is listed in Table 4-16.

Country	Location	hot spot	rural.	urban	Year	Reference
Austria	remote forest sites		02-7.5 (Σ 7 PCBs)		1993	Weiss et al. 1998
Germany	forest soils in northern Bavaria			12-46 (Σ 12 PCBs)	1998	Krauss et al. 2000
UK	all types of soil	1.1-1,600 (Σ 7 PCBs)			1992-1995	Lead et al. 1997
Bulgaria	all types of soil	1 (Σ 7 PCBs)			1999	Atanassov et al. 2001
	arable & forest soils		< 0.5 (Σ 7 PCBs)		1999	Shegunova et al. 2001
Czech Republic	Basal soil Topsoil		6.03 (Σ 7 PCBs)		2000	Sanka et al. 2001
	Basal soil Subsoil		3.29 (Σ 7 PCBs)		2000	Sanka et al. 2001
	Region Zlin			35.36 (Σ 7 PCBs)	1993, 1996-8, 2000	Holoubek et al. 2003a
	Mountain sites		31.13 (Σ 7 PCBs)		1994, 1995, 1996, 1998, 2001	Holoubek et al. 2003a
	Mokrá industrial source			5.20 (Σ 7 PCBs)	1993 – up to date	Holoubek et al. 2003a
	Beroun region;			8.09 (Σ 7 PCBs	2001	Holoubek et al. 2003a
	National Monitoring, 24 regions	14,25 (Σ 6 PCBs)			1995	Holoubek et al. 2003a
	Regional background; Ko šetice		10.06 (Σ 7 PCBs)		1988	Vana et al. 2001
	Spolana Neratovice	32.8 (Σ 7 PCBs)			2000	Holoubek et al. 2003a
	Surroundings of highways	19.94 (Σ 7 PCBs)			2000	
	Mountain sites		31.13 (Σ 7 PCBs)		2001	Holoubek et al. 2003a
Hungary	country wide	1.52 (Σ 7 PCBs)			1997	NPOPsInv 2003
Latvia	Soviet military camps	61.19 (lower bound) max. 822 (Σ 7 PCBs)			2003	Latvian Environment Agency (unpubl.)
Poland	Soviet military base Swinoujscie	32-3,400 (total PCB)			1994	Falandysz et al. 1997
	agriculture and forest soils		0-28 (Σ 7 PCBs)		1990-94	Lulek, 2001
	Katowice			380 (67-870) (total PCB)	1994	Falandysz et al. 1997
	Krakow			53 (4.6-110) (total PCB)	1994	Falandysz et al. 1997

Romania	Rural areas		4.0 + 2.5 (Σ 7 PCBs)		1999	Covaci et al. 2001
Romania	Urban areas			57.3 + 41.0 Σ 7 PCBs)	1999	Covaci et al. 2001
	Industrial			23.1 + 17.3 (Σ 7 PCBs)	1999	Covaci et al. 2001
	Waste site	63.2 + 35.3 (Σ 7 PCBs)			1999	Covaci et al. 2001
	OLTCHIM factory	722.2 (Σ 7 PCBs)			1999	Covaci et al. 2001
	West Romania	8.1 + 6.5 (Σ 7 PCBs)			1999	Covaci et al. 2001
	South Romania	3.6 + 3.1 (Σ 7 PCBs)			1999	Covaci et al. 2001
	Rural		3.8 + 5.9 Σ 7 PCBs)		2001	Dumitru et al. 2002
	Industrial			129.3 (Σ 7 PCBs)	2001	Dumitru et al. 2002
Slovakia	Agricultural soils and grasslands	0.1-02 (total PCBs)				NPOPsInv 2002
	Michalovce district (hot spot)		9.15 (total PCBs)		1997-1998	Kocan et al. 1999, 2001
▪	Stropkov district		6.27 (total PCBs)		1997-1998	Kocan et al. 1999, 2001
▪	contaminated soils near asphalt/gravel mixing plants	3,900-35,000 (total PCBs)			1997-1998	Kocan et al. 1999, 2001
	soil near Chemko dump site			400-5,800	1997-1998	Kocan et al. 1999, 2001
Slovenia	Hot spot region Bela Krajina	10-1,530 (total PCBs)			1991	Fazarinc et al. 1992

Table 4-16 Soil contamination with PCBs (ng/g d.w)from different Member States (Background report, UNEP regional report Europe, 2003)

Discussion

Based on the provided data it can be stated that in general agricultural and background levels in AC/CCs range from 0.1 to 10 ng/g d.w. for total PCBs and are in the range or even a bit lower than levels in MS (however recent data from MS are too scarce to draw final conclusions). Levels reported for urban/industrial sites show ranges from 10-100 ng/g d.w. With somewhat higher levels reported in 1994 for the surrounding of Katowice in southern Poland.Levels reported from agricultural soil, in Hungary and Bulgaria seem to be especially low. Contamination is significantly higher and sometimes extreme near to industrial, military sites or corresponding dump sites which is related to leakage of PCBs from electrical equipment or former PCB production.

To conclude it can be stated that problematic contamination levels of PCBs can only be observed at certain hot spots in e.g. Poland, Slovak Republic, Slovenia. As the contamination is very localized remediation measures would be beneficial.

Sewage sludge

Information on sewage sludge has been provided from the Czech Republic. Data from 1998-2001 are at a median level of 145 ng/g d.w. (range 15-2,232) for the Sum 6 PCBs.

In the Mediterranean region sewage sludges are monitored for PCBs in countries like France were they are largely used (60%) in agriculture. The EU establishes a maximum concentration of 800 ng/g of PCBs (Σ7). The values found in 50 wastewater plants of the East of France were between 50 – 1,130 ng/g and 500 ng/g in the region of Paris. The mean value in sludges disposed in agriculture was of 190 ng/g (Table 4-17). Although data from CZ have been reported only from one WWTP, so that a conclusion can not be drawn, the data suggests that contamination could be in the same range.

Location	Sampling	PCBs (µg/g dw)	PAHs (µg/g dw)	References
Mean of 50 plants (East of France)	1994	(Σ7 cong.) 0.05-1.13		ADEME, 1998
Agricultural area (Chalons en Champagne)	1996		0.72 (Σ6 PAHs)	Palayer, 1997
Industrial area (Le Havre)	1996		10.8 (Σ6 PAHs)	Palayer, 1997
Mean in agricultural recycling	2000	(Σ7 cong.) 0.19	1.23 (Σ Flu, BaF, BaP)	ADEME, 2001
Paris (*Achères*) annual mean	2000	(Σ7 cong.) 0.50	1.80 (Σ Flu, BaF, BaP)	(Data from SIAAP)

Table 4-17: UNEP Mediterranean Regional Report 2002)

Time trends

Time trends can only be assessed from Czech and Slovak soil data because other countries do not dispose of the necessary time series.

Sum of 3 congeners (138, 153, 180); topsoil [ng.g^{-1} d.w.]									
	1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Median	1.20	n.d.	n.d.	0.60	1.50	1.43	0.75	1.00	1.50
Mean	2.26	0.64	1.35	7.60	3.66	3.65	5.91	3.88	4.28
Maximum	31.70	5.50	18.50	147.50	31.50	51.80	74.05	38.60	56.9

Sum of 3 congeners (138, 153, 180); subsoil [ng.g^{-1} d.w.]									
	1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Median	0.70	n.d.	n.d.	0.60	0.75	0.98	0.75	0.75	0.75
Mean	1.26	0.89	0.44	3.18	2.42	2.20	2.50	2.24	3.05
Maximum	11.80	32.41	5.10	32.00	30.20	31.95	27.73	30.30	43.4

Topsoil [ng.g^{-1} d.w.]								
	Sum of 6 congeners (28, 52, 101, 138, 153, 180)					Sum of 7 congeners (28, 52, 101, 118, 138, 153, 180)		
	1998	1999	2000	2001	2002	2000	2001	2002
Median	2.60	2.43	1.50	1.75	2.25	1.75	1.75	2.5
Mean	4.80	4.79	7.00	5.08	5.34	6.03	4.73	5.67
Maximum	33.65	54.30	82.20	41.50	61.7	84.3	42.1	62.9

Subsoil [ng.g^{-1} d.w.]								
	Sum of 6 congeners (28, 52, 101, 138, 153, 180)					Sum of 7 congeners (28, 52, 101, 118, 138, 153, 180)		
	1998	1999	2000	2001	2002	2000	2001	2002
Median	1.50	1.90	1.50	1.50	1.50	1.75	1.75	1.75
Mean	3.33	3.22	3.30	3.13	3.91	3.29	3.23	4.18
Maximum	32.05	35.30	28.91	32.65	46.25	28.91	32.9	47.05

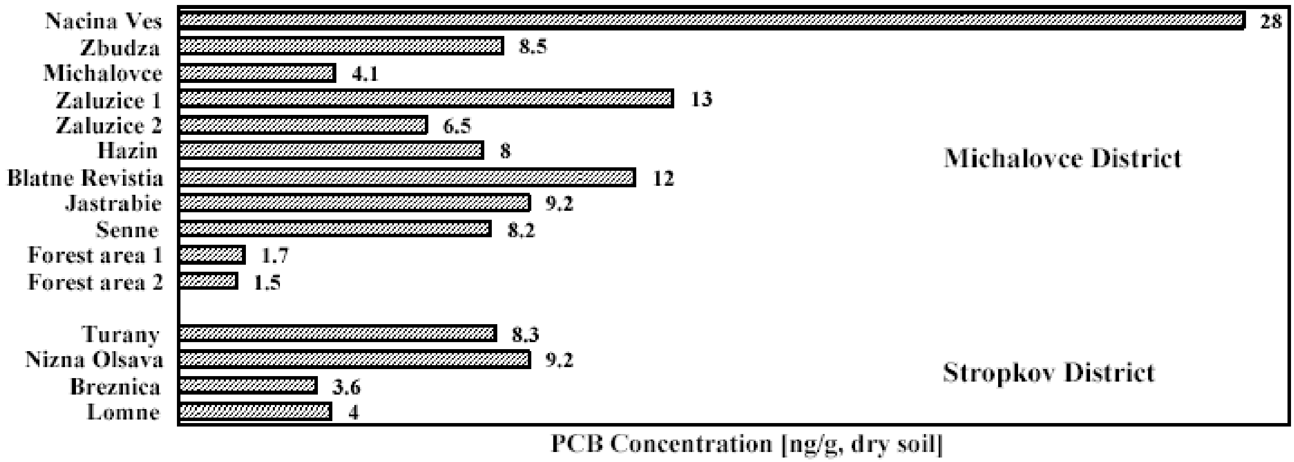
Table 4-18: Time trends of PCB contamination in soils in CZ (1994-2002) (Holoubek et al. 2003a) ; n.d. = no data

In the Czech Republic soil contents of Indicator PCBs have been quite stable over the last 10 years throughout the whole country with even a slight increasing trend in the last years. The time trends as presented in the basal soil monitoring programme for agricultural soils is presented in Table 4-18.

Spatial differences

Contamination levels reported from the Czech Republic, Poland or Romania show regional differences of up to one order of magnitude which corresponds to findings in MS and reflects a "normal" range of contamination for rural, urban and industrial areas.

In Slovakia the existence of some extreme hot spots has to be taken into account, when assessing the national average levels. While the general level in the Slovak Republic is relatively low single samples dramatically change the national average. The following figures are well illustrating this effect with differences in contamination levels of some local hot spot exceeding the average levels of other regions by 4-8 orders of magnitude.



As shown in Figure 4-19 contamination levels in agricultural soils from the "hot spot" region of Michalovce in except of one sample do not differ much from the levels in the control region of the Stropkov district.

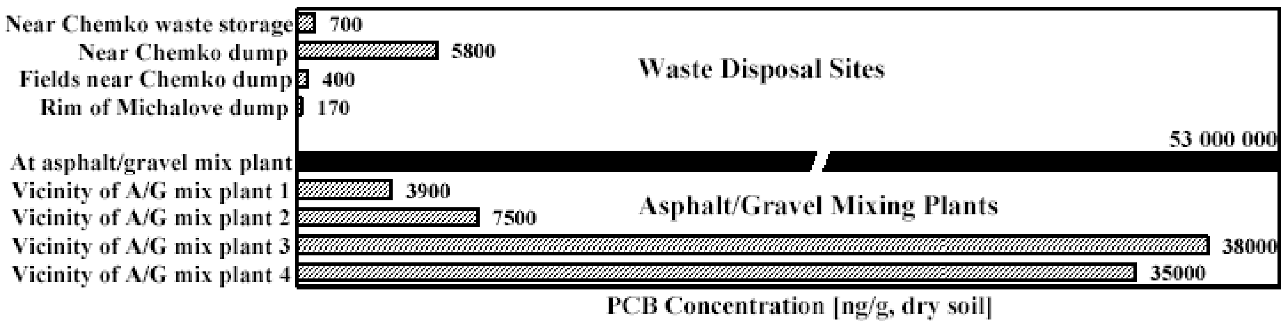


Figure 4-20 Levels of total PCBs in soil samples collected in the vicinity of asphalt/gravel mixing plants and the waste disposal sites of the Chemko chemical factory.

As illustrated in Figure 4-20 on the other hand high contamination levels have been detected soil samples taken from the direct vicinity of waste tombs and dump sites show. Absolute extreme levels however have been obtained from samples at asphalt/gravel mixing plants with the highest result in a sample taken directly under a heat exchanger filled with PCBs.

4.5 Vegetation

Information about PCDD/F and PCB contamination in vegetation is scarce. Countrywide monitoring is restricted to the Czech Republic. Some other data have been provided from Slovenia. Information includes data for spruce and pine needles, mosses and pollen. From all other countries no information has been provided.

For detailed data and references see Annex III – contamination of vegetation

Czech Republic

For the Czech Republic information on PCDD/Fs is available from the CISTA biomonitoring at 3 sites in 2001 (0.25-2.4 pg PCDD/F-TEQ/g), from analysis of pinus negri at 4 sites in 2001 (0.21-2.2 pg PCDD/F-TEQ/g) and from the TOCOEN project analysing 4 year old spruce needles from border mountains in the Czech Republic in 1995 and 1998 (0.86-10.14 pg PCDD/F-TEQ/g wet weight) (Holoubek et al. 1995,1998).

Median contamination levels with Indicator PCBs obtained in the framework of the national monitoring programme from sites throughout the Czech Republic for the years 1995-2001 range from 0.71-1.87 ng/g w.w (Σ7 PCBs) for Pollen, 2.45-4.78 ng/g d.w. (Σ7 PCBs) for Mosses and 0.62-3.56 ng/g w.w. (Σ7 PCBs) for needles (ICT Prague, 2003 unpubl.). Data from the background observatory in Kosetiče show median levels of 3.79-8.54 ng/g for needles and 4.26-18.62 for mosses (Holoubek et al. 1998-2003; Vana et al. 2001)

Slovenia

For Slovenia information on PCDD/Fs is restricted to one joint Austrian-Slovenian research project. The results show a median contamination level of 8.5 (range 2.8-16.9) pg Σ PCDD/Fs/g d.w.. These results correspond to a PCDD/F-I-TEQ of 0.1 (range 0.03-0.23) pg/g d.w.

As data collection and analysis have been standardised and coordinated a reliable comparison of contamination levels is possible. All samples have been collected in October. Only young ½ year old needles have been included. The spatial disaggregation of contamination levels at the different sites included in this investigation is shown in Figure 4-21.

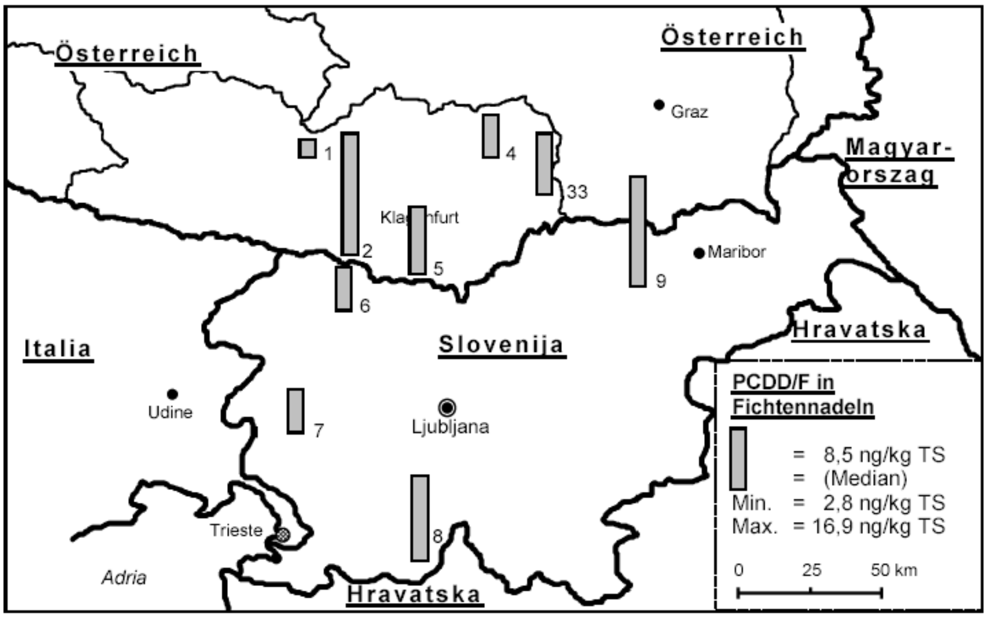


Figure 4-21: Contamination levels of PCDD/Fs in spruce needles in remote mountain sites in Carinthia and Slovenia (Σ PCDD/Fs); (Weiss et al. 2003) sampling period October; young needles

With respect to information on PCBs in Slovenian vegetation there are some relatively old data on contamination levels in mosses from the Bela Krajina region (the national hot spot region in Slovenia) from 1991 (10-1,013 ng/g Total PCBs). Recent data from spruce needles and humus layer have been collected in a joint research project investigating remote sites in Austria and Slovenia. The results show a median contamination levels of 1.2 (range 0.2-2.0) ng/g d.w. for Σ 6 PCBs (Weiss et al. 2003). The distribution of contamination levels with Indicator PCBs in this research project is illustrated in Figure 4-22.

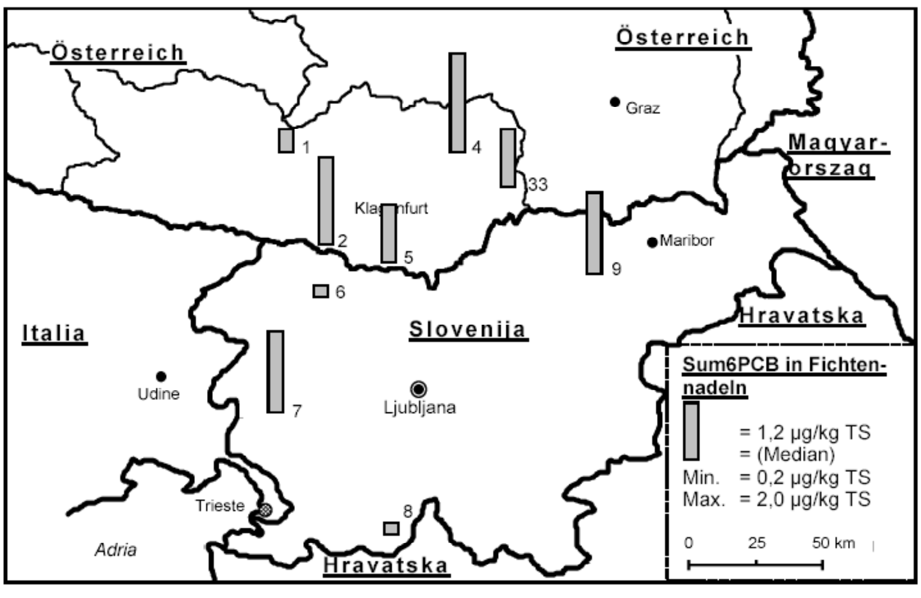


Figure 4-22: Spatial distribution of contamination of spruce needles with PCBs (Sum 6 PCBs) in remote sites of Carinthia and Slowenia (Weiss et al. 2003); sampling period October; young needles

Comparison with EU Member States

As illustrated in Figure 4-21 and Figure 4-22 overall contamination levels in Austrian and Slovenian mountain sites are similar although regional difference of contamination levels can be observed in both countries. As samples have been taken under standardised conditions a reliable conclusions can be drawn. In the consequence it can be stated that according to this study there is no difference in background contamination levels at remote mountain sites between these two countries.

According to Buckley-Golder et al 1999 typical PCDD/F contamination levels for spruce and pine needle in EU MS range from 0.3 to 1.9 pg I-TEQ/g d.w. Maximum levels amount up to 100 pg I-TEQ/g d.w. However these data are older and include urban and industrial sites which are higher contaminated.

Data that can best be compared to the Austrian-Slovenian samples are recent data collected in Bavaria in 1997/98. The collected needles showed levels of 0.25-0.65 pg I-TEQ/g d.w. in spring and levels of 0.11-0.42 in October. (Basler et al. 2003). Taking into account that not only remote rural sites have been included in the Bavarian samples the difference to the Austrian-Slovenian levels of median 0.1 pg/g d.w. (range 0.03-0.23) does not appear to be very important.

A direct comparison of Czech data on is not possible due to differences in reporting (wet and dry weight) and missing information about season, age of needles and other factors.

To conclude it can be stated that levels seem to be about in the same order of magnitude, however further standardised data collection including other AC/CCs as well will be necessary to draw final conclusions.

Time trends

Based on the data from the Czech monitoring programme there is a clear decreasing trend for PCB contamination in needles, but this trend is not detectable for the samples of pollen and mosses. (see Figure 4-23).

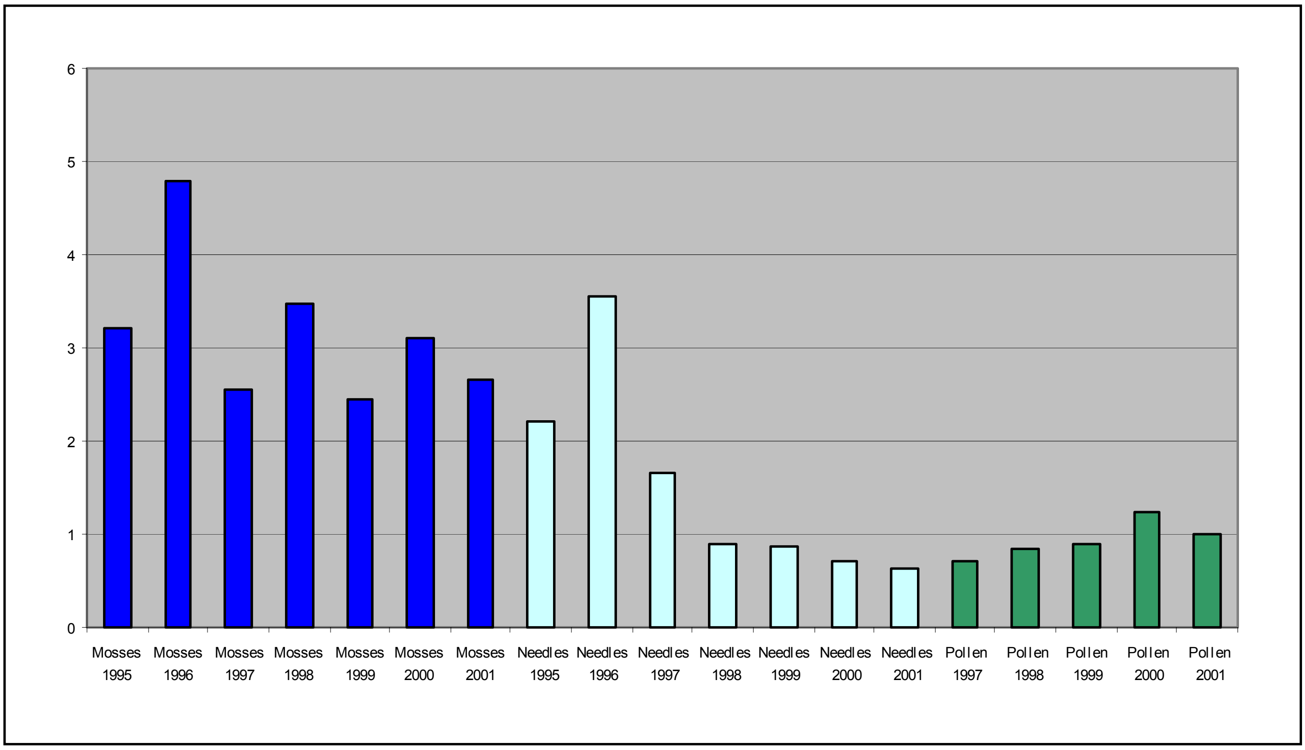


Figure 4-23 Time trends of median Σ 7 PCB (ng/g w.w.) contamination in mosses, needles and pollen in the Czech monitoring programme (1995-2001) ICT Prague, 2003 unpubl.); left: mosses; middle: needles; right: pollen

4.6 Wildlife

Information on contamination of wildlife in AC/CCs is mostly based on contamination data from marine and freshwater fish and some fish eating birds. Some information is available for otter and wild game which is included in the food monitoring in some of the countries.

4.6.1 PCDD/F and dl PCB levels in wild animals

Information on PCDD/Fs and dioxin-like PCBs in AC/CCs is mostly related to data for marine and fresh water fish from Czech Republic, Estonia, Latvia and Poland. There is some information about other marine animals (mussels, cormorant, harbour porpoise and sea eagle from the beginning and mid of nineties collected in Poland (Falandysz et al. 1997, 2000).

Marine fish

Information on marine fish is restricted to data from Estonia, Latvia and Poland. No information on PCDD/F contamination of marine animals is available from the Mediterranean and Black Sea countries. Most information on contamination of fish is based on muscle tissue which has ben analysed without skin. If samples have been analysed with skin a remark is given in the text.

Estonia

Mean contamination levels reported from Estonia in 2002 have been 0.07 pg PCDD/F-WHO-TEQ/g w.w. for cod, 2.13 (1.6-2.6) pg PCDD/F-WHO-TEQ/g w.w for Sprat and 1.8 (0.8-4.5) pg PCDD/F-WHO-TEQ/g w.w for herring.

Latvia

Latvian samples collected in 2002 showed levels of 0.07-0.09 pg PCDD/F-WHO-TEQ/g w.w for cod, 3.59-6.02 pg PCDD/F-WHO-TEQ/g w.w for sprat and 2.2-5.81 pg -PCDD/F-WHO-TEQ/g w.w for herring.

Poland

Information from Poland comprises old data (1991-1993) for fish, shell fish, birds and aquatic mammals, but these data appear to be too old for a reliable comparison.

Recent data on PCDD/F levels in fish collected in the Southern Baltic in 2002 have been reported by A. Grochowalski. Median levels have been 2.03 pg PCDD/F-WHO-TEQ/g w.w for flounder, 1.00 pg PCDD/F-WHO-TEQ/g w.w for herring, 1.63 pg PCDD/F-WHO-TEQ/g w.w for cod and 2.6 pg PCDD/F-WHO-TEQ/g w.w for salmon. Data reported for several species from 1992 can be used for the evaluation of time trends and are discussed in the corresponding paragraph.

Data on contamination with non- and monoortho PCB-TEQs caught in the bay of Gdansk in 2001 have been reported by Falandysz et al. (2003). Mean levels in eel were at 0.5-0-64 pg TEQ/g wet weight, mean levels in cod 0.28 pg TEQ/g wet weight, mean levels in perch and pike perch 2.0-2.3 pg TEQ/g wet weight, levels in flounder 1.1. pg TEQ/g wet weight and levels in herring 0.48 pg TEQ/g wet weight.

Fresh water fish

Czech Republic

Except of some information on PCDD/F contamination of river Elbe fish in the surroundings of the PCDD/F hot spot of Spolana Neratovice from 2002 and 2003 no reliable information is available on contamination of fresh water fish with PCDD/Fs. The contamination level in fishes (n=11) caught near the hot spot of Spolana Neratovice in 2002 and 2003 was in the range of 0.13-1.34 pg PCDD/F-TEQ/g wet weight. The PCB-TEQ ranged from 0.35-7.22 wet weight.

Some information on non- and monoortho PCB-TEQ is available for eel and barbel from the Elbe river and roach from Skalice river 12 years after a serious pollution incident by Delor 103 (Czechoslovakia name of PCBs- containing technical PCBs mixture with 48 %, w/w, chlorine) occurred at the locality Rozmital (Elbe tributary). Samples of pooled fish (fillets, skin removed) collected in autumn 1997 showed median levels of 0.53 pg TEQ/g wet weight in eel and 25.13 pg TEQ/g in barbel. Roach caught upstream of Rozmital showed mean levels of 2.76 pg TEQ/g whereas roach caught downstream of the PCB "hot spot" Rozmital showed levels of 17.61 pg TEQ/g. (Gregor and Hajslova (1998)).

Latvia

Data for perch from 3 lakes and the Daugava river analysed in Latvia in autumn 2003 (n=4) show contamination levels 1.04-1.47 pg PCDD/F-WHO-TEQ /g wet weight.

European comparison of average levels and ranges

According to Holoubek et al. 2003a concentrations of non-ortho and mono-ortho substituted PCBs determined in barbel from Elbe river exceed values reported for other freshwater fish (pike-perch, perch) collected in Rhine, Meuse and their side-rivers. However as contamination of different species differs these data can not be used for comparison.

Mean levels of non- and monoortho PCB-TEQs in eel from the River Elbe were in the same range as in eel from the Bay of Gdansk analysed by J.Falandysz.

Data reported in 1992-1995 for different fish species from Bavarian background sites (Mayer R. 2002) ranged from 0.5-2.2 pg PCDD/F-TEQ/g w.w.. This contamination level would correspond to the data recently collected in Latvian perch and to the levels reported for fish caught near Spolana Neratovice in the Czech Republic.

This findings support the results of sediment monitoring which showed relatively low PCDD/F contamination levels in the Czech part of the Elbe river. However the number of samples from Latvia is to small, the specification for the Czech samples missing and the temporal difference to big to draw final conclusions.

With respect to contamination levels reported in 2002 for cod from Estonia (mean 0.076 pg PCDD/F-TEQ/g), Latvia (range 0.07-0.09pg PCDD/F-TEQ/g w.w.) and Poland (mean 1.49 pg PCDD/F-TEQ/g w.w.) the hugh difference by a factor of 12 in contamination levels is astonishing and will need further clarification.

A quite reliable comparison between national contamination levels can be made for levels of PCDD/F in fish from the Baltic Sea as samples are comparable with respect to species, age and analysis standards. This comparison is based on latest data from Sweden, Estonia and Latvia compiled in the following tables and illustrated in Figure 4-24 below. The analysis has been performed by reference laboratories in the UK and in Sweden. Finish data (Isosaari et al. 2003) for Baltic herring < 4 years of age have been included in Table 4-19 . All data present samples with skin.

Baltic herring – Age group 2-3 years

Country	Number of Samples	Catchment Area	PCDD/F [pg TEQ/fresh weight]
Sweden	14	Bothnian Bay	1.1
Sweden	14	Bothnian Bay	1.4
Sweden	15	Bothnian Sea	2.0
Sweden	15	Bothnian Sea	2.5
Sweden	15 (avg. age 3.1 years)	W. Bornholm	4.6
Sweden	17(avg. age 3.6 years)	W. Bornholm	3.0
Sweden	18	W. Bornholm	1.6
Sweden	20	W. Bornholm	1.5
Sweden	15	W. Bornholm	1.6
Latvia	2	Baltic Sea	3.6
Latvia	2	Gulf of Riga	2.4
Estonia	3	Western part of the Gulf of Finland	1.3
Estonia	3	Central part of the Gulf of Finland	1.6
Estonia	3	Gulf of Riga	1.7
Finland (< 4 years)	11	Bothnian Bay, Bothnian Sea, Gulf of Finland	2.6

Table 4-19:Contamination of Baltic herring in 2002, Age Group 2-3

Baltic herring – Age group 4-6 years

Country	Number of Samples	Catchment Area	PCDD/F [pg TEQ/fresh weight]
Sweden	9	Bothnian Bay	10
Sweden	6	Bothnian Bay	10
Sweden	9	Baltic Proper	6.8
Sweden	9	Baltic Proper	4.6
Sweden	9	Baltic Proper	4.7
Sweden	9	Baltic Proper	4.5
Sweden	9	Baltic Proper	1.7
Sweden	9	Baltic Proper	1.9
Latvia	2	Baltic Sea	5.4
Latvia	2	Gulf of Riga	4.8
Estonia	3	Open part of the Baltic Sea	3.6

Table 4-20:Contamination of Baltic herring in 2002, Age Group 4-6

Baltic sprat (no information on age of the fishes)

Country	Number of Samples	Catchment Area	PCDD/F [pg TEQ/fresh weight]
Sweden	22	W. Bornholm	3.6
Sweden	16	W. Bornholm	2.4
Sweden	14	W. Bornholm	2.7
Latvia	2		5.4
Estonia	2	open Baltic Sea	2.5
Estonia	4	western Gulf of Finland	2.0
Estonia	2	central Gulf of Finland	2.0

Table 4-21:Contamination of Baltic sprat in 2002, Age Group 4-6

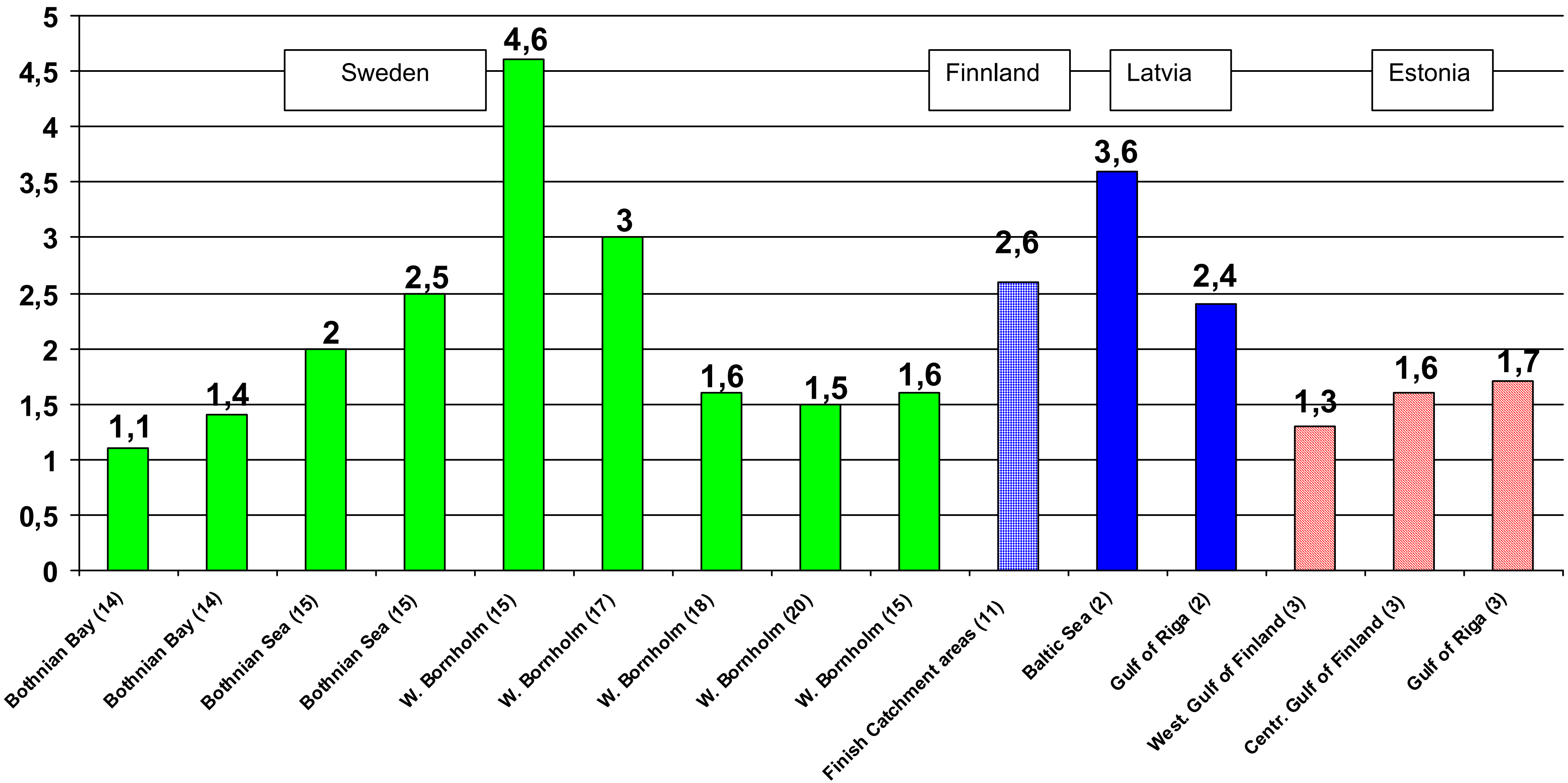


Figure 4-24 PCDD/F contamination levels [pg TEQ/fresh weight] in herring of 2-3 years of age from different Baltic Sea countries based on data from 2002 (from left to right: Sweden, Finland, Latvia, Estonia) (x) = number of fishes/sample

All data are from common sources (Sweden: Bjerselius, et al. 2003; Finland: Isosaari et al. 2003; Estonia: Estonian Environmental Research Centre Ott Roots, Mart Simm 2003; Latvia: National Food and Veterinary Service, Maris Balodis unpublished.]

Discussion

As illustrated in Figure 4-24 levels in Latvian samples (3.6 and 2.4 pg TEQ/fresh weight) seem to correspond to higher contaminated samples from Sweden, whereas Estonian samples seem to be somewhat less contaminated corresponding to the lower contaminated Swedish samples. Finish data show levels which correspond to the lower contaminated Latvian samples.

Data from Polish herring caught in the southern Baltic proper in 2002 and analysed in the Laboratory for Trace Organic Analysis of the Chemistry Department of the University of Krakow are not included in Figure 4-24 because they can not directly be compared to the other data due to missing information about age, analysed part of the fish and possible differences in laboratory standards. The 10 Polish herring samples showed a median contamination level of 1.00 pgTEQ/g wet weight (Grochowalski personal communication) which would be at the lower edge of the range of levels measured in the other countries.

In general the small number of data available from the ACs compared to data from MSs hampers a reliable comparison. Nevertheless it is possible to state that the levels in the ACs do not exceed the levels in Sweden and Finland but are in a comparable range. Estonian and Polish data even seem to be slightly lower. More comparable data will be necessary for a definite conclusion.

Time trends

Comparing contamination data reported in Polish studies for herring , flounder and cod for the years 1992-93 (Falandysz et al. 1994, 1997, 1998) and 2002 (Grochowalski personal communication) suggests a strong increase of the contamination level from 1992 to 2001 for flounder and cod from 8.4 to 31.56 and 7.8 to 23.3 respectively, while the data for herring suggest a decline from 81 to 18.1 pg TEQ/g fat. (see Figure 4-25). Due to changes in analysis methods these differences are probably not very reliable, but it may be interesting to further investigate the future development. On the basis of available data it has not been possible to assess time trends for the other AC/CCs.

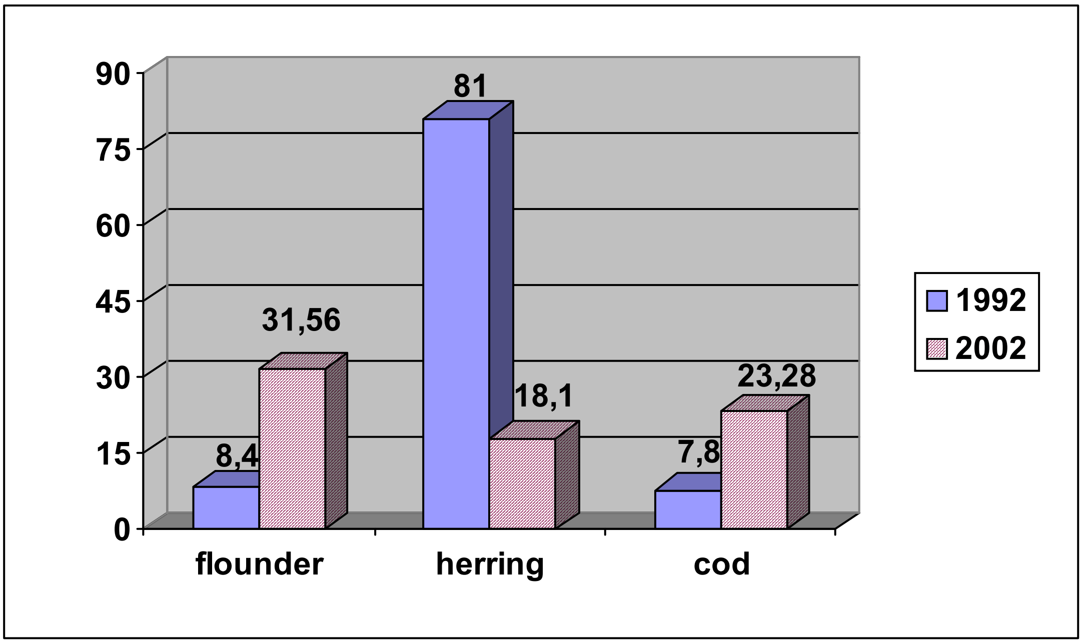


Figure 4-25: trends of contamination levels in Polish fish samples (pg PCDD/F-TEQ/g fa). data 1992: Gulf of Gdansk, Falandysz et.al. 1997; data 2002: Baltic proper; region of Koszalin; Grochowalski (personal communication)

Age dependency

Any assessment of contamination levels in animals has to take into account the close relation between age and contamination level with is clearly demonstrated in Figure 4-26 comparing Finnish and Estonian contamination data for Herring. This figure furthermore illustrates, that there is no large difference regarding contamination levels in herring samples of the same age group.

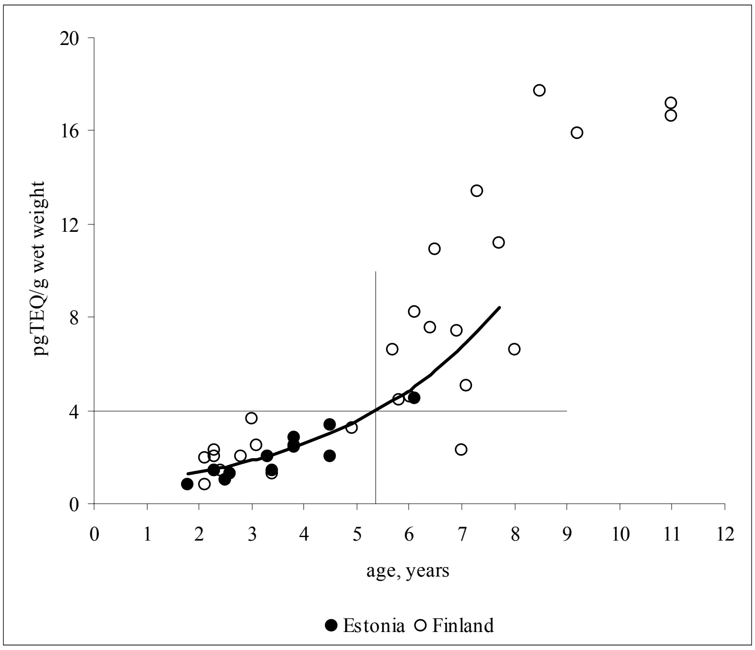


Figure 4-26: Dioxin concentration (pg/g wet weight in TEQ) in Estonian (Roots, et al., 2003) and Finnish (Isosaari et al., 2003; Kiviranta et al., 2003) Baltic Sea herring muscle tissue.

Species particularities

Data from different fish species caught in the Gdansk Bay in 2001 show significant differences in wet weight contamination levels from 0.28 pg PCB-TEQ/g in cod to 2.4 pg PCB-TEQ/g in eelpout that become even more pronounced if looked at on a fat weight basis. (Falandysz et al. 2002).

Data for PCDD/F contamination in fish from the Southern Baltic show increasing contamination levels (wet weight basis) from herring (median 1.00 pg TEQ/g w.w) via cod (1.63 pg TEQ/g w.w) and flounder (2.03 pg TEQ/g w.w) to salmon (median 2.6 pg TEQ/g w.w.) (Grochowalski, personal communication, 2003). Similar results are obtained for the fat weight calculation with a change in position only for flounder and salmon (see Figure 4-27).

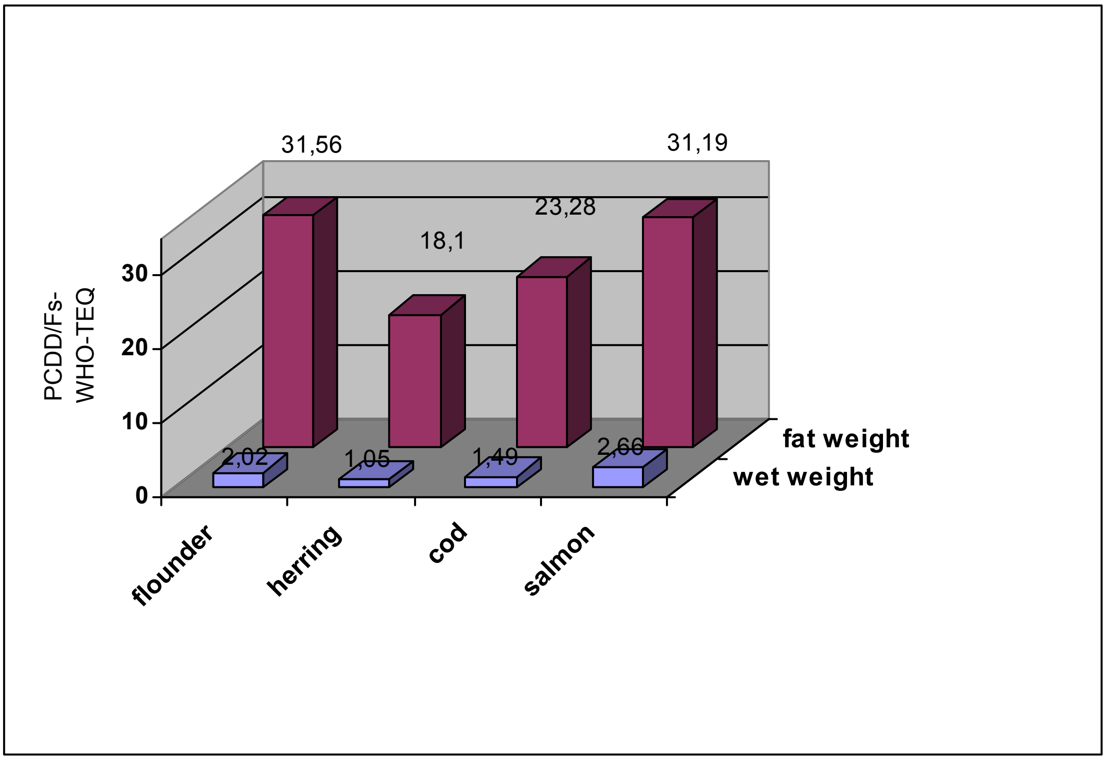


Figure 4-27: Differing contamination levels in various species from Polish sea waters; (Southern Baltic, 10 samples each; 2002, Grochowalski (personal communication)

Other animals

Falandysz et al. (1997d) reported a mean level of 5.6 pg PCDD/F-TEQ/g fat in the blubber of 4 harbour porpoises from the Polish coast in 1991-1993 while grey seals from the Gulf of Finland showed a range of contamination of 12-61 pg/g fat in the blubber of grey seal (Koistinen et al. 1997) As the species differed and age and sex of the animals in the Polish study was not recorded a comparison of these results is a bit difficult.

Highest contamination levels have been found in fish eating birds from coastal areas. Levels of 108,000 pg PCDD/F-TEQ/g fat in black cormorant and 470,000 pg PCDD/F-TEQ/g fat in white-tailed sea eagles have been found in dead birds from the Polish coast whereas residues in birds from inland areas were below detection limits. (Falandysz et al. 2000a). Comparable contamination levels have been reported by Scandinavian authors.

4.6.2 PCB levels in wild animals

Data about Indicator PCBs in wild animals are far more common than data on PCDD/F contamination. Data are reported from Czech Republic, Estonia, Latvia, Lithuania, Poland, Romania and Slovakia.

Numerous data and time series on contamination levels with Indicator PCBs are available for the Czech Republic. The results support data from other countries as far as inter species and tissue differences of contamination levels.

Fish

Czech Republic

In the Czech Republic fresh water fish (e.g. barbel, perch, bream, trout and chub) is routinously monitored for Indicator-PCBs for the last 8 years. In Slovakia comparative measurements have been performed in fish of the highly contaminated area of Michalovce and a control area. As information on fresh water fish is missing for most of the other countries only contamination trends in the Czech Republic are possible on the collected data basis. They show relatively constant median levels of Σ 7 PCBs from 1998 to 2002 in trout (1170.8–1189.0 ng/g fat), a slight decrease in perch (2940.00–2545.56 ng/g fat) undulating levels in chub (oscillating between 2904.4 and 4547.82 ng/g fat) and a constant increase of PCB levels in bream (2844.3 to 9012.0 ng/g fat) and barbel (5640.5 to 20,135.23 ng/g fat) over the same period (Czech State Veterinary Administration). Analysis of bream, pike perch and carp in a lake in southern Moravia in 1996 showed highest contamination levels in bream and pike perch of 2977 and 2916 ng/g fat for Σ 7 PCBs (5190 and 5149 Σ 20 PCBs). (Holoubek et al. 2003a)

Estonia

Mean contamination levels of PCBs in herring from Estonian coastal waters oscillated from 50-700 ng/g fat with a mean level of 200 ng/g fat in 2002. Mean levels reported for perch in 1999 did range from 355.3-658.5 ng/g fat for Σ 11 PCBs.

Malta

Wild fish has been included in the national food monitoring programme in Malta in 2001. For the first 10 samples contamination levels ranged from <40-958 ng/g fat for Σ 7 PCBs with a mean contamination level of 421.7 ng/g fat (Σ 7 PCBs) in 2002. (see annex IV)

Poland

According to information from the Ministry of Agriculture PCB levels in the main fish species caught

in the Polish Sea waters (herring, plaice, cod , flounder) mean contamination levels have been 190 ng/g fat (range 27-420) (see annex IV). In a study performed in 1992-93 2,900 ng/g fat have been detected in perch from the Bay of Gdansk (Falandysz et al. 1997). Samples of perch collected in 1996-97 at 3 sites in the Oder estuary and adjacent parts of the Southern Baltic showed mean contamination levels of 370-1,100 ng/g fat Σ 8 PCBs. (Falandysz et al 2002).

Romania

For Romania data from fish collected in the Danube delta in 2001 (Covaci et al. 2002) have been reported. Levels found in Bream were at 170.7-544.3 ng/g fat Σ 18 PCBs, levels in carp 1,209.1 ng/g fat Σ 18 PCBs, levels in roach 500.9 ng/g fat Σ 18 PCBs in pike perch 1,239.9 ng/g fat Σ 18 PCBs and in perch 302.4 ng/g fat Σ 18 PCBs.

Slovak Republic

Data on fish from the Slovak Republic have been reported from a study performed in Eastern Slovakia in 1997-98 in order to trace differences in contamination levels between the "hot spot" region of Michalovce and the control district of Stropkov. Pooled samples of Plankto- and Benthophags and Predator fishes have been analysed. A mean contamination level of 1,540 ng/g fat (total PCBs) for Planktophags and a mean contamination of 5,150 ng/g fat (total PCBs) for Predator fishes have been reported for the control district, mean contamination levels of 233,550 ng/g fat (total PCBs) for Planktophags and 375,430 ng/g fat (total PCBs) for Predator fishes have been detected in fishes from the "hot spot" region.

European comparison of average levels and ranges

Contamination levels differ markedly between different fish species, so that a general comparison of contamination levels would not be reasonable. In the consequence only corresponding data are compared below. Data from Czech Republic can be compared with corresponding data from Poland, Romania and Mediterranean countries.

In the Mediterranean Region levels of Σ7 PCBs investigated in muscle of fish species of the Po River: chub and barbel were in the range from 1174 to 5130 ng/g fat weight. (Viganò et al., 2000). In the Seine River (France) Σ7-PCBs were found in roach at concentrations of 40.5 ng/g w.w (Chevreuil, personal communication).

Country	Species	Contamination level	Location	Reference
Czech Republic	chub	mean 2,904.5-4,547.8 Σ 7 PCBs)	national water courses	State Veterinary Administration
	barbel	mean 5,640.5-20,135.2 (Σ 7 PCBs)		
	perch	mean 2,940-2,545. 6 (Σ 7 PCBs)		
		mean 5,190-5,149 (Σ 20 PCBs)		
Estonia	perch	mean: 355.3-658.5 (Σ 11 PCBs)	Matsalu Bay	Ott Roots 2003
Poland	perch	mean 370-1,100 (Σ 8 PCBs)	Oder estuary	Falandysz et al. 2002
Romania	perch	mean 302.4 (Σ 18 PCBs)	Danube delta	Covaci et al. 2002
Slovak Republic	predators	mean 5,150 (total PCBs)	Stropkov District	Kocan et al. 1999

		mean 375,430 (total PCBs)	Michalovce District (hot spot)	
Italy	chub & barbel	mean 1,174-5,130 (Σ 7 PCBs)	River Po	Vigano et al 2000

Table 4-22: Contamination with Indicator PCBs (Σ7-8) in fish species (muscle tissue) from different European Countries (ng/g fat)

Discussion

The data suggest a significantly higher contamination level of PCBs in Czech fish samples in comparison to recent data for the same species from other European countries. Data reported from the Slovak Republic can not be well used for direct comparison with data from other countries as a disaggregation has only been done for predators and planktofags however contamination levels seem to be high in comparison to other countries. Levels in Romania seem to be low in comparison whereas data from Poland and Estonia seem to be more or less in the same range of contamination.

Old data on PCB contamination of perch in Latvia, Lithuania and Estonia collected in 1992-93 for comparison with Swedish data showed concentrations of 680 and 1 800 ng/g fat for Latvia, 760 and 2,100 ng/g fat for Lithuania, 2,080 ng/g fat for Sweden and 530 ng/g fat for Estonia. These data can be compared because they have been analysed in the same study (Blomkvist et al. 1993) but can not very well be compared to recent data from other countries. Furthermore the small number of samples does not allow more than a rough estimate of levels in the same order of magnitude with somewhat lower levels in Estonia. This conclusion has been confirmed by other more recent studies in herring and sprat (see Figure 4-24). In another study performed in the same period of time (1992-93) 2,900 ng/g fat had been detected in perch from the Bay of Gdansk (Falandysz et al. 1997).

Provided data suggest that PCB levels in Czech fish samples somewhat exceed the levels found in corresponding fresh water species in other European countries, but final conclusions can not be drawn on the small basis of comparable data. For better comparability of sampling data a standardised approach would be needed to allow a definite comparison in future times.

Other animals

Different species of wild game are included in the national food monitoring in a number of AC/CCs (Czech Republic, Lithuania, Poland, Slovak Republic, Slovenia). However available data can not be compared as species included in the monitoring programmes vary from country to country.

For the Czech Republic data provided for hare show contamination levels of 0.147 ng/g muscle tissue.

Polish data for wild boar and roe showed a mean contamination level of 5.9 ng/g fat (Σ 7 PCBs) for the years 1998-2000.

Contamination levels in the Slovak Republic are summarised in Figure 4-30 . Mean levels for all species ranged from 24-203 ng/g fat with significantly higher contamination levels in animals caught in the "hot spot" region of the Michalovce District (500-2,000 ng/g fat).

Relative old data from white-tailed sea eagles found dead or dying in both inland and coastal areas of Poland can be used for comparison of the impact of sea water fish consumption. Birds from the Baltic coast showed contamination level of 66,000-480,000 ng/g fat compared to levels of 4,600-32,000 ng/g fat in inland birds (Falandysz et al. 1994). The concentrations of total PCBs were similar to those reported in dead eagles from the breeding sites of the coastal area of the northern Baltic in Sweden and Finland in the 1960s and 1970s (Falandysz *et al.* 1994d).

Similar findings were recorded by another more recent study comparing eagles from coastal and inland areas. In this study white-tailed sea eagles from coastal areas of the Baltic had PCB concentrations in their tissues that were 73 times greater than those from inland areas (1100,000 ng/g fat compared with 15,000 ng/g fat) (Falandysz *et al.* 2000a).

Relative old data for contamination of otter with Indicator PCBs are available from Latvia, Czech Republic and several Member States. The levels are listed in Table 4-23 below.

Country	Number	Year	PCBs mean (range)
Austria	11	1990-94	38 (4.2-130)
Denmark	16		16 (7.5-60)
UK	14		53 (ND-300)
Sweden	53	1970	120 (4.7-970)
Spain	21		100 (4.4-1 000)
Czech Republic	8		130 (19-260)
Latvia	8		2.3 (0.4-10)

Table 4-23 PCB concentrations in otter in different European Countries in µg/g muscle tissue(Sjöasen et al. 1997) .

A comparison of PCB levels in seals in general show similar concentrations of PCBs for seals from different regions of the Baltic Sea. For instance, a study in the Gulf of Finland noted that levels of PCBs in ringed seals and grey seals were similar to levels reported for seals from Lake Saimaa in Finland, and were not high compared to other studies on Baltic seals (Koistinen et al. 1997c).

A study undertaken on Baltic seals collected from coastal areas of Estonia in 1994 also revealed that the blubber of grey seals from the Vilsandi National Park contained similar concentrations of PCBs similar to the blubber of seals from other areas of the Baltic (Roots 1998, Roots & Talvari 1999). In the Vainameri Sea off the coast of Estonia, however, levels of PCBs were comparatively lower in grey seals, possibly due to the availability of different prey.

Time trends

Samples of 2-3-year-old female Baltic herring caught during the years 1995-2002 from 2 two catchment areas in the Gulf of Finland (Tallinn and Kunda) and from the north-eastern part of the Gulf of Riga (Pärnu Bay) in the framework of the Estonian Monitoring Programme of the marine Environment (EEIC 2002) can be used for an assessment of trends in the Estonian coastal waters. Figure 4-28 shows a wavelike contamination trend. So far there is no explication for the high contamination levels in 2001. It will be necessary to track the further development.

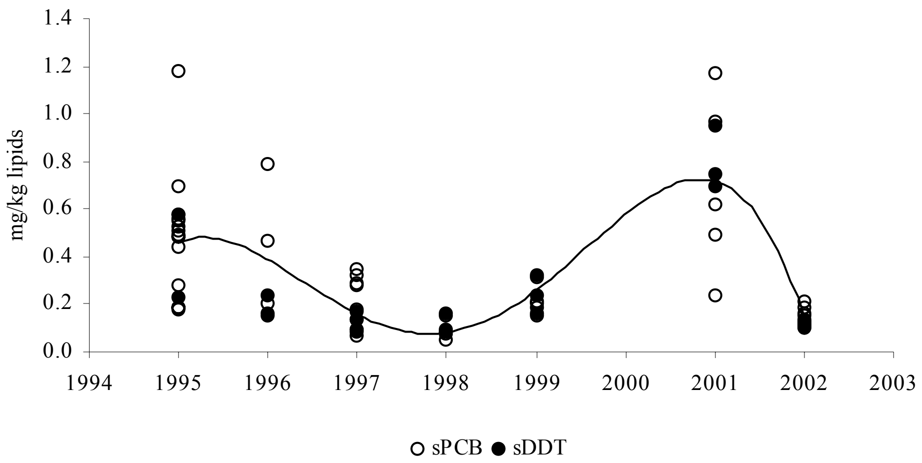


Figure 4-28 Contents of sDDT and sPCB (mg/kg lipids) in the muscle tissue of Baltic herring from different parts of the Estonian coastal sea (Roots and Simm 2003).

With respect to time trends in fresh water fish the Czech data provide quite good time series for trout, bream, barbel and chub over 5-6 years. Probably due to the flood in 1997 the levels in barbel, bream and trout did raise significantly in the last years with the strongest increase in barbel from 242.54 Σ7-PCBs in 1997 to 845.68 Σ7-PCBs in 2002 (Data from National Monitoring Programme).

For hare a strong decline contamination levels have been reported for the last 5 years with a intermediate increase in 1997 and 1998 which could be explained as a flood effect. While the median level for 1995 was at 0.6, it was only 0.15 ng/g Σ 7 PCBs in 2000.

Spatial differences in contamination levels

Data collected in the Slovak Republic confirm the observation traceable in all environmental media in this country. While contamination levels in predator fish from the Laborec River and the Zemplinska Sirava Lake in the hot spot region of Michalovce are at a mean level of 375,430 ng/g fat for the Σ6 - PCBs contamination the level in lakes and rivers of the control district is almost 3 orders of magnitude lower illustrated in Figure 4-29 (see below).Kocan et al. 1999, 2000).

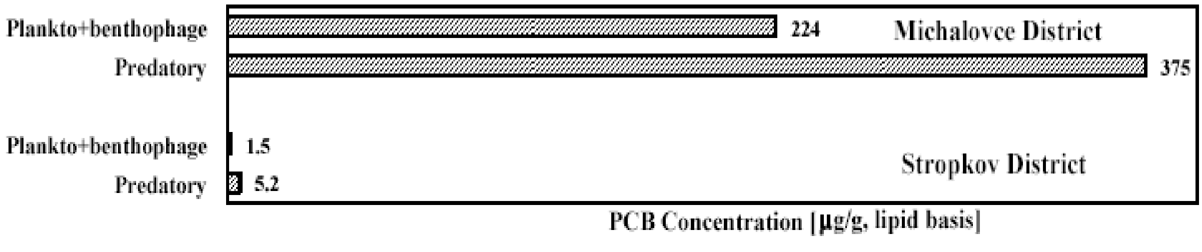


Figure 4-29: Contamination of fishes (total PCBs) in rivers and lakes of the hot spot region Michalovce and a control district in eastern Slovakia (Kocan et al. 1999, 2001)

A similar effect can be observed in wild game shot in different parts of the country in the last 10 years. In total > 1,000 samples have been collected and analysed for Σ 9 PCBs. As illustrated in Figure 4-30 levels in most regions of the country ranged from 1-90 ng/g fat whereas levels of 500-2,200 ng/g fat have been observed in wild game from the Michalovce district and a adjacent region in eastern Slovakia.

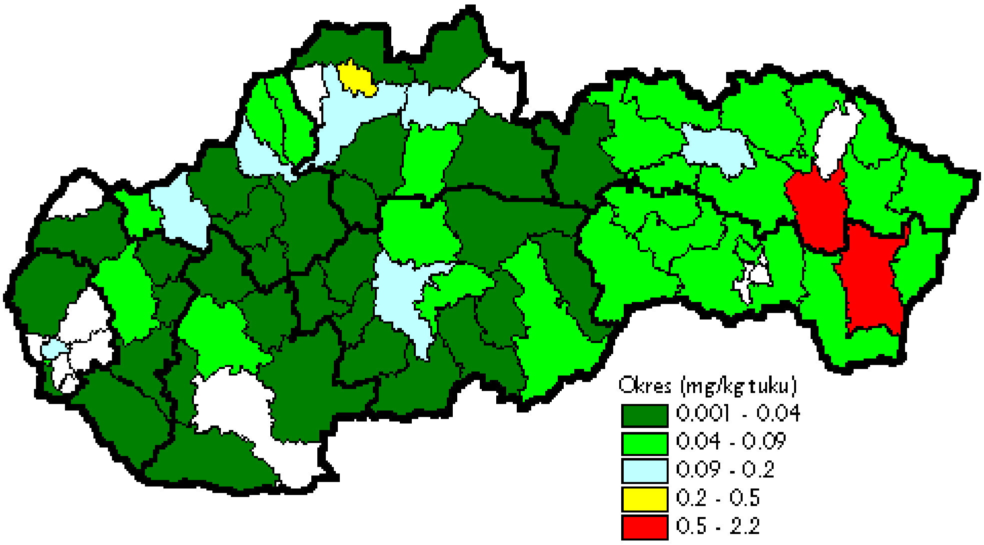


Figure 4-30: Regional differences in PCB contamination of wild animals in SK from 1987 – 2001 (Slovak NPOPsInv 2003). (data in µg/g fat tuku=fat)

Congener specific information on PCBs in wild animals

As illustrated in Table 4-24 a research study tracing the environmental fate of dioxin and dioxin-like PCB congeners in two river cross sections of the Oder and Vistula rivers shows a clear bioaccumulation of all PCB congeners with a certain predominance of CB 118 and 153.

Compounds	River water [ng/l]	Bottom sediment [ng/g D.W.]	Fish [ng/g lipids]
Indicator PCBs			
PCB 28			11,4
PCB 52	1,50	2,01	20,3
PCB 101	not detected	2,36	37,4
PCB 118	not detected	0,90	68,1
PCB 138	not detected	4,91	15,3
PCB 153	4,93	6,92	81,7
PCB 180	2,86	4,69	29,1
PCB 189	not detected	not detected	
Σ PCBs in most polluted sample	4,9	16,9	346,1
Coplanar PCBs			
PCB 77	not detected	0,92	33,2
PCB 126	not detected	0,05	22,7
PCB 169	not detected	0,04	20,3
Σ PCBs in most polluted sample	not detected	0,99	69,9

Table 4-24: Bioaccumulation of PCB congener from water to fish in identic river sections of Vistula and Oder (Institute of Mteorology and water Management; NPOPsInv Poland 2003)

4.7 Emission sources and Hot spots

Based on data provided from national Emission Inventories it can be stated that industrial emissions, uncontrolled burning at dump sites and domestic heating with waste co-incineration are the major sources for dioxin emissions in AC/CCs. Furthermore it can be stated that soils and sediments at former production sites, at former Soviet military sites and near to Capacitors and Transformers as well as stocks of contaminated oils mostly not adequately stored and leakage from dump sites are the most important sources for local contamination with PCBs.

Hot spots – as a result of former or ongoing industrial activities and leakage from electronic equipment exist and are expected in almost all AC/CCs but differ to a large extent in spatial distribution and level of impact to the environment and the ecosystem as a whole. Information on hot spots is not equally available in all countries and has only in part been reported so that some information has been taken from environmental contamination data suggesting a local hot spot.

Definitely hot spots are the most severe problem with respect to dioxins and PCBs in AC/CCs. In almost all countries of the regions emission inventories including investigations for possible hot spots and inventories on PCB containing equipment or PCB stocks have been performed or are ongoing in the framework of GEF funded projects as preparatory activities in preparation of National Implementation Plans under the Stockholm Convention "Preparation of POPs National Implementation Plan under the Stockholm Convention". However, there are some doubts whether these activities enable a systematic detection of all relevant hot spots.

Cyprus

Cyprus has reported about 5 clinical waste incinerators, 3 power plants, 2 cement factories and uncontrolled burning of agricultural waste including plastic film from greenhouse cultivation as potential sources for dioxin emissions in. As up to now no PCDD/F analysis has been performed there is no information about possible PCDD/F hot spots in the country. With respect to PCB contamination the Polemidia dam is a local hot spot with high contamination levels in water and sediments due to illegal disposal of transformer oils.

Czech Republic

Based on data from the National monitoring system in the Czech Republic local hot spots with elevated levels of PCBs and PCDD/Fs are scattered over the whole territory of the country with a certain dominance in the northern and central part of the country and relatively low contamination levels in the southern part. One major hot spot for PCDD/F contamination is located at a former factory site in Spolana Neratovice located at the Elbe 35 km north of Prague. Remediation of this site has been started in 2003. An important hot spot for contamination with PCBs is located at Rozmital a former PCB production site. Due to an accident around 1990 the local Skalize River (Elbe tributary) has been heavily contaminated with PCBs leading to highly elevated levels in fish at down stream sampling sites.

Estonia

In Estonia there are two paper and pulp mills and two large oil shale burning power plants with important emissions of PCDD/Fs. No other important hot spots are known in Estonia.

Hungary

Hungary has provided information about the municipal waste incinerator in Budapest as source for high PCDD/F emissions. The incinerator shall be modernised until 2005. According to the provided information there is no important hot spot related to PCB contamination.

Latvia

In Latvia an important local hot spot for atmospheric pollution with PCBs seems to exist near Salaspils about 30 km south of Riga. With respect to PCB levels in sediment samples taken downstream from Riga have shown high levels that have not been detected in other parts of the Country. Other problematic sites are former Soviet military camps located mainly in the western part of the country. At least one local hot spot with high soil contamination level has been detected during first measurements performed in 2003 by the Latvian Environment Agency. With respect to dioxin emissions medical waste incinerators are the most problematic sites in the country.

Lithuania

In Lithuania many industries are concentrated along the Nemunas river including some pulp and paper mills and chemical industries. Some of these are old and with limited possibilities for modernisation and pollution abatement but no information with respect to hot spot has been reported or can be drawn from reported contamination data.

Malta

Malta has reported about the 2 dump sites on Malta and Gozo and different waste incineration facilities (Malta drydocks, abattoir, hospital, private), old military sites and power generation/distribution equipment as possible emission sources for PCDD/Fs. Waste oil stocks from

the dock industry which is an important economic sector in Malta are a potential source for PCB contamination. First measurement in the sewage system has revealed PCB contamination at the Valetta sewage discharge (personal communication).

Poland
In Poland the highest level of contamination and the majority of emission sources are located in the southern part (Katowice) near to the frontier to the Czech Republic. Besides this chemical and pulp and paper industries are located along the Vistula River. There are several industrial plants along the Polish coast, including chemical, metal and forest industries. The Oder River carries some discharges from forest industries. Dumping of chemical waste at the production site of Neratovice in southern Poland led to high local soil contamination with 2,3,7,8,-TCDD. No other concrete "hot spot" has been reported. Sewage sludge from WWTP is another potential source of PCDD/F pollution that is already addressed in the polish legislation.

With respect to PCB contamination at least one local hot spot for PCB contamination is located at a former production site for wood preservatives near Wroclaw (personal com. Adam Grochowalski). Furthermore former Soviet military camps in the north-west and south-west of the country show elevated contamination levels with PCBs.

Romania
Romania has provided information on the distribution of PCB containing equipment as potential source of PCB pollution. According to the national emission inventory the major emission source for PCDD/Fs is the energy and industry sector due to missing abatement devices in combustion plants. Energy and Transport are the two major emission sources for PCBs. Based on contamination data in soils and fish is can be stated that the most important local hot spot for PCB contamination is the OLTCHIM factory, a former organochlorine producer.

Slovakia
In contrast to other countries with elevated contamination levels like the Czech Republic Slovakia has a localised PCB problem. The essential and only important hot spot in Slovakia is the Chemko factory in the Michalovce district in eastern Slovakia. Due to huge amounts of former produced PCBs in sediments, soils, dump sites and stocks extremely high contamination levels are found in certain focus sites that would need an urgent remediation in order to prevent further spilling and contamination of the whole region.

Slovenia
In Slovenia the problem with respect to PCBs is similar to the Slovak situation with extreme contamination levels in the surroundings of the Krupa river spring in the Bela Krajina region due to accidental contamination of the river in 1983 by the Iskra capacitor producing factory at the town of Semič.

Turkey
Official Information from Turkey is scarce but according to information provided by the Marmara Research Center – a newly installed Research Center for dioxin related issues – the most important potential emission sources in the country are the energy sector, the industry sector (metallurgic industries, cement kilms, pulp and paper industries) and uncontrolled combustion processes as well as leakage from wild landfills.

5 Human exposure

The following chapter gives summarising information on exemplary data for food and feed contamination as well as on dietary intake assessment. It is not the intention of this chapter neither possible in the framework of this project to present a complete compilation of all data that have been collected in AC/CCs in the past years. But it will provide an overview about relative contamination levels and link to sources that may be used for further in depth investigation of specific topics. All data discussed in this chapter are compiled in more detail in the annexes corresponding to the different paragraphs of this chapter including available background information and references.

5.1 Food and Feed contamination & Dietary intake assessment

Information on contamination levels in different kinds of food and feedingstuffs as well as on dietary intake is of interest because of the important role that has to be attributed to food with respect to human tissue levels and body burden. Data on food contamination in AC/CCs is available for a number of countries as far as concerning data on contamination with classical PCBs while information on PCDD/F contamination is scarce. Information on contamination levels in feedingstuffs is completely missing. With respect to dietary intake assessment the situation is not much better. Time series have only been provided from Czech and Slovak Republic. Some information on estimated daily intake of PCBs by breast fed infants has also been provided from Poland.

5.1.1 PCDD/F levels in Food

Information on contamination of foods with PCDD/Fs in AC/CCS is restricted to first data from the Czech and Slovak Republic. First analyses have been performed in Malta in 2003 but results are not yet available. Other countries will start food control for PCDD/Fs only after accession in 2004.

Czech Republic
Summarised Information for 2001 from the Czech Republic shows median levels for vegetable oils of 0.995 pg Sum-TEQ/g fat (including PCDD/Fs and dl PCBs). The median contamination level in animal products has been reported as 1.6 pg Sum-TEQ/g fat. Summary contamination levels in fish have been reported as 0.22 pg TEQ/g in 2002.

Slovak Republic
More precise data have been reported from the Slovak Republic for 2002 showing contamination levels of 0.876 pg PCDD/F-WHO-TEQ/g fat for bacon, around 0.64 PCDD/F-WHO-TEQ/g fat as a mixed calculation for beef and pork, a min-max. range of 0.56-0.65 pg PCDD/F-WHO-TEQ/g for fish and a contamination level of 3.44 pg PCDD/F-WHO-TEQ/g for eggs.

European Comparison

Average contamination levels in EU Member States as reported in Buckley-Golder et al. in 1999 are at 1.3 (0.1 – 16.7) pg I-TEQ/ g fat for meat; 21.2 (2.4 – 214.3) pg I-TEQ/ g fat for fish and 1.5 (1.2 – 4.6) pg I-TEQ/ g fat for eggs. Taking these data as a basis for comparison Slovakian data is on the lower

edge of contamination.

Comparing the results to the European Union limit for PCDD/Fs in foodstuffs it can be concluded that only levels in samples from Slovakian eggs did exceed the European limit values as set in 2375/2001/EC.

In 2002 two butter samples have been taken from a number of AC/CCs in order to get first screening results on potential PCDD/F and dl PCB contamination that would be comparable to Member States results. As a conclusion it could be stated that levels in the samples from Czech Republic, Lithuania, Slovak Republic, Romania and Estonia except 2 were in the range of actual low background contamination for PCDD/F and dl PCBs in EU Member States (Malisch & Dilara 2003). These results however do not allow final conclusions and higher levels in certain hot spots are possible.

Time trends

As data collection for PCDD/F contamination in food has only recently started in the AC/CCs there is no possibility for an assessment of trends in these countries.

5.1.2 PCB levels in Food

Information about food contamination with indicator PCBs is much more abundant and has a far longer tradition in AC/CCs as the investigation for PCDD/Fs or dl PCBs. Nevertheless the intensity of control is differing markedly between the countries with episodic screening of certain indicator foods in some countries and comprehensive food monitoring over a long period of time in others

Data have been reported from Cyprus, Czech Republic, Estonia, Lithuania, Latvia, Malta, Poland, Slovakia and Slovenia.

Cyprus
Data for food analysed in Cyprus in 1999 and 2000 were below the detection limits. Meat samples were analysed > 1-5 ng/g fat, milk was analysed < 0.6 ng/g fat for Σ 7 PCBs.

Czech Republic
In the Czech Republic data for 2001 were reported as 17 ng/g fat for beef, 11 ng/g fat for pork, 10 ng/g fat for meat tins, 12 ng/g fat for consumer milk, 8.1 ng/g fat for butter and 8 ng/g fat for cheese samples for Σ 7 PCBs.

Estonia
In Estonia the median contamination level in 4 butter samples collected in 2001 was 6.95 ng/g fat. The levels in meat analysed in 1999 ranged from 5.1-9.6 ng/g fat compared to 21-23 ng/g fat in samples of imported meat from Belgium.

Latvia
From Latvia only data for contamination levels in fish have been reported. According to information from the Latvian Environment Agency levels < 160 ng/g fat weight have been characteristic for fish samples (salt water, fresh water, smoked, tinned) analysed in 2000. 63% of the samples (n= 119)

showed PCB levels of 1-138 ng/g fat.

Lithuania

In Lithuania beef, pork, wild game, milk, eggs and farmed fish is included in the national food monitoring programme. All samples analysed in 2002 were < 40 ng/g fat (LOD).

Malta

In Malta results for food samples collected in 2002 showed mean contamination levels of 8 ng/g fat for bovine renal fat , <12 ng/g for porcine renal fat, 159.7 ng/g fat for muscle tissue from farmed fish and 421.7 7 ng/g fat for muscle tissue from wild fish. The number of samples has been small however, so that final conclusions are difficult to make.

Poland

In Poland food samples collected in the framework of the national food monitoring programme in 2000 showed mean contamination levels of 2.3 ng/g fat for cow milk, 152.4 ng/g fat for meat and meat products including sausage etc., 3.6ng/g for bovine fat, 1.2 ng/g for porcine fat, 130 ng/g for vegetable oils, 135.1 ng/g for margarine, 138.8 for rape seeds, 159.2 ng/g fat for Goose, 177.9 ng/g fat for turkey and 123.4 ng/g fat for lamb. The contamination levels for broilers ranged from 184-265.6 ng/g fat. The 4 main marine fish species (cod, herring, sprat, flounder) showed contamination level ranging from 27-420 ng/g fat. Tinned (mean 120 ng/g fat), smoked (mean 90 ng/g fat), salted fish (mean 84 ng/g fat) or pickles (mean 69 ng/g fat) much significantly lower contamination levels. Tinned cod on the other hand showed high mean contamination levels of 660ng/g fat. Mean contamination levels reported for the period of 1998-2000 have been 27.8 ng/g fat for carp, 1.2 ng/g fat for pork and 3.6 ng/g fat for cattle.

Slovak Republic
In the Slovak Republic data from food monitoring in 5 regions 1993-95 showed average levels of 2.1-33.1 ng/g fat total PCBs for most food groups (Beef, pork, butter, milk, lard and poultry) whereas in home made butter (84.2 ng/g fat and fish (142 ng/g fat) levels were significantly higher. Extreme contamination levels however have been detected in eggs from small farm with showed PCB levels of 838 ng/g fat.

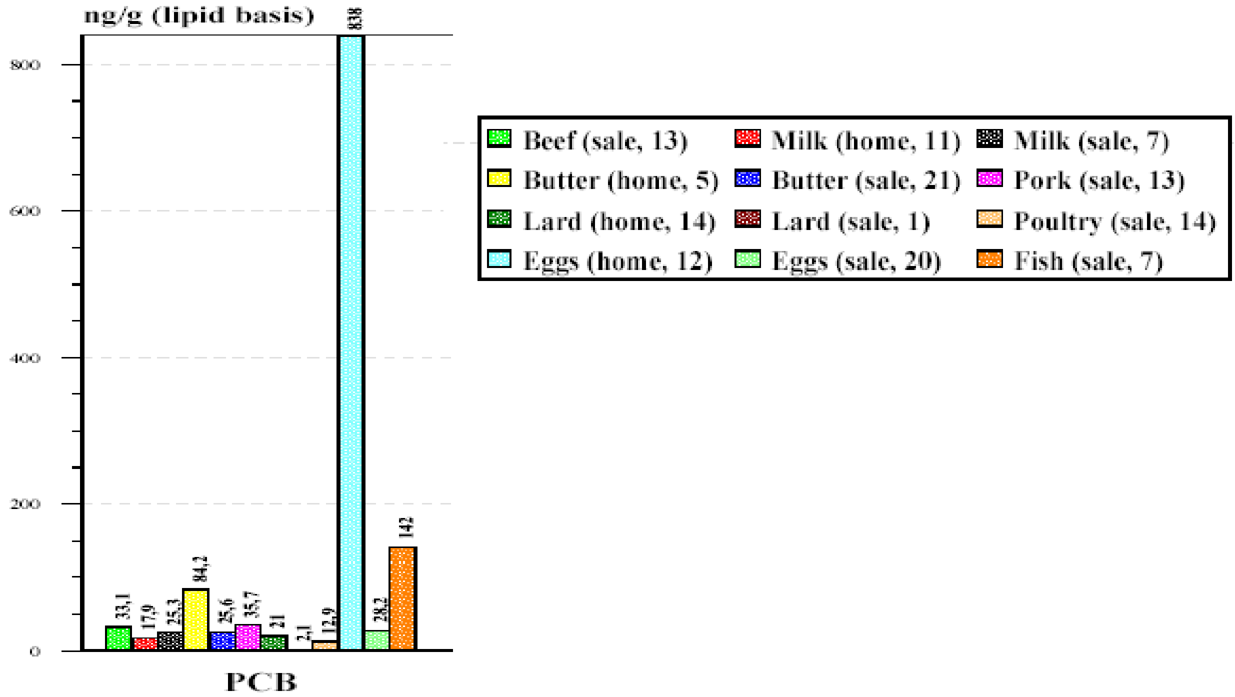


Figure 5-1: Mean PCB, levels in food (n=138)(collected in five selected Slovak districts Myjava, Bratislava, Nitra, Michalovce and Velky Krtis)in 1993-95 (Kocan et al. 1995b)

659 food samples collected in eastern Slovakia (Michalovce and Stropkov district) in 1997-98 showed contamination levels in the range of 4-28.5 ng/g fat whereas eggs produced on small farms in the Michalovce district showed contamination levels of 2,764.2 ng/g fat. (see Figure 5-4)

Slovenia
Information from Slovenia is restricted to data collected in the hot spot region of Bela Krajina in 1991. Contamination levels in fish ranged from 210-177 000 ng/g fat, 0.9-59.2 in food of animal origin and 0.01-25 ng/g fat in fruits, nuts and vegetable. Wild game was relatively low contaminated (0.06-7.3 ng/g fat) while contamination levels in chicken and eggs exceeded the normal level of animal products ranging from 2-550 ng/g fat for chicken and 0.6-85 ng/g fat for eggs. (see Annex- Contamination of food).

European Comparison of averages and Ranges

Due to uncertainties with respect to laboratory standards, certain differences in grouping of foods and other possible confounding factors a comparison of national contamination levels can not be more but a rough estimation of contamination ranges. Having in mind these limitations it can be concluded – on the basis of the presented data that contamination levels vary markedly between different AC/CCs.

Milk

With respect to milk data from Cyprus seem to be extremely low, compared to low Polish values which are still by a factor 5-6 lower than the levels in Czech and Slovak Republic and Slovenia. (When comparing Slovenian and Slovak data to the other it has to be taken into account that they are a lot older and at least partly related to local hot spots).

Meat

With respect to meat Polish and Cypriot samples show a low contamination level which is by a factor 3-4 lower than the one reported for samples from Estonia, Czech Republic and Malta.

Fish

With respect to fish the contamination levels seem to be in the same range for wild fish from the Baltic and the Mediterranean region round Malta while data from Latvia suggests a lower level of contamination.

Butter

Data for butter show similar levels of contamination for Estonian and Czech Samples with Slovak samples one order of magnitude higher.

Vegetable Oil

Data reported from Poland for vegetable oils and margarine is even significantly higher than those reported for home-made Slovak butter. There is no explication for these levels that will urgently need a clarification.

Poultry

Another result giving raise of concern are high contamination levels for poultry and lamb which are reported only a factor 2-3 lower than fish. Furthermore Polish data for meat & meat products are not consistent with other data reported for pork and cattle differing by more than one order of magnitude.

According to (Holoubek et al., 2002a) typical contemporary levels for the most important PCB-containing food items in Europe are the following: animal fat, 20-240 ng./g fat; cow's milk, 5-200 ng/g fat; butter, 0-80 ng/g fat; fish, 10-500 ng/g fat. Certain fish species (eel) or fish products (fish liver and fish oils) contain much high levels, up to 10,000 µg/g fat. Vegetables, cereals and fruits typically contain low concentrations. (Holoubek et. al., 2002a).

Compared to these levels the reported values are even more on the lower edge, except of fish and home made butter from Slovakia. With respect to fish however it can be stated that in none of the fish product samples the admissible concentrations (2,000 ng of total PCBs/g fat) set in the Dutch standards were exceeded.

As Member States have focused on monitoring of PCDD/Fs and dl PCBs in food a direct comparison of AC/CCs levels with recent levels in Member States is difficult.

An example for a direct comparison between Member State and Accession Country is given in Figure 5-2.

Porc fat

Swedish n=79 (1997)

Polish n=150 (2000)

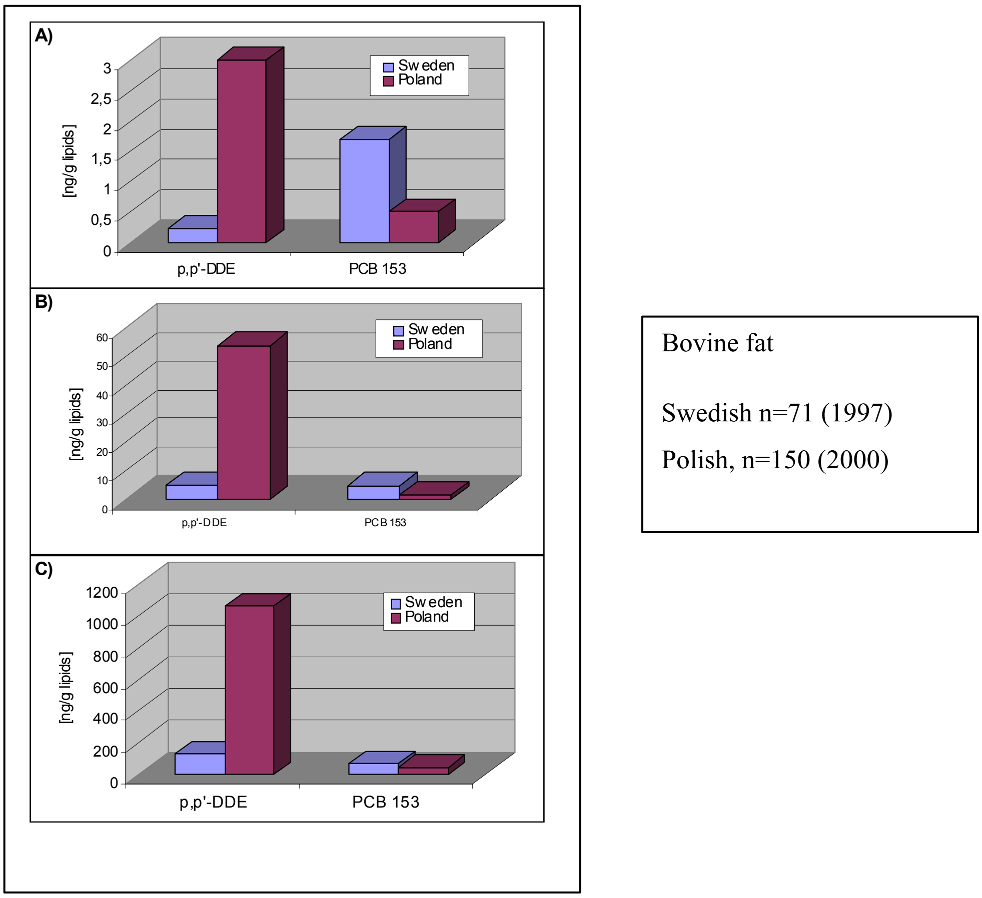


Figure 5-2: Mean concentrations of p'p'-DDE and PCB 153; (Michna, W. Szteke B. Eds.,: ISBN 83-7151-480-8; Ministry of Agriculture and Rural Development Warszawa, Poland 2001; Glynn et al. 2000)

Although the year is not identical and uncertainties have to be taken into account it shows a lower contamination level of PCB 153 which is especially prominent for pork and almost negligible for human milk.

What is at least as important and can repeatedly by observed in data from all environmental compartments and human exposure related studies is a significantly higher level of DDE (POPs pesticide) in the Polish samples that can be observed similarly in other AC/CCs as well. As however it is no objective of this study to follow and compare contamination levels with POPs pesticides this results will not be further discussed in this report.

Time trends

Information about time trends is available from time series reported by the Czech Republic and Poland showing a declining trend over the last decade which may be slowing down somewhat in the last years. The results of these time series are illustrated exemplary in Figure 5-3 and Table 5-1 ..

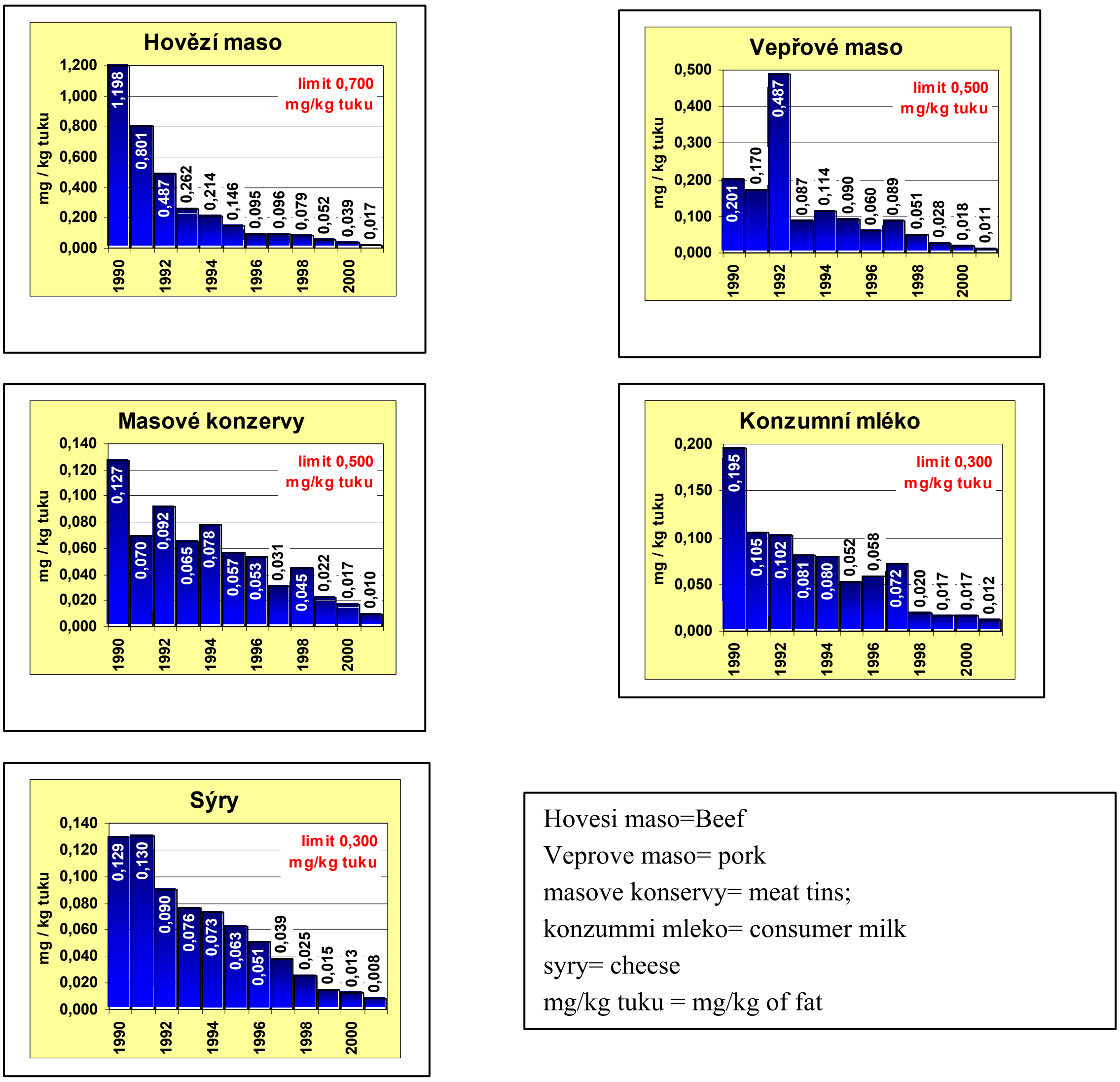


Figure 5-3 Time trends of PCB contamination in various foods from the Czech Republic (State Veterinary Inspection; Holoubek et al. 2003a)

Material tested	1998	1999	2000
Meat products	269,1	212,0	153,0
Vegetable oil	178,6	228,4	130,9
Margarine	125,9	201,5	135,1
Rape seeds	414,4	229,3	138,8

Table 5-1: time trend of contamination with PCBs in Polish food products from 1998 – 2000 (National food monitoring programme of the Ministry of Agriculture; NPOPsInv Poland 2003)

Spatial differences

Data from the Slovak Republic are the only provided data that can be used for the assessment of regional differences in contamination levels within the same country. As illustrated in Figure 5-4 there are extreme differences in contamination levels of eggs from free running hens between the hot spot region of Michalovce and the control area and less pronounced differences in home made products from the two regions, whereas commercially sold products do not show this variation, what can easily be explained by common sources of these products.

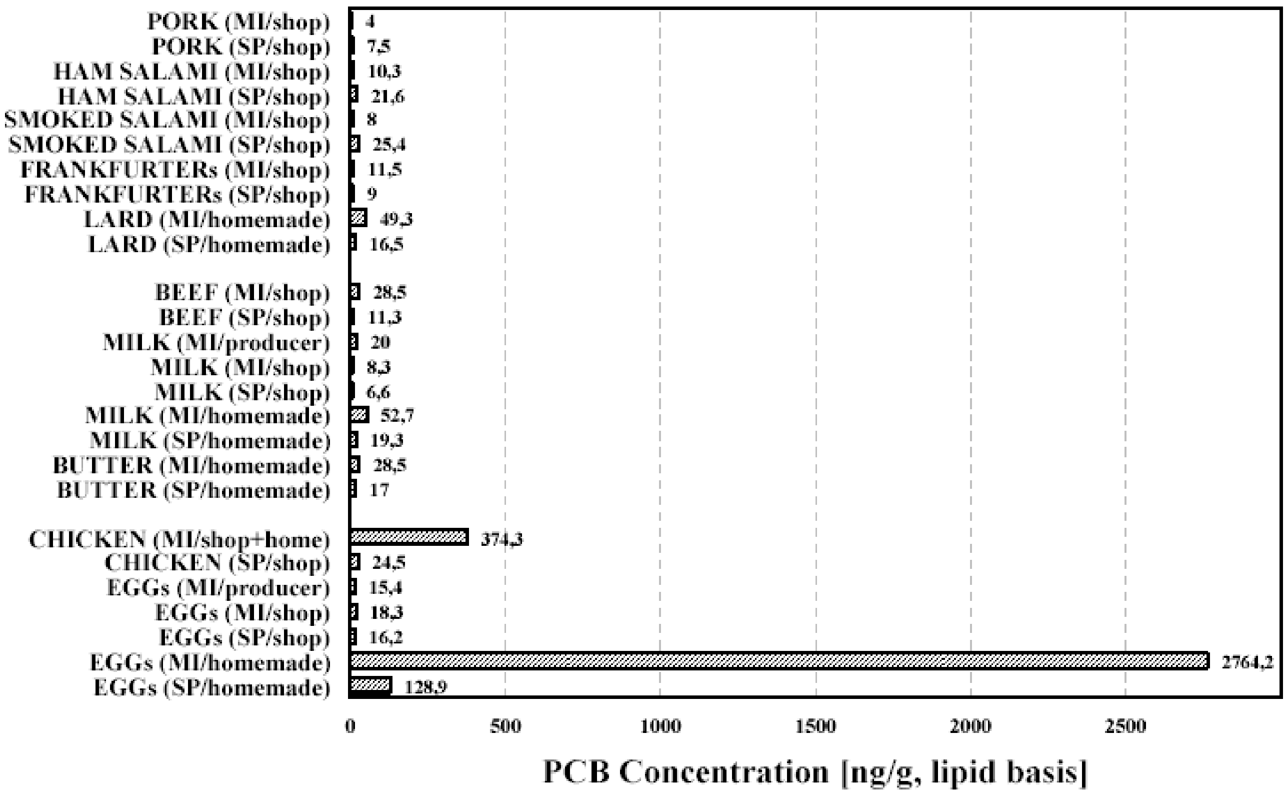


Figure 5-4 PCB levels (the sum of 28, 52, 101, 118, 138, 153, 156, 170, and 180 congeners) in foods of animal origin collected in the districts of Michalovce (MI) and Stropkov (SP) (Kocan et al 1999).

Congener specific information

Information about congener patterns of PCBs in different food groups can be derived exemplary from the annual report of the polish food monitoring programme showing high contribution of CB 28, 52 and 101 in most food products except carp and bovine fat and certain differences in congener patterns between different food groups. Comparing the congener patterns in food with those detected in samples of human milk Figure 5-15 and adipose tissue Figure 5-18 reveals a completely different congener pattern showing an almost opposite relative contribution of the congeners to the total contamination load.

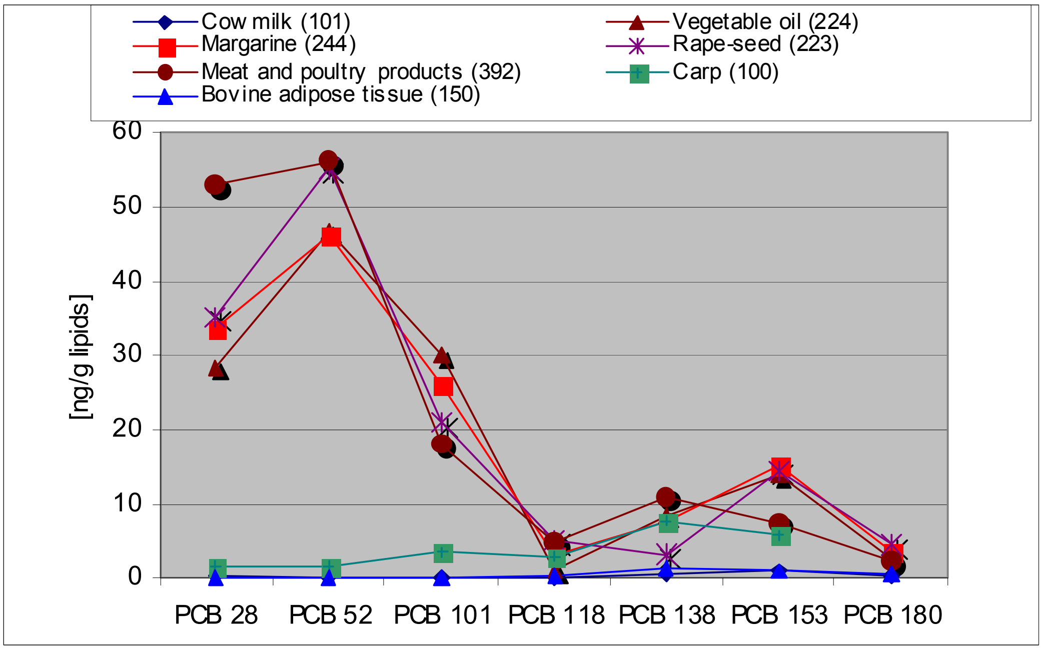


Figure 5-5: The concentration profiles of seven indicator PCB congeners in the raw and processed food products. (Report 2001 of the national Food and Veterinary Service to the Polish Ministry of Agriculture)

5.1.3 Dietary intake assessment

In the Czech Republic total diet studies are included in the national monitoring programme since 1994 for Indicator PCBs and since 2000 for PCDD/Fs. The time trend of dietary intake of PCBs via food is illustrated in Figure 5-6. Contamination with PCDD/Fs from the years 200 and 2001 is illustrated in Table 5-2. As illustrated in the figure there is a downward trend for human exposure concerning PCBs that is especially strong for young children.

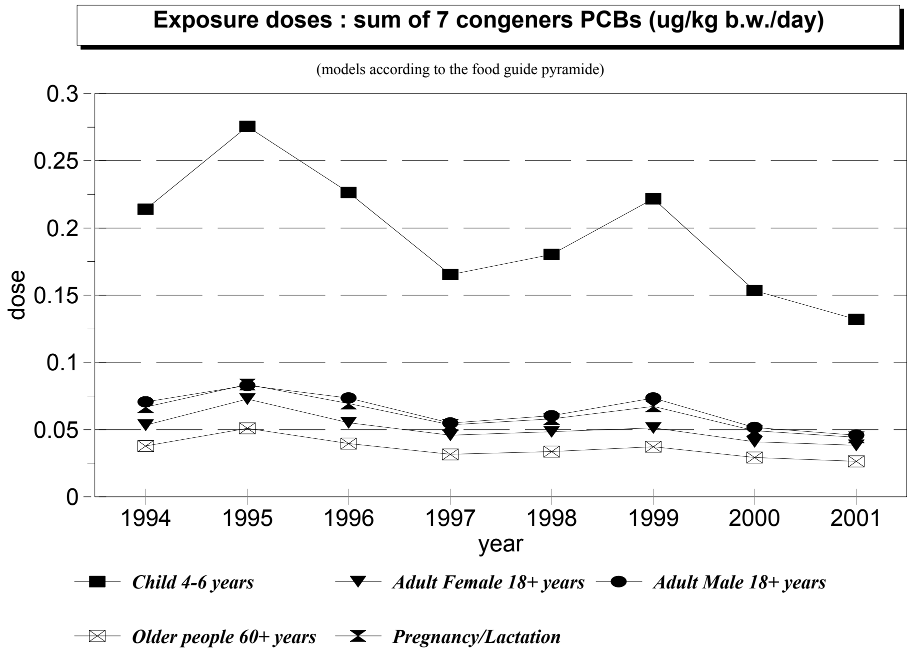


Figure 5-6: The temporal trends of PCBs exposure doses, Czech total diet study, results from the period 1994-2001 (Holoubek et a., 2003a)

Dietary Intake of PCDD/Fs

Data about dietary intake of PCDD/Fs do not cover enough years to allow any conclusions about trends. Looking at data from 200 and 2001 suggests either a small increase instead of a decline.

Year	Determined values pg TEQ-WHO/.kg bw.week		
	Minimum	Maximum	Notes
2000	3.3	20.8	111 085 analytical results from 4 517 various composite samples which represent 195 kinds of foodstuffs (16 718 individual samples)
2001	3.1	33.3	

Table 5-2: Levels of PCDD/Fs in total diet studies in the Czech Republic (NPOPsInv)

European Comparison of averages and ranges

Data from the Member States have last been compiled in the SCOOP report (Assessment of dietary intake of dioxins and related PCBs by the population of EU Member States; 7 June 2000). The results show that the PCDD/DF intake in EU Member states, range from a breastfed infant value of 57 pg PCDD/F-TEQ/kg b.w. day, children and adolescents between 1.3-3.4 pg PCDD/F-TEQ/kg b.w. day to adults with values between 0.49-1.4 pg PCDD/F-TEQ/kg b.w. day (3.43-9.8 pg TEQ-WHO/kg bw.week).

Recent data from Germany (Mathar, 2003) report about a EDI of 1.3 pg/d (9.1 pg TEQ-WHO/.kg bw.week). With this level Germany would be situated at the upper edge of the European average but the levels would be significantly below the data provided from the Czech Republic for the years 200 and 2001. To conclude it can be stated that based on the rare data the Czech EDI calculation for 2000 – 2001 seems to be in the same range or slightly above. The range in the intake estimation is reflecting the regional differences in ambient air concentration with PCDD/Fs (see chapter 3; Figure 3-1).

Dietary Intake of PCBs

According to information from the NPOPsInv 2003 from Poland the daily intake (EDI) of PCBs estimated in 2000 on the basis of average concentration data in raw and processed food products and the average daily intake reported by GUS (Central Statistical Office) in the same year did not exceed 1.0 % of ADI (USA/FDA recommendation: 1µg total PCBs /kg body weight/day) value for total PCBs regarding pork, beef, game, cow milk and milk products consumption. The EDI of total PCBs from Baltic Sea fish and fish products consumption did not exceed 0.07 % ADI_{PCBs}

The approximate daily intake of PCBs (µg/kg body weight/ day) by breastfed infants from Wielkopolska region was calculated by multiplying the concentration in breast milk (µg/kg) (Szyrwi ńska and Lulek 2002) by a factor 0.12 according to suggestions of Schutz et al. (Schutz et al. 1998). The obtained EDI values were compared to the reference intakes proposed by Codex Alimentarius and WHO as well as to the revised tolerable daily intakes recently proposed by National Institute of Public Health and Environment, Netherlands (RIVM).

Congener	EDI (µg/kg body weight/day)
PCB 28	0,004
PCB 52	0,005
PCB 101	0,004
PCB 118	0,033
PCB 138	0,157
PCB 153	0,210
PCB 180	0,114
Σ 7- PCB[s)]	0,527
Total PCBs	**0,818**
ADI (USA-FDA)	**1**

Table 5-3: Estimated daily intakes of PCBs by infants breast-feed in Wielkopolska region in Poland in 2000-01 (Szyrwińska and Lulek, 2002) Total PCBs=(PCB138+PCB153+PCB180)x1,7

The daily intake of the total PCBs have been estimated below the ADI value established by USA/FDA and was found to be about four times lower than the EDI calculated for Slovakian infants (2,56 µg/kg body weight/day) (Holoubek et al. 2000a) or former EDIs calculated for Polish infants (2,8 µg/kg body weight/day) by Czaja et al.(Holoubek et al. 2000a).

National statistics about average intake of different food groups by the population exist in the National

Statistic Institutes of most of the AC/CCs and are published in national statistical year books in the national language. With the exception of Lithuania no data have been provided for the project. Data have only been provided from Lithuania for the year 1997 but calculation of the total daily intake is not reasonable because results from the national food control are all below the limit of detection and thus the estimation would be far too imprecise.

Food group	Consumption (g/day)
Vegetables including potatoes	424.9
Potatoes	237.6
Fruit	172.6
Cereals	145.4
Milk and Milk products	317.8
Meat and Meat Products	154.6
Fish and Fish products	17.9
Fats and Oils	29.8

Figure 5-7: National evaluation of food intake in Lithuania (National Statistical Institute, 1997):

Data from the Slovak Republic that still can be regarded as valid if looking at more recent data from different environmental compartments or from human tissue levels (see chapter 4 and Figure 5-17) show extreme regional differences in dietary intakes calculated for the Slovak population on the basis of food contamination data and statistical consumption data.

In Kosice representing the hot spot region of the Michalovce the EDI reached > 250% of the tolerable daily intake whereas all other regions where far below (see Figure 5-8).

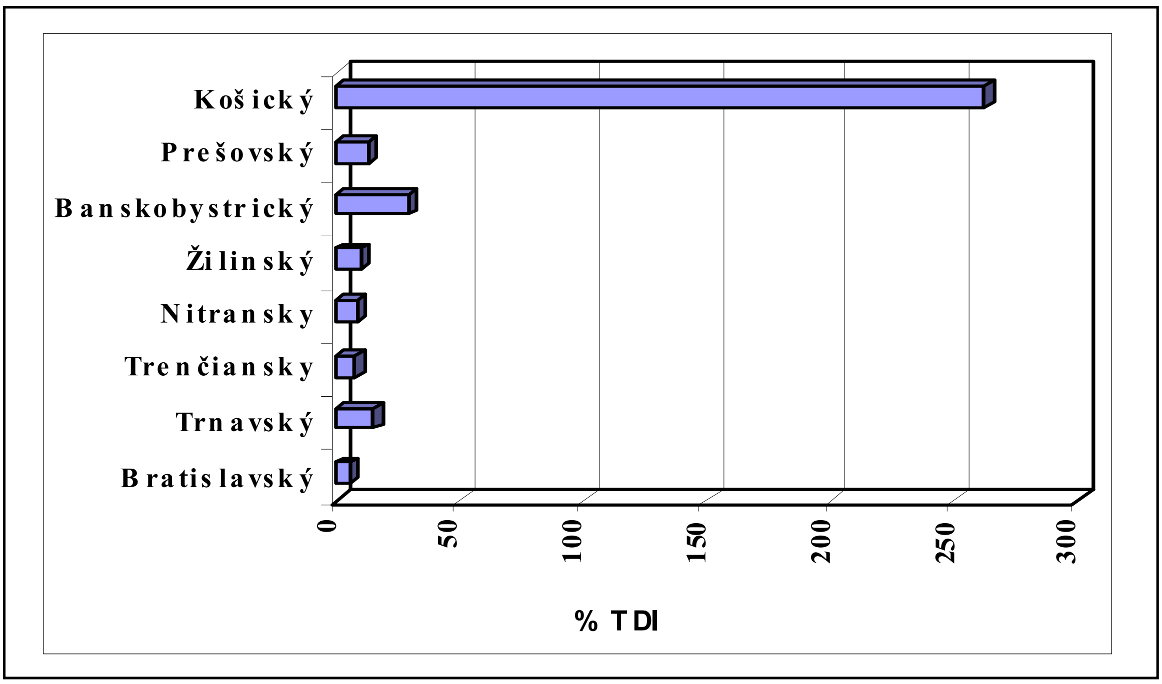


Figure 5-8: Dietary intake of PCBs in relation to different regions of Slovakia as % of tolerable daily intake (TDI) (1984-89) (NPOPsInv)

5.2 Tissue levels

The human tissue most widely used in AC/CCs as well as in old Member States and throughout the world to assess and estimate human exposure to PCBs and PCDD/Fs is human milk. The second most used tissue is adipose tissue collected during autopsies or in some cases – related to toxicological or epidemiological studies – from breast tissue of women.

Blood is used in most cases in studies designed to assess the exposure of professionally exposed people or of populations living close to sources or in areas with increased contamination levels and therefore is not generally used.

In the following paragraphs an overview on data from AC/CCs will be given illustrated by exemplary results concerning the relevant issues. A more detailed compilation of collected data from AC/CCs is presented in the corresponding annexes to this report.

5.2.1 Human milk levels

Information on contamination levels in human milk is widespread and comparable due to the "WHO exposure study on the levels of PCBs, PCDDs and PCDFs in Human Milk" –shortly called WHO milk study in the paragraphs below – which is currently the best source for a reliable comparison of human exposure to PCDD/Fs and PCBs in the different European countries. It provides the important advantage of comparable data and furthermore often is the only source for data on PCDD/F contamination of human milk in most of the countries. On the other hand the number of samples is relatively small and therefore the criteria of representativity are not always fulfilled. The most important confounding factor (besides potentially insufficient representativity) that has to be taken into account when assessing this study is the fact that the age of the mothers included might differ between the different countries due to different traditions. The evaluation of this impact is in the process of being done.

As a consequence of the situation explained above the 2^{nd} and 3rd round of the WHO milk study are used as major tool for comparison of national contamination levels in this report, being aware that some confounding effect may occur.

Countries that did not participate in any of the studies are presented and compared with national data if available.

PCDD/F levels in human milk

Data on PCDD/F levels in human milk have been reported from Bulgaria, Czech Republic, Estonia, Lithuania, Hungary, Poland, Romania and Slovakia. There is no information from Latvia, Slovenia, Malta, Cyprus and Turkey.

Data on PCDD/Fs in breast milk of women from Estonia have been collected in a study on contamination levels in Baltic Sea countries (Mussalo-Lindström, 1995) in Nordic TEQ which is similar but not directly comparable to the I-TEQ system used in the WHO. Estonian data from 1991 were at a level of 13.5-21.4 pg N-TEQ/g fat which was in the same range as data for 1987 from Norway (14.9-20.4) and Finland (16.0-17.9). Corresponding data from Sweden were slightly higher (20.8-23.8).

Another study performed by Vartiainen in 1993 and 1995 showed contamination levels of 14.4 ng/g fat for urban and 12.4 ng/g fat for rural areas in Estonia whereas the levels for Finland have been 34 and 20 ng/g fat respectively in the same study. (Vartiainen et al. 1997)

These data can be compared to the results from the 2nd round of the WHO milk study that has been performed in the same period of time and which are illustrated in Figure 5-9.

Presuming a relative comparability of data Estonia would have been somewhere in the middle of the range of contamination levels and Sweden would have been in the upper third of the range of contamination at that time. The Finish data from the second study being somewhat higher than those analysed in the WHO study.

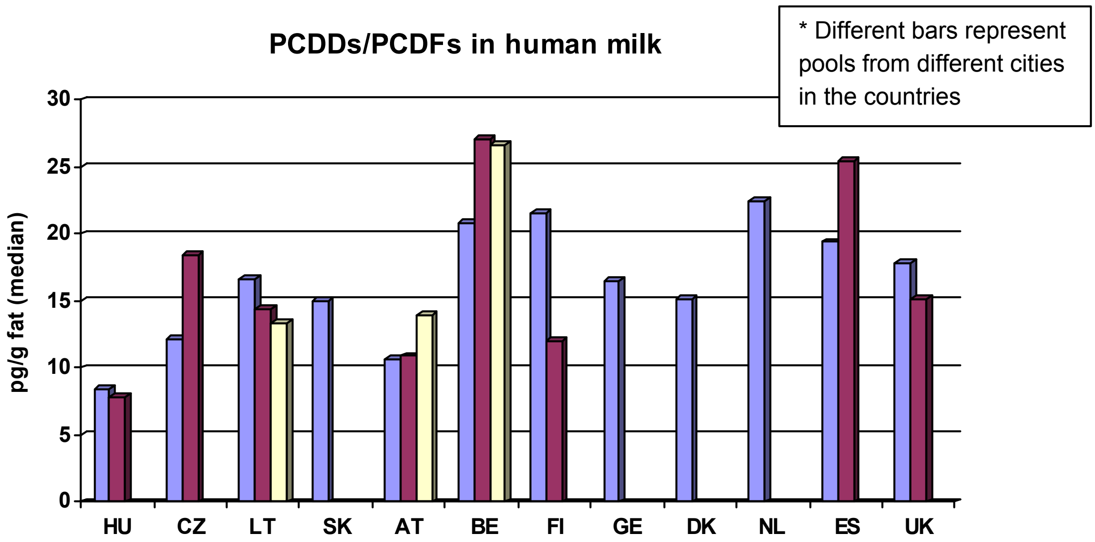


Figure 5-9 Contamination of human milk with PCDD/Fs in different European Countries.(WHO/ECEH 1996)

Comparing the contamination levels allows to conclude that the contamination level with PCDD/Fs was about in the same range in Member States and participating Accession Countries with lower levels in Hungary and higher levels in Belgium, the Netherlands and Spain. The situation is different when looking at the contamination levels with dioxin-like PCBs where especially high contamination levels have been detected in the Lithuanian samples from all three sites. As in general information from Lithuania is quite scarce it is a bit difficult to find a correlation to this result in the environmental data from the country. Further investigation of environmental compartments and food or participation in the next round of the WHO milk study may help in clarifying the observation.

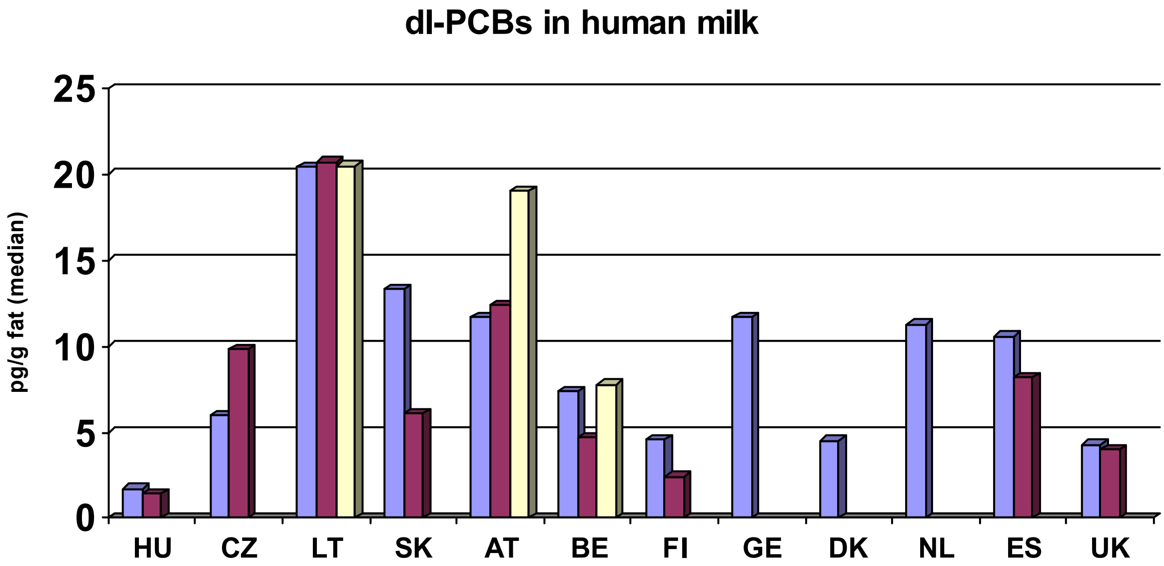


Figure 5-10: Contamination of human milk with dl-PCBs in different European Countries (WHO/ECEH 1996)

A compilation of data from the participating countries indicating number of samples and cities involved is presented further down in this chapter in the paragraph concerning PCB contamination of human milk (see table 5-4).

The relative contamination levels in the different European countries observed in the 2nd round were confirmed by the results from the 3rd round of the WHO milk study performed in 2000-2001. The results of this study are illustrated in Figure 5-11. In this round data from Bulgaria, Romania, Ireland, Sweden, Italy and Spain could have been included. While PCDD/F levels in the participating AC/CCs have been at the lower edge of the EU range the levels for dioxin-like PCBs were at the upper edge for the Czech Republic and Slovakia.

The data from the WHO milk studies are confirmed by data from national monitoring programmes in Czech Republic and Slovakia (as compiled in annex human milk).

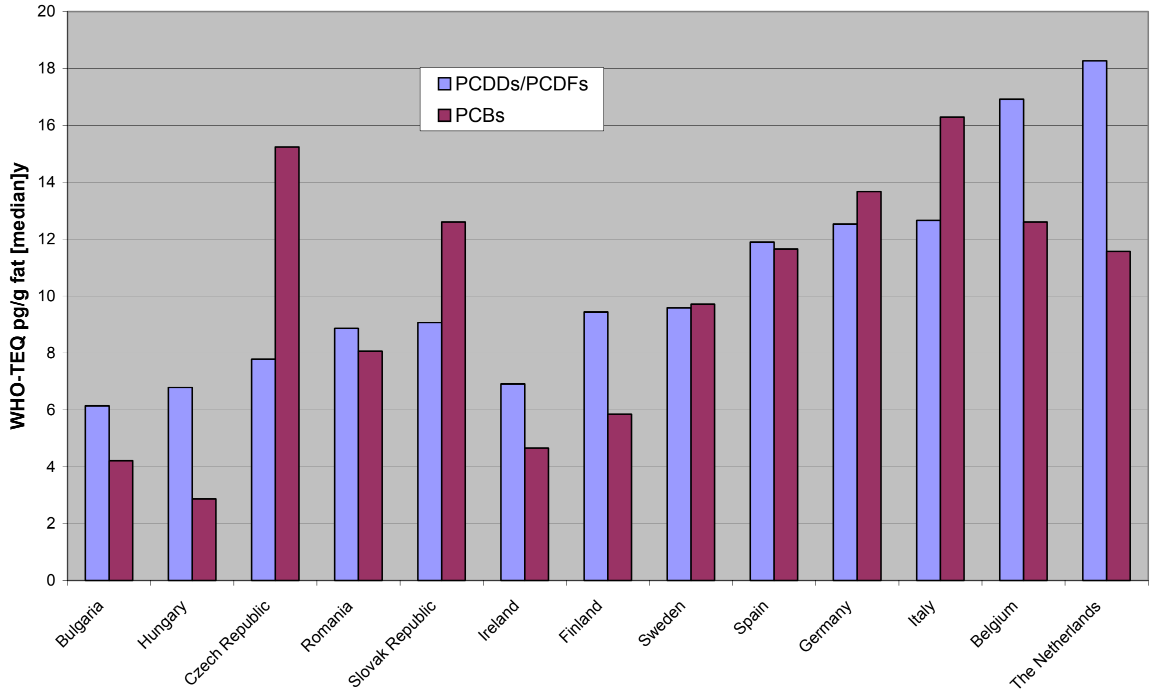


Figure 5-11: Overview on human milk levels in European countries 2001/2002[Van Leeuwen, R. Malisch, 2002]

Comparing the results the total exposure in the AC/CCs seems to be significantly lower than in the Member States with exception of the Czech Republic and Slovakia where dl PCB levels correspond to high MS levels (Germany, Italy). Unfortunately the Baltic States, Slovenia, Malta, Cyprus and Turkey did not participate in the 3rd round so that conclusions on the contamination in these countries are not possible as national data have not been collected.

For Poland data for dioxin-like PCBs in human milk from the Wielkopolska region are available for the same period of time. Mean contamination levels measured in this study ranged from 2.05-2.44 pg/g fat for Σ 12 PCBs which would be in the range of Hungary, but due to differences in sampling and analysis standards this conclusion may not be too realistic.

Time trends

Also time trends of contamination are best assessable from the WHO milk studies showing a significant decrease in contamination levels in all participating countries over the last 10-15 years, although in can be stated that the extend of decrease varies between the countries. The decline is illustrated in Figure 5-12

These results are confirmed by information/data from national studies in a number of European Member States (e.g. NL, GE, FI, SE).

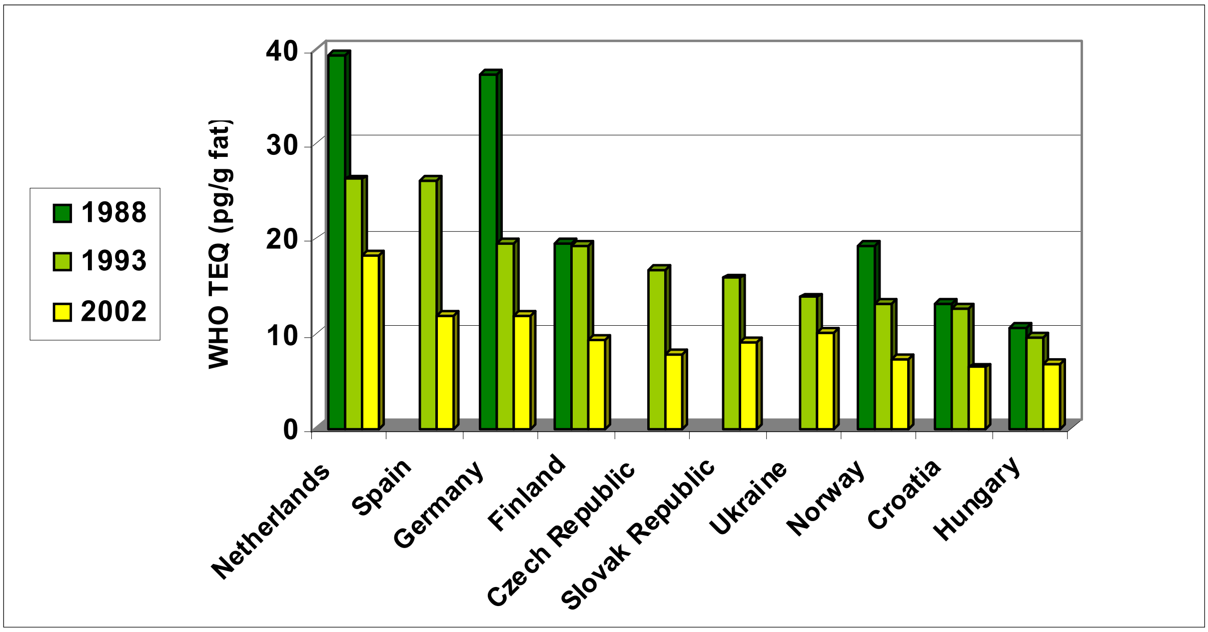


Figure 5-12: Time trends of TEQ values in human milk from various countries (three WHO studies - 1988, 1993, 2002)

The trend observed in the WHO studies is also supported by data that have been collected in the national monitoring systems in France and Spain illustrated in Figure 5-13.

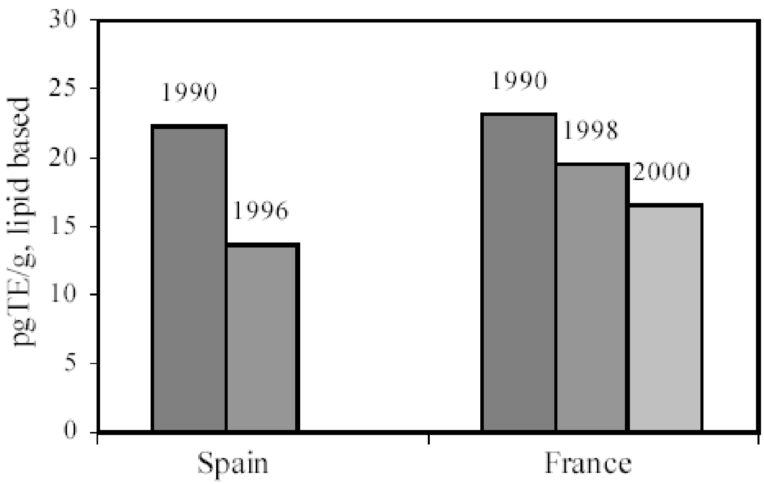


Figure 5-13: Trends of PCDD/F levels in human milk in Mediterranean countries (UNEP-Mediterranean Regional Report 2003)

Indicator PCB levels in human milk

With respect to contamination of human milk with Indicator PCBs the WHO studies again are the best sources for comparison. Additionally national contamination data from the Czech and Slovak Republic and from Hungary are of special interest for a more in depth analysis of regional differences in contamination levels within the countries. Data regarding PCB contamination have been collected in Bulgaria, Czech Republic, Hungary, Lithuania, Poland, Romania and Slovakia.

The results of the 2nd round of the "WHO exposure study on the levels of PCBs, PCDDs and PCDFs in Human Milk" are illustrated below in comparative presentation of the national contamination levels. Fields marked in blue show contamination levels with Indicator PCBs at 2 sites in the Czech and Slovak Republic which are one important reason for the extreme position of the two countries in the international comparison (Table 5-4).

Country	Town	N° of samples	PCDDs/PCDFs (WHO-TEQ) [pg/g fat] median	dl-PCBs (WHO-TEQ) [pg/g fat] median	dl-PCBs [pg/g fat] median sum marker PCBs
Hungary	Budapest	20	8,50	1,70	61-65
	Scentes	10	7,80	1,40	45-47
Czech Republic	Kladno	11	12,10	6,00	532-533
	Uherske Hradiste (hot spot)	11	18,40	9,80	1068
Lithuania	Palanga (coastal)	12	16,60	20,40	361,00
	Anykshchiai (rural)	12	14,40	20,70	287,00
	Vilnius (urban)	12	13,30	20,50	322,00
Slovak Republic	Michalovce (hot spot)	10	15,1-15,2	13,30	1015,00
	Nitra (control)	10	38150,00	6,10	489-490
Austria	Vienna (urban)	13	10,70	11,70	381,00
	Tulln (rural)	21	10,90	12,40	303,00
	Brixlegg (industrial)	13	14,00	19,00	449,00
Belgium	Brabant Walou	8	20,80	7,40	275-277
	Liege	20	27,10	4,70	306-308
	Brussels	6	26,60	7,80	260-261
Finland	Helsinki	10	21,50	4,60	189,00
	Kuopio	24	12,00	2,40	133-135
Germany	Berlin (urban)	10	16,5-16,6	11,70	375,00
Denmark	7 different cities	48	15,20	4,50	209-210
The Netherlands		17 individual	22,4-22,5	11,30	253-256
Spain	Bizkaia	19	19,40	10,60	461,00
	Gipuzkoa	10	25,50	8,20	452-453
UK	Birmingham	20	17,90	4,30	129-131
	Glasgow	23	15,20	4,00	131-133

Table 5-4: Overview of the results of the WHO exposure study on the levels of PCBs, PCDDs and PCDFs in Human Milk(WHO/ECEH, 1996)

The results obtained in the 2nd round are confirmed by the 3rd round of the WHO milk study which is illustrated below in comparative presentation of the country contamination levels with additional information for a number of AC/CCs Figure 5-14. Unfortunately the Baltic States, Slovenia, Malta, Cyprus and Turkey did not participate in the 3rd round so that conclusions on the contamination in these countries are not possible as national data have not been collected.

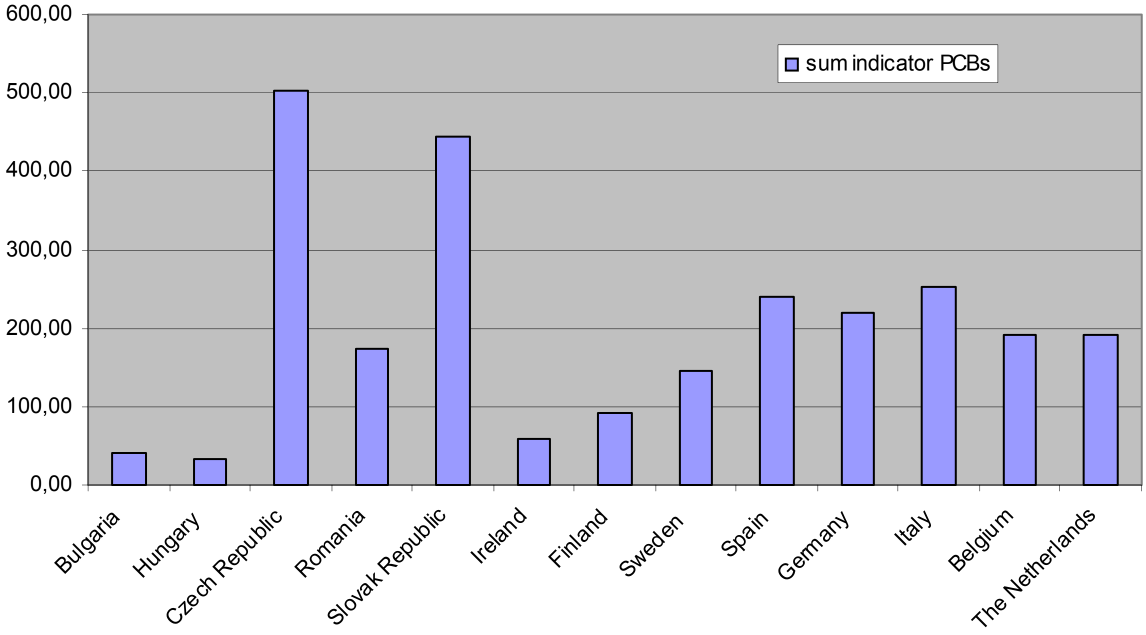


Figure 5-14: Overview on human milk levels in European countries 2001/2002 [Van Leeuwen, R. Malisch, 2002]

Human milk collected from rural and urban sites in Poland in 2001 showed contamination levels ranging from 166-289 ng/g fat (Czaja et al. 2002; Lulek et al. 2002) which would be in the same range or even a bit higher than the results reported for the Member States in the WHO study. But as the sampling and analysis conditions for these data differ from the ones in the WHO study a final conclusion is not possible.

Spatial differences & correlation to age

Data from the Czech Republic are numerous but have not been reported in a formal way that regional particularities could be assessed. Polish studies designed to investigate differences between rural and urban population have found some differences in contamination level of rural and urban samples (12.8 ng/ml versus 13.1ng/ml) (Czaja et al. 1997b) which however were not significant (personal communication of Mrs Czaja).

Data from Hungary collected in 10 different regions of the country in 2001 show median contamination levels in human milk ranging from 23 ng/g fat to 89 ng/g fat which corresponds to a factor of almost 4 between the highest and lowest contaminated regional samples.

For a comprehensive assessment of the levels it would be necessary however to include specific information about the average age of women included in the data pool to take into account the strong impact of age that is well known and may have an strong confounding effect on horizontal comparison.

Information from studies conducted in Poland by the National Institute of Hygiene in Warsaw showed a dominating impact of age in comparison to the living region (Czaja et al. 1997b). While mean contamination levels in milk from women <25 years was at 34.1 ng/ml the contamination level in milk collected from women of 25-30 years of age was at a level already almost twice as high (58.4ng/ml).

Ranges in one age group however sometimes show to be quite large (e.g. 1.3-338.1ng/ml in the age group >30 years in the study mentioned above), providing some evidence that individual factors may also play an important role.

Data from Slovakia collected in 1993-94 in five different regions of the country showed median regional contamination levels ranging from 590 ng/g fat in the least contaminated region to 1 320 ng/g fat in the Michalovce district, confirming the results of the WHO study from 1992. (Kocan et al. 1994, 1995). A compilation of the mean contamination levels in the five regions is presented in Annex- contamination of human milk.

Time trends

Data from the Czech Breast milk monitoring can be used for an assessment of trends with respect to PCB contamination levels. Time series from 1994-2002 consisting of around 300 samples annually, show a decrease of the mean contamination level from 1 600 ng/g fat in 1994 to 884 ng/g fat in 2002.(Holoubek et al. 2000a). The same results- a decline by 50% (352-139 ng/g fat) has been reported for PCB 153 in samples from 4 different regions for the same period of time (Černa et al 2003).

These results correspond quite well to findings in the EU Member states exemplary illustrated by data from Sweden

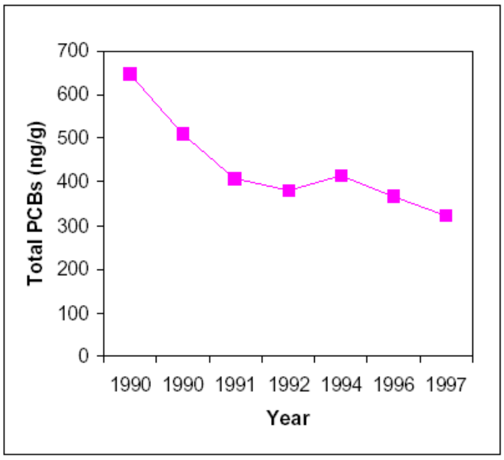


Figure 7.1: PCB levels in the breast milk of Stockholm women (data from Norén & Merionyté, 2000)

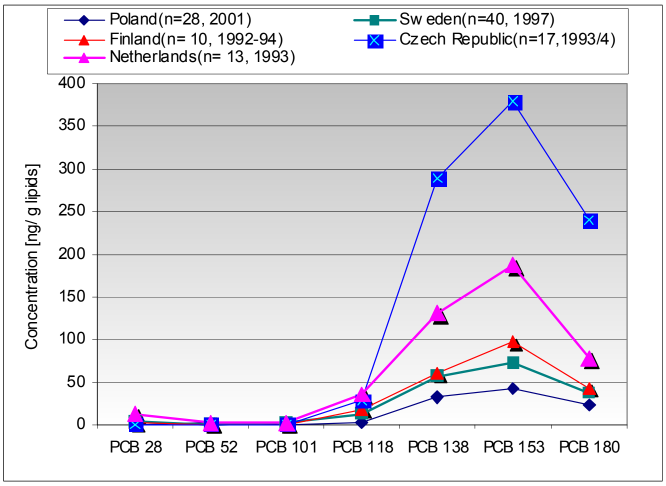


Figure 5-15Profiles of specified PCB congeners in human milk from different countries in Europe. Data from references (Schoula et al. 1996; Kiviranta et al. 1999; Norén and Meironyté 2000; Szyrwińska and Lulek 2002)

Congener specific information

The concentration profiles of the seven indicator congeners (28, 52, 101, 118, 138, 153, 180) in Polish human milk from Wielkopolska region are very similar to those reported by other authors in the other countries of Europe. The presented data confirm the finding reported by Norén et al. (Norén and Meironyté 2000), that PCB 153 (2,2',4,4',5,5' – hexa-chlorobiphenyl) and PCB 138 (2,2',3,4,4',5 – hexa-chlorobiphenyl) are the most stable congeners in the environment.

5.2.2 Adipose tissue levels

Information on adipose tissue is mostly restricted to data of contamination with dioxin like PCBs. Only from the Czech Republic data on PCDD/F contamination have been collected.

PCDD/F levels in Adipose tissue

Information on levels of PCDD/F in adipose tissue has only been provided from the Czech Republic. Analysis of 61 samples taken from 1996-99 has resulted in a median contamination level of 98.0 pg PCDD/F-TEQ/g fat. Comparing these levels with data from EU Member States –Germany 1996 16.5 pg/g aft, Sweden 1994-95 18.6 pg/g fat, Spain 1996 31.0 pg/g fat (Buckley-Golder 1999) shows a difference in contamination levels by a factor of 3.

PCB levels in Adipose tissue

Data about contamination of adipose tissue with PCBs have been collected in Czech Republic, Hungary, Poland, Slovakia, Slovenia and Turkey.

Median contamination levels from 4 regions reported for the Czech Republic in 2001 are at 2,239 ng/g fat Σ 7 PCBs, levels reported from a recent study in Hungary were at 226.9 ng/g fat Σ 37 PCBs, levels reported from the Wielkopolska region in Poland in 2001 were in the same range 276.1 ng/g wet weight Σ 14 PCBs. Data from the Slovak Republic (1993-94) were in the range of the Czech data (1 140-6,870 ng/g fat Σ 14 PCBs) and recent Turkish data showed levels of ng/g fat Σ 7 PCBs.

Data are varying in number of congeners analysed but nevertheless it can be stated that on the basis of the reported information the contamination levels in Poland, Hungary and Turkey are in about the same range whereas the contamination level in Czech and Slovak Republic are one order of magnitude higher.

International comparison

PCB levels in the adipose tissue of the general population in industrialised countries range from less than 1,000 up to 5,000 ng/g fat (Holoubek et al. 2003a). Compared to these data contamination levels in Hungarian, Polish and Turkish tissue samples appear to be low, whereas the Czech and Slovak samples are in the above mentioned range.

Polish data have been compared to Italian data showing contamination levels of one third to one half

of the Italian levels. This result correspond quite well to the results obtained in a joint Swedish –Hungarian study undertaken in 2000 (Van Bavel et al. 2003) which showed contamination levels of one third of the Swedish (mean 661.9; 247.2-1 651.2 ng/g fat Σ 37 PCBs) in the Hungarian samples.

Although the data base is quite scarce there is limited evidence from the results mentioned above that the human body burden of PCBs might be somewhat lower than the EU average in a number of AC/CCs and still significantly higher in the Czech and Slovak Republic.

Figure 5-16 illustrates the comparison of Polish and Italian data based on studies from Szafran and Mariottini. At the same time the figure gives some interesting information about contamination levels in other parts of the world and on some differences that seem to occur in the relative contribution of different PCB congeners in the collected samples.

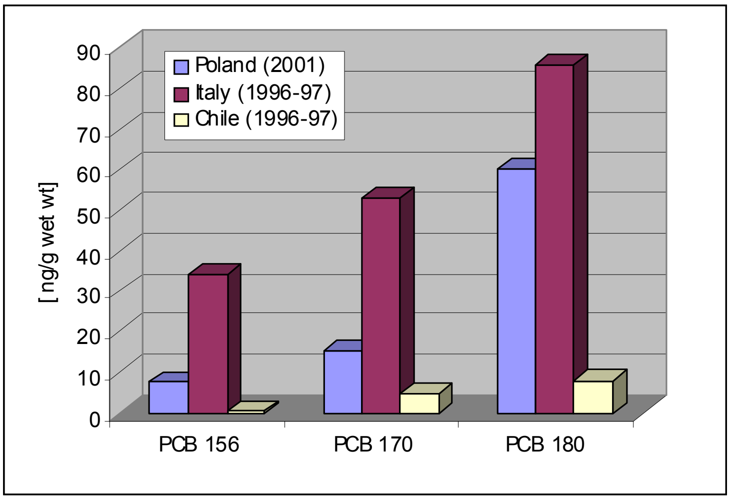


Figure 5-16Concentration of specific PCB congeners in human adipose from different countries. (Szafran et al. 2002;_ Mariottini et al. 2000)

Time trends

A time series from 1994-2001 provided from the Czech health monitoring programme can be used for a rough estimation of trends of PCB contamination of adipose tissue in this Country. Data compiled in the corresponding annex show a clear decreasing trend (4,760-2,239 ng/g fat Σ 7 PCBs. However information about exact location is not complete and number of samples is differing so that it is not possible to conclude about a reduction by 50%. (Holoubek et al. 2003a)

Spatial differences

Information on regional differences is only available for data from the Slovak Republic showing a range of a factor of 2 with somewhat higher levels in larger urban agglomeration as can be expected for almost all European countries and an extreme contamination level in samples collected from the hot spot region of Michalovce.

This effect can be observed in all data provided from the Slovak Republic and has to be taken into

account, when assessing national mean data for the whole country (e.g. in the WHO study on milk contamination).

The results of a study conducted in 1993-94 are illustrated below, providing information not only on adipose tissue levels but on human milk and blood. As shown in the figure however the differences in contamination level are most prominent in adipose tissue which seems to acts as the best indicator for long term exposure or the total body burden.

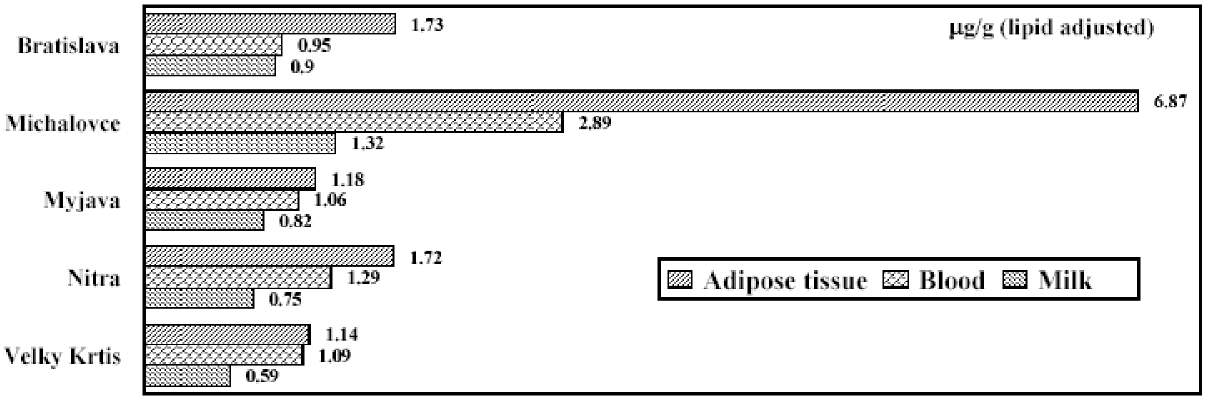


Figure 5-17 PCB (the sum of 6 indicator and 8 monoortho- congeners) levels in human blood lipids taken from the human population living in selected Slovakia's districts (adipose tissue, blood and milk samples were collected from different donors) in 1993-94 (Kocan et al. 1994)

Congener specific information (congener patterns)

Data from Poland provide information on different congener patterns in human milk and adipose tissue illustrating the storing character of adipose tissue with higher levels of "steady state" congeners (74, 105, 118+149, 138, 153, 156, 170, 180 and 187) compared to milk, whereas the "episodic" congeners (CB 52 and 101) are at higher concentration in breast milk (see Figure 5-18).

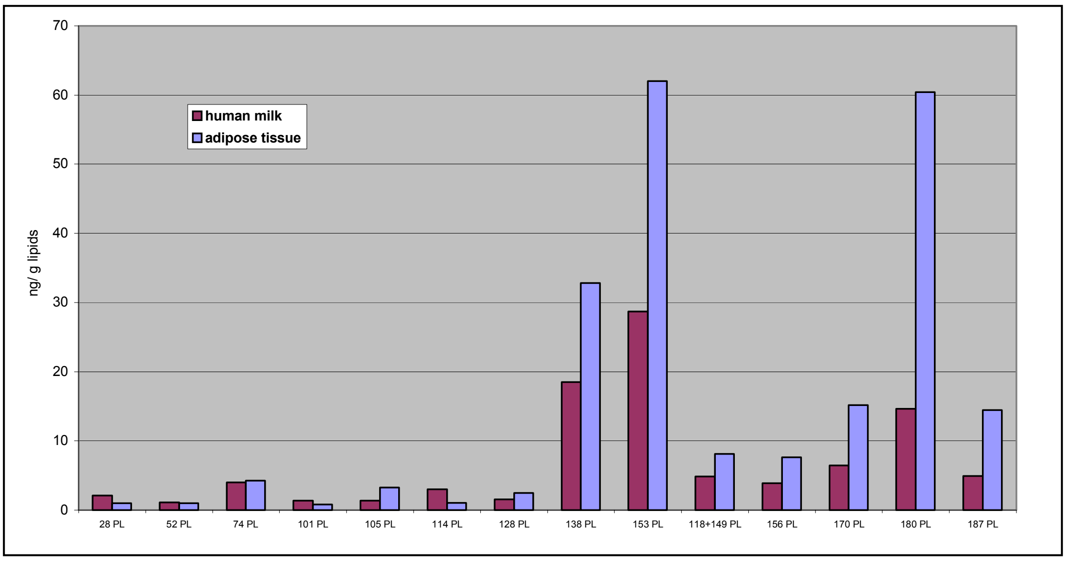


Figure 5-18Comparison of the specified "state study" and "episodic" PCB congeners in human milk (n=27) and adipose tissue (n=7) of the people living in Wielkopolska region in Poland. (Szafran et al, 2002; Szafran et al 2002a)

5.2.3 Human blood levels

Data on contamination of human blood are quite scarce in the AC/CCs and are mostly restricted to contamination with PCBs. Collecting human blood is quite invasive and therefore sampling is normally focused on areas with known exposure and often related to research on health impact of elevated contamination levels. Data on PCDD/F contamination have only been provided from the Slovak Republic. Data on PCB contamination have been reported from Czech Republic, Latvia, Romania, Slovakia and Slovenia.

PCDD/F levels

Samples from professionally exposed worker from the municipal waste incinerator in Bratislava and from the Chemko factory in the Michalovce district in eastern Slovakia have been collected in 1995-97. Mean levels ranged from 24.5 pg PCDD/F-TEQ/g fat for the employees of the municipal waste incinerator (MWI) to 61.3 pg PCDD/F-TEQ/g fat for worker at the Chemko factory.

Analysis of dl PCBs showed a large difference in contamination levels between the employees of the municipal waste incinerator and the Chemko factory (9.3 versus 56.9 pg PCB-TEQ/g fat..

Samples collected in Germany in 1996 showed a medium contamination level of 15.6 pg I-TEQ /g fat; (Päpke et. al. 1997). Samples collected in Spain from employees of a MWI were at a mean level of 27 pg I-TEQ/g fat (Schumacher et al. 1999).

According to (Kiviranta et al. 2000) the background concentration for men in Finland aged 40-70 years is around 33 pg PCDD/F-TEQ/g fat.

Comparing the Slovak data to these Member States levels allows to roughly conclude that the contamination level in the blood of the MWI workers is in the range of comparable exposure in Member States whereas the contamination level in blood samples from former Chemko employees does exceed the European average.

PCB levels

Median blood contamination with PCBs in samples collected within the Czech National Health Monitoring Programme in 2002 was at a level of 1,297 ng/g fat.

In the Slovak Republic 2,047 people have been investigated in 2000 in the framework of the PCBRISK project (QLK4-CT-2000-00488) designed as pilot project for health impact assessment. The results showed a median contamination level of 1,065 ng/g fat for all participants which is in the same range as the contamination level detected in the Czech population. Elevated contamination levels have been detected in blood levels from the local population in the Michalovce district ranging from 7 000 ng/g fat for former employees of the Chemko factory to 3,562.1 ng/g fat for local females. Local men showed mean contamination levels 5,017.6 ng/g fat. Levels detected in children ranged from 26-6 311 ng/g fat (median 321 ng/g fat) (Trnovec et al. 2003).

Another study performed in the Slovak Republic in 1998 is illustrated in Figure 5-19. As shown in the

figure there is a significant difference in contamination levels of blood between the population of the hot spot region and the control area. Furthermore the results of the study clearly indicate the impact of increased consumption of local fish showing highest contamination levels not in occupationally exposed people but in fishermen from the Michalovce district due to high contamination of water, sediment and fish in the local waters. (see also chapter 4).

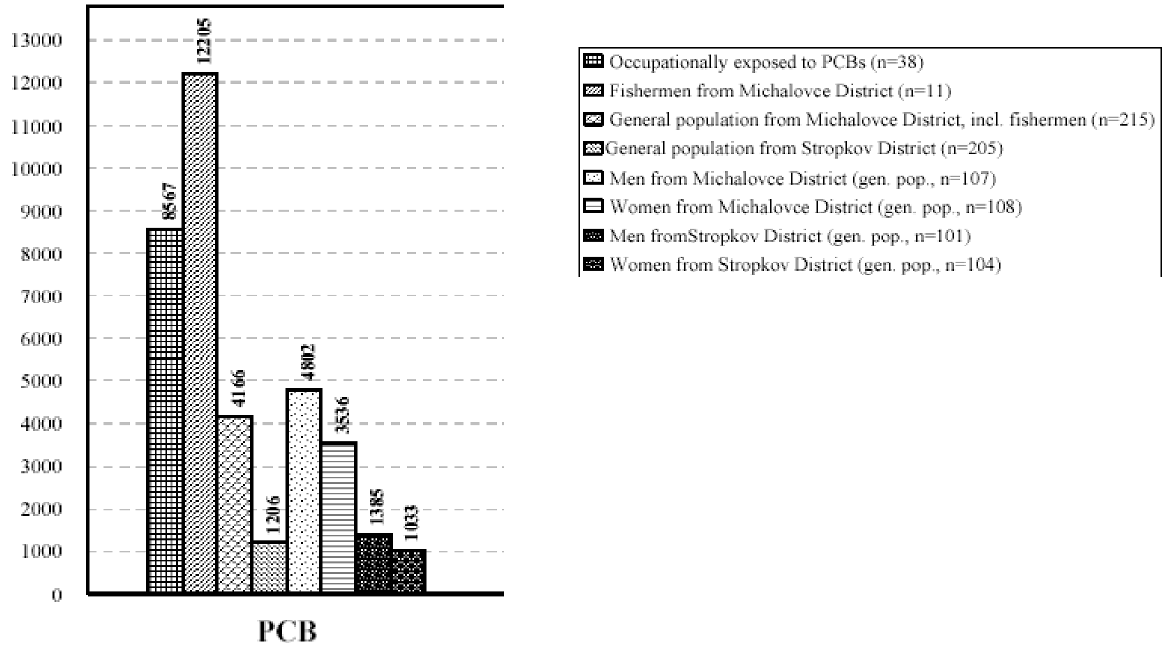


Figure 5-19 Average PCB (the sum of 28, 52, 101, 138, 153, 118, 156, and 170 PCB congeners) levels in human blood lipids from workers working for a former Slovak PCB producer, fishermen consuming fish from PCB-polluted waters in Michalovce District and the general population long-term living in Michalovce (polluted area) and Stropkov (control and background area) districts. (Kočan et al. 1999)

European Comparison

The contamination levels detected in the PCBRISK project are in the same range as levels detected in blood samples from the Faroer Island or Greenland, were high contamination levels due to high whale consumption do occur (Heilmann et al. 2003).

In a study comparing hydroxylated PCB metabolites in blood of Latvian and Swedish men levels of Latvian high fish consumers were high compared to the corresponding Swedish levels 4.5 versus 1.4 ng/g fat while the low fish consumers had quite similar contamination levels (1.2 Latvian versus 1.1 as Swedish median). These results could lead to the conclusion that fish from Latvian waters could be in the same range of contamination or even higher than Swedish fish. Further investigations will be necessary (see also chapter 4-wildlife).

In another study (Jaraczewska et al. 2003) mean levels of certain PCB (153, 138, 180) congeners in the blood samples of 3 cites have been compared with Belgium samples. The results were in the same range giving some evidence that average Polish PCB contamination can be expected in the same range as in other middle European countries.

Time trends

Trends of contamination after cessation of accidental pollution can be assessed on the basis of data from the hot spot region of Bela Krajina in Slovenia. Blood levels in the local population decreased from 500 ng/ml in 1984 to 4.99 ng/ml in 1991. (Fazarinc et al. 1992)

Based on the available data it is not possible to assess time trends in the Michalovce district in the Slovak Republic.

5.2.4 Other tissues and health effects

A number of research projects have been performed in the Czech and Slovak Republic and in Poland for scientific purpose including analysis of placenta and cord blood and a number of projects has been designed to assess health effects of PCDD/Fs and PCBs (see annex-research) but up to now no clear correlation between tissue levels and specific diseases could have been detected.

Within the PCBRISK project (QLK4-CT-2000-00488) currently ongoing in the Slovak Republic there is some evidence for health effects (thyroid antibodies, diabetes, neurodevelopmental disorders, enamel defects) but a statistically significant correlation has not been detected so far.

In the Czech Republic liver and brain analysis has been included in the national health monitoring programme but as the results did not provide additional information these tissues do not have been further monitored.

6 Legislation, Administrative Structure & Capacities

6.1 Legislation

Legislation with respect to dioxins and PCBs covers the following thematic fields:

- Environmental media
- Production and use
- Food and feed

6.1.1 EU regulations

In these fields the European Community has passed different regulations. The following regulations are those that are most relevant against the project background:

Environmental media

- Directive **2000/76/EC** on the incineration of waste aims to prevent or reduce, as far as possible, air, water and soil pollution caused by the incineration or co-incineration of waste, as well as the resulting risk to human health.

  The directive defines limit values on emissions of particles and total organic matter from incineration of all types of waste.

Substances addressed are among other **PCDD/Fs**.

The air emission limit TEQ value for the co-incineration of waste established for PCDD/Fs is **0.1 ng/Nm^3**.

The established emission limit TEQ value for discharges of waste water from the cleaning of exhaust gases is **0.3 ng/l**.

- **Council Directive 96/59/EC** on the disposal of PCBs and PCTs obliges Member States to submit an inventory and detailed plans for the disposal of the relevant PCB wastes and the decontamination/disposal of relevant equipment containing more than 5 litres (> **5 dm^3**) of **PCBs** until September 1999. The year **2010** has been set as a deadline for complete disposal or decontamination of equipment containing PCBs. Any equipment, which is subject to inventory, must be labelled. Transformers containing between **500 and 50 ppm of PCBs** are allowed to remain in service indefinitely. Furthermore the Member States must prohibit the separation of PCBs from other substances for the purpose of reusing the PCBs and the topping-up of transformers with PCBs. Member States have also to establish plans for the collection and disposal of equipment not subject to the inventory.

- Commission Decision **2001/68/EC** of 16 January 2001 establishes two reference methods of

measurement for PCBs pursuant to Article 10(a) of Council Directive 96/59/EC on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCBs/PCTs).

- The **Directive 1999/31** on the landfill of waste provides measures, procedures and guidance for preventing or reducing pollution of surface waters, ground water, soil and air from landfills of wastes.
- Council Directive 91/689/EEC of 12 December 1991 on hazardous waste
- Council Directive 75/439/EEC of 16 June 1975 on the disposal of waste oils
- Council Directive **2000/60/EC** of the European Parliament and of the council establishing a framework for Community action in the field of water policy (**Water Framework Directive**) contains provisions on measures aimed at progressively reducing (for priority substances) and at ceasing or phasing out (for priority hazardous substances, within 20 years) discharges, emissions and losses as well as identification of these priority substances and hazardous priority substances (emission inventories according to Article 13(4)).

The Directive contains an indicative list of the main pollutants including Organohalogen compounds (such as PCBs and PCDD/Fs) but emission limit values are not established for PCBs or PCDD/Fs.

Member States shall implement the necessary measures with the aim of progressively reducing pollution from priority substances and ceasing or phasing out emissions, discharges and losses of priority hazardous substances but the list on priority substances in the field of water policy does not include PCBs or PCDD/Fs.

Council Directive **86/280/EEC** on limit values and quality objectives for discharges of certain dangerous substances in the aquatic environment, sets time limits for compliance, reference methods of measurement, establishes a monitoring procedure and requires Member States to co-operate and to draw up programmes to avoid or eliminate pollution. PCDD/Fs or PCBs are not addressed.

Council Directive **98/83/EC**, Drinking Water Directive, on the quality of water intended for human consumption aims to protect human health from the adverse effects of any contamination of water intended for human consumption by ensuring that it is wholesome and clean. But PCDD/Fs or PCBs are not addressed.

Production and use

Council Directive **1996/61/EC (IPPC)** has the objective to prevent or minimise air, water and soil pollution by emissions from industrial installations in the Community, in view of achieving a high level of environmental protection.

This Directive requires the assessment of chemicals used in certain production processes and certain conditions for the licensing of industrial installations. Article 15 (3) of the Directive requires Member States to inventory and supply data on principal emissions and responsible sources, that is from all large facilities with one or more activities as mentioned in annex I to this Directive. According to this Article 15 the Commission decided on the implementation of a European Pollutant Emission Register (**EPER** according to Council Directive 2000/479). Substances addressed include PCDD/Fs.

- Council Directive **1996/82/EC** is related to the control of major-accident hazards involving dangerous substances. The objective of the directive is to prevent major accidents involving dangerous substances and limit their consequences for man and the environment, with a view to ensuring high levels of protection throughout the Community

- Council Directive **76/769/EEC** with its amendments is related to restrictions on the marketing and use of certain dangerous substances and preparations.

In its last amendment this directive set restrictions on marketing and use of certain dangerous substances and preparations prohibits the use and reuse of **PCBs** and any mixture containing them in more than **0.005% by weight**.

Four priority lists (containing about 150 substances and identified Rapporteur Member States) have been established for carrying out the risk assessment work under regulation No. 793/93 (2001).

- Council Directive **92/32/EC** is related to the Classification, packaging and labelling of dangerous substances states that dangerous substances, which are placed on the market have to be labelled according to their classification in annex I, which in 2001 contains approximately 2350 existing and 214 new substances. For dangerous substances not in annex I, the manufacturer, distributor and importer is obliged to apply a provisional classifications and labelling following the criteria in annex VI of this directive.

- Directive **1999/45/EC** of the European Parliament and of the Council of 31 May 1999 concerning the approximation of the laws, regulations and administrative provisions of the Member States relating to the classification, packaging and labelling of dangerous preparations.

Feed and Food Contamination:

The measures addressed in feed and food consist of a combination of maximum limits, action and target levels as explained in the Community Strategy for dioxins, Furans and Polychlorinated Biphenyls [COM(2001)593 final]. At present only PCDD/Fs are covered but the inclusion of dioxin-like PCBs is foreseen until the end of 2004. To this end a database of dioxin-like PCBs shall be established.

- Council Directive **2001/102/EC** of 27 November 2001 fixes maximum limits and Commission recommendation **2002/201/EC** sets corresponding action levels in feedingstuffs. The following overview summarises these maximum limits and action levels (ng PCDD/Fs-WHO-TEQ/kg product weight relative to a feedingstuff with a moisture content of 12%):

Feed material	Maximum limit	(action level)
feed materials of plant origin (including vegetable oils and fats and roughages)	0.75	(0.50)
minerals	1.00	(0.50)
animal fat	2.00	(1.20)
meat and bone meal	0.75	
fish oil	6.00	(4.50)
fish meal	1.25	(1.00)
compound feedingstuffs (except fish feed, except feedingstuffs for fur animals, except feedingstuffs for pet animals)	0.75	(0.40)
feedingstuffs for fish and feedingstuffs for pet animals	2.25	(1.50)

Table 6-1: Overview on maximum limits and action levels according to Council Driective 2001/102/EC and Commission recommendation 2002/201/EC

Regulation **2375/2001/EC** sets maximum levels for certain contaminants including dioxins for fish and other foods and food products of animal origin. Up to now the directive does not include dioxin-like PCB or classic PCBs. The directive will be first revised in December 2004 and may than also set limits for dioxin-like PCBs.

The following table gives an overview on WHO-TEQ maximum limits expressed as pg WHO-PCDD/Fs-TEQ/g fat or product:

Product group	Maximum level [pg WHO-PCDD/Fs-TEQ]	per g fat per g product
Meat originating from ruminants	3	/g fat
Meat originating from poultry and farmed game	2	/g fat
Meat originating from pigs	1	/g fat
Liver and derived products	6	/g fat
Muscle meat of fish and fishery products and products thereof	4	/g fresh weight
Milk and milk products, including butter and fat	3	/g fat
Hen eggs and egg products	3	/g fat
Animal fat from ruminants	3	/g fat
Animal fat from poultry and farmed game	2	/g fat
Animal fat from pigs	1	/g fat

Mixed animal fat	2	/g fat
Vegetable oil	0,75	/g fat
fish oil intended for human consumption	2	/g fat

Table 6-2: Overview on WHO-TEQ maximum limits

- Commission Directive **2002/69/EC** of 26 July 2002 lays down the sampling methods and the methods of analysis for the official control of dioxins and the determination of dioxin-like PCBs in foodstuffs

6.1.2 Implementation of EU Regulations in National Laws

According to the available information the main requirements of EU regulations relevant to dioxins and PCBs have been transposed into national legislation in almost all of the Candidate Countries. As reported missing aspects shall be transposed upon Accession in nearly all of the reported cases. As the focus of the present study was not a comprising legislative analyses, the validity of such statements has not been verified.

Also with respect to implementation and enforcement adequate systems are in place or will be installed until May 2004 for the majority of regulations. But problems may occur with respect to waste management, the IPPC Directive and monitoring of food and feedingstuffs. Some countries report that a transitional period has already been requested or has been admitted in some cases with respect to IPPC requirements for existing installations and with respect of environmental sound disposal of hazardous waste.

An additional problem might exist with respect to the implementation of Council Directive 96/59/EC. According to the received information not all countries have already transposed the requirements concerning topping-up of transformers with PCBs and the ban of separation and reuse.

A detailed overview of existing national legislation including limit values as far as reported and available is shown in annex II, tables 2.1–2.8. In selected cases it includes information on implementation time schedules or other comments.

The following table gives an overview on the implementation of EU Regulations in the Candidate Countries as far as it has been possible to evaluate of the answers from experts and authorities from the Candidate Countries.

Area	EU-Legislation	Issue	BG	CY	CZ	EST	HU	LT	LV	MT	PL	RO	SK	SLO	TR
Env Med	CD 2000/76/EC incineration of waste	emission to air **0.1 ng/Nm³**	0.1a	0.1	0.1	0.1a	0.1	0.1	0.1	0.1	0.1	0.1a	0.1	0.1	20 mg/Nm³
Env Med	CD 2000/76/EC incineration of waste	emission to waste water **0.3 ng/l**	(a)	(a)	**0.3**	(a)	**0.3**	(a)	(a)	(a)	(a)	(a)	(a)	**0.3**	(a)
Env Med	CD 1996/59/EC disposal of PCBs/PTCs	specific duties for equipment containing **> 5 dm³**	(a)	yes	(a)	yes	yes	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Env Med	CD 1996/59/EC disposal of PCBs/PTCs	deadline for complete disposal **2010(1)**	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Prod. & use	CD 1976/769/EEC marketing and use	maximum content by weight **0.005%**	(a)	yes	(a)	(a)	yes	(a)	(a)	yes	(a)	(a)	(a)	(a)	(a)
Prod. & use	CD 1996/61/EC pollution prevention	duty for **EPER(2)**	(a)	(a)	(a)	yes	(a)	(a)	2007	(a)	(a)	(a)	(a)	(a)	(a)
Env Med	CD 2000/60/EC water framework	progressive reduction of organohalogene compounds; **no limit values**	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Feed & Food	CD 2001/102 animal nutrition	specific action levels and maximum limits	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
Feed & Food	CZ 2375/2001	Specific maximum levels for PCDD/Fs in food	(b)	(b)	(a)	adopted for fish others from 2004	2003 only limits for PCBs	(a)	EU standard s adopted 2004	EU limits	(a)	(a)	yes	planned	limit values for PCBs

(a): According to expert statement all Community legislation that is relevant to dioxins and PCBs has been transposed into national legislation or will be transposed within the time limits as foreseen for transposition within the corresponding regulation

(b): no information obtained

(1) Transformers containing between 500 and 50 ppm of PCB are allowed to remain in service indefinitely

(2) EPER According to CD 1996/61/EC, Article 15, the Commission decided on the implementation of an European Pollutant Emission Register (EPER according to Council Directive 2000/479). Substances addressed include PCDD/Fs.

Table 6-3: Overview on the implementation of EU Regulations in the Candidate Countries

6.1.3 Additional limit values in national regulations

As far as national regulations correspond to the respective EU regulations the limit values set meet the requirements established in the Community Directives.

Besides these regulations several countries have established national regulations for the control of PCBs and PCDD/Fs in fields where no obligations are set by EU regulations. The countries have reported limit and action values for dioxin and/or PCB contamination in ambient air, workplace air, soil and water or even human blood. Limit values in soil and water are in several cases further differentiated into limits for highly sensitive, sensitive and less sensitive areas. The following tables show an overview on exemplary limit values in in water and soil.

PCB [ng.l^{-1}]		**CZ**	**EST (ground water)**	**H**	**SK**	**SLO**
Background				0.5		
Pollution		10	500 (Target value)	1	<LOD (for water courses) 250 (0ther) 100 (irrigation water)	10
Action	increased sens.		1 000 (Guidance value)	50		
	sensitive			100		
	less sens.			1 500		
Dioxin (pg/l)	pollution limit			0.3		

Table 6-4: Exemplary limit values for POPs in ground or surface water

PCB [mg.kg^{-1}]		CZ	H	PL	SK	SLO
Background		0.02	0.02			0.2 (limit threshold)
Pollution		2.5	0.1		0.1	0.6 (warning quantity)
Action	increased sens.	5 (living)	0.2	0.02		1.0 (critical quantity)
	sensitive	10 (recreational)	1.0	0.02		
	less sens.	30 (industrial)	5	2		

Table 6-5: National limit values for PCBs in soil

Limit values for dioxins in soil have only been reported from Czech Republic and Hungary. As in the

case of the limits for PCBs and for the limits in water there is a significant difference in the tolerated levels of about one order of magnitude.

PCDD/Fs [ng TEQ.kg^{-1}]		CZ	H
Background Limit		10	0.5
Pollution Limit		100	5
Action Limit	increased sensitive area	500 (living)	10
	sensitive area	1 000 (recreational)	100
	less sensitive area	10 000 (industrial)	1 000

Table 6-6: National Limit values for dioxins in Czech Republic and Hungary

Besides the limits for environmental compartments nearly all countries have set limit values for Indicator PCBs in food that do not exist in the EU regulations.

The following tables shows the range for limit values set for the most important food groups and for drinking water in different Candidate Countries.

PCB [mg.kg^{-1}]	CZ	H	LV	PL	TR
Meat	0.2	0.5	3.0	0.2	0.2
Milk	0.1	0.5	1.5	0.1	0.1
Egg	0.2	0.5	0.3	0.2	0.2
Fish	0.1–0.3	1.0	2.0		2.0
Fish liver		3.0			2.0

Table 6-7: Selected national limit values for PCBs in major foodgroups

Limit for Drinking water	CZ	PL	SLO
PCBs [µg.l^{-1}]	bottled 0.01	0.5	0.01

Table 6-8: Exemplary national limit values for drinking water

Further food groups are addressed in single countries according to specific needs or interests. Interestingly with respect to the limit values in food and drinking water the limits set by the Czech Republic are significantly stricter than those set in Hungary.

Detailed information on limit values reported from the different Candidate Countries is summarised in annex II, tables 2-1 to 2-8.

6.2 Administrative Structures

Legislation, planning and enforcement is not uniformly structured in all Candidate Countries but similar to the situation in the Member States is mainly under the competence of the corresponding ministries of environment, health and agriculture and is organised down to the county level. Exceptions to a certain extent can be found in small Countries like Cyprus or Malta where the relevant issues are under the responsibility of only two ministries.

In recent times strong efforts have been made to clearly allocate responsibilities and to separate permitting and control in all sectors under the new environment protection policy in order to prevent violation and corruption in this field.

In the Baltic States permitting is performed by Environmental Boards under the Ministries of Environment whereas the Enforcement authorities responsible for inspection and control are in general the national and regional environmental inspectorates, the state veterinary services and the public health services.

Furthermore in many countries national environment agencies or national environmental research centres have been established under the jurisdiction of the environmental ministry as scientific and administrational centres responsible mainly for collection and publication of the various data as well as for the development of monitoring programmes.

On the local level county services are mainly responsible for data collection, sampling and permits, control of reporting and emission measurements. In the field of food and feed monitoring National /State veterinary services are the responsible bodies for sampling and analysis for official control.

The following tables give an overview on the administrative structure in the different Candidate Countries.

Country	Ministry	Permits	Control	Supervision on Data collection/ Analysis; Data storing; Planning
Bulgaria	Ministry of Environment and Water		Regional Inspectorates of Environment and Water	Executive Environment Agency Executive Agency for Exploitation and Protection of the Danube River (Ministry of Transport and Communication)
Cyprus	Ministry of Agriculture, Natural Resources and Environment		Environment Service, Geological Survey Department	State General Laboratory, Laboratory of Geological Survey Department (groundwater, landfills)
	Ministry of Labour and Social Insurance		Department of Labour Inspection (atmospheric emission & immission)	

Czech Republic	Ministry of Environment	17 Regional Boards	Environmental Inspectorate with 8 Regional departments	Czech Hydrometeorological Institute Water Research Institute Czech Ecological Institute Czech Geological Survey
	Ministry of Agriculture		State Veterinary Administration Czech Agricultural and Food Inspectorate	Central Institute for Supervising and Testing in Agriculture (CISTA) Research Institute of Amelioration and Soil Conservation (RIASC) Water River Catchment Administration Agricultural Water Management Administration
Estonia	Ministry of Environment	15 County environmental Boards	Environmental Inspectorate with 7 Regional departments	Estonian Environmental Research Centre Estonian Environmental Information Centre
Hungary	Ministry of Environment	?	Chief Inspectorate of Environment and Water with 12 Regional inspectorates National Service for Soil and Plant production	?
Latvia	Ministry of Environment	8 Regional Environmental Boards	Environmental State Inspectorate	Latvian Environmental Agency
Lithuania	Ministry of Environment	State Environment Protection Inspectorate with 8 regional departments	Control division in Legal Department of the Ministry Regional Environment Protection Inspectorates (other divisions than permitting))	Environmental Protection Agency established (2002)
Malta	Ministry of Home Affairs and the Environment	Malta Environment and Planning Authority	Environment Protection Directorate	Environment Monitoring board

Poland	Ministry of Environment (Dep. of Environmental Policy, of Water resources, of Capital Expenditure and Technology Development	?	Chief Environmental Protection Inspectorate with Voivodship Inspectorates	?
Romania				
Slovakia	Ministry of Environment		Environmental Inspectorate	Slovak Hydrometeorological Institute Water Research Institute
Slovenia	Ministry of Environment		Inspectorate for the Environment and spatial Planning	Environmental Agency

Table 6-9: Administrative Structure in the Environmental Sector

Country	Ministry	Control	Data collection/ Analysis; Data storing; Planning
Bulgaria	Ministry of Health		National Centre of Hygiene, Medical Ecology and Nutrition
Cyprus	Ministry of Health		State General Laboratory
Czech Republic	Ministry of Health	Hygienic Survey	National Institute of Public Health with 17 regional departments Food and foodstuffs control is connected with MoA which was mentioned in previous Table
Estonia			
Hungary	Ministry of Health	National Food Science Research Institute National Public Health Centre	National Food Investigation Institute National Institute of Food Hygiene and Nutrition (Food monitoring)
Latvia	Ministry of Health		Food and Veterinary Service (Ministry of Agriculture)
Lithuania	Ministry of Health Care	State Hygienic Inspection; Public Health centre with State Public Health Supervision Services	State Food and Veterinary Service (Independent Institution under the Government)
Malta	Ministry of Health	Food safety Commission ; Health Inspectorate	Department of Veterinary Service (food monitoring)

Poland	Ministry of Health	Chief Sanitary Inspection Inspection for Chemical Substances and Preparations	several institutions
Romania			Public Health Institute
Slovakia	Ministry of Health	National Public Health Institute of the SR, Institute of Preventive and Clinical Medicine	Food Research Institute (MoA) monitoring of food
Slovenia	Ministry of Health	Health Inspectorate, National Chemicals Bureau	?

Table 6-10: Administrative Structure in the Health Sector

6.3 National Capacities

Information about competent experts, institutions, laboratories and PCB destruction capacities is available for all Candidate Countries that replied to the questionnaire. Information includes names and contact details of competent institutions and experts for Dioxin and PCB related issues. It has been agreed with the Commission that the contact details of the relevant institutions will be published on the project homepage.

Tables 1 of annex II summarises the information that has been reported or is available by other means on competent institutions and local experts, national laboratories for PCBs and PCDD/Fs analysis, storing and destruction capacities.

6.3.1 Research Institutions, Experts and Laboratory Capacity

With respect to number of institutions and experts working in the field of dioxin and PCB research and analysis there exist marked differences between the different Candidate Countries reflecting not only the geographical extension but also different levels of concern.

This concern seems to be based at least in part on the level of industrialisation with correlated environmental pressure imposed to the countries by high historic dioxin and PCB emission and contamination levels leading to elevated human body burdens.

In the Candidate Countries the largest relative number of experts and institutions can be found in countries like Poland, Czech Republic and Slovakia.

With respect to the analysis capacity there is probably a sufficient number of PCB analysing laboratories in every country even if not all might meet quality standard requirements set in the European legislation up to now.

On the other hand the dioxin analysis capacity is often not always sufficient. Several countries reported that they do not have any analysis facility for dioxins at all.

In the consequence most analyses undertaken in the Candidate Countries restrict to classic PCBs,

whereas analyses of PCDD/Fs and dioxin-like PCBs are not available from all countries or have often only be started in recent time in the framework of the preparatory actions to meet the obligations under the Stockholm Convention. Most data on PCDD/Fs and dioxin-like PCBs are still available from countries like Czech Republic, Poland and Slovakia.

The restriction to PCBs in former times and to only very selected environmental compartments or small numbers of samples, mainly for research purposes can easily be explained by economic restrictions, as PCDD/F analyses are by far more delicate and cost intensive than PCB measurements for which furthermore a significantly more simple technical equipment is sufficient.

Some country experts stated that in recent time the technical equipment of national or regional laboratories has been improved a lot as a consequence of capacity building projects launched by the European Community or international organisations like the WHO, but the correct handling of samples during all steps of the analysis process may still not always be satisfying.

The following Table 6-11 gives an overview on the reported laboratory capacities of the Candidate Countries (for detailed information see annex II tables 1).

Country	BG	CY	CZ	EST	H	M	LT	LV	PL	RO	SLO	SK	TR
Number of PCB laboratories	?	2	~30	3	8	0	2	2	~30	(10)[2]	4	?	0
Number of dioxin laboratories	0	0	3	0	1	0	1	0	5	(1)[2]	1	1	0

Table 6-11: Number of facilities for PCB and dioxin analysis per country

The number of laboratories in the table as well as the laboratories mentioned in annex II are those that have been designated by the national authorities and that have the potential for the corresponding analyses. This though does not mean that they all meet the quality standards set in the EC quality requirements as laid down in Commission directives 2002/69/EC[6] and 2002/70/EC[7]. If special information according to accreditation or ability to undergo inter-laboratory calibration tests has been provided, this is stated in the tables.

6.3.2 Storing and Destruction Capacity

As a first important step towards save disposal and destruction all Candidate Countries dispose of national inventories of PCB containing equipment as well as pesticide stocks and major emission sources for dioxins and PCBs that have been collected in the framework of the GEF funded preparatory actions for the development of national implementation plans to meet the obligations under the Stockholm Convention. As in the Member States this inventories are based on calculations and on voluntary reporting of owners and therefore may not be complete. But nevertheless they may give a

[2] Not yet accredited

quite good overview on the quantity of stocks and the needs for storing and destruction capacities in most of the Candidate Countries. The inventories have been elaborated under the responsibility of the Ministries of Environment and are included in the National POPs Inventory Reports to UNEP as well as in the National Implementation Plans (NIP) under the Stockholm Convention. Information will be provided upon request or will be available on the relevant web sites after publication.

Information about environmental sound disposal of hazardous waste, namely PCB containing waste, oils and equipment has not been provided by nearly any of the Candidate Countries but information from other sources shows that safe storing often is a problem and a major priority in most of the Candidate Countries.

Several countries reported that they are in the process of building up save central storing capacities. For economic and organisational reasons this process will not always be finalised until the accession. As a consequence different countries have already requested a transition period to meet the obligations of the Community Regulations.

Similar to save storing environmental sound destruction of dioxins and PCBs or PCB containing equipment is a major problem for most of the Candidate Countries.

Hungary is the only country that reported of a sufficient destruction capacity in two waste incineration plants. Poland reported of a constantly growing destruction capacity that is sufficient for the destruction of PCB containing oils but not for the decontamination of all installations where PCBs have been drawn off. Small mobile installations will be needed for this purpose. Also the Czech Republic and Slovakia are in the process of constructing environmentally sound destruction capacities.

As a consequence of the currently insufficient destruction capacity in the Candidate Countries the WHO is supporting projects for the development of non-combustion technologies and promotes the establishment of regional co-operations for destruction purposes.

Further details on storing and destruction capacities are documented in annex II.

7 Priorities & Plannings

Future PCBs and PCDD/Fs strategies in Candidate Countries are strictly connected to the Community Strategy on dioxins, furans and polychlorinated biphenyls and directed towards the development of National Implementation Plans under the Stockholm Convention. The CC will regulate their strategic approaches in harmony with the European Commission’s proposal for a Regulation on persistent organic pollutants (POPs) forwarded to the European Parliament and the Council in June 2003 together with the proposals for ratification on behalf of the Community of the Stockholm Convention and the UNECE Protocol.

Similar to EU Member States and the European Community Candidate Countries are strongly committed to a rapid ratification and effective implementation of the Stockholm Convention and the UNECE Protocol on POPs.

Candidate Countries that will enter the EU in 2004 focus on accomplishing the implementation of EU regulations, the development of national monitoring programmes, implementation of IPPC and BAT with respect to waste incinerators and waste disposal sites, PCB destruction, strengthening of enforcement and education of local authorities depending on their national needs.

Major priorities that have been reported are related to the following issues:

- Stock and source identification
- Waste Management
- Emission reduction
- Monitoring schemes
- Registration systems
- Remediation

In specific terms this means that measures shall be taken to further identify the PCB content of existing stocks by means of inspections and measurements at suspicious sites. In the field of waste management measures shall be taken for the progressive destruction of PCB containing waste, oil and equipment by means of export or development of national destruction facilities. The reduction of emissions to soil and groundwater as well as the reduction of dioxin emission shall be achieved by means of closing existing landfills and old waste incineration facilities or by their modernisation. Several countries are in the process of building up of central hazardous waste collection and destruction facilities corresponding to EU safety standards.

Emission reduction of dioxins shall be achieved by implementation of BAT and IPPC performance standards to all relevant industrial installations as well as the progressive phasing out of PCB containing equipment.

With respect to monitoring especially activities related to human exposure (e.g. food control, human milk monitoring, etc.) and dioxins (e.g. emission monitoring, dioxin monitoring in food) have been reported as priority actions.

The establishment of national data bases (e.g. building of dioxin sample-bank and preparation of dioxin map in Hungary following the example of Germany and the Scandinavian Countries) shall improve the availability and usability of collected contamination data. Monitoring systems with mandatory reporting in fixed intervals (e.g. Poland) shall be used for an effective control of the elimination progress with respect to PCBs.

Nearly all countries stressed the need that final implementation of the acquis as well as effective enforcement of the established regulatory framework will have to be further promoted by educational measures and improved knowledge exchange at all involved parties.

The following picture gives an overview on the different thematic fields of reported priority actions.

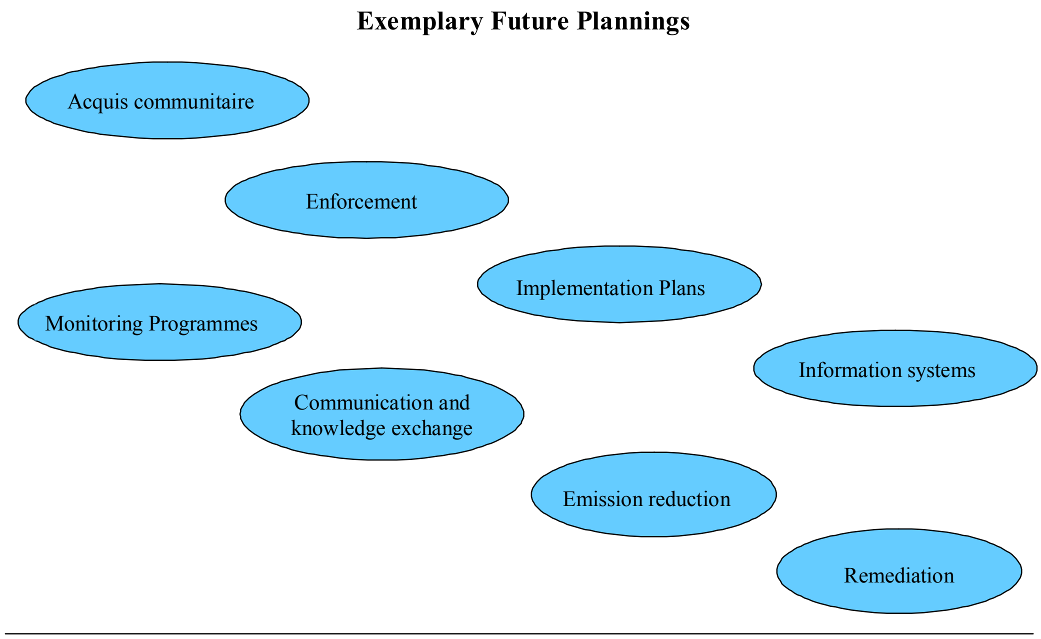


Figure 7-1: Overview on the different thmatic fields of reported priority actions

Specific activities was performed in the Czech Republic, where National POPs Centre was established as a part of activities connected with the implementation of Stockholm Convention a EC regulation for implementation of Stockholm Convention and POPs Protocol of UNECE CLRTAP. This Centre also initiates some activities focused on the establishment of European POPs expert network with special

attention to CCs.

Detailed information concerning reported plannings is summarised in annex II, table 3-1.

8 Gaps, Deficits and Capacity building

In general it can be stated that a lot of efforts have been made in the Candidate Countries in the last few years. With the necessity to meet the European regulatory requirements upon Accession and supported by intensive capacity building measures the *transposition of the Acquis communautaire* has largely been achieved. As another consequence awareness with regard to hazardous substances has been increased sustainable especially at expert and governmental levels. Furthermore - following the legislational changes and the obligations imposed to Member States as well as Candidate Countries by signing the Stockholm Convention - a number of monitoring and research activities has been started also in countries that did not have a special concern for these issues before. In many cases the activities have been based on external funding by the European Union, Members States or international organisations like the WHO. These approaches are often multilateral or regionally built and beyond other are dedicated to knowledge exchange and cooperation. By this means a dialogue between the different participating parties has been started in many fields and networks on political level as well as on scientific level are more and more developing further promoting mutual understanding, knowledge exchange and awareness rising.

Nevertheless a number of questions is still open and further information will be needed.

8.1 Gaps and deficits

Information of ministries or other competent authorities has been provided by most of the AC/CCs except Turkey and Bulgaria. From Romania Information has been provided on PCDD/Fs and PCB emissions, stocks and priority actions but not on legislation, experts, storing and destruction capacity, ongoing monitoring and research activities.

8.1.1 Research and Monitoring

Systematic national monitoring of PCDD/Fs and PCBs has been performed only in some of the AC/CCs. Information in most countries is based on episodic studies, so that the data base is often relatively small, especially with respect to PCDD/Fs and with respect to human exposure. Available data differ in many aspects (e.g. year, number of samples, spatial characteristics, number and type of analysed congeners, laboratory standards, etc.).

As a consequence there is in many cases no information on possible hot spots or high exposure to humans, however, experiences of some countries show that hot spots might be expected.

A further consequence is that possibilities for comparison between national situation and levels in Member States are relatively limited and a possible need for action can hardly be detected.

In recent time first measurements or real nation wide monitoring programmes have been started in almost all countries in the framework of GEF funded projects "Preparation of POPs National Implementation Plan under the Stockholm Convention" which will improve the situation but up to now

data have not yet been made accessible in many countries.

However, it is an open question up to which degree necessary and already started activities will continue when external funding will decrease.

8.1.2 Environmental Contamination

Contamination data have to be read with reservation because of the above mentioned differences in availability and representativity of data, unknown reliability of analysing laboratories, differences in the year of data collection as well as number and distribution of sampling sites. Nevertheless the data can be used to give a comparative overview and a rough estimate of the order of magnitude of the contamination levels in different AC/CCs.

One major knowledge gap related to POPs in AC/CCs that can be generally stated is the relative lack of information about PCDD/F and dioxin-like PCB contamination. For the majority of countries information on PCB levels (sum of PCBs, Indicator PCBs) is far better available than information on PCDD/Fs or dioxin-like PCBs, the collection of which has often only just begun or is not performed at all. This deficit can be explained by the high costs of PCDD/Fs analysis and the more complicated technology that is needed for dioxin measurements.

Looking at specific environmental compartments for the majority of countries information on contamination levels in environmental compartments (air, water, sediments, soil, vegetation and wildlife) is fairly incomplete.

Air

Major gaps exist in view of PCDD/Fs monitoring in ambient air. Information has been provided from Czech Republic, Slovakia, Poland and one oil shale power plant in Estonia. In the other countries estimates on PCDD/Fs emissions to air are made based on CORINAIR or the UNEP toolkit. In the framework of the EU funded project on "Dioxin emission" in Candidate Countries PCDD/F emission measurements will be performed at suspected locations.

In countries where measurements have been carried out they are normally done on a episodic and regional or local basis. Only the Czech Republic has established a nation-wide monitoring system. Monitoring of PCBs has been reported from 6 out of 13 countries (Czech Republic, Estonia, Latvia, Lithuania, Poland and Slovakia) and in most cases has been episodic or local only.

Water

With the exception of 2 localised measurements in the Czech Republic (Spolana Neratovice before and after the 2002 flood) and Poland PCDD/Fs measurements in water have not been performed in any of the AC/CCs.

On the other hand classical PCBs are regularly monitored in 6 of the 13 AC/CCs (CY CZ, HU, LT, SK, SLO). In Malta groundwater monitoring is planned. In Latvia PCDD/Fs and PCBs are not included in

the national water monitoring programme because they have not been detected in the water supply system during a testing period.

Sediments

Information on PCDD/Fs levels in sediments is quite poor and almost completely restricted to the Czech and Slovak Republic.

On the other hand systematic monitoring of PCB contamination in the main water courses is performed in 7 AC/CCs (CY, CZ, HU, LT, PL, SK, SLO). Research projects have been performed in Romania and Turkey. No monitoring is performed until now in Malta. In Latvia first samples of sediments at suspected contaminated sites have been collected in 2003. From Bulgaria no information has been available.

Soils

National soil monitoring systems for PCDD/Fs only exist in the Czech Republic and Hungary., Poland and Estonia have performed specific hot spot monitoring.

Monitoring for PCBs has not been done systematically in most countries but a least some measurements have been performed in 8 AC/CCs (BG, CZ, HU, LV, PL, RO, SK, SLO). Comparative measurement of rural and urban soils or suspected hot spots exists in several countries. In the Czech Republic several country wide measurement system have been established.

Vegetation

Information about PCDD/Fs s or PCBs in vegetation is rare. Annual monitoring is performed in the Czech Republic only. Sporadic information has been collected in Poland and Slovenia.

Wildlife

Certain information about contamination levels in sea water and fresh water fish is available from Baltic Sea countries, Malta, Romania and from the Czech and Slovak Republic.

PCDD/Fs monitoring in fish from the Baltic Sea has been started in Estonia, Latvia and Poland, but there is no information from Lithuania. The number of samples taken in the ACs however is not enough to draw reliable conclusions in comparison to Scandinavian Countries. Information on dioxin-like PCBs is still missing for the ACs.

Monitoring of fresh water fish has been performed in 8 AC/CCs (CZ, EST, LV, LT, MT, PL, RO, SK) either in the framework of the national food monitoring or as separate monitoring activity but normally selection of species and analysis parameters have not been harmonised.

Other wild animals (rabbits, games, boars) are monitored in the framework of the national food monitoring programmes or in the framework of ecosystem studies.

8.1.3 Human Exposure

In general the situation with respect to human exposure is similar to the one described for the environmental contamination. The overall database is relatively small and there are important gaps. Information on tissue levels is relatively poor for all countries except Czech Republic, Slovakia and Poland.

Data on feed and food

National food monitoring programmes for contaminants in food seem to exist in most of the AC/CCs but are based mainly on the control of contamination with Indicator PCBs and often differ with respect to selection and grouping of foods. Data on PCDD/Fs in food and feedingstuff are almost completely missing. This however will probably change next year with the adoption of the EU limit values and the monitoring obligations set by the relevant directives.

Up to now PCDD/Fs monitoring is restricted to the Czech and Slovak Republic and to marine fish from the Baltic region (Estonia, Latvia and Poland) and in Malta.

According to GEMS/food information in Slovenia a general food monitoring has begun in 1998 with pesticides residues which now shall include PCDD/Fs but only data on contamination levels with PCBs in the "Hot spot" region of Bela Krajina have been provided.

A monitoring of feeding stuffs for PCBs and PCDD/Fs is not common in AC/CCs. Only the Czech Republic and Slovakia have reported about existing programmes. PCDD/Fs so far are only monitored in the Czech Republic. From Estonia the existence of an Act on Feedingstuffs has been reported but this act does not contain concrete provisions for monitoring or limit values and no further information on monitoring programmes or contamination data has been provided.

Data on dietary intake and human tissue levels

Also dietary intake assessments are missing in most countries. Only four AC/CCs (Czech and Slovak Republic, Poland, Hungary) dispose at least about some relevant information. Human breast milk is the predominant tissue, with monitoring being performed in 8 AC/CCs (Bulgaria, Czech Republic, Estonia, Hungary, Lithuania, Romania, Poland, Slovakia). No information on breast milk contamination is available from Latvia, Slovenia, Turkey, Cyprus and Malta.

Unfortunately the Baltic States, Poland, Slovenia, Malta, Cyprus and Turkey are not included in the third round of the WHO milk study – which at the moment presents the best source for horizontal comparison of human tissue levels.

Adipose tissue has been monitored in 5 AC/CCs (CZ, PL, HU, TR, SK). 6 Countries (LV, SLO, SK, RO, PL, CZ) have reported data about PCB levels in blood. Information on other tissues is normally restricted to specific scientific projects. An exception is the Czech Republic where also placental, liver and brain tissue has been analysed in several sampling campaigns from 1996 to 1998.

To conclude it has to be stated that the available contamination data are difficult to compare because they differ with respect to a number of important parameters analysed group of congener like (single, three, six, seven, fourteen, etc.), year of data collection, location of sampling sites and number of samples. Often even only total PCBs are used to document the contamination level.

These factors may work as strong confounders and have to be taken into account when comparisons between national data are made. Even more problems occur when contamination levels shall be compared to levels in Member States where research and monitoring has focused on PCDD/Fs and dioxin-like PCBs in the last years.

A special problem with comparability occurs in the field of wildlife and food monitoring as the definitions for parts of fish, food items and composition of food groups vary significantly between the different national programmes.

In trying to assess time trends it has to be taken into account that because of changes in methodology and analysis technologies only data collected after 1995 are comparable in certain limits. These time trends show a declining trend, that looking at data in the Czech Republic and Poland seems to level out in the last years at least in some compartments.

8.1.4 Legislation, administrative structures and capacities

Legislation and Administrative structure

While the majority of the relevant laws and subsequent regulations has been almost completely transposed into national legislation the implementation and control of these regulations may cause some further problems. As in the framework of the Accession process hundreds of new regulations had to be adopted, institutions had to be reorganised new departments to be established and responsibilities to be changed. Major challenges will be to:

- assure sufficient know-how at all administrative levels down to the local inspectorates
- guarantee full coordination, co-operation and data- exchange between all involved institutions being responsible for certain aspects of environmental protection.

With respect to specific legislational aspects namely a lack of information on legislation related to contaminants in feeding stuffs has to be stated in the context of this project.

Poland stated the problem that the national law on waste management needed to be amended by including a ban on recycling of hazardous waste and the condition of irreversible transformation of POPs during the destruction process. In some other countries (e.g. Latvia) the refilling of transformers with PCBs so far is still permitted.

With respect to control of emission limit values or other limit values set in the national legislation e.g. waste incineration, IPPC in certain countries there does exist the problem of adequate laboratory capacity to perform the measurements.

Furthermore it will not be possible for all countries to modernise existing installations or build up adequate waste management systems in the time period foreseen in the relevant European Directive. in this cases some Countries have already applied for transitional periods for implementing the relevant regulations.

With respect to the administrative structure it seems that most of the EU requirements have been adopted through several projects dedicated to capacity building in the enforcement sector but the information on the separation of permitting and control is not completely provided for all countries, so that some deficits still may exist.

Laboratory capacity

With respect to laboratory capacity and skilled experts in the field of dioxin and PCB analysis the two following problems have to be reported:

- While the capacity for PCB analysis seems to be sufficient in nearly all of the countries the capacity for dioxin analysis is not always existing or well developed.

- While the technical equipment is absolutely sufficient the reliability of the measurement is lacking because of quality problems during sampling, pre-treatment and analysis. These deficits that have a strong impact on comparability of collected data can only be overcome by repeated training and interqualibration tests.

Only 6–7 out of 13 countries have laboratories that dispose of the necessary equipment for dioxin analysis at the moment. But is has to be stated that in the framework of capacity building measures more countries will be provided with necessary equipment and training programmes for involved staff that shall give support to meet the necessary quality standards.

Estonia, Latvia, Bulgaria, Turkey, Cyprus and Malta up to now do not have laboratory capacity for dioxin analysis and the only dioxin laboratory in Romania is not yet accredited by international norms. But the accreditation process has been started for several laboratories as it has recently been accomplished for others. Where national capacities are not available co-operations with laboratories in Member States are used for analyses of first samples.

8.2 Capacity building

A large number of projects and activities have been launched in the last years with the intention to support capacity building in the Candidate Countries at different levels. Through these measures legislation as well as enforcement have been strongly supported and technical equipment as well as financial support for constructions of e.g. hazardous waste disposal sites have been provided. A detailed compilation of the activities that have been performed in the Candidate Countries in the Baltic region can be found in the HELCOM report 2002.

8.2.1 Programmes in the framework of the European Community

Financial, technical and administrative support for the capacity building with respect to the adoption of the *acquis communautaire* in the Candidate Countries is effected mainly via three programmatic instruments (PHARE, ISPA and SARPAD) focusing on three different aspects of preparatory actions in the process of the Accession.

PHARE is focused on assistance in the adoption of the *acquis* and the identification of priority areas for action. In this context 30% of the PHARE resources are allocated to the Institution Building through the instrument of **Twinning,** a bilateral co-operation between Member State and Candidate Country with arrangements between ministries, institutions, professional organisations (e.g. judiciary bodies and social partners), agencies, European and regional bodies and local authorities, in order to provide specialist technical advice on the acquis and to help develop public administration training facilities at central and regional level.

70% of the financial resources of PHARE are allocated to the priority investment in the fields of regulatory infrastructure and in economic and social cohesion.

While PHARE is focused on the regulatory aspects in the Candidate Countries that means strengthening the administrational capacity and supporting related investments the second instrument ISPA is dedicated to the financing of large infrastructure projects in the fields of Traffic and Environment.

Around 50% of the ISPA resources are allocated to projects in the environmental sector that shall help to support the implementation of the relevant EU legislation. The investments focus in the first line to cost intensive sectors like

- Drinking water supply
- Waste water treatment
- Solid waste and hazardous waste management and
- Improvement of the Air quality

The support provided in the framework of ISPA is as well financial as educational and technical.

The third instrument SARPAD is focusing mainly on the development of agriculture and rural regions and is therefore less related to dioxins and PCBs.

8.2.2 Programmes in the framework of the WHO

"Enabling activities to facilitate early action in the implementation of the Stockholm Convention on Persistent Organic Pollutants"

All Candidate Countries have signed the Stockholm Convention on persistent organic pollutants from May 2001 which requires measures to reduce or eliminate, inter alia, release of dioxins and PCBs. Among the measures recommended by the Convention is the development of national, regional or sub-regional action plans designed to identify, characterise and address the releases of the listed chemicals and to facilitate the implementation of measures for achieving release reduction or source elimination.

In this context all Candidate Countries participate in UNEP, UNIDO,UNDP/GEF funded projects on enabling activities in the field of implementation of the obligation under the Stockholm Convention, that started between 2001 and the end of 2002 and will lead to the development of inventories and National Implementation Plans (NIP) end of 2003 or 2004.

The project with duration of 18 months, consist of two phases with a focus on prioritisation in the first phase and the setting up of a monitoring system in the second phase.

For the realisation of the projects National Focal points and Co-ordinators have been established and nominated. They have the task to co-ordinate a network of different expert organisations including the several e.g. Ministries of Environment, Health, Agriculture, Transport, Internal Affairs and Economy.

By this approach information from environment and health as well as statistical and economic information can be combined and evaluated by one specialist team. Furthermore UNEP promotes information transfer and knowledge exchange by repeated meetings of representative of the different WHO regions and subregions enhancing discussion and training projects.

As the WHO regions for Europe do not reflect the political structures on the continent Candidate Countries as well as Member States are mixed in two different regions, so that information exchange across the boundaries is already realised in the context of the project. The two regions relevant with respect to the Candidate Countries are the following:

Europe III: including besides Bulgaria, Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Romania and Slovakia, all middle and northern European Member States, Ireland and Great Britain as well as Switzerland and Eastern European Countries as far as Russia and the Caucasian Countries.

Europe IV: including besides the Candidate Countries Slovenia, Malta, Cyprus and Turkey, Member States like France, Italy, Spain, Portugal and Greece and all coastal African and middle-eastern countries.

GEMS/Food-EURO

The GEMS/Food-EURO programme was re-started in 2001 by the WHO European Centre for Environment and Health in Rome as a priority activity in the WHO European Region is designed to collect and provide information on levels and trends of contaminants in food including PCDD/Fs and PCBs through its network of participating countries. One of the main objectives is to promote the monitoring of food contaminants by all European countries and to facilitate the collection and collation of data by the promotion of the use of the Operating Programmes for Analytical laboratories (Opal I and II). The work of GEMS/Food-EURO is in line with other regional monitoring systems in particular in co-ordination with the monitoring programmes of the European Union. Currently activities are ongoing in supporting Candidate Countries in the development of national dietary intake assessment systems.

WHO Human Milk Study (3.round)

WHO has conducted periodic studies on levels of dioxins and PCBs in mother's milk every five years in order to give an comparative overview on the contamination levels in different countries across the world. Whereas the project started mainly with EU Member States in the first round of the project in 1987-88 it has been extended more and more covering in the third round (2001-2002) a total of 26 countries around the world including 5 Candidate Countries.

In this study strict quality standards with respect to comparability of data have been set up for the sampling and analysis procedure resulting in highly comparable information for the human milk levels in the participating countries.

The added value of the project is the information on

- Major Sources of human contamination expressed by the proportion of PCDD/Fs and PCB contamination as well as the specific country patterns namely of PCBs
- Awareness rising for the potential risk the general population is exposed to and enhancing activities to reduce or eliminate possible dioxin or PCB sources.
- Laboratory capacity building as participating laboratories have to undergo sophisticated interqualibration studies.

8.1.3 Regional Co-operations

Regional co-operations among the Candidate Countries or involving Candidate Countries have been established at different levels of the scientific and political society.

One example for a intergovernmental co-operation within the Candidate Countries is the BALTIC ENVIRONMENTAL FORUM (BEF). The project started in 1995 as an information exchange forum for the three Baltic States to co-ordinate information, expertise and experience exchange in the environmental field via work-shops, training programmes and publications.

In the view of dioxins and PCBs the Baltic Chemicals Programme (BAltic States Regional Co-operation programme on Chemicals CONtrol) BACCON is an important platform for supporting capacity building and enforcement in the Baltic Countries. The current BACCON 3 project started in August 2003 and is focused on co-operation of the different stakeholder as well as enforcement of inspection.

Another example is the DANCEE (Danish Cooperation for Environment in Eastern Europe) initiative initiated and financed mainly by the Danish EPA. DANCEE has performed besides others several projects in the Baltic States and Poland to establish a survey on dioxin and PCB sources and emissions in that region. Detailed information on these projects are documented at the web site of the Danish Environmental Agency and published in the "Survey on Dioxin Sources in the Baltic Region".

Furthermore all Candidate Countries participate in one or several of the below mentioned Conventions and Databases and by these means are involved in the exchange of relevant Contamination data. The main international Conventions and Databases Candidate Countries are participating in are HELCOM, BARCOM, Budapest Convention, EIONET, EUROWATERNET and EMEP. Detailed information on ongoing activities and stored data are documented at the relevant web sites of the conventions.

9 Conclusions & Recommendations

Conclusions drawn in this chapter are based on the information collected and evaluated in the framework of this report. Relevant data and details can be found in the corresponding chapters, so that specific links and references are not given for every chapter.

9.1 Research and Monitoring Activities

Research and monitoring activities vary significantly within AC/CC and in comparison with activities in the EU Member States. In this context countries with extended monitoring systems on a representative basis (e.g. Czech Republic; Slovakia, Poland) contrast with countries that have started first measurements e.g. in the framework of GEF projects to prepare the development of national implementation plans under the Stockholm Convention or in the framework of EU requirements.

Monitoring in ambient air is not common. PCDD/Fs are monitored routinously only in the Czech Republic. Episodic measurements at the local level have been performed in Poland and in Slovakia only. The situation with respect to PCBs is similar with few additional data from the Baltic States.

Monitoring of water courses is performed in 7 AC/CCs in the framework of national and international monitoring networks but is restricted to classical PCBs. Groundwater is not always included. Monitoring of sewage sludge only started at first exemplary sites in the Czech Republic and Poland.

A monitoring system for PCDD/Fs in soils does only exist in the Czech Republic and in Hungary so far. Single hot spot measurements have been performed in Poland and Estonia. With respect to PCBs quite representative monitoring has been performed in the Czech and Slovak Republic, Bulgaria, Hungary and Romania. In Poland monitoring for PCBs and PCDD/Fs currently is not included in the national soil monitoring. In Latvia only first samples have been taken at suspicious sites.

Monitoring of vegetation is not common in AC/CCs. A national monitoring programme does only exist in the Czech Republic.

Monitoring of PCDD/Fs in wildlife is mainly focused on marine fish. Monitoring of PCBs in wild game and fish often is part of the national food control. No information is available from Bulgaria, Cyprus and Hungary. The marine food chain and marine mammals have been sampled for scientific purpose.

Up to now national food monitoring in most AC/CCs does include classical PCBs but no PCDD/Fs. In 2003 they have been included in the Czech, Slovak and Maltese monitoring only. Monitoring programmes for PCBs vary significantly.

Feed monitoring does not seem to be common in AC/CCs. There is information from Czech and Slovak Republic only.

Dietary intake assessment for PCDD/Fs is performed in the Czech Republic only. With respect to

PCBs there is at least some kind of assessment from Poland, the Slovak Republic and Hungary, too.

Monitoring of human tissue levels is mainly based on human milk. However it has to be stated that monitoring intensity is very different between countries. No information is available from Cyprus, Malta, Latvia, Slovenia and Turkey.

Human adipose tissue as storage organ for long time exposure has been monitored in Czech and Slovak Republic, Poland, Hungary and recently in Turkey.

Monitoring of blood is not common in AC/CCs. Presently there is one major monitoring project on contamination levels in blood in the Slovak Republic, launched as a 5^{th} Framework project for health risk assessment. Besides this there has been a smaller research project in Poland and local monitoring of blood levels in the hot spot region of Bela Krajina in Slovenia.

Against this background the following recommendations are suggested:

- AC/CC with poor databases should be encouraged to screen key compartments (soil, sediments, human milk, representative food and feed) and try to identify possible hot spots
- Suggestions for improvement of the data base should be coordinated with the European Commission
- For selected indicator food and feed samples an EU initiative for a systematic monitoring including both PCDD/Fs and dioxin-like PCBs should be taken into consideration; results should be correlated to existing information on human exposure and possibly also to human health effects
- AC/CC should be encouraged to participate in international monitoring activities like WHO milk study, GEMS food, EMEP, etc.) and to adopt international standards
- Support should be provided with respect to information exchange between the European Commission, MS and AC/CC and within AC/CC to avoid double work and to benefit from existing experiences; an international workshop might be an appropriate instrument for realisation
- Structures and systems should be developed that allow to realise continuous research and monitoring even if external support is decreasing

An extended monitoring system like in the Czech Republic may not be necessary for all AC/CC. Due to the related high costs and the dimension of contaminations such systems can only be recommended for certain hot spot areas.

9.2 Environmental Contamination and Human Exposure

It can be summarised that information concerning dioxin and dioxin-like PCB contamination in AC/CC

is typically available to a lower extent than in MS, while information on classical PCBs is more abundant than in MS (at least looking at recent years).

As furthermore data normally do not correspond fully to each other with respect to temporal and spatial parameter, number of samples and congener and laboratory standards a direct comparison between AC/CC and MS is difficult and only a rough estimation about the range of contamination is possible on the basis of available data.

Being aware of these limitations and restrictions for horizontal comparison it can be concluded that the average levels of contamination within AC/CCs are in the same range or even somewhat lower than the corresponding levels in MS.

However, there are some "hot spots" regions where dramatically increased levels can be found. And it should be clearly stated that probably not all "hot spots" have already been identified.

Conclusions on time trends and congener specific information concerning patterns, transport and fate can be drawn exemplary from the data that are available from countries like Czech Republic, Poland, Slovakia and for certain aspects from Estonia and Hungary. It is expected that new data including information on dioxins and dioxin-like PCBs will become available after accession.

On the basis of existing data it can be summarised that levels of contamination in food and human tissue in general have declined a lot in the last 10 years while the situation with respect to environmental contamination is not that clear showing in part stable levels or even a slight increase of contamination.

Specific conclusions can be drawn for the different compartments investigated:

Air

PCCD/F levels in air in the Czech Republic and Poland in part seem to exceed MS levels whereas levels in Slovakia seem to be comparable to levels in MS. PCB levels seem to be in the range of EU MS for Poland, Slovakia and the Baltic States while levels in the Czech Republic and Slovenia in part significantly exceed MS levels.

Water

For water information in AC/CCs is almost completely restricted to classical PCBs where levels –with the exception of the hot spot region in eastern Slovakia seem to be in the range of MS levels. No general decline has been observed over the last 10 years in Poland, Czech and Slovak Republic due to a significant raise of levels as a consequence of the heavy flood events in 1997 and 2000.

An alarming trend can be observed in ground water levels in some areas like eastern Slovakia and Slovenia.

Sediments

With respect to PCDD/F contamination levels in the Czech Republic seem to be in the range of MS levels or slightly below. Levels in the Slovak hot spot region correspond to Finish hot spots levels. PCB levels also seem to be in the range of MS levels with hot spots in Cyprus, Czech Republic, Latvia, Slovak Republic and Slovenia and low levels in Turkey and Lithuania. As there is no explanation for some high levels reported in Latvia so far, further investigation would be needed.

First data for sewage sludge from Poland and Czech Republic correspond to MS results.

Soils

PCDD/F levels in AC/CCs seem to be in the range or slightly lower than levels in MS however data are rare. PCB levels seem to be comparable. Agricultural soils in Bulgaria, Hungary and the Slovak Republic seem to be very low. Corresponding soils in Czech Republic and Poland are slightly higher contaminated than levels in MS. Far higher and sometimes extreme contamination levels are found near to old industrial and military sites and corresponding dump sites.

Vegetation

Scarce data that are available show levels in the same range as in corresponding regions in MS.

Wildlife

PCDD/F levels in Polish and Estonian fish seems to be slightly lower than in Scandinavian countries, while Latvian samples are probably in the same range.

With respect to PCBs levels seem to be comparable for central European countries, with high and still increasing levels in some Elbe fish species and extreme levels for wildlife from the Slovakian hot spot region of Michalovce. In comparison Danube fish from Romania seems to be less contaminated.

Food

Data on PCDD/F contamination in food are definitively not sufficient to draw final conclusions. Recent Slovak data seem to be more on the lower edge of contamination range in MS compared to data compiled by Buckley-Golder et al. in 1999. Also PCB data from AC/CC seem to be at the lower edge to MS contamination range compared to typical European contemporary levels (Holoubek et al 2002) and to scarce recent MS information. An exception to this is home made butter from Eastern Slovakia. Generally, a significant decline has been observed during the last decade. High contamination levels reported for poultry and vegetable oil from Poland would require further tests for clarification even more as Polish meat and milk levels seem to be low compared to other AC/CCs.

Dietary intake assessment

In general there is no information from AC/CCs that can be compared to MS data. Data from the Czech Republic suggest a slightly higher total daily intake than in MS. A comparison of recent PCB intake is not possible due to lacking information from MS.

Human milk

Based on the WHO milk studies, which results are confirmed by national data from Czech and Slovak Republic and Hungary, PCDD/F levels in AC/CCs are generally somewhat lower than in MS. This conclusion does not apply for PCBs where high contamination levels have to be stated in the Czech and Slovak Republic. There is some evidence for high PCB levels in Lithuania and levels in the European average for Poland and Estonia but final conclusions are not possible. Data from Cyprus, Malta, Latvia, Slovenia and Turkey would be urgently needed.

Adipose tissue

Data for PCDD/Fs suggest a contamination level in the Czech Republic exceeding the MS average. With respect to classical PCBs levels in Hungary, Poland and Turkey seem to be lower than levels in MS while the levels in the Czech and Slovak Republic seem to be above. Data from Slovenia are too old to be compared to recent results.

Human Blood

Data on PCDD/F levels in human blood are not sufficient to draw conclusions for more than occupationally exposed workers from the Slovak Republic, showing levels above the MS average for employees from the Chemko factory in Eastern Slovakia, the major hot spot of the country. With respect to PCB contamination levels in Eastern Slovakia are at the same level as the highly contaminated population from the Faroer Islands or Greenland. Data from smaller research studies suggest higher levels in Latvian high fish consumers than in corresponding Swedish samples, and comparable blood levels between Polish and Belgian samples.

Emission and PCB inventories

In the process of GEF funded projects "Preparation of POPs National Implementation Plan under the Stockholm Convention" most of the AC/CCs have performed inventories on major PCDD/F and PCB sources and on PCB containing equipment and stocks. Data have been provided from some Countries and may be available on request from others. The inventories are based on estimations (CORINAIR or UNEP Toolkit), on voluntary reports of potential owner and calculations based on national export-import and production statistics.

Emission sources and Hot spots

Hot spots – as a result of former or ongoing industrial activities and leakage from electronic equipment – exist in almost all AC/CCs but differ to a large extent in spatial distribution and level of impact to the environment and the ecosystem as a whole. Major known emission sources for PCBs exist in the Czech (Rozmital) and Slovak Republic (Chemko Strazske-Michalovce District) and in Slovenia (Iskra Factory in Semič-Bela Krajina Region). Less well investigated local hot spots might exist in Latvia, Poland, Romania and all other countries (see chapter 4.7). A major emission source for PCDD/Fs is a extremely high polluted factory area (Spolana Neratovice) in the Czech Republic. While remediation measures have been started at this site and the Iskra factory, other hot spots still wait for rehabilitation.

In the consequence the following recommendations are suggested:

- AC/CC should be encouraged to identify further hot spots in suspicious areas (see also recommendations with respect to monitoring)
- AC/CC should be encouraged to investigate the reasons in those cases where contamination levels are significantly above background levels.
- Financial and technical support should be provided for remediation of identified hot spot areas to avoid further contaminations
- AC/CC should be encouraged to verify inventory estimations by specific measurements and to take regulatory measures to improve cooperation of stock owners (e.g. of contaminated oil or equipment) and promote environmentally sound destruction
- Inventories should be used for remediation measures and emission reduction
- AC/CC should be encouraged to improve their database especially with respect to key compartments (soil, sediments, indicator food and feed and human milk)

9.3 Legislation, Administrative Structure and Capacities

Legislation, Enforcement and Administrative structure

According to the received information most of the relevant regulations of the European Community have been transposed in the AC/CC that will enter the Community in May 2004. Problems with implementation seem only to occur in the field of waste management, the IPPC directive and the total phase out of PCBs. Some countries have requested transitional periods beyond Accession or the time schedule set in the regulation. Furthermore information is missing with respect to the implementation of the feedingstuff directive and problems might occur with the implementation of the food control requirements because of lack of laboratory capacity in certain countries.

According to the available information strong efforts have been made in the field of enforcement and separation of permit and control. But information to these issues has not been complete for all countries and problems with the level of awareness at the local administrative level have still been reported.

In the consequence following recommendations can be made:

- Support AC/CC in the field of waste management and IPPC Directive and intensify exchange on best available technologies
- Support AC/CC in the field of food and feed control procedures
- Help AC/CC with further training measures and awareness rising by appropriate pilot projects

for the enforcement of EU Directives

- Review legislation corresponding to Directive 96/59/EC on the disposal of PCBs

Experts and Laboratories

The number of experts seems to be sufficient in most of the countries but may need to be further increased in the Baltic States, Malta, Bulgaria, Romania and Turkey. With respect to laboratory facilities the capacity for PCB analysis seems to be sufficient for most of the countries whereas the capacity for dioxin analysis is not always sufficient. Furthermore the quality standards of the stated laboratories may not always meet the requirements of the European Union.

As a consequence there is need for action in the field of dioxin and of quality control. In this context the following recommendations can be made:

- Enhance further training and knowledge exchange
- Encourage AC/CC with respect to the development of analytical capacities for dioxin analysis
- Reflect about international co-operation to improve quality standards and reduce costs

Storing and Destruction

Information on storing capacities has not been provided for most of the countries but it seems that environmentally sound storing capacities are a problem in almost all AC/CC. Environmentally sound destruction capacities for PCBs do not exist in the majority of Candidate Countries. In the Accession process projects for building of appropriate facilities have been started and first dump sites as well as first old waste incineration facilities have been closed.

In this context the following recommendations can be made:

- Support the establishment of adequate facilities
- Evaluate possibilities for regional co-operations for storing and destruction including revisions of the existing legislation relating to import and export bans for PCBs and PCB containing equipment or waste.

9.4 Priorities & Plannings

Identification and destruction of existing stocks, establishment or extension of databases and monitoring systems, implementation of the existing legislation in the field of waste management and emission reduction (IPPC) as well as remediation activities related to dioxins, PCBs and other POPs have been stated as major priorities from the majority of countries.

In this context and in addition to the above said the following recommendation could be added:

- Support the identification of possible hot spots to became a priority
- Support a coordinated monitoring of indicator food and feed materials
- Support the establishment of adequate communication procedures

9.5 Capacity building

A large amount of projects have been performed on European and international (e.g. WHO) level that have had a considerable effect on the harmonisation of legal regulations, separation of permitting and control and development of adequate laboratory capacity. Furthermore the awareness for dioxin and PCB related issues has risen at the governmental and expert level.

On the other hand awareness in the general population and on the local administrative level is still quite low so that further educational efforts will be necessary to assure a good implementation of the established regulatory framework and to reduce the emissions from uncontrolled and domestic burning as well as from inadequate management and disposal of PCB containing installations.

10 List of abbreviations

AC/CCs	Accession Countries and/ Candidate Countries
ACs	Accession Countries
ADI	acceptable daily intake
BARCOM	Barcelona CommissionConvention
BEF	Baltic Environmental Forum
BG	Bulgaria
CCs	Candidate Countries
CISTA	Central Institute for Supervising and Testing in Agriculture, Czech Republic
CLRTAP	Convention on Long-range Transboundary Air Pollution
CORINAIR	Core Inventory of Air Emissions
CY	Cyprus
CZ	Czech Republic
dl PCBs	dioxin-like polychlorinated biphenyls
d.w.	dry weight
EDI	estimated daily intake
EEA	European Environment Agency
EEIC	Estonian Environment Information Centre
EIONET	European Environment Information and Observation Network
EMEP	Co-operation programme for monitoring and evaluation of the long range transmission of air pollutants in Europe
Env.Med.	Environmental Media
EPER	European pollutant emission register
EST	Estonia
GAW	Global Atmosphere Watch Programme

GEF	Global Environmental Facilities
GEMS/Food	Global Environmental Monitoring System
HELCOM	Baltic Marine Environment Protection Commission (Helsinki Commission)
HU	Hungary
ICES	International Council for the Exploration of the Sea
ICES	International Council for the Exploration of the Sea
IKSR	Internationale Kommission zum Schutz des Rheins
IPPC	Integrated Pollution Prevention and Control (Directive 96/61/EC)
ISPA	Instrument for Structural Policies for Pre-Accession
LEA	Latvian Environment Agency
LOD	Limit of detection
LT	Lithuania
LV	Latvia
MT	Malta
MAP	Mediterranean Action Plan
MEDPOL	Mediterranean Pollution Programme
MoA	Ministry of Agriculture
MoE	Ministry of Environment
MoH	Ministry of Health
MWI	Municipal waste incinerator
NIP	National Implementation Plan (under the Stockholm Convention)
NPOPsInv	National POPs Inventory
N-TEQ	Nordic Toxic Equivalent
OSPARCOM	The Oslo and Paris Marine Commissions

PCB	Polychlorinated Biphenyls
PCDD/Fs	Polychlorinated Dioxins and Furans
PHARE	Poland and Hungary: Action for the Restructuring of the Economy
POPs	persistent organic pollutants
Pord. &use	Production and Use
RIASC	Research Institute for Amelioration and Soil Conservation, Czech Republic
RO	Romania
SK	Slovak Republic
SLO	Slovenia
TOCOEN	Toxic Organic Compounds in the Environment
Total-PCBs	Sum of all PCBs estimated on the basis of analysis results for Indicator PCBs
TR	Turkey
UN ECE	United Nations Economic Commission for Europe
w.w.	wet weight
WWTP	Waste water treatment plant

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Endnotes

[1] European Commission, DG Health and Consumer Protection, Reports on tasks for scientific cooperation (SCOOP); Report of experts participating in Task 3.2.5; Assessment of dietary intake of dioxins and related PCBs by the population of EU Member States, 7 June 2000

[2] European Commission, DG Health and Consumer Protection: Opinion of the Scientific Committee on Animal Nutrition (SCAN) on the dioxin contamination of feedingstuffs and their contribution to the contamination of food of animal origin, adopted on 06.11.2000

[3] Joas, R., Potrykus, A., Hosseinpour, J., Rottler, H., Schott, R.: Preparatory actions in the field of Dioxins and PCBs; on behalf of the European Commission, DG Environment, Brussels, April 2002

[4] Joas, R., Potrykus, A., Hosseinpour, J., Rottler, H., Schott, R.: Dioxins and other POPs in by-products, recyclates and wastes and their potential to enter the food chain; on behalf of the European Commission, DG Environment, Brussels, September 2002

[5] North Rhine Westphalia State Environment Agency: European Dioxin Emission Inventory Stage I and II; on behalf of the European Commission, DG Environment, Brussels, September 1999 (stage I) and December 2000 (stage II)

[6] Commission Directive 2002/69/EC of 26 July 2002 laying down the sampling methods and the methods of analysis for the official control of dioxins and the determination of dioxin-like PCBs in foodstuffs

[7] Commission Directive 2002/70/EC of 26 July 2002 establishing requirements for the determination of levels of dioxins and dioxin-like PCBs in feedingstuffs

Annex I: Questionnaire and Structure of the Homepage

Questionnaire

Introduction

In the framework of the implementation of the "Community Strategy for dioxins, furans and PCBs" (COM(2001)593) and given the high priority given by the Council to include the Candidate Countries in the implementation of this strategy the European Commission, Environment Directorate General has launched a research project on "*Environmental Levels and Human Exposure to Dioxins and PCBs in Candidate Countries".*

The present questionnaire shall help to prepare an overview of available data on environmental levels of dioxins and PCBs as well as related human exposure in Candidate Countries. Relevant data and information shall be collected from governments, competent authorities and from scientists and other experts throughout the Candidate Countries. In this context we would ask you to respond to the present questionnaire.

Instructions to answer the questionnaire

The questionnaire is divided in two parts: Part I (questions no 1 to 10) is related to environmental levels and part II (questions no 11 to 19) is related to human exposure.

Each question is followed by a short table to facilitate your answer:

- *"Information attached"*
  Please attach available information in a numbered annex (numbering of annexes according to the number of the corresponding question)
- *"Information documented at"*
  Please let us know where available information is documented e.g. websites, references, etc.
- *"Not existing"*
  Please note if the topic in questions does not exist according to your knowledge (e.g. no corresponding national law existing)
- *"Contact for further information"*
  Please fill in or attach a list of persons or institutions that you would recommend to contact for detailed information related to the corresponding question

If you have any questions, please do not hesitate to contact us (mail@bipro.de, telephone ++49-89-18.97.90.50).

What to do with the completed questionnaire?

Please send the questionnaire and the attached information at the latest until 30 of April 2003 to BiPRO GmbH, Grauertstr. 12, D-81545 München, Germany.

Part I: Environmental levels

1. ***Are there national regulations regarding one or several of the following items?***

Could you please provide us all relevant information about legislation with respect to:

- Dioxin[1]/ PCB[2] emission
- Production/ Use of PCBs
- Dioxin/ PCB immission
- Dioxin/ PCB environmental levels

National laws and/or guidelines related to Dioxin/PCB emission, utilisation or environmental contamination

Information attached (e.g. annex)	
Information documented at (e.g. www…)	
Not existing	
Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

2. ***Are there national limit values, action values or target values set with respect to:***

- Dioxin/ PCB emission ?
- Dioxin/ PCB immission ?
- Dioxin/ PCB environmental levels ?

If yes, could you please provide us the relevant information (values and corresponding reference).

[1] The term "dioxins" refers to polychlorinated di-benzo-dioxins and –furans (PCDDs and PCDFs)

[2] The term "PCBs" refers to polychlorinated biphenyls

Limit values and recommended levels

Information attached (e.g. annex)	
Information documented at (e.g. www…)	
Not existing	
Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

3. ***Are there any national research programmes (accomplished or in progress) or do you participate in international programmes?***

   Could you please provide us all relevant information about your national research activities in the field of dioxins and/or PCBs.

   Research programmes national /international

Information attached (e.g. annex)	
Information documented at (e.g. www.….)	
Not existing	
Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

4. ***Are there any national monitoring activities (accomplished or in progress) or do you participate in international programmes?***

   Could you please provide us all relevant information about your national monitoring programmes in the above mentioned fields.

   Monitoring programmes

Information attached (e.g. annex)	
Information documented at (e.g. www.….)	
Not existing	

Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

5. ***Is there any collection of national contamination data for dioxins/ PCBs in various environmental compartments?***

Please send us all available contamination data in the fields of air, soil sediments (sludges), water, vegetation and wildlife or any other information that is relevant with respect to the ecosystem.

Contamination data for air, soil, sediments, water, vegetation, wildlife, etc.

Information attached (e.g. annex)	
Information documented at (e.g. www.….)	
Not existing	
Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

6. ***What are the locations of actual or historical possible dioxin/ PCB sources (e.g. industrial agglomerations and waste incinerators)?***

Could you please send us all relevant information about the location and number of the main possible “hot spots” (chemical or metal industry sites, waste incinerators).

Industrial agglomerations (chemistry, metal industry) and municipal waste incinerators

Information attached (e.g. annex)	
Information documented at (e.g. www.….)	
Not existing	
Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

7. Which are the competent authorities (ministries, administrational bodies) for implementation and enforcement of the above mentioned laws and regulations?

Implementation/ enforcement organs

Information attached (e.g. annex)	
Information documented at (e.g. www.….)	
Not existing	
Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

8. What are the existing know-how capacities to cope with dioxin and PCB related issues (people and institutions)?

Could you please name all relevant institutions and experts concerned with dioxin/PCB emission, environmental contamination or data collection and note their address for further contacts.

Research institutions, national experts in the field

Information attached (e.g. annex)	
Information documented at (e.g. www.….)	
Not existing	
Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

9. What are the existing infrastructure capacities to cope with dioxin and PCB related issues (Laboratories, PCB destruction capacities, etc.)?

Could you please name all laboratories concerned with environmental analyses of dioxins and PCBs, existing PCB-destruction capacities and other infrastructures related to the issue and note their address for further contacts.

Research institutions, national experts in the field

Information attached (e.g. annex)	
Information documented at (e.g. www.….)	
Not existing	
Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

10. What are national plannings and priority actions in respect to legislation, communication, monitoring, research and emission reduction?

Could you please provide us all relevant information about planned actions including the intended timetable of their realisation.

National plannings and priority actions (e.g. foreseen regulations, communication, emission reduction, contamination monitoring, research etc.)

Information attached (e.g. annex)	
Information documented at (e.g. www.….)	
Not existing	
Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

Part II: Human exposure

11. Are there any national regulations regarding Dioxin/ PCB contamination and human exposure?

Could you please provide us all relevant information about legislation with respect to Dioxin/ PCB contamination and human exposure.

National laws and/ or guidelines related to Dioxin/PCB contamination or human intake

Information attached (e.g. annex)	
Information documented at (e.g. www.….)	
Not existing	
Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

12. Are there national limit values, action values or target values set with respect to:

- human dioxin/ PCB intake (e.g. tolerable intake levels)?

If yes, could you please provide us the relevant information.

Limit values for tolerable intake and levels in venous serum, milk or body tissues

Information attached (e.g. annex)	
Information documented at (e.g. www.….)	
Not existing	
Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

13. Are there any national monitoring activities (accomplished or in progress) or do you participate in international monitoring programmes?

Could you please provide us all relevant information about your national monitoring programmes in the fields of human exposure (e.g. food monitoring programmes, total dietary exposure studies, human tissue level monitoring) stating also as far as possible the monitored Dioxin/ PCB congeners, the responsible authority and monitoring frequency.

Monitoring programmes

Information attached (e.g. annex)	
Information documented at (e.g. www.….)	
Not existing	
Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

14. Are there any national research programmes (accomplished or in progress) or do you participate in international programmes?

Could you please provide us all relevant information about your national research programmes in the field of human exposure.

Research programmes national /international

Information attached (e.g. annex)	
Information documented at (e.g. www.….)	
Not existing	
Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

15. Is there any collection of national contamination data for dioxins/ PCBs in feed, food, blood, breast milk or other body tissues?

Please send us all available contamination data in the below mentioned fields.

Data for dioxin/ PCB contamination in food/ feed, breast milk, venous serum/ plasma, placenta, sebum or hair

Information attached (e.g. annex)	
Information documented at (e.g. www.….)	
Not existing	

Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

16. Are there any national statistics about the population's dietary consumption habits?

If yes, please send us all available data.

Statistical data on national dietary consumption habits

Information attached (e.g. annex)	
Information documented at (e.g. www.….)	
Not existing	
Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

17. Are there any studies/assessments on the dietary intake of dioxins and/or PCBs?

If yes, please send us all available data.

Dietary intake assessments

Information attached (e.g. annex)	
Information documented at (e.g. www.….)	
Not existing	
Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

18. What are the existing capacities in the fields of analysis and research?

Could you please name all competent institutions and experts concerned with human dioxin/ PCB exposure and note their address for further contacts.

Analysis laboratories, research institutes, national experts in the field of human exposure

Information attached (e.g. annex)	
Information documented at (e.g. www.….)	
Not existing	
Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

19. What are your national plannings and priority actions in respect to communication, monitoring, research and emission reduction?

Could you please provide us all relevant information about planned actions including if possible the intended timetable for realisation.

National plannings and priority actions (communication, monitoring of food and human tissue levels, contamination reduction, research etc.)

Information attached (e.g. annex)	
Information documented at (e.g. www.….)	
Not existing	
Contact for further information (e.g. name of body or expert; e-mail, fax, phone)	

Project homepage

Homepage structure

1. Home

1.1 ELICC (project consortium)
- BiPRO (link & mail)
- RECETOX (link & mail)
- Project Team

1.2 Background and project objectives
Commission Strategy
Project Background

1.3 Project approach
- Work programme
- Time schedule and milestones

2. Project results

2.1 Project reports

2.1.1 Executive Summary

2.1.2 Interim Reports

2.1.3 Full Report

2.1.4 Recommendations

2.2 Environmental levels in Candidate Countries and comparison with EU average levels

2.2.1 Air

2.2.2 Water

2.2.3 Soil

2.2.4 Sediments

2.2.5 Vegetation

2.2.6 Wildlife

2.2.7 Conclusions for the ecosystem as a whole

2.3 Human exposure in Candidate Countries and comparison with EU average levels

2.3.1 Contamination data food

2.3.2 Dietary intake data

2.3.3 Dietary exposure data

2.3.4 Contamination data feedingstuffs

2.3.5 Human contamination levels

2.4 Linkage between environmental levels and human exposure

2.5 Legal situation

2.5.1 Existing regulations and laws

2.5.2 Existing limit values

2.5.3 Enforcement authorities

2.6 Monitoring and research programmes

2.7 Capacities

2.8 Congener specific data

2.9 Trends

2.10 Data gaps and prioritisation of actions to fill them

3. Discussion forum

Open structure, request to place questions for discussion or project relevant results on the website (or to provide them on a confidential basis to the project team)

4. Events

Selected events in the field of dioxins and PCBs or other POPs

5. Contact us

Contact data ELICC, BiPRO and RECETOX

6. Links

Selected links

BiPRO
Beratungsgesellschaft für integrierte Problemlösungen

Home | Project results | Discussion forum | Events | Contact | Links

TOCOEN s.r.o.

Project Homepage

Dioxins & PCBs: Environmental Levels and Human Exposure in Candidate Countries

REFERENCE: ENV.C.2/SER/2002/0085

On behalf of the European Commission, Brussels

DG Environment

Enter

Project Consortium

ELICC

Environmental **L**evels **I**n **C**andidate **C**ountries

This homepage is designed as an information exchange tool for the EU-project

"Dioxins & PCBs: Environmental Levels and Human Exposure in Candidate Countries"

The homepage informs the public and all project partners on the project background (#link) and gives an updated overview on the project results (#link) and other relevant information.

The links (#link) and the discussion forum (link) shall initiate an information exchange between experts and interested individuals throughout Member and Accession States of the European Union in the field of dioxins and PCBs and related issues. The information exchange by the means of this web-page may be maintained after the end of the project in order to continue the information exchange.

The Contractor for the project "Dioxins & PCBs: " is the ELICC Consortium. **ELICC** stands for "**E**nvironmental **L**evels and Human Exposure **I**n **C**andidate **C**ountries".

The Consortium is formed by two partners situated on the one hand in the Candidate Countries (**TOCOEN s.r.o.** from Brno, Czech Republic) and on the other hand in the Member States (**BiPRO GmbH** from Munich, Germany).

Both stand for long time experienced institutions in the field of dioxins, PCBs and other POPs with particular experiences related to the environmental occurrence of POPs:

BiPRO GmbH #link	TOCOEN, s.r.o. #link
Beratungsgesellschaft für integrierte Problemlösungen	Kamenice 126/3
Grauertstr. 12	625 00 Brno
D-81545 München	Czech Republic
Tel: +49-(0)89-18 97 90 50	Phone: +420 5 47 121 401
Fax: +49-(0)89-18 97 90 52	Fax: +420 5 47 121 431
e-mail: mail@bipro.de	e-mail: holoubek@recetox.muni.cz

The core project team consists of the following persons:

Dr. Reinhard Joas (Dipl.-Ing., Dipl.-Ök.)	Prof. Dr. Ivan Holoubek
Dipl.-Biol. Alexander Potrykus	RNDr. Irena Holoubková
Dr. Med. Anke Joas	Mgr. Pavel Čupr, PhD.
Dipl.-Wirtsch.-Ing. Sonja Bauer	Mgr., Ing. Jiří Kohoutek

The core project team is supported by a row of external members: Ing. Anton Kočan, CSc. (Slovakia), Dr. Ott Roots (Estonia), Prof. Dr. Jerzy Falandysz (Poland), Dr. Ernest Voncina (Slovenia), Dr. Oya Okay (Turkey), Dr. Sylvia Raykova (Bulgaria), Dr. Jamshid Hosseinpour (Ökometric, Germany), Ing. Rudolf Schott (AFC, Austria)

An important background of the project is formed by the "Community Strategy for Dioxins, Furans and Polychlorinated Biphenyls" of the European Commission (#link). The Environment Council adopted Conclusions on the Commission Communication stressing the need for the Candidate Countries to be involved from an early stage on in the development of such a strategy, with special attention to the inventory of sources of dioxins, furans and PCBs and the monitoring of environmental and human exposure.

In the past the Commission has launched several studies on dioxin emissions that revealed a harmonised view on dioxin issues across Member States (#links), which is apparently lacking for Candidate Countries. This lack of data can be also expected for information on the exposure to PCBs.

Against this background there are two important objectives of this project stated by the European Commission. First to prepare an overview and analysis of available data on environmental levels of dioxins and PCBs as well as related human exposure in Candidate Countries which will be part of a first integral assessment on the extend of the dioxin and PCB related issues in Candidate Countries. Second to contribute to the capacity building in Candidate Countries which will be achieved by mutual know how transfer and close cooperation.

The project concept is outlined in order to fulfil the two overall tasks to

- collect and evaluate available data on environmental levels of dioxins and PCBs and on human exposure to these substances across all 13 candidate countries, i.e. Bulgaria, Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia and Turkey as a primary task and
- to contribute to capacity building in candidate countries as a secondary task

Accordingly the work will be realised in close consultation with competent authorities, institutions and internationally accepted experts from the candidate countries in cooperation with experienced team members from the Member States that have realised several POP related projects at European level. Relevant information supplied by the DG Environment and by the JRC will be integrated into the results. Where possible links to other relevant projects shall be established in order to use synergies and to avoid double work. In particular links to the EC-HELCOM project on “Integrated Monitoring and for dioxins and PCBs in the Baltic Region” will be established.

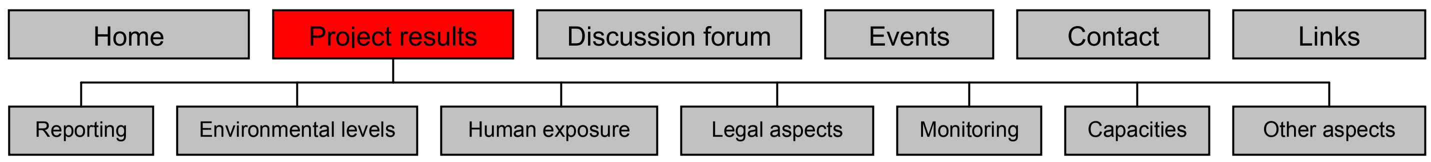
To achieve the project objectives in an efficient way, several focal working points, each of them subdivided in precise tasks, are carried through. The concept represents a modular and systematically organised structure providing causal based and transparent results. Results will be available according to the following time schedule:

Focal working points	Jan 03	Feb 03	Mrz 03	Apr 03	Mai 03	Jun 03	Jul 03	Aug 03	Sep 03	Okt 03	Nov 03	Dez 03	Jan 04	Feb 04		End 2004
Reporting																
Structure of information																
Strategy to collect information																
Environmental levels																
Human Exposure																
Capacity building																
Recommendations																

After approval of the European Commission, the interim and final results are provided on the present homepage under "project results". #link.

BiPRO
Beratungsgesellschaft für integrierte Problemlösungen

TOCOEN s.r.o.



The project results shall demonstrate the status of work and shall invite all interested experts to contribute to the results where they can provide additional or new data or to contribute to the discussion.

The results are made available after approval of the Project Coordinator at the European Commission (#link?).

You will find the results via the above link-bar according to the following structure:

1.1 Project reports

1.1.1 Executive Summary

1.1.2 Interim Reports

1.1.3 Full Report

1.1.4 Recommendations

1.2 Environmental levels in Candidate Countries and comparison with EU average levels

1.2.1 Air

1.2.2 Water

1.2.3 Soil

1.2.4 Sediments

1.2.5 Vegetation

1.2.6 Wildlife

1.2.7 Conclusions for the ecosystem as a whole

1.3 Human exposure in Candidate Countries and comparison with EU average levels

- 1.3.1 Contamination data food
- 1.3.2 Dietary intake data
- 1.3.3 Dietary exposure data
- 1.3.4 Human contamination levels

1.4 Linkage between environmental levels and human exposure

1.5 Legal situation

- 1.5.1 Existing regulations and laws
- 1.5.2 Existing limit values
- 1.5.3 Enforcement authorities

1.6 Monitoring and research programmes

1.7 Capacities

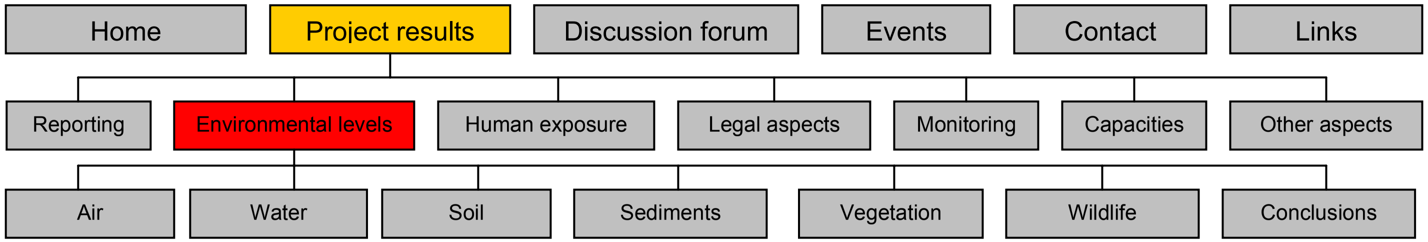
1.8 Other aspects

- 1.8.1 Availability of congener specific data
- 1.8.2 Time trends
  - 1.8.2.1 Environmental time trends
  - 1.8.2.2 Human contamination level time trends
- 1.8.3 Data gaps and prioritisation of actions to fill them
- 1.8.4 Link to a parallel project on dioxin emissions

The project interim and final report and selected presentations will be made available here after approval by the project coordinator at the European Commission:

Downloads:

- First progress report #download
- Interim report #download
- Brno workshop presentation #download
- Final presentation #download
- Final report #download

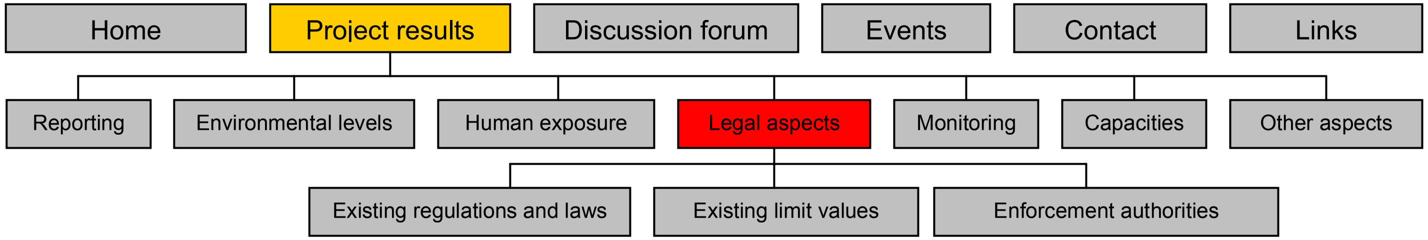


First results on environmental levels will be presented as soon as available and approved by the Project Coordinator at the European Commission.

Please contact us if you are able to contribute to the results or the discussion with respect to environmental levels #link BiPRO.

First results on human exposure will be presented as soon as available and approved by the Project Coordinator at the European Commission.

Please contact us if you are able to contribute to the results or the discussion with respect to human exposure #link BiPRO.

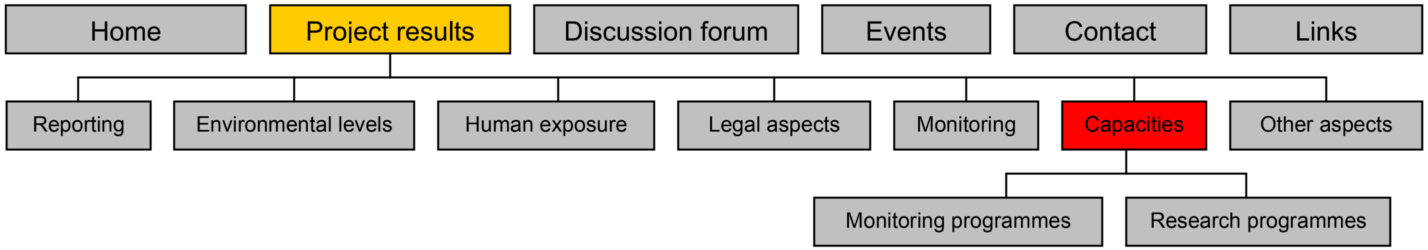


First results on legal aspects will be presented as soon as available and approved by the Project Coordinator at the European Commission.

Please contact us if you are able to contribute to the results or the discussion with respect to legal aspects #link BiPRO.

First results on monitoring and research programmes will be presented as soon as available and approved by the Project Coordinator at the European Commission.

Please contact us if you are able to contribute to the results or the discussion with respect to monitoring and research on dioxins and PCBs #link BiPRO.



First results on existing know how-capacities and infrastructure capacities (such as analytical laboratories or PCB destruction infrastructure) will be presented as soon as available and approved by the Project Coordinator at the European Commission.

Please contact us if you are able to contribute to the results or the discussion with respect to monitoring and research on dioxins and PCBs #link BiPRO.

First results on other aspects will be presented as soon as available and approved by the Project Coordinator at the European Commission.

Other aspects are in particular:

- Congener specific data where available and relevant
- Time trends
- Data gaps

Please contact us if you are able to contribute to the results or the discussion with respect to these aspects #link BiPRO.

The discussion forum (link) shall provide an information platform for an information exchange and discussion between experts and interested individuals throughout Member and Accession States of the European Union in the field of dioxins and PCBs and related issues.

The information exchange by the means of this web-page may be maintained after the end of the project in order to continue the information exchange.

Please send us your questions, comments and contributions to the discussion. The project team will evaluate your contribution and will put it on this web-site for a structured discussion. #Note that your e-mail address will be visible in the corresponding contribution.

Please keep in mind to indicate if any information provided shall be treated confidential and shall not be put on the web-site.

See contributions: #link

Make a contribution: #link mail@BiPRO.de

our Workshop in Brno, November 2003: #Link

possibly final workshop on the present project beginning 2004

workshop on dioxin emissions in CCs including the results from the present project

events Baltic? (#Birgit v.T?)

#Dioxin 2003 Boston: http://www.dioxin2003.org/index1.htm

#Contact details ELICC

http://europa.eu.int/comm/environment/dioxin/index.htm
Link of the European Commission "Dioxin Exposure and Health"

http://europa.eu.int/comm/research/endocrine

http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=55264
U.S. EPA page on Dioxin and related compounds

http://www.who.int/fsf/Chemicalcontaminants/
Link to the WHO page on "Dioxins and their effects on human health"

http://www.chem.unep.ch/pops/
UNEP webpage on POPs

http://www.ejnet.org/dioxin/
Enviroweb "Dioxin Homepage"

http://c3.org/chlorine_issues/understanding_dioxin/dioxin_index.html
Chlorine Chemistry Council webpage "understanding dioxin"

http://www.ping.be/~ping5859/
The Chlorophiles web page

http://www.greenpeaceusa.org/toxics/
Greenpeace U.S.A. on POPs and other toxics

http://www.helcom.fi
Helsinki Commission

Annex II: Monitoring and Research

Content

Monitoring - ambient air and deposition

	Monitoring – Ambient air; Deposition						Responsible Authority/ Enforcement Organ
	Monitoring programme (national/international)	**Type of sample**	**Determined compounds**	**Description**	**Monitoring frequency**	**Monitoring period**	
CZ	UN ECE/EMEP Monitoring Programme – PBT Compounds – Middle European Background Monitoring – Regional Observatory Košetice, South Bohemia	Air, wet deposition	PCBs	Regional background monitoring	Air – every weekend Deposition – every event	since 1988	RECETOX – TOCOEN & Associates (Ivan Holoubek) / Czech Hydrometeorological Institute (Jaroslav Šantroch)
	Monitoring of environmental contamination	Bulk deposition	PCBs	22 sampling sites + 5 complex sampling sites	Once per year	since 1995	Chemical Institute Prague (Karel Volka) /Ministry of the Environment
	Occurrence of POPs in ambient air and deposition in the Czech Republic	Ambient air and deposition	PCDD/Fs	35 stations	monthly	1996-2001	Czech Ministry of Environment
	GA 1582/94: Determination of organic pollutants in Prague area 1994-95	Ambient air	PCBs, PCDD/Fs		monthly	1994-1995	Ministry of Environment AXYS Variolab
EST	Nordic environment research program	Ambient air; precipitation and deposition	PCBs	2 stations	Once per year (2 weeks)	1993-97, 1999	Estonian Environmental Research Centre
	Swedish Baltic Programme	Deposition	PCBs	2 stations	monthly (n = 9/12)	1991-1992	Swedish EPA
LV	Environmental Research in the Baltic Sea Region	Ambient air; precipitation and deposition	PCBs	3 stations	monthly	1993-97, 1999	Nordic Council of Ministers
	Swedish Baltic Programme	Deposition	PCBs	1 station	monthly (n=2)	1991-1992	Swedish EPA
LT	Nordic environment research program	Ambient air; precipitation and deposition	PCBs	1 station	monthly	1993-97, 1999	Nordic Council of Ministers
	Swedish Baltic Programme	Deposition	PCBs	1 station	monthly (n=15)	1991-1992	Swedish EPA
PL	PCBs in ambient air in city of Gdansk	Ambient air	PCBs		monthly	1991-1992	Ministry of Environment; University of Gdansk
	Ambient air concentration and emissions of dioxins in Krakow	Ambient air	PCDD/Fs		monthly (8 month)	1995/96	Ministry of Environment; Krakow Technical University
	Swedish Baltic Programme	Deposition	PCBs	2 stations	monthly (n = 4/4)	1991-1992	Swedish EPA

	Monitoring – Ambient air; Deposition						Responsible Authority/ Enforcement Organ
	Monitoring programme (national/international)	**Type of sample**	**Determined compounds**	**Description**	**Monitoring frequency**	**Monitoring period**	
SK	Local studies on air quality in the cities of Bratislava and Košice – national needs assessment of air pollution	Ambient air	PCBs; PCDD/Fs	20 sites: background, rural., urban, industrial in Bratislava, Kosetice and 5 other places	monthly	1996 - 1997	Slovak Hydrometeorological Institute
	No monitoring in ambient air						
	BG, CY, HU, MT, RO, SLO, TR						

Monitoring – water

	Monitoring – Surface waters						Responsible Authority/ Enforcement Organ
	Monitoring programme (national/international)	**Type of sample**	**Determined compounds**	**Description**	**Monitoring frequency**	**Monitoring period**	
BG	no information						
CY	Monitoring and research programme for water-supply system and its resources	Surface and ground waters	PCBs	This programme covers the water-supply systems, major dams, drinking water treatment plants and part of ground water used for drinking water	annually	Since 1988	State General Laboratory SGL, Water Development Department, Department of Medical and Public Health Services DMPHS
	Monitoring of ground waters	Ground waters	PCBs	no information			Geological Survey Department
	National Programme for Surface Water	Surface waters	PCBs	The programme covers in terms of capacity the 80 % of the surface water in Cyprus	annually	since 1988	State General Laboratory, Lab of Environmental Chemistry
CZ	National monitoring the quality of surface and ground waters	Surface and ground waters	PCBs	44 complex sampling sites + 257 profiles of surface waters 457 wells for ground waters sampling	12 times per year – surface waters 2 times per year – ground waters	1992	Czech Hydrometeorological Institute (Mark Rieder) / Water Research Institute (Vladimír Kužílek)
	UN ECE/EMEP Monitoring Programme – PBT Compounds – Middle European Background Monitoring – Regional Observatory Košetice, South Bohemia	Surface waters	PCBs	Regional background monitoring 6 sampling sites	One times per year	Since 1988	RECETOX – TOCOEN & Associates (Ivan Holoubek) / Czech Hydrometeorological Institute (Jaroslav Šantroch)
	Project BMBF 523 KFK 9402: Determination and evaluation of River Elbe contamination by harmful substances - Czech River Elbe tributaries	Surface waters	PCBs	Sampling at 5 tributaries; total 51 sites	annually	1995, 1996, 1998	German Ministry of Education and Research
EST	HELCOM Programme	Surface waters	PCBs	3–4 stations	depending on budget	2000	EERC, Tartu University

	Monitoring – Surface waters						Responsible Authority/ Enforcement Organ
	Monitoring programme (national/international)	**Type of sample**	**Determined compounds**	**Description**	**Monitoring frequency**	**Monitoring period**	
	Toxic chloroorganic compounds in the ecosystem of the Baltic Sea		PCBs			1996	Ministry of Environment; EERC
HU	National water Monitoring	Surface water	PCBs	12 sites/118 samples nation wide	annually	1993-2003	Chief Inspectorate of Environment and water; VITUKI water resources research centre
				6/30 International Danube Program		2002	
		Groundwater		>1000 samples from wells and springs		1996-2001	
LT	National Lake Monitoring Program	Surface water	PCBs	13 lakes, 1 reservoir	2 times/year	Since 1994	Environmental Protection Agency
LT	National River Monitoring Program	Surface water	PCBs	39 rivers, 58 stations	4 times/year	Since 1996	Environmental Protection Agency
LV	No Monitoring because in testing of the centralised water supply system POPs not detected						Latvian Environment Agency
MT	None so far; Groundwater monitoring program planned						
PL	National water monitoring program	surface water	PCBs	20 river cross sections	One time /year	Since 2000	Chief Environmental Protection Inspectorate
				6 river cross sections	3-5 years	Since 1992	
RO	no monitoring						
SK	National monitoring the quality of surface and ground waters	Surface and ground waters	PCBs	more than 3 000 samples taken from rivers and lakes throughout the country	annually	1989-97	Slovak Hydrometeorological Institute / Research Institute of Water Management
	Loading of environment and population in the area of PCBs contamination		PCBs			1997-1999	Ministry of Environment
SLO	"Preparation of POPs National Implementation Plan under the Stockholm Convention	drinking water, groundwater, sea water	PCBs	Monitoring in the framework of UNEP/GEF project; no further information			Institute of Hydrometeorology
	Contamination with PCBs in and around river Krupa	surface water	PCBs	measurements at spring, mid river and river mouth	no information	1984, 1994	Ministry of Health; Institute of Public Health Novo Mesto
		ground water				1997	
TR	no information						

Monitoring - Sediments

	Monitoring – Sediments						Responsible Authority/ Enforcement Organ
	Monitoring programme (national/international)	Type of sample	Determined compounds	Description	Monitoring frequency	Monitoring period	
BG	no information						
CY	Monitoring of the major dams (Life project)	Sediments	PCBs	samples from various depth	annually	1997-98	State General Laboratory
CZ	National monitoring the quality of surface and ground waters	Sediments, suspended sediments	PCBs (OCPs, PAHs)	44 complex sampling sites + 257 profiles of surface waters 457 wells for ground waters sampling	12 times per year – surface waters 2 times per year – ground waters	Since 1992	Czech Hydrometeorological Institute (Mark Rieder) / Water Research Institute (Vladimír Kužílek)
	UN ECE/EMEP Monitoring Programme – PBT Compounds – Middle European Background Monitoring – Regional Observatory Košetice, South Bohemia	Sediments	PCBs, PCDD/Fs	Regional background monitoring	One times per year	Since 1988 6 sampling sites	RECETOX – TOCOEN & Associates (Ivan Holoubek) / Czech Hydrometeorological Institute (Jaroslav Šantroch)
	Monitoring of TOCOEN model sites	Sediments	PCBs, PCDD/Fs	rural, urban, industrial, hot spot	campaigns	1993, 19996-98, 2001, 2002	
EST	Monitoring of dangerous substances in the water bodies	Sediments	PCBs	marine sediments	annually		Ministry of Environment; Estonian Environmental Research Centre
	HELCOM Programme	Sediments	PCBs		Once/ 5 years		
HU	National monitoring program	Sediments	PCBs		annually		Chief Inspectorate of Environment and water; VITUKI water resources research centre
LT	National Lakes Monitoring Program	Sediments	PCBs	13 lakes, 1 reservoir	annually	Since 1994	Environmental Protection Agency
	National River Monitoring Program	Sediments	PCBs	39 rivers, 58 monitoring stations	annually	Since 1996	
LV	First measurements at suspected sites		PCBs	4 sites at the Daugaava river and tributaries		2003	Latvian Environment Agency
MT	none						
PL	International Oder project	Sediments	PCBs	Oder and tributaries	annually	1998-2000	Chief Environmental Inspectorate (Institute of Meteorology and water marine)
		Sediments	PCBs	Wloclawek Reservoir (Vistula)	annually	2000	

	Monitoring – Sediments						Responsible Authority/ Enforcement Organ
	Monitoring programme (national/international)	**Type of sample**	**Determined compounds**	**Description**	**Monitoring frequency**	**Monitoring period**	
PL	National Environmental Monitoring	Sediments	PCBs	Southern Baltic Sea	annually	1996-99	Institute of Meteorology & Water Management, Gdynia
	HELCOM Combine	Sediments	PCBs	benthic sediments at 9 stations	Once/ 5 years		
	Determination of content and analysis of polychlorinated biphenyls in solid waste and sludge (theses)	Sludge				06.1996-12.1998	Ministry of Environment
	Dioxins in municipal wastewater sludge as criteria of their non-industrial utilisation	Sludge	PCDD/Fs			08.2001-07.2002	Ministry of Environment
RO	research project: Coastal sediments from the Black Sea	Sediments	PCBs	10 samples from several sites along the coast	1 campaign	1995	Fillmann et al. 2002
SK	Loading of environment and population in the area of PCBs contamination	Sediments	PCBs, PCDD/Fs	river and lake sediments in polluted area and control district	campaigns	1997-1999; 2001	Ministry of Environment SHIMU (National Institute of Hydrometeorology)
SLO	Determination o PCBs in river sediments from a polluted region	river sediments	PCBs	measurements at spring, mid river and river mouth	campaigns	1984, 1994	Ministry of Health Regional Institute of Public Health Maribor
TR	Research project: Sediments from the Bosporus	coastal sediments	PCBs	10 samples from the Bosporus region	1 campaign	1995	Fillmann et al. 2002

Monitoring – soil

	Monitoring – Soil						Responsible Authority/ Enforcement Organ
	Monitoring programme (national/international)	Type of sample	Determined compounds	Description	Monitoring frequency	Monitoring period	
BG	Screening of background soils	Soils	PCBs	background soils from 96 sites	1 campaign	1999	Ministry of Environment; research project
CY	no monitoring						
CZ	UN ECE/EMEP Monitoring Programme – PBT Compounds – Middle European Background Monitoring – Regional Observatory Košetice, South Bohemia	Soils	PCBs, PCDDs/Fs)	Regional background monitoring 8 sampling sites	One times per year	Since 1988	RECETOX – TOCOEN & Associates (Ivan Holoubek) / Czech Hydrometeorological Institute (Jaroslav Šantroch)
	Basal Soil Monitoring	Soil	PCBs, PCDDs/Fs (OCPs, PAHs)	Basal monitoring of soil quality 40 sampling sites	One time per year	Since 1992	Central Institute for Supervising and Testing in Agriculture (CISTA) (Jiří Zbíral) / Ministry of Agriculture
	Monitoring of soil contamination	Soil	PCBs, PCDDs/Fs (OCPs, PAHs)	Study of contamination of selected sites 30 sampling sites	One time per year	Since 1992	Research Institute of Amelioration and Soil Conservation (RIASC) (Radim Vácha) / Ministry of Agriculture
EST	Hot spot monitoring near landfill (Laguja)	Soil	PCDD/Fs	Contamination levels near possible source	annually		EERC
HU	National Soil Monitoring Program	Soil	PCBs, PCDD/Fs,	country wide	annually	1996, 1997	Hungarian Academy of Science, Research Institute for Soils and Agrochemie
LT	no monitoring up to now						
LV	First measurements at suspicious sites		PCBs	sampling near electrical equipment at 27 former military camps	1 campaign	2003	Latvian Environmental Agency
PL	Monitoring of agricultural & forest soils,	Soils	PCBs		annually	1990-1994	University of Gdansk

	Monitoring – Soil						Responsible Authority/ Enforcement Organ
	Monitoring programme (national/international)	**Type of sample**	**Determined compounds**	**Description**	**Monitoring frequency**	**Monitoring period**	
	Monitoring of military camps and industrially polluted soils in Silesias	Soils	PCBs	Soviet military base Swinoujiscie; industrial, urban sites near Katowice, Krakow	campaign	1994	University of Gdansk
RO	Measurements in different regions of the country	Soils	PCBs	rural, urban, industrial soils country wide	campaign	1999, 2001	Ministry of Environment; research project
SK	Basal Soil Monitoring	Soil	PCBs (OCPs)	Basal monitoring of soil quality	One time per 5 years	Since 1991	Central Institute for Supervising and Testing in Agriculture (CISTA) / Ministry of Agriculture
	Loading of environment and population in the area of PCBs contamination	Soil	PCBs	agricultural soils in Eastern Slovakia	1 campaign	1997-1999	Ministry of Environment
	Human exposure in risk area region Michalovce by PCBs and related compounds	Soil	PCBs	industrial hot spots; agricultural and forset soils in contaminated region	campaigns	1997-1999	Ministry of Health
SLO	Monitoring of hot spot region "Bela Krajina"	Soils	PCBs	arable land, grassland, forest soils in contaminated region	campaigns	19987-88; 1991	Ministry of Health
	recent monitoring according to UNEP information; but no data						
TR	no monitoring						

Monitoring - vegetation

	Monitoring – Vegetation						Responsible Authority/ Enforcement Organ
	Monitoring programme (national/international)	Type of sample	Determined compounds	Description	Monitoring frequency	Monitoring period	
CZ	UN ECE/EMEP Monitoring Programme – PBT Compounds – Middle European Background Monitoring – Regional Observatory Košetice, South Bohemia	Mosses, needles	PCBs, (OCPs, PAHs)	Regional background monitoring	Mosses, needles - one time per year	Since 1988 8 sampling sites	RECETOX – TOCOEN & Associates (Ivan Holoubek) / Czech Hydrometeorological Institute (Jaroslav Šantroch)
	Monitoring of environmental contamination	Mosses, needles	PCBs, (OCPs, PAHs)	22 sampling sites + 5 complex sampling sites	One time per year	Since 1995	Chemical Institute Prague (Karel Volka) / Ministry of the Environment
	Occurrence and toxicity of POPs (PAHs, OCPs, PCBs, PCDDs/Fs) in high mountains spruce ecosystems	Spruce needles	POPs (PAHs, OCPs, PCBs, PCDDs/Fs)	8 sampling sites in boundary mountains	2 campaigns	1995-1997	Grant Agency; RECETOX – TOCOEN & Associates (Ivan Holoubek)
PL	Research project	Pine needles	PCBs	sampling sites in boundary mountains	1 campaign		Migaszewski et al. 1999
SLO	Research project	Spruce needles	PCBs, PCDD/Fs	sampling sites in boundary mountains in Austria and Slovenia	1 campaign	2000	EPA Vienna and Ljubljana
	no monitoring in the other countries						

Monitoring - wildlife

	Monitoring – Wildlife						Responsible Authority/ Enforcement Organ
	Monitoring programme (national/international)	**Type of sample**	**Determined compounds**	**Description**	**Monitoring frequency**	**Monitoring period**	
BG	no information						
CZ	Monitoring of veterinary commodities	wild game, fish	PCBs, PCDDs/Fs	hundreds of samples per year covering major production areas of the country	monthly	Since 1984	State Veterinary Administration of the CR (Jiří Drápal) / Ministry of Agriculture
	Monitoring of environmental contamination	hare, fish,	PCBs,	22 sampling sites + 5 complex sampling sites		Since 1995	Chemical Institute Prague (Karel Volka) /Ministry of the Environment
EST	Monitoring of hazardous substances in the coastal sea	Fish	PCBs (OCPs)	18 samples from 3 regions (Tallin, Kunda, Pärnu Bay)	Yearly	Since 1976	Extonian Environmental Research Centre (EERC)
	Dioxin analysis in Baltic Sea Fish	Fish, herring, sprat	PCDDs/Fs	(with/without skin)	Yearly		Ministry of Agriculture
	HELCOM Programme (Marine Monitoring)	Fish female herring (2-3 years)	PCBs (OCPs)	4 Herrings /3-4 stations	Yearly	Since 1994	EERC
		Plankton, Algae, Mussels,	PCBs	south of island Hiiumaa	One time per year		EERC
	Research project	Perch	PCBs	Väinimeri Sea	1 campaign	1992–93	Blomkvist et al.1993
		Perch	PCBs	100 individual samples; 5 regions	Yearly	1998–2002	Roots, Holoubek, Zitko
	Research project	Grey Seal	PCBs	Väinameri Sea, Vilsandi National Park	1 campaign	1994	EERC
HU	no monitoring						
LT	Research project	Perch	PCBs	Kuronian Bay	1 campaign	1992–93	Blomkvist et al.1993
	National food monitoring	Wild game	PCBs	in the framework of the national food monitoring programme	annually	since 2001	State Food &Veterinary Service
LV	Monitoring of dioxin levels in Fish of Baltic Sea and Gulf of Riga	Fish (Sprat, Cod, Herring)	PCDD/Fs	16 fish samples 30 samples	One times per year	2002 – 2003 2003	Food and Veterinary Service of Latvia (Maris Balodis)
	Research project	Perch	PCBs	Daugava estuary	1 campaign	1992–93	Blomkvist et al.1993

	Monitoring – Wildlife						Responsible Authority/ Enforcement Organ
	Monitoring programme (national/international)	**Type of sample**	**Determined compounds**	**Description**	**Monitoring frequency**	**Monitoring period**	
MT	National food monitoring	wild fish	PCBs, PCDD/Fs	included in the national food monitoring	annually	since 2001 (PCBs); since 2003 (PCDD(Fs)	National Meat Residue Program; Department of Veterinary Services
PL	HELCOM Programme Marine Monitoring	Herring, Mussels	PCBs		One time per year		Institute of Meteorology & Water Management Gdynia
	National Monitoring Programme	Herring, Cod, Sprat, Plaice	PCBs	hundreds of samples of major fish species	Yearly	Since 1995	Sea Fisheries Institute/ Ministry of Agriculture
	National Food Monitoring	Wild boar Carp	PCBs	included in national food monitoring		1998-2000	Ministry of Agriculture
	Monitoring of Baltic Sea fish	herrings flounder cod salmon	PCDD/Fs	10 samples each from the Baltic Sea	annually	2002	Technical University Krakow
	Monitoring of Baltic Sea fish	perch, pike perch, flounder cod herring eelpout	dl PCBs	3-20 samples from the Gulf of Gdansk	1 campaign	2001	University of Gdansk
	Monitoring of the aquatic food chain	mussles, fish, harbr porpoise, cormorant, sea eagle	PCDD/Fs	screening project for risk assessment to the aquatic environment	1 campaign	1992-93	University of Gdansk
RO	Measurements in the Danube Delta	Bird eggs	PCBs		1 campaign	1997	Augiri et al. 2000
	Measurements in the Danube Delta	Fish Cormorant Biota	PCBs	First screening at 3 sites	campaign	2000	Covaci et al. 2001
SK	Loading of environment and population in the area of PCBs contamination	Plankto-/Benthophags & Predators	PCBs	117 samples from hot spot region and control area	1 campaign	1997-1999	Ministry of Healtht; Institute of Preventive and Clinical Medicine
	National Monitoring Programme	wild game		about 1,000 samples of wild game caught throughout the country	monthly	1988-1998	Ministry of Health; Institute of Preventive and Clinical Medicine

Food and foodstuffs

	Monitoring – Food						Responsible Authority/ Enforcement Organ
	Monitoring programme (national/international)	Type of sample	Determined compounds	Description	Monitoring frequency	Monitoring period	
BG	no information						
CY	National Food Monitoring Programme	Milk, Meat	PCBs		2 campaigns	1999-2000	State General Laboratory, Ministry of Health
CZ	National programme – Total diet study	Food basket	PCBs, dl PCBs, PCDDs/Fs	Representative pooled samples of diet (4 x 108 / year) – PCBs (OCPs) 4 aggregated samples per year – DL PCBs, PCDDs/Fs	One times per year	Since 1994	National Institute of Public Health, Centre of Food Chains (Jiří Ruprich) Ministry of Health
	Monitoring of veterinary commodities	Meals, eggs, wildlife, fish, cereals, milk	PCBs, PCDD/Fs	several hundred samples per year from different regions of the country	monthly	Since 1984	State Veterinary Administration of the CR (Jiří Drápal); State Agriculture and Food Inspectorate (Petr Cuhra) / Ministry of Agriculture
	Monitoring of drinking water quality	Drinking water	PCBs				National Public Health Institute / Ministry of Health
EST	National Monitoring Programme	meat , pork, sausage, frankfurter, liver paste, butter, milk, egg, raw fish, fat, cheese, eggs	Bs	100 samples	yearly	Since 2000	Tartu Laboratory of Health Protection Inspectorate, Ministry of Health
		fish	PCDD/Fs	20 samples	2x/year	Since 2002	Ministry of Agriculture
HU	Analysis of imported food		PCBs	**no information**			National Institute of Food Hygiene & Nutrition
LT	National Food monitoring programme	red meat, poultry, fish, milk, eggs, wild game and honey	PCBs	hundreds of samples/ year	monthly	Since 2002	State Food and Veterinary Service, Ministry of Agriculture, Ministry of Health
LV	Monitoring of dioxins &dl-PCBs in fish & fishery products	(Herring, Cod, Sprat)	PCDDs dl-PCBs	Gulf of Riga and the Baltic proper	2 times/year	Since 2002	Food & Veterinary Service Latvian Institute of Fishery

	Monitoring – Food						Responsible Authority/ Enforcement Organ
	Monitoring programme (national/international)	**Type of sample**	**Determined compounds**	**Description**	**Monitoring frequency**	**Monitoring period**	
MT	National Meat Residues Programme	Cattle, Pig, poultry, fish, bovine milk	PCBs PCDDs	Number of samples 04 PCB: cattle (1), pig (1), Poultry (2), Fish (4), Milk (10) PCDD: Cattle (1), Pig (1), Milk (5)	annually	PCBs since 2001 PCDDs since 2003	Department of Veterinary Services
PL	National Monitoring Programme	Fish, fish products	PCBs	Herring, cod, sprat, plaice and fish products	monthly	1995 - 2001	Ministry of Agriculture and Rural Development / Sea Fisheries Institute
	Monitoring of quality of soils, plants, agriculture products and foodstuffs	meat products, milk, butter, vegetable oils, etc	PCBs	hundreds of samples/year	monthly	ongoing since 1995	National Veterinary Research Institute in Pulawy and Meat and Fat Research Institute in Warsaw
RO	no information						
SK	Monitoring of drinking water quality	Drinking water	PCBs (OCPs)		annually	since 1988	National Public Health Institute / Ministry of Health
	Food monitoring	Meat, milk, drinking water, food basket (3 regions) fish, wild game	PCBs PCDD/Fs	hundreds of samples/year	2 times/year	since 1988 (PCBs) since 2001 (PCDD/Fs)	Food Research Institute; Ministry of Agriculture
SLO	Monitoring of locally produced food in Bela Krajina	meat, milk, eggs, nuts, vegetable, etc	PCBs	Locally produced food from the Bela Krajina region	campaigns	1985, 1988, 1991, currently in progress	Institute of Public Health, Novo Mesto
	National food monitoring		PCDD/Fs	no further information			
TR	no information						

Monitoring - feed

	Monitoring – Feed						Responsible Authority/ Enforcement Organ
	Monitoring programme (national/international)	**Type of sample**	**Determined compounds**	**Description**	**Monitoring frequency**	**Monitoring period**	
CZ	Monitoring of veterinary commodities	Feeds, feed water	PCBs, PCDDs/Fs (OCPs)	Few hundred samples per year covered production areas of the country		Since 1984	State Veterinary Administration of the CR (Jiří Drápal); State Agriculture and Food Inspectorate (Petr Cuhra); Central Institute for Supervising and Testing in Agriculture (CISTA) (Jiří Zbíral); Research Institute of Amelioration and Soil Conservation (RIASC) (Radim Vácha) / Ministry of Agriculture
SK	Monitoring of veterinary commodities	Feeds, feed water	PCBs (OCPs)	no information			State Veterinary Administration; State Agriculture and Food Inspectorate
no information from the other countries							

Monitoring - Human Exposure

	Monitoring – Human Exposure						Responsible Authority/ Enforcement Organ
	Monitoring programme (national/international)	**Type of sample**	**Determined compounds**	**Description**	**Monitoring frequency**	**Monitoring period**	
BG	WHO milk study (3. round)	Human milk	PCBs, dl PCBs, PCDD/Fs	2 pools		2000	Ministry of Health
CY	no monitoring						
CZ	Environmental Health Monitoring System in CR – Health effects of toxic pollutants exposure	Human milk, umbilical blood, adipose tissue, placentas, livers, brains	PCBs, dl PCBs, PCDDs/Fs	Monitoring of health effects of environmental pollutants in four selected regions	Breast milk – 400 samples per year	Since 1994	National Institute of Public Health (Milena Černá)
	WHO milk study (3. round)	Human breast milk	PCBs, dl PCBs, PCDD/Fs	3 pools	campaign	2000	Van Leuwen et al.
EST	Nordic Research Programm; Finish-Estonian research project	Human breast milk	PCDD/Fs	2 pools	campaign	1991/93	Mussalo-Lindström; Vartiainen
HU	National Human Milk Monitoring	Human breast milk	non-planar PCBs	200 samples from 20 counties	campaign#	Since 2001	National Institute of Food Hygiene & Nutrition
	Total diet studies	total diets from boarding schools	Sum of PCBs	90 samples from 3 regions	2 times/ year	mid nineties	
	WHO milk study (3.round)	Human breast milk	PCBs, dl PCBs, PCDD/Fs	3 pools	campiagn	2000	Van Leuwen et al.
	Research project	Adipose tissue	PCBs	28	caqmpaign	2000	van Bavel et al. 2003
LT	Programme for improvement of nutrition of infant and young children	Human milk & newborn blood	PCBs	92 pairs of samples	campaigns	1995-98	Ministry of Health
	WHO milk study (2. round)	Human breast milk	PCBs, dl PCBs, PCDD/Fs	2. round	campaing	1992–93	Van Leuwen et al.
MT	No monitoring						

	Monitoring – Human Exposure						Responsible Authority/ Enforcement Organ
	Monitoring programme (national/international)	**Type of sample**	**Determined compounds**	**Description**	**Monitoring frequency**	**Monitoring period**	
PL	Different research projects	Human milk	dl PCBs, PCBs	urban and rural samples;	campaigns	1996-2001	National Institute of Hygiene, Nofer Institute of Occupational Medicine, University of Medical Sciences/ Ministry of Health
		Adipose tissue	PCBs			1979-2001	
		Human blood	PCBs	volunteers fom 3 cities in Poland	campaign	2003	
RO	WHO human milk study (3. round)	Human milk	PCBs, dl PCBs, PCDD/Fs	3 pools	campaign	2000	Van Leuwen et al.
SK	WHO human milk study (2. round)	Human milk	PCBs, dl PCBs, PCDD/Fs	2 cities	campaign	1992	Van Leuwen et al.
	WHO human milk study (3. round)			4 pools		2000	Van Leuwen et al.
	National health monitoring		PCBs	Western. middle and eastern Slovakia	annually	1986-2001	Regional branches of National Institute of Health
	The environmental and human load in an area contaminated with PCBs	Blood,	PCBs	Hot spot region in Eastern Slovakia: District of Michalovce, Stropkov District	campaign	1997-1999	Ministry of Health; Institute of Preventive & Clinical Medicine
		Adipose tissue	PCDD/Fs			1995-97	
	PCBRISK 5th FP Project Evaluation human health risk from low-dose and long-term PCB exposure	Blood	PCBs	occupationally esposed people; local population; population of control region	campaign	2001-2004	Ministry of Health, Institute of Preventive & Clinical Medicine
SLO	Various research projects on human exposure in the "hot spot" region of Bela Krajina	Blood; Adipose tissue	PCBs	occupationally esposed people; local population	campaign	1984-1991	Institute of public Health, Novo Mesto
			PCBs	residents around river Krupa	campaign	1988	Ministry of Health
TR		Adipose tissue	PCBs		campaign	2000	Ministry of Health

Research projects – air

	Research programmes and projects – Air					
	Research programme (National/ International)	**Title of project**	**Institutions**	**Coordinator/principal investigator**	**Time of implementation**	**Responsible Authority/ Enforcement Organ**
CZ	I	The Compilation of Emission Factors for Persistent Organic Pollutants	Masaryk University, Brno	Prof. Dr. Ivan Holoubek	1993	Government of Canada
	I	EU PHARE Project EU/Air/21 Ambient Air Monitoring – Establishment of RECETOX	RECETOX, Masaryk University Brno	Prof. Dr. Ivan Holoubek	1995	EU
	N	Methodology of determination of PCDDs/Fs in ambient air	RECETOX, Masaryk University Brno	Prof. Dr. Ivan Holoubek	1991	Ministry of the Environment
	N	Methodology of emission inventory of persistent organic pollutants	Masaryk University, Brno	Prof. Dr. Ivan Holoubek	1993	Ministry of the Environment
	N	Standardization of analytical methods for determination of selected organic pollutants in emission from model sources and in ambient air	Masaryk University, Brno	Prof. Dr. Ivan Holoubek	1993	Ministry of the Environment
	N	SYMOS. System of monitoring, control and assessment of persistent organic pollutants in ambient air – pilot study	Masaryk University, Brno	Prof. Dr. Ivan Holoubek	1994	Ministry of the Environment
	N	Project PPŽP/520/2/96: Getting of technical basis for changes of legislature and realization of international commitment in the area of air protection	AXYS-Varilab, s.r.o., Vrané nad Vltavou	Dr. Jiří Mitera	1996	Ministry of the Environment
	N	VaV/520/1/97: Research and development of scientific basis for quantification of ambient air pollution in the CR	AXYS-Varilab, s.r.o., Vrané nad Vltavou	Dr. Jiří Mitera	1997 - 1999	Ministry of the Environment
	N	Project VaV 520/6/99: Study of occurrence of persistent organic compounds in ambient air and deposition in the area of the CR	AXYS-Varilab, s.r.o., Vrané nad Vltavou	Dr. Jiří Mitera	1999 - 2001	Ministry of the Environment

	Research programmes and projects – Air					
	Research programme (National/ International)	**Title of project**	**Institutions**	**Coordinator/principal investigator**	**Time of implementation**	**Responsible Authority/ Enforcement Organ**
	N	Project VaV 340/2/00: Impact of complex mixtures in polluted air on the heath of risk population groups (Program AIR POLLUTION ANH HEALTH)	AXYS-Varilab, s.r.o., Vrané nad Vltavou	Dr. Jiří Mitera	2000 - 2002	Ministry of the Environment
	N	Project VaV/740/2/01: Transformation of air pollutants in relation to negative anthropogenic processes, their effects to human population, landscape receptors and modelling their transfer in atmosphere	EKOTOXA Opava	Ing. Marie Skybová	2001 - 2004	Ministry of the Environment
	N	VaV/740/05/01: Evaluation of ecosystem and human risks of persistent environmental pollutants (HMs, POPs) in the relationships to the commitment of the CR in the frame of CLRTAP Convention and connected protocols including the goals which were defined by Working Group for Effects (WG-UN ECE), 2001 - 2002	EKOTOXA Opava / TOCOEN, s.r.o.	Dr. Miloš Zapletal / Prof. Dr. Ivan Holoubek	2001 - 2002	Ministry of the Environment
	N	VaV 740/1/02: Efficiency investigation of measures for reduction of air pollution based on abatement of negative effects of pollutants on environmental compartments and human health	EKOTOXA Opava / TOCOEN, s.r.o.	Dr. Miloš Zapletal / Prof. Dr. Ivan Holoubek	2002 - 2005	Ministry of the Environment
PL		Measurements of dioxins and furans as well as other pollutions released into air from the cement furnace of the Cement Factory Rudniki S.A	Tadeusz Kościuszko Krakow Technical University; Faculty of Chemical Engineering and Technology; Institute of Inorganic Chemistry and Technology	dr hab. inż. Adam Grochowalski	04.2001 – 05.2001	Ministry of Environment

Research projects - water, sediments

	Research programmes and projects – Water, sediments					
	Research programme (National/ International)	**Title of project**	**Institutions**	**Coordinator/principal investigator**	**Time of implementation**	**Responsible Authority/ Enforcement Organ**
CZ	I	FITA Program of Flemish Government - Transfer of Ecotoxicological Tests to CZ and Countries of Central and Eastern Europe	RECETOX, Masaryk University	Prof. Dr. Ivan Holoubek	1995 - 1998	Flemish Government
	I	Project BMBF 423 KFK 9601: Input and occurrence of PCBs in River Elbe	T. G. Masaryk Water Research Institute Prague		1996 - 1999	German Ministry of Education and Research
	I	EESD-ENV-2000-0209 (5th framework): Standardised Aquatic Monitoring of Priority Pollutants by Passive Sampling (STAMPS)	Institute of Chemical Technology, Prague	Prof. Jana Hajslova	2002 - 2004	Coordinator: University of Portsmouth, U.K.
	N	Project Elbe	T. G. Masaryk Water Research Institute Prague		1990 - 2001	Ministry of the Environment
	N	Project Morava	T. G. Masaryk Water Research Institute Brno		1998 - 2001	Ministry of the Environment
	N	Project Oder	T. G. Masaryk Water Research Institute Ostrava		1999 - 2001	Ministry of the Environment
	N	Identification and determination of OCPs and PCBs in waters by gas chromatography	T. G. Masaryk Water Research Institute Prague Lubos Nondek	Lubos Nondek	1988, 1990	
	N	Elimination of organic micropollution during water treatment	T. G. Masaryk Water Research Institute Prague	V. Homstová	1995	Ministry of the Environment
	N	Point sources of pollution - Part: Balance of priority pollutants contents iv MWTP sewage sludges including proposals for usage or disposal of these sewage sludges	T. G. Masaryk Water Research Institute Prague	(J. Novák		

	Research programmes and projects – Water, sediments					
	Research programme (National/ International)	**Title of project**	**Institutions**	**Coordinator/principal investigator**	**Time of implementation**	**Responsible Authority/ Enforcement Organ**
	N	Project VaV/650/3/00: Occurrence and movement of dangerous substances in hydrosphere of the CR	Czech Hydrometeorology Institute Prague	Dr. Mark Reader	2000 - 2002	Ministry of the Environment, CR
PL	**N**	Studies on the effect of matrix on surface water samples preparation for determination of the organic compounds content. (theses)	Gdansk Technical University, Faculty of Chemistry, Chair of Chemical Technology	prof. dr hab. inż. Jacek Namiesnik	01.2000 – 12.2000	Ministry of Environment
SLO	**N**	Environmental burden with PCBs in Semič	Institute of Public Health, Ljubljana	Andrej Perc	1987	Ministry of Health

Research projects - soils

	Research programmes and projects – Soils					
	Research programme (National/ International)	**Title of project**	**Institutions**	**Coordinator/principal investigator**	**Time of implementation**	**Responsible Authority/ Enforcement Organ**
CZ	N	GACR526/98/1147 Biodiversity of microbial communities in terrestrial ecosystems contaminated by POPs	RECETOX, Masaryk University	Assoc. Prof. Dr. Ladislav Dušek	1998 - 2000	Grant Agency CR
PL	N	Development of a determination method for coplanar chlorinated biphenyls' in soil and sediment samples with use of mass spectrometry of the MS/MS type	Tadeusz Kościuszko Krakow Technical University; Faculty of Chemical Engineering and Technology; Institute of Inorganic Chemistry and Technology	dr hab. inż. Adam Grochowalski	01.2000 – 12.2000	
	N	Determination of coplanar chlorinated biphenyls' in soil and sediment samples in the presence of chlorinated dibenzodioxins and dibenzofurans. Phase I	Tadeusz Kościuszko Krakow Technical University; Faculty of Chemical Engineering and Technology; Institute of Inorganic Chemistry and Technology	dr hab. inż. Adam Grochowalski	01.1998 – 12.1998	

Research projects - biota

	Research programmes and projects – Biota					
	Research programme (National/ International)	**Title of project**	**Institutions**	**Coordinator/principal investigator**	**Time of implementation**	**Responsible Authority/ Enforcement Organ**
CZ	N	Study of toxic effects of POPs on vegetation	Masaryk University Brno	Prof. Dr. Ivan Holoubek	1993 - 1995	Grant Agency CR
	N	Biochemical and cell markers of toxicity and carcinogenesis effects of xenobiotics	Research Institute of Veterinary Medicine, Brno	Dr. Miroslav Machala	1998 - 2000	Grant Agency CR
	N	Characterization of cytochromes P450 and other systems of detoxification of agricultural animals and wildlife	Research Institute of Veterinary Medicine, Brno	Dr. Miroslav Machala	2000 - 2002	Grant Agency CR
	N	VaV/340/1/01: Effects of environmental chemical pollution on the contamination and quality of biotic parts of ecosystems	Institute of Chemical Technology, Prague	Prf. Dr. Karel Volka	1995 - 2003	Ministry of the Environment, CR
	I	EU- SMT 4-CT96-2113: Certification of Chlorobiphenyls in mussels (CERMUS)	Institute of Chemical Technology, Prague	Prof. Jana Hajslova	1998 - 1999	Coordinator: Netherlands Institute for Fisheries Research, IJmuiden, NL
	I	EU-SMT BROC01/05: Biological Reference Materials for Organic Contaminants (BROC)	Institute of Chemical Technology, Prague	Prof. Jana Hajslova	2002 - 2003	Coordinator: the Netherlands Institute for Fisheries Research, IJmuiden, NL
PL	N	Function of the Ah receptor and the action mechanism of dioxins and related compounds	State Veterinary Institute	dr hab. Jadwiga Piskorska-Pliszczyńska	12.1998 – 04.1999	
	N	Studies on polychlorinated biphenyls in samples of organic origin	Tadeusz Kościuszko Krakow Technical University; Faculty of Chemical Engineering and Technology; Institute of Inorganic Chemistry and Technology	dr inż. Ryszard Chrząszcz	01.2001 – 12.2001	

	Research programmes and projects – Biota					
	Research programme (National/ International)	**Title of project**	**Institutions**	**Coordinator/principal investigator**	**Time of implementation**	**Responsible Authority/ Enforcement Organ**
	N	Polychlorinated biphenyls (PCB) as a factor disturbing endocrine processes in pigs ovary	Jagiellonian University Krakow, Faculty of Biology and Earth Science; Institute of Zoology,	dr Anna Wójtowicz	01.2000 - 12.2002	

Research projects - food

	Research programmes and projects – Food					
	Research programme (National/ International)	**Title of project**	**Institutions**	**Coordinator/principal investigator**	**Time of implementation**	**Responsible Authority/ Enforcement Organ**
CZ	I	Flair Flow 4 network - food, nutrition and health)	Institute of Chemical Technology, Prague	Prof. Jana Hajslova	2001 - 2003	Coordinator: INRA, Paris, F/Institute of Chemical Technology, Prague
PL	N	Development of polychlorinated-p-dibenzodioxins, dibenzofurans determination methods in material of the food products type	Tadeusz Kościuszko Krakow Technical University; Faculty of Chemical Engineering and Technology; Institute of Inorganic Chemistry and Technology	dr inż. Ryszard Chrząszcz	01.2000 – 12.2000	

Research projects - human

	Research programmes and projects – Human					
	Research programme (National/ International)	Title of project	Institutions	Coordinator/principal investigator	Time of implementation	Responsible Authority/ Enforcement Organ
CZ	N	Projekt VaV 340/2/00: Effects of complex mixtures of air pollutants to the health status of vulnerable group of population	AXYS-Varilab, s.r.o., Vrané nad Vltavou	Dr. Libor Jech	2000 - 2002	Ministry of the Environment
	N	IGA MZ 1301-2: Determination of diffences of PCBs and OCPs levels during lactation	Veterinary Research Institute Brno	Ing. Věra Gajdůšková, CSc.	1995	Ministry of Agricultural
	N	CEZJ 071400003 Environment - Carcinopgenesis - Oncology	Masaryk University Brno, Faculty of Medecine	Prof. MUDr. Jan Žaloudík	1999 - 2004	Ministry of Education, Youth and Sports
	I	EC-ENV4-CT96-0202: Air pollution distribution of adult population in Europe	Centre of genetic ecotoxikology , Institute of Experimental Medicine Academy of Science CR, Praha	MUDr. Radim Šram, DrSc.	1996 - 1998	Coordinated by M. J.Jantunen, National Public Health Institute, Helsinki, Finland)
	I	EC-ENV4-CT96-0203: Biomarkers of genotoxicity of urban air pollution: A dose-response study	Centre of genetic ecotoxikology, Institute of Experimental Medicine Academy of Science CR, Praha	MUDr. Radim Šram, DrSc.	1996 - 1999	Coordinated by S.A.Kyrtopoulos, National Hellenic Research Foundation, Athens, Greece
PL	N	Influence of dioxins on creation of steroids by ovarian cells	Jagiellonian University, Faculty of Biology and Earth Science	Dr Renata Wołcz	12.1998 – 06.2001	
SK	N	Early childhood development and PCB exposure in Slovakia	Institute of Preventive and Clinical Medicine		2002 - 2005	

	Research programmes and projects – Human					
	Research programme (National/ International)	Title of project	Institutions	Coordinator/principal investigator	Time of implementation	Responsible Authority/ Enforcement Organ
	I	Assessment of early signs of biological action following exposure to polyhalogenated dibenzo-p-dioxins and related substances	Institute of Preventive and Clinical Medicine	Dr. Anton Kočan	1995 - 1997	EC PECO
	I	Case control study of environmental exposure to PCBs and cancer risk in Eastern Slovakia	Institute of Preventive and Clinical Medicine	Dr. Anton Kočan	1999 - 2000	EHSRC International Pilot Grant of University of Iowa and NIH Fogarty International Grant
SLO	N	Evaluation of PCBs pollution on health and environmental status in the region of Metlika and Črnomej in the region of Bela Krajina	Institute of Public Health (Novo Mesto)	Dušan Harlander	1991	Ministry of Health
	N	Environmental and public health in Semič: a case study of PCBs pollution, post audits of environmental programmes and projects	University of Occupationmal Medicine, Ljubljana	Dr. Ana Tretjak	publ. 1989	
	N	Polychlorinated Biphenyls cause developmental enamel defects in children	Stomatology Clinic Ljubljana	Dr. Janja Jan	publ. 2000	
	N	Frequency of malignant diseases at community of Črnomelj in the years 1968 – 1077 and 1978 – 1987	Oncology Insitute, Ljublana	Prof. Maja Zakelj	1968-77 1978-87	
	N	Estimation of the state health and threat to health of the inhabitants of the villages Krupa, Praprot, Stranska vas, Moverna vas, Vinji vrh, Brstovec on the basis of special medical examination	University of Occupationmal Medicine, Ljubljana	Dr. Meta Dodič		
	N	PCBs in White Carniola	Institute of Public Health – Novo Mesto	Dr. Dušan Harlander	2004	

Research programmes - risk assessment

	Research programmes and projects – Human and Ecological Risk Assessment					
	Research programme (National/ International)	**Title of project**	**Institutions**	**Coordinator/principal investigator**	**Time of implementation**	**Responsible Authority/ Enforcement Organ**
CZ	N	**Methodology of environmental risk assessment - I**	TOCOEN, s.r.o.	Prof. Dr. Ivan Holoubek	1995	
	N	**Methodology of environmental risk assessment - II**	TOCOEN, s.r.o.	Prof. Dr. Ivan Holoubek	1996	
	N	**Identification of Ecological Risks – IDRIS I**	TOCOEN, s.r.o.	Prof. Dr. Ivan Holoubek	1996 - 1998	
	N	VaV/340/1/00 Region specific approach in ecological risk assessment. Methodology of assessment in the relationships to the natural catastrophes – IDRIS II	TOCOEN, s.r.o.	Prof. Dr. Ivan Holoubek	2000 - 2002	
PL	N	Dioxins – assessment of hazards for man in Poland – preliminary studies			02.1998 – 12.1998	

Research projects - waste

	Research programmes and projects – Waste and products					
	Research programme (National/ International)	**Title of project**	**Institutions**	**Coordinator/principal investigator**	**Time of implementation**	**Responsible Authority/ Enforcement Organ**
CZ	N	VaV/720/5/01: Problems of PCBs connected with Waste Act	Water Research Institute TGM Praha	J. Barchánková	2001 - 2003	Ministry of the Environment, CR
	N	1431/240: Register of point sources of contamination	Water Research Institute TGM Praha	J. Barchánková	2001 - 2002	Ministry of the Environment, CR
PL	N	Studies on determination of dioxins in samples of wastewater and municipal waste and wastewater sludge	Tadeusz Kościuszko Krakow Technical University; Faculty of Chemical Engineering and Technology; Institute of Inorganic Chemistry and Technology	dr hab. inż. Adam Grochowalski	09.2001 – 10.2001	Ministry of Environment
	N	Extraction and dynamic of bleaching of polychlorinated biphenyls from wastewater sludge	Czestochowa Technical University, Faculty of Environmental Engineering and Protection, Institute of Environmental Engineering	dr Agata Rosińska	01.1997 – 06.2000	
	N	Hydrodesulphurisation of mineral oils contaminated by polychlorinated biphenyls (PCBs)	Wroclaw Technical University; Faculty of Chemistry; Institute of Petroleum and Coal Chemistry	dr inż. Marek Stolarski	01.2000 – 12.2001	

Annex III: Environmental Contamination

Content

Glossary

Total PCBs = if not stated otherwise, sum of all congener estimated via sum of indicator PCBs

Σ PCBs = in these cases the number of PCBs analysed has not been available

Σ TEQ = summarised PCDD/F and dl PCB TEQ

< LOD = if not specified the necessary information has not been provided

empty fields = no information provided

Contamination - Air

Levels of PCDD/Fs and dl PCBs in ambient air										
	Sites	Number of sites/samples per year	Annual frequency of measurements	Year	Determined values [fg TEQ/m3]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
CZ	EMEP background observatory, Košetice	1/7	Campaign, 1 times per 4 weeks	1995-2001 spriug & summer	38	11	8.7	184.7	PCDD/F-I-TEQ	Vana et al. 1995, Holoubek et al. 1996, Holoubek et al. 2003a
	Zlin region 24 (urban, industrial)	3/9	1 campaign (3 days)	2001 autumn	109	109	62.2	164.2	PCDD/F-WHO-TEQ	Holoubek et al. 2003a
					5.3	6.0	3.3	7.2	PCB--TEQ	
		5/15	1 campaign (3 days)	2002 autumn	79	75	41.0	118.5	PCDD/F-WHO-TEQ	
					4.1	3.8	2.92	6.32	PCB--TEQ	
		6/18	1 campaign (3 days)	2003 summer	55.30	26.12	14.05	454.1	PCDD/F-WHO-TEQ	
					7.51	4.44	2.82	31.98	PCB--TEQ	
	Bohemia	20/20	Episodically	1997-1998			0.7	2 214.6	PCDD/F-WHO-TEQ	
	East Bohemia, Moravia	17/17	Episodically	1999-2001			10	123		
	National Monitoring Programme	35/35	campaigns	1996-2001			0.1	399		
PL	Krakow; 4			1995			950	12 000	PCDD/F-I-TEQ	Grochowalski et al. 1995
	Krakow; 4	32	2 campaigns	1996	2 000			2 580 – 5 740	winter time	Grochowalski et al. 1995,1997
								60 – 120	summer time	

Levels of PCDD/Fs and dl PCBs in ambient air										
	Sites	Number of sites/samples per year	Annual frequency of measurements	Year	Determined values [fg TEQ/m3]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
SK	20	160	8 campaigns	1996 - 1997	110	80	30	690	PCDD/Fs- I-TEQ	Kocan et Stenhouse 1999
					Summer 55				PCDD/Fs- I-TEQ	Kocan et Stenhouse 1999
					Winter 247					

Levels of Indicator PCBs in ambient air-										
	Sites	Number of sites/samples per year	frequency of measurements	Year	Determined values [pg.m^{-3}]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
CZ	EMEP background observatory, Košetice	1/52	Weekly, 24 hrs	1996	142 ± 57	135	< 1	420	Σ 7 PCBs	Vana et al. 1995/1997; Holoubek et al. 1996, 2003a
				1997		155	4.5	467		
				1998		185				
				1999		70				
				2000		130				
				2001		140				
	National Monitoring	10 sites	Annual averages	1996-2001	196-340				Σ 7 PCBs	Holoubek et al. 2003a
		16 sites			340-1000					
		7 sites			1000-9700					
		All 33 sites			Median bound 1541					
	Beroun region	3/63	3 campaigns (7 days)	2001	370 ± 309	311	75	2 091	Σ 7 PCBs	Holoubek et al. 2003a
	Bohemia	20	Episodically	1997-1998			198	3 765		Holoubek et al. 2003a
	East Bohemia, Moravia	17/17	Episodically	1999-2001			211	9 692		
	Prague		Episodically	1994-95			79.5-	3 018.5		Axys Variolab unpubl.

Levels of Indicator PCBs in ambient air-										
	Sites	Number of sites/samples per year	frequency of measurements	Year	Determined values [pg.m^{-3}]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
EST	Pärnu			1992-93; 1999	160				Total PCBs	State of Environment in Estonia (EEIC) www.env.ee; ; Ott Roots 1995
	Vilsandi				50					
	Vilsandi	9		1991-92	79				Total PCBs (calculated from Σ 51 congener)	Agrell et al 2001
	Lahemaa	16			49					
LT	Ventes									
LV	Salaspils	20			454					
	Salaspils			1992-93; 1999	600				Total PCBs	State of Environment in Estonia (EEIC) www.env.ee ; Shatalov et al. 2002
	Salacgriva				210					
	Siltere				100					
	Swedish Baltic programme;	2		1991 - 1992		454			Total PCBs	Agrell et al 2001
PL	Gdańsk		monthly	1991 - 1992	360 ± 280	270	120	1 100	Total PCBs	Falandysz et al. 1998
	Dziwnow	5			55				Total PCBs (calculated from Σ 51 congener)	Agrell et al 2001
	Swibno	6			69					
SK	Phare project 20	80	8 campaigns	1996 - 1997	136	100	15	1 730	Σ 6 PCBs	Petrik et al. 1998; Kočan et al 1999
	15	15	Campaign	1995	410	200	40	2 420		
	Michalovce district (hot spot region)	6/6	September	1997	82	14	4	241	Total PCBs	Kočan et al. 2000,2001
SK	Stropkov district (control)	6/6	September	1997	11	3	2.2	27	Total PCBs	Kočan et al. 2000,2001

Levels of Indicator PCBs in ambient air-										
	Sites	**Number of sites/samples per year**	**frequency of measurements**	**Year**	**Determined values [pg.m^{-3}]**					
					Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
SLO	Bela Krajina (hot spot)	3; Semic, Metlika, Crnomelj		1991			30 000	140 000	Total PCBs	Fazarinc et al. 1992 personal Information National Chemicals Bureau

Contamination - Water

Levels of PCDD/Fs and dl PCBs in surface waters										
	Sites	Number of sites/samples per year	frequency of measurements	Year	Determined values [pg TEQ.l^{-1}]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
CZ	Area of factory	27/27	Episodically	2002			17.9	1 159.2	PCDD/F-WHO-TEQ	Holoubek et al. 2003
	Elbe near Spolana Neratovice	4/4					0.1	14.7		
PL	estuarine section of Vistula and Oder	2/5 each	Episodically	2002				< LOD (1 ng/l)	Σ PCDD/Fs	Institute of Meteorology and Water management (NPOPsInv Poland)
									Σ coplanar PCBs	

Levels of Indicator PCBs in surface waters										
	Sites	Number of sites/samples per year	frequency of measurements	Year	Determined values [ng.l^{-1}]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
CY	6 major Dams Kalavasos, Asprogemmos, Evretou, Yermasoyia, Dhypotamos, Kourris	6/6	annually	1989				600	Σ 14 congener	Michailidou et al. unpublished data 1990-2000.
				1992 – 1995				80		
				2000				60		
	Polemidia Dam	1/1		2000				464		
	12 contributing rivers	12/12	annually	1996 - 2000				31	Σ 14 congener	Michailidou et al. unpublished data 1990-2000.

Levels of Indicator PCBs in surface waters										
	Sites	**Number of sites/samples per year**	**frequency of measurements**	**Year**	**Determined values [ng.l^{-1}]**					
					Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
CZ	Elbe & tributaries	in total 51 sampling sites		1995, 1996, 1998					total PCBs	Holoubek et al. 2003a
		Vltava			1.0 – 1.5	0.8 – 1.1	0.6	5.2		
		Berounka			0.9 – 1.1	0.9 – 1.0	0.8	1.7		
		Ohře			0.7 – 1.6	0.5 – 1.2	0.1	2.7		
		Jizera			0.8 – 1.4	0.7 – 1.4	0.6	3.1		
		Bilina			2.9 – 7.6	1.7 – 2.4	1.3	25.7		
	wastewaters from WWTP (project Morava)	22	Episodically	2000			14.5	200.7	Σ 6 PCBs	Holoubek et al. 2003a
	Morava, Oder	14/14	Episodically	2000			48.0	221		
	Oder,	35/35	Episodically	1999-2001			18	108		
HU	Water monitoring network	12/ total 118		1993-2003			5	60	total PCBs	Institute of Environment Management; Ferenc Laszlo VITUKI unpubl.
	Hunagarian-Slovakian Danube programme	6/ total 30		2002						
LT	13 lakes, 1 reservoir		2 times/year	from 1994				< LOD (10 ng/l)	Σ 7 PCB	National Environmental Protection Agency (unpublished data)
	39 rivers	58 stations	4 times/year	from 1996				< LOD (10 ng/l)		
PL	Oder River Basin			1998-2000			0.3-	150	Σ 7 PCB	Falandysz 2000

Levels of Indicator PCBs in surface waters										
	Sites	Number of sites/samples per year	frequency of measurements	Year	Determined values [ng.l^{-1}]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
PL	Vistula	Krakow		1992	2.57				Σ 7 PCB	Environmental Protection Inspectorates; NPOPs Inv Poland 2003
		Warsaw			7.8					
		Kiezmark			7.5					
	Oder	Chałupki			1.8					
		Wroclaw			1.4					
		Krajnik Dolny			< LOD (1 ng/l)					
	Vistula	Krakow		1995	12.9					
		Warsaw			9.0					
		Kiezmark			1.1					
	Oder	Chałupki			17.1					
		Wroclaw			9.7					
		Krajnik Dolny			< LOD (1 ng/l)				Σ 7 PCB	Environmental Protection Inspectorates; NPOPs Inv Poland 2003
	Vistula	Krakow		2000	17.0					
		Warsaw			14.1					
		Kiezmark			< LOD (1 ng/l)					
PL	Oder	Chałupki			1.5					
		Wroclaw			15.8					
		Krajnik Dolny			< LOD (1 ng/l)					
	Vistula	Krakow		2001	7.8					
		Warsaw			8.2					
		Kiezmark			< LOD (1 ng/l)					
	Oder	Chałupki			9.8					
		Wroclaw			15.7					

Levels of Indicator PCBs in surface waters										
	Sites	Number of sites/samples per year	frequency of measurements	Year	Determined values [ng.l^{-1}]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
PL	Oder	Krajnik Dolny			< LOD (1 ng/l)				Σ 7 PCB	Environmental . Protection Inspectorates (NPOPsInv 2003) unpubl
	Vistula	Krakow		1992–2000	15				Σ 7 PCB	Environmental . Protection Inspectorates (NPOPsInv 2003) unpubl
	estuarine sections of Oder and Vistula			2002				4.9	Σ 8 PCB	Institute of Meteorology and Water Management; NPOPsInv 2003
	Gdansk Bay	4		1992–2000	0.8–1.3				Σ 7 PCB	Falandysz et al. 2002
SK	Michalovze District	Zemplinska Sirava, Laborec river, effluent canals	total samples >3 000		306.55	45.5	14	1950	total PCBs solid particles filtered off	Kocan et al. 1999
	Stropkov District	3 lakes 2 rivers	total samples >3 000		8.08	8.1	6.6	10	total PCBs solid particles filtered off	Kocan et al. 1999
SLO	River Krupa (hot spot)	spring, mid river, river estuary		1994			26	35	total PCBs	Institute of Hydrometeorlogy 1995 (unpubl.)

Levels of Indicator PCBs in ground waters										
	Sites	**Number of sites/samples per year**	**Total number of samples**	**Year**	**Determined values [ng.l^{-1}]**					
					Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
CZ		446	446	1995	3 > LOD*				total PCBs	Holoubek et al. 2003a
HU	wells, springs		1476	1996-2001	PCBs detected in 10/1670 samples		1	50	total PCBs	Institute of Environment Protection Marta Bagi VITUKI unpubl.
SK			6 794	1997-2001	10-15			60	total PCBs	Slovak NPOPsInv
SLO	Bela Krajina			1997		100			total PCBs	UNEP Mediterranean Regional Report 2002

Contamination - Sediment

Levels of PCDD/Fs and dl PCBs in sediments										
	Sites	Number of sites/samples per year	Annual frequency of measurements	Year	Determined values [pg.g^{-1}]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
CZ	Regional background monitoring, EMEP 1	1	Once per year	1996-2001		128.41			Σ PCDD/Fs	Vana et al. 2001
						1.4			PCDD/F-TEQ	
						8.97			Σ dl PCBs	
						0.185			PCB-TEQ.	
	Region Zlín	6/6 total 15 samples	Campaigns	1993, 1996 – 1998, 2001	101.59	60.77	1.13	463.4	Σ PCDD/Fs	Holoubek et al. 2003a
					73.28	30.3	0	722.51	Σ (4-8)PCDD/Fs	
					2.69	1.64	0.9	5.6	PCDD/F-TEQ	
					27.82	0.13	0.01	152.65	Σ dl PCBs	
					0.58	0.40	0.10	1.60	PCB-TEQ	
	Beroun region;	16/16	Campaign	2001	291.89	200.1	30.3	1 105	Σ PCDD/Fs	
					137.73	93.80	11.31	646.86	P(4-8)CDD/Fs	
					2.58	1.83	0.21	11.2	PCDD/F-TEQ	
					220.76	87.68	11.15	1 217.3	Σ dl PCBs	
					1.58	0.69	0.11	8.37	PCB-TEQ	
	Spolana Neratovice	Area of factory 11/11	Episodically	2002			18.7	8 868.8	PCDD/F-TEQ	Holoubek et al. 2003
		Elbe before floods 14/14					0.9	518.8		
		Elbe after floods 23/23					11.5	690.8		
CZ	International Elbe Project	11	campaign	2002			3.0	23.0	PCDD/F-TEQ	Knoth et al. 2003

Levels of PCDD/Fs and dl PCBs in sediments										
	Sites	Number of sites/samples per year	Annual frequency of measurements	Year	Determined values [pg.g^{-1}]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
PL	estuarine sections of Vistula and Oder	2/5 each		2002				836	Σ PCDD/Fs	Niemirycz, Institute of Meteorology and Water Management (NPOPsInv)
	sewage sludge 1/3	primary sludge	typical municipal WWTP	2001-2002	12.16				PCDD/F -TEQ	Dudzinska et al. 2003
		digested digested			53.50				PCDD/F-TEQ	
SK	21	21	Campaign	2002			0.75	603	PCDD/F-TEQ	Slovak NPOPsInv
							0.16	1 992	non-ortho PCB- TEQ	
							0.029	1 236	mono-ortho PCB- TEQ	

Levels of Indicator PCBs in sediments										
	Sites	Number of sites/samples per year	Annual frequency of measurements	Year	Determined values [ng.g^{-1}]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
CY	7 major dams	Kalavasos	One campaign	1997-98	32				total concentration from all depth 10-240 cm **Σ 14PCBs**	Michailidou State General Laboratory
		Asprogremmos			54					
		Evretou			2					
		Yermasoyia			11					
		Dhypotamos			<LOD (1 ng/g)					
		Polemidia (hot spot)			158					
		Kourris at Zygos inflow			<LOD (1 ng/g)					

Levels of Indicator PCBs in sediments										
	Sites	Number of sites/samples per year	Annual frequency of measurements	Year	Determined values [ng.g-1]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
CZ	National Monitoring Programme	41	1	2001			5	220	Σ 6 PCBs	Holoubek et al. 2003a
	Regional background monitoring, EMEP 6	6/6 total = 47 samples	1 time/year	1988	2.82	2.57	0.93	7.07	Σ 6 PCBs	Holoubek et al. 2003a
	Zlín region5	5	Campaigns	1998 - 2001	53.85	37.8	2.6	143.1	Σ 6 PCBs	
	Beroun region	25	Campaign	2001	31.38	14.91	4.76	114.8	Σ 6 PCBs	
	Elbe & tributaries	14/14 Vltava	Campaign, every 3 years	1995.98	87.5 - 106	47.8 – 74.0	3.0	493	Σ 6 PCBs	Holoubek et al. 2003a
		Berounka			78.1 – 172	82.8 – 90.3	23.4	538		
		Ohře			142 – 154	62.5 – 103	4.0	667		
		Jizera			138 – 173	87.4 – 123	32.0	586		
		Bilina (Rozmital)			482 - 760	469 - 543	115	1 450		
	Sewage sludge from WWTP	Total = 209	Campaigns	1998 - 2001	203	145	15.0	2 232	Σ 6 PCBs	
	sewage sludges from WWTP (project Morava)	16	Episodically	1998-1999			40	610	Σ 6 PCBs	
		25	Episodically	2001			7	14 600		
LT	39 rivers	58 stations	1 time/year	from 1994				<LOD (1 ng/g)	Σ 7 PCBs	National Environmental Protection Agency
	13 lakes, 1 reservoir		1 time/year	from1996				<LOD (1 ng/g)		

Levels of Indicator PCBs in sediments										
	Sites	Number of sites/samples per year	Annual frequency of measurements	Year	Determined values [ng.g^{-1}]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
LV	4; Daugava & tributaries	4/4	campaign	2003	< 1 000				Σ 7 PCBs	Latvian Environmental Agency (unpubl.)
	downstream of Riga	1	campaign	2003	>20 000					
PL	Vistula			1991 - 1992	410 ± 230		120	300	Total PCBs	Falandysz et al. 1997
	Eastern Oder	12		1995			17.4	76.1	Σ 7 PCBs	Vana et al. 2001
	Western Oder	11					12.4	85.6		
	Oder and tributaries			1998 - 2000	28.9		1.3	189		Falandysz et al. 2002
	estuarine sections of Vistula and Oder			2002				16.9	Σ 7 PCBs	Institute of Meteorology and Water Management (NPOPsInv 2003)
	Włocławek Reservoir	mud		2000	6.77				Σ 6 PCBs	Institute of Meteorology and Water Management/ Environmental Protection Inspectorates (NPOPsInv)
		sand			0.15					
		dusty sand			0.88					
	Southern Baltic Sea			1996-99			1	149	Σ 7 PCBs	Konat & Kowalewski 2001
RO	Black Sea coastal	10		1995			0.06	72	Σ 7 PCBs	Fllmann et al. 2002
SK	Stropkov district (control)	4 rivers /21	Campaign	2001			1.8	3.3	total PCBs	Slovak NPOPsInv
		Domasa Lake I &II2		1997-98			7	10	total PCBs	Kocan et al. 1999, 2001

Levels of Indicator PCBs in sediments										
	Sites	**Number of sites/samples per year**	**Annual frequency of measurements**	**Year**	**Determined values [ng.g^{-1}]**					
					Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
SK	Stropkov District	Ondava rivers	Campaign	1997-98	33		14	52	total PCBs	Kocan et al. 1999, 2001
	Michalovce District (hot spot)	Zemplinska Sirava Lake/ 3	Campaign	1997-98	2400		1 700	3 100	total PCBs	Kocan et al. 1999
		Effluent canal Zemplinska Sirava Lake , Laborec river / 8	Campaign		1159		52	6000	total PCBs	Kocan et al. 1999, 2001
		effluent canal Chemko &Strazske / 3	Campaign		1,016 500		1.6	3,000 000	total PCBs	Kocan et al. 1999, 2001
SLO	Krupa river	Spring (hot spot)	Campaign	1991	15 000 000				total PCBs	Fazarinc et al. 1992 personal information National Chemicals Bureau
		mid-river			7 000 000					
		estuary			630					
TR	Bosporus	Coastal sediments/ 10		1995			0.4	4.7	Σ 7 PCBs	Fillmann et al. 2002

Contamination – Soil

Levels of PCDD/Fs and dl PCBs in soils									
	Sites	Number of sites/Samples per year	Year	Determined values [pg /g d.w.]					
				Arith. mean	Median	Minimum	Maximum	Notes	Reference
CZ	CISTA, basal soil monitoring	35x agricultural soils; 5x protected soils	2001	274.1	118.9	32.8	1 136.1	Σ PCDD/Fs	Holoubek et al. 2003a
				230.7	91.9	24.7	1 082.8	Σ (4-8) PCDD/Fs	
				3.1	1.3	0.5	14.3	PCDD/F-TEQ	
	RIASC Fluvisol, basal soil monitoring	Elbe river basin 60	1999-2001			0.1	14.1	PCDD/F-WHO-TEQ	Holoubek et al. 2003a
	Kosetice background EMEP	8/1	1998-2001	254.79	87.11	22.8	1 241	Σ PCDD/Fs	Vana et al 2001
				186.93	70.20	17.23	878.7	Σ (4-8) PCDD/Fs	
				3.69	1.3	0.3	16.4	PCDD/Fs-WHO-TEQ	
				0.25		0.08	5.24	PCB –WHO-TEQ	
	Region Zlin, 5	5 total = 15 samples	1998, 2001	523.83	307.1	75.3	2 238	Σ PCDD/Fs	Holoubek et al. 2003a
				240.73	148.46	49.29	697.28	Σ (4-8) PCDD/Fs	
				2.60	2.42	1.27	4.45	PCDD/F-TEQ	
				50.32	53.40	6.59	84,34	dl PCBs (77+126+169)	
				0.91	0.78	0.16	0.94	PCB-TEQ.	
CZ	Mokrá, industrial source	6	1994, 1998, 2002, 2003	121.00	59.59	29.17	703.46	Σ PCDD/Fs	Holoubek et al. 2003a
				102.54	43.48	20.96	673.35	Σ (4-8) PCDD/Fs	
				2.06	0.84	0.42	13.65	PCDD/F-TEQ	
				22.09	8.97	2.20	172.57	dl PCBs (77+126+169)	

Levels of PCDD/Fs and dl PCBs in soils									
	Sites	**Number of sites/Samples per year**	**Year**	**Determined values [pg /g d.w.]**					
				Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
CZ	Mokrá, industrial source	6	1994, 1998, 2002, 2003	0.60	0.20	0.06	4.08	PCBs -TEQ	Holoubek et al. 2003a
	Boarder mountains	6, 8	1994-95, 1998-2001	2 555	1 900	624.5	8 383	Σ PCDD/Fs	Holoubek et al. 1998a, 2003a
				2 226	1 900	624.5	7 133	Σ (4-8) PCDD/Fs	
				39.56	28.05	11.15	141.58	PCDD/F-WHO-TEQ	
				211.7	242.6	0.18	547.87	dl PCBs (77+126+169)	
				5.22	6.44	0	12.01	PCB-TEQ	
	Beroun region, 25	25	2001	334.4	276.2	98.3	1 279	Σ PCDD/Fs	Holoubek et al. 2003a
				124.52	109.1	49.8	307.1	Σ (4-8) PCDD/Fs	
				2.51	1.82	0.97	7.11	PCDD/Fs-WHO-TEQ	
				46.96	40.76	11.23	158.66	dl PCBs (77+126+169)	
	Spolana Neratovice		2002	913.6	904.0	120.9	2 191.0	Σ PCDD/Fs	Holoubek et al. 2003a
				411.769.7	161.5	31.0	1 468.2	Σ (4-8) PCDD/Fs	
				69.7	7.07	1.1	82.9	PCDD/Fs-WHO-TEQ	
EST	Laguja Landfill	surrounding agricultural soils				0.64	1.53	PCDD/F-I-TEQ	(Roots et al., 2003)
HU	country wide	43 sites **33 sites < 0.93 =LoD**	1996	Upper bound 2.53	2.74	0.93	18.6	PCDD/F-I-TEQ	NPOPsInv 2003
				Lower bound 0.64					
				Mediuum bound 0.98					

Levels of PCDD/Fs and dl PCBs in soils									
	Sites	**Number of sites/Samples per year**	**Year**	**Determined values [pg /g d.w.]**					
				Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
PL	Neratovice	pesticide production site					29,800	2,3,7,8-TCDD	(Holoubek et al. 2000).

Levels of Indicator PCBs -in soils									
	Sites	Number of sites/samples	Year	Determined values [ng.g^{-1}d.w.]					
				Arith. mean	Median	Minimum	Maximum	Notes	Reference
BG	96	96	1999	1				Σ 7 PCBs d.w.	Atanassov et al. 2001
	arable & forest soils		1999	<LOD					Shegunova et al. 2001
CZ	Regional background monitoring, EMEP Košetice	9/9	1988	10.058	4.423	0.072	116.0	Σ 7 PCBs	Vana et al. 2001
	Basal soil monitoirng CISTA	40/40	1994	2,26	1,20		31,70	Topsoil, congeners 138, 153, 180	Sanka et al. 2001
			1995	0,64	0		5,50	Topsoil, congeners 138, 153, 180	
			1996	1,35	0		18,50	Topsoil, congeners 138, 153, 180	
			1997	7,60	0,60		147,50	Topsoil, congeners 138, 153, 180	
			1998	4,80	2,60		33,65	Topsoil, Σ 6 PCBs	
			1999	4,79	2,43		54,30		
			2000	6,03	1,75		84,30	Topsoil, Σ 7 PCBs	
			2001	4,73	1,75		42,10		
			2002	5,67	2,50		62,90		
			1994	1,26	0,70		11,80	Subsoil, congeners 138, 153, 180	Sanka et al. 2001
			1995	0,89	0		32,41	Subsoil, congeners 138, 153, 180	
			1996	0,44	0		5,10	Subsoil, congeners 138, 153, 180	
			1997	3,18	0,60		32,00	Subsoil, congeners 138, 153, 180	
			1998	3,33	1,50		32,05	Subsoil, Σ 6 PCBs	
			1999	3,22	1,90		35,30		
			2000	3,29	1,75		28,91	Subsoil, Σ 7 PCBs	

Levels of Indicator PCBs -in soils									
	Sites	Number of sites/samples	Year	Determined values [ng.g^{-1}d.w.]					
				Arith. mean	Median	Minimum	Maximum	Notes	Reference
CZ	Basal soil monitoirng CISTA	40/40	2001	3,23	1,75		32,90	Subsoil, Σ 7 PCBs	Sanka et al. 2001
			2002	4,18	1,75		47,05		
	Region Zlin	27/total 63 samples	1993, 1996-8, 2000	35.36	16.47	1.1	345.8	Σ 7 PCBs	Holoubek et al. 2003a
	Mountain sites	8/total = 28 samples	1994, 1995, 1996, 1998, 2001	31.13	26.2	7.9	82.8		
	Mokrá industrial source	12/ total = 168 samples	1993 – up to date	5.20	3.94	0.863	27.5		
CZ	Beroun region;	25/25	2001	8.09	6.87	4.36	29.2		
	Surroundings of highways	45/45	2000	19.94	3.90	1.14	227.3		
	Spolana Neratovice	1	2002						
CZ	**24 Regions**	**11-77**	**1995**	**14.25 (5-41.5)**	**(disaggragation of regions see below)**			**Σ 6 PCBs**	**Holoubek et al. 2003a**
		Chomutov/ 34	1995	10			10	Σ 6 PCBs	Holoubek et al. 2003a
		Most / 39	1995	11			50		
		Teplice / 48	1995	10			10		
		Ústí n.L. / 33	1995	12,6			80		
		Děčín / 27	1995	34,6			530		
		Litoměřice / 29	1995	16,3			193		
		Louny / 14	1995	10			10		
		Cheb / 22	1995	21			30		
		Sokolov / 20	1995	17,3			10		Holoubek et al. 2003a

Levels of Indicator PCBs -in soils									
	Sites	**Number of sites/samples**	**Year**	**Determined values [ng.g^{-1}d.w.]**					
				Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
		Karlovy Vary / 26	1995	21,1			140	Σ 6 PCBs	Holoubek et al. 2003a
CZ	**24 Regions**	Frýdek-Místek / 23	1995	9,7			32		
		Karviná / 18	1995	15,1			24	Σ 6 PCBs	Holoubek et al. 2003a
		Ostrava / 13	1995	19,7			10		
		Kladno / 28	1995	33,9			218		
		Mělník / 11	1995	8,8			42,4		
		Beroun / 19	1995	8,6			34,4		
		Praha-západ / 12	1995	41,4			264		
		Příbram / 32	1995	6,8			41		
		Benešov / 77	1995	5,2			8,29		
		Kolín / 60	1995	5,7			14,80		
		Kutná Hora / 52	1995	6,8			18,40		
		Liberec / 26	1995	5,1			6,89		
		Ml. Boleslav / 28	1995	5			5,40		
		Nymburk / 23	1995	5,7			20,10		
HU	country wide	44/44	1997	1.52		1.29	2.42	Σ 7 PCBs	NPOPsInv 2003
LV	Soviet military camps	18	2003	61.19 (lower bound)	55.5	<LOD (1 ng/g)	822	Σ 7 PCBs.	Latvian Environment Agency (unpubl.)
		Cenu, Smardes, Skrunda, Liepajas, Ances, Daugava-Kraslavas, Daugava-Daugavpils		**<LOD**					

Levels of Indicator PCBs -in soils									
	Sites	Number of sites/samples	Year	Determined values [ng.g-1d.w.]					
				Arith. mean	Median	Minimum	Maximum	Notes	Reference
LV	Soviet military camps	Andrejbaudas, Cimdenieki, Nigrandes, Cenu	2003			**7**	**46**	Σ 7 PCBs.	Latvian Environment Agency (unpubl.)
		Zvardes & Smardes				**98**	**110**		
		Nigrandes		**822**					
PL	agriculture and forest soils		1990-94			<LOD	28	Σ 7 PCBs	(Lulek, 2001)
	Soviet military base Swinoujscie		1994	900	260	32	3 400	total PCBs	Falandysz et al. 1997
	Katowice	9	1994	380 ± 300		67	870		Falandysz et al. 2000
	Krakow	15	1994	53 ± 34		4.6	110		Falandysz et al. 2000
RO	Rural areas	7	1999	4.0 ± 2.5				Σ 7 PCBs	Covaci et al. 2001
	Urban areas			57.3 ± 41.0					
	Industrial			23.1 ± 17.3					
	Waste site			63.2 ± 35.3					
	OLTCHIM factory			722.2					
	West Romania	5	1999	8.1 ± 6.5		2.2	19.2	Σ 7 PCBs	Covaci et al. 2001
	South Romania	9		3.6 ± 3.1		0.9	8.1		
	Rural	17	2001	3.8 ± 5.9		<LOD	23.1	Σ 7 PCBs	Dumitru et al. 2002
	Industrial	18		129.3	71.05	0.7	1 119.7		
SK	Agricultural soils national monitoring programme	1000	1999-2001	0.1-02				total PCBs	NPOPsInv 2002

Levels of Indicator PCBs -in soils									
	Sites	**Number of sites/samples**	**Year**	**Determined values [ng.g^{-1}d.w.]**					
				Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
SK	Agricultural soils Michalovce district	11/11	1997 - 1998	9.15	7.72	3.6	28	total PCBs	Kocan et al. 1999, 2001
	Agricultural soils Stropkov district4	4/4		6.27	6.15	1.5	9.2	total PCBs	Kocan et al. 1999, 2001
	contaminated soils near asphalt/gravel mixing plants	agricultural soils				35 000	38 000	total PCBs	Kocan et al. 1999, 2001
		forest soils				3 900	7 500		
	soil near Chemko dump site	3	1997-98			400	5 800		
	soil from rim of Michalovce dump site	1	1997-98	170					
SLO	Hot spot region Bela Krajina	arable land	1987-88			<LOD (10 ng/g)	1 130	total PCBs	Fazarinc et al. 1992 personal information National Chemicals Bureau
		grassland					66		
		forests					82		
	Hot spot region Bela Krajina	arable land	1991				1 530		
		grassland					235		
		forests					28		

Contamination - Vegetation

Levels of PCDD/Fs and dl PCBs in vegetation										
	Matrix	Number of sites/samples per year	Annual frequency of measurements	Year	Determined values [pg.g^{-1}]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
CZ	Biomonitoring of CISTA – jílek	3/12	4 times	2001			0.25	2.4	PCDD/F-WHO-TEQ w.w.	Holoubek et al. 2003a
	Pinus negri	4/4	campaign	2001			0.21	2.2		
	Spruce needles	Boarder high mountains 6/6	Episodically	1995-1998			0.86	10.14		Holoubek et al. 1998a,b
SLO	Spruce needles	8	campaign	2000		8.5	2.8	16.9	Σ PCDD/Fs	Weiss et al. (2003)
				2000		0.10	0.03	0.23	PCDD/F-I-TEQ	
				2000		0.10	0.03	0.23	PCDD/F-WHO-TEQ	
				2000		230	180	280	dl PCBs	
				2000		0.21	0.19	0.27	PBC-WHO-TEQ	

Levels of Indicator PCBs in vegetation										
	Matrix	Number of samples per year	Annual frequency of measurements	Year	Determined values [ng/g dry weight]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
CZ	Needles	EMEP background Kosetiče	9/9		3.70-8.51	3.79-8.54	3.25	9.86	Σ 7 PCBs	Holoubek et al. 1998a-2003a, Vana et al. 2001
CZ	Mosses		6/6		4.67-17.53	4.26-18.62	4.03	20.12		
CZ	Mosses	11	2	1995	3,54	3,20	2,10	5,60	Σ 7 PCBs	ICT Prague, 2003 (unpubl.); monitoring programme of the Czech Ministry of Environment
		15	3	1996	5,67	4,78	3,18	10,44		
		19	4	1997	2,90	2,55	0,97	5,07		
		20	4	1998	3,68	3,48	1,71	5,62		
		24	4	1999	2,73	2,45	0,98	5,91		

Levels of Indicator PCBs in vegetation										
	Matrix	**Number of samples per year**	**Annual frequency of measurements**	**Year**	**Determined values [ng/g dry weight]**					
					Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
		24	4	2000	3,20	3,10	0,99	10,90		ICT Prague, 2003 (unpubl.); monitoring programme of the Czech Ministry of Environment
		24	4	2001	3,55	2,67	1,58	7,58		
	Needles	11	2	1995	1,97	2,20	1,00	2,80	Σ 7 PCBs w.w.	
		15	3	1996	3,01	3,56	0,8	5,38		
		22	4	1997	1,90	1,66	0,70	5,62		
		20	4	1998	1,03	0,90	0,70	1,71		
		25	4	1999	0,88	0,87	0,70	1,21		
		24	4	2000	1,03	0,70	0,70	2,69		
		24	4	2001	0,70	0,62	0,20	1,75		
	Pollen	46	3	1997	1,19	0,71	0,18	13,15	Σ 7 PCBs w.w.	
		66	3	1998	1,14	0,84	0,10	5,33		
		66	3	1999	1,19	0,90	0,25	8,24		
		66	3	2000	2,06	1,24	0,27	14,13		
		18	3	2001	0,97	0,99	0,40	1,77		
SLO	Spruce needles			2000		1,2	0,2	2,0	Σ 6 PCBs	Weiss et al. (2003)
	Mosses	Bela Krajina		1991			10	1 013	Total PCBs	Fazarinc et al. 1992 personal information National Chemicals Bureau

Contamination – Fish

Levels of PCDD/Fs & dl PCBs in fish									
	Species	Number of sites/samples per year	Year	Determined values [pg /g]					
				Mean	Median	Minimum	Maximum		Notes
CZ	Fish rivers & lakes	2/2	2000			32.6	117.8	Σ-TEQ f.w.	State Veterinary Control
						276	978	PCB-TEQ f.w.	
	Fish Elbe hot spot	Spolana Neratovice ; 9/9	2002			0.86	7.22	PCB-WHO-TEQ f.w.	Holoubek et al. 2003e
						0.36	0.88	PCDD/F-WHO-TEQ f.w.	
		Spolana Neratovice ; 2/2	2003			0.35	5.23	PCB-WHO-TEQ f.w.	
						0.13	1.34	PCDD/F-WHO-TEQ f.w.	
	Roach	River Skalice	1998		2.58			PCB TEQ f.w.	Holoubek et al. 2003a; ICT Prague 2003
		Skalice downstream Rozmital (hot spot)			17.61				
	Eel	River Elbe			0.55				
	Barbel				25.13				
EST	Baltic herring	4/8	2002	2.65	1.45	0.6	2.6	PCDD/F-WHO-TEQ/g w.w. (without skin)	EERC; Ott Roots et al.
	Baltic herring	4/12	2002	1.8		0.8	4.5	PCDD/F-WHO-TEQ/g w.w.	
	Sprat (marine)	3/8	2002	2.13		1.6	2.6	PCDD/F-WHO-TEQ/g w.w.	
	Cod (marine)		2002	0.0775				PCDD/F-WHO-TEQ/g w.w.	

Levels of PCDD/Fs & dl PCBs in fish									
	Species	**Number of sites/samples per year**	**Year**	**Determined values [pg /g]**					
				Mean	**Median**	**Minimum**	**Maximum**		**Notes**
LV	Herring /Baltic Sea	4	2002			3.63	5.81	PCDD/F-WHO-TEQ/g w.w.	Latvian National Food & Veterinary service unpubl.
	Herring /Gulf of Riga	4	2002			2.2	5.01		
LV	Sprat (marine)	4	2002			3.59	6.02	PCDD/F-WHO-TEQ/g w.w.	Latvian National Food & Veterinary service unpubl
	Cod (marine)	4	2002			0.07	0.09		
	Perch (river)	3 lakes/3	2003			1.18-	1.47	PCDD/F- WHO-TEQ/g w.w.	Latvian Environment Agency 2003
		Daugava up stream & downstream of Riga/2				1.04	1.18		
PL	flounder	Gulf of Gdansk	1992-93	8.4				PCDD/Fs-TEQ f-w-	Falandysz et al. 1997
	herring			81					
	cod			7.8					
PL	flounder 6,46% fat	Baltic proper; region of Koszalin' 10 each	2002	2.02	2.03	1.37	2.55	PCDD/Fs-WHO-TEQ w.w.	Grochowalski (personal communication)
				31.56				PCDD/Fs-WHO-TEQ f.w.	
	herring 5.58% fat			1.05	1.00	0.77	1.71	PCDD/Fs-WHO-TEQ w.w.	Grochowalski (personal communication)
				18.1				PCDD/Fs-WHO-TEQ f.w.	
	cod 6.43% fat			1.49	1.63	0.82	2.43	PCDD/Fs-WHO-TEQ w.w.	
				23.28				PCDD/Fs-WHO-TEQ f.w.	
	salmon 8.46% fat			2.66	2.6	1.53	3.79	PCDD/Fs-WHO-TEQ w.w.	

Levels of PCDD/Fs & dl PCBs in fish									
	Species	**Number of sites/samples per year**	**Year**	**Determined values [pg /g]**					
				Mean	**Median**	**Minimum**	**Maximum**		**Notes**
PL				31.19				PCDD/Fs-WHO-TEQ f.w.	
	local fish	estuarine sections of Vistula and Oder	2002				64.5	PCDD/Fs-TEQ f.w.	Niemirycz et al. (NPOPsInv Poland)
	Local fish	estuarine section of Vistula and Oder	2002				69.9	Σ coplanar PCBs f.w.	Institute of Meteorology 6Water Management (NPOPsInv Poland 2003)
	Eel	Gulf of Gdansk	2001	0.50-0.64				PCB-TEQ/g; w.w.	Falandysz et al.2002
				9-11				PCB-TEQ/g f.w.	
	Cod	Gulf of Gdansk	2001	0.28				PCB-TEQ/g w.w.	
				8.1				PCB-TEQ/g f.w.	
PL	Perch			2.0		0.89	3.1	PCB-TEQ/g w.w.	Falandysz et al.2002
				35		17	53	PCB-TEQ/g f.w.	
	Pikeperch			2.3				PCB-TEQ/g w.w.	
				51				PCB-TEQ/g f.w.	
	Flounder			1.1(± 1.0)		0.15	2.2	PCB-TEQ/g w.w.	
				24 (± 22)		3.1	46	PCB-TEQ/g f.w.	
	Herring			0.48				PCB-TEQ/g w.w.	
				5.3				PCB-TEQ/g f.w.	
	Eelpout			2.4				PCB-TEQ/g w.w.	
				81				PCB-TEQ/g f.w.	

Levels of Indicator PCBs in fish									
	Species	**Number of sites/samples per year**	**Year**	**Determined values [ng.g]**					
				Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
CZ	**perch** 2.7% fat	4/6	1997	158.34	123.76	37.10	351.24	Σ 7PCBs /g muscle tissue	State Veterinary Administration; National Monitoring Programme **fresh water (rivers & lakes)**
					4583.70			Σ 7PCBs /g f.w.	
	perch 0.5% fat	7/12	1998	21.10	14.70	10.15	51.28	Σ 7PCBs /g muscle tissue	
					2940.00			Σ 7PCBs /g f.w.	
	perch. 0.7% fat	8/19	1999	27.29	19.72	4.88	73.70	Σ 7PCBs /g muscle tissue	
					2817.14			Σ 7PCBs /g f.w.	
	perch, 0.8% fat	12/75	2000	32.63	24.84	8.41	140.27	Σ 7PCBs /g muscle tissue	
CZ	**perch**, 0.8% fat	7/8	2001	23.55	19.78	11.98	52.27	Σ 7PCBs /g muscle tissue	State Veterinary Administration; National Monitoring Programme **fresh water (rivers & lakes)**
					2472.5			Σ 7PCBs /g f.w.	
	perch, 0.9% fat	6/13	2002	33.65	22.91	9.06	124.96	Σ 7PCBs /g muscle tissue	
					2545.56			Σ 7PCBs /g f.w.	
CZ	**chub** 1.6% fat	4/10	1997	100.94	46.47	17.82	580.89	Σ 7PCBs /g muscle tissue	
					2904.4			Σ 7PCBs /g f.w.	

Levels of Indicator PCBs in fish									
	Species	**Number of sites/samples per year**	**Year**	**Determined values [ng.g]**					
				Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
CZ	**chub** 1.3% fat	9/27	1998	72.65	55.60	16.19	278.53	Σ 7PCBs /g muscle tissue	State Veterinary Administration; National Monitoring Programme **fresh water (rivers & lakes)**
	chub. 2.4% fat	19/31	1999	89.34	60.57	15.23	438.90		
	chub, 2.6% fat	13/124	2000	132.67	87.53	15.27	727.59		
					3366.53			Σ 7PCBs /g f.w.	
	chub, 2.3% fat	9/19	2001	205.74	104.60	16.65	1184.49	Σ 7PCBs /g muscle tissue	
	chub, 2.2% fat	7/16	2002	88.36	64.54	23.88	314.70		
					2933.63			Σ 7PCBs /g f.w.	
CZ	**barbel** 4.3% fat	3/4	1997	314.37	242.54	24.75	747.64	Σ 7PCBs /g muscle tissue	State Veterinary Administration; National Monitoring Programme **fresh water (rivers & lakes)**
					5640.5			Σ 7PCBs /g f.w.	
	barbel 2.6% fat	5/10	1998	203.67	162.00	40.32	491.21	Σ 7PCBs /g muscle tissue	
	barbel, 4.4% fat	8/16	1999	338.92	213.61	50.01	1132.22		
	barbel, 3.3% fat	5/15	2000	458.85	350.99	86.89	1785.05		
					10636.0			Σ 7 PCBs /g f.w.	
	barbel, 2.8% fat	4/6	2001	601.33	367.76	76.39	1850.91	Σ 7PCBs /g muscle tissue	
	barbel, 4.2% fat	3/7	2002	664.00	845.68	123.92	1189.13		
					20135.23			Σ 7 PCBs /g f.w.	

Levels of Indicator PCBs in fish									
	Species	**Number of sites/samples per year**	**Year**	**Determined values [ng.g]**					
				Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
CZ	**bream** 1.1%	1	1997	47.07				Σ 7 PCBs /g muscle tissue	State Veterinary Administration; National Monitoring Programme **fresh water (rivers & lakes)**
	bream, 2.8%	6/17	1998	182.87	79.64	17.82	747.64		
					2844.3			Σ 7 PCBs /g f.w.	
	bream, 3.6% fat	5/14	1999	202.41	168.03	14.75	551.27	Σ 7 PCBs /g muscle tissue	
					4667.5			Σ 7 PCBs /g f.w.	
	bream, 2.7% fat	8/60	2000	234.15	168.96	21.26	1811.43	Σ 7 PCBs /g muscle tissue	State Veterinary Administration; National Monitoring Programme **fresh water (rivers & lakes)**
					6257.78			Σ 7PCBs /g f.w.	
	bream, 2.0% fat	5/9/6	2001	196.71	180.24	70.18	390.14	Σ 7 PCBs /g muscle tissue	
CZ					9012.00			Σ 7PCBs /g f.w.	
	bream, 2.5% fat	6/9	2002	132.25	120.23	10.93	283.59	Σ 7 PCBs /g muscle tissue	
					4809.2			Σ 7PCBs /g f.w.	
	trout 4.2% fat	1	1997	4.66				Σ 7 PCBs /g muscle tissue	
	trout, 1.2% fat	4/11	1998	22.70	14.05	1.47	55.96		
					1170.8			Σ 7PCBs /g f.w.	
	trout, 1.8% fat	4/10	1999	17.97	15.76	1.63	49.75	Σ 7PCBs /g muscle tissue	

Levels of Indicator PCBs in fish									
	Species	**Number of sites/samples per year**	**Year**	**Determined values [ng.g]**					
				Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
					875.55			Σ 7PCBs /g f.w.	
CZ	**trout**, 2.2% fat	4/10	2000	35.00	27.27	10.96	71.48	Σ 7PCBs /g muscle tissue	State Veterinary Administration; National Monitoring Programme **fresh water (rivers & lakes)**
					1239.54			Σ 7PCBs /g f.w.	
	trout, 2.0% fat	3/6	2001	28.66	22.05	12.87	59.06	Σ 7PCBs /g muscle tissue	
					1102.5			Σ 7PCBs /g f.w.	
	trout, 2.0% fat	3/6	2002	33.78	23.78	7.95	71.72	Σ 7PCBs /g muscle tissue	
					1189.0			Σ 7PCBs /g f.w.	
CZ	**carp liver**, 11.3% fat	2	1999	44.82	44.82	39.11	50.54	Σ 7 PCBs /g w.w.	Holoubek et al. 2003a
	8.0% fat	4/8	2001	84.68	18.91	13.60	334.22		
	6.2% fat	4/5	2002	7.63	6.52	2.25	15.23		
	carp berry, 7.6% fat	2	1999	25.28	25.28	25.05	25.51		
	6.6% fat	4/3	2001	14.97	13.54	11.51	19.87	Σ 7 PCBs /g w.w.	Holoubek et al. 2003a
	6.6% fat	4	2002	5.40	4.93	1.69	10.08		
CZ	**carp milt**, 3.2% fat	2	1999	16.83	16.83	6.83	26.83	Σ 7 PCBs /g w.w.	
	1.5% fa)	4	2001	17.72	4.85	2.19	59.00		

Levels of Indicator PCBs in fish									
	Species	**Number of sites/samples per year**	**Year**	**Determined values [ng.g]**					
				Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
CZ	3.2% fat	3	2002	6.17	4.82	4.80	8.88		Holoubek et al. 2003a
	carp muscle tissue, 5.5% fat	2/10	1999	26.02	24.22	17.77	39.14		
	4.2% fat	4/28	2001	33.91	16.33	2.98	153.0		
	5.9% fat	4	2002	7.46	6.95	2.13	13.78		
CZ	Bream	Mušov lake, south Moravia	1996	5 190		2 705	13 417	Σ 20 PCBs	Holoubek et al. 2003a, ICT Prague, 2003
				2 977		1 549	7 976	Σ 7 PCBs	
	Pike pearch			5 149		2 177	10 301	Σ 20 PCBs	
				2 916		1 242	5 845	Σ 7 PCBs	
	Carp			2 840		1 724	4 572	Σ 20 PCBs	Holoubek et al. 2003a, ICT Prague, 2003
				1 589		887	2 572	Σ 7 PCBs	
	Roach	River Skalice	1998	2 329				Σ 7 PCBs	
		Skalice downstream Rozmital (hot spot)		5 758					
	Eel	River Elbe		607				Σ 7 PCBs	
	Barbel			24 794				Σ 7 PCBs	
EST	Perch (marine)	Island Hiiumaa	1992–93	530				Σ 7 PCBs	Blomkvist et al. 1993
		Matsalu Bay	August 1999		658.5			Σ11 PCBs	Ott Roots 2003
		Matsalu Bay	September 1999		355.3			Σ11 PCBs	Ott Roots 2003
LT	Perch (marine)	Kuronian Bay	1992–93			760	2 100	Σ 7 PCBs	Blomkvist et al. 1993

Levels of Indicator PCBs in fish									
	Species	**Number of sites/samples per year**	**Year**	**Determined values [ng.g]**					
				Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
LV	Perch (fresh water)	Dagauva estuary	1992–93			680	1 800	Σ 7 PCBs	Blomkvist et al. 1993
PL	stickleback	Gulf of Gdansk	1992–93			4.4	8.2	total PCBs	Falandysz et al. 1997a
	three spinned stickleback					2 700	4 200		Falandysz et al 1998b
	eelpout			11 000					Falandysz et al 1997a
	pikeperch			11 000					Falandysz et al 1998a
	perch					3 000	4 000		Falandysz et al 1998a
	flounder					910	9 400		Falandysz et al. 1997c
	flounder					4 800	9 400		Falandysz et al 1998a
	Perch (fresh water)	3 sites Oder estuary/ 137	1996-97	725		21	5 000	Σ 8 PCBs	Falandysz et al. 2002
	Local fish	Vistula and Oder	2002				346.1		Niemirycz et al. (NPOPsInv Poland)
RO	Fresh water	**Danube delta ;**	**2001**					Σ 18 PCBs	Covaci et al. 2002
	Bream	2/2				170.7.	544.3		
	Gibel carp	3/6				83.9	232.8		
	Carp	1/2		1 209.1					
	Roach	1/2		500.9					
	Pikeperch	1/2		1 239.9					
	Perch	1/2		302.4				Σ 18 PCBs	Covaci et al. 2002
SK	Planktofags and benthofags	District Michalovce, (hot spot region); 20 pooled		223 550		949	587 410	total PCBs	Kocan et al. 1999, 2001
	Predator fishes			375 430		4 490	933 770		

Levels of Indicator PCBs in fish									
	Species	**Number of sites/samples per year**	**Year**	**Determined values [ng.g]**					
				Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
SK	Planktofags and benthofags	District Stropkov, (control area; 11 pooled		1 540		628	2 820		
	Predator fishes			5 150		2 700	8 160		

Contamination – Wildlife

Levels of PCDD/Fs & dl PCBs in wildlife									
	Species	**Number of sites/samples per year**	**Year**	**Determined values [pg./g fat]**					
				Mean	**Median**	**Minimum**	**Maximum**		**Notes**
PL	Plankton	Southern part of the Baltic Sea	1991 - 1993	18				PCDD/Fs-TEQ	Falandysz et al. 1994, 1997, 1998
	mussels					23	590		
	crabs			42					
	fish					3.8	67		
	blubber of harbor porpoise	Southern part of the Baltic Sea		5.6				PCDD/Fs-TEQ	
PL	black cormorant	coastal	1996	108,000 (n=1)				PCDD/Fs-I-TEQ	Falandysz et al. 2000a
	white-tailed sea eagle)		1996	470,000 (n=1)				PCDD/Fs-I-TEQ	Falandysz et al. 2000a

Levels of Indicator PCBs in wildlife									
	Species	**Number of sites/samples per year**	**Year**	**Determined values [ng.g fat]**					
				Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
CZ	**hare** (liver)	15	1995	0.913	0.680	0.230	3.990	∑ 7 PCBs	Holoubek et al. 2003a &e
		21/67	1996	0.470	0.299	0.035	3.105		
		21	1997	0.941	0.500	0.112	3.035		
		17	1998	1.081	0.865	0.245	2.862		
		18/52	1999	0.424	0.237	0.052	2.010		
		21/57	2000	0.531	0.282	0.068	5.640		
	hare (muscle tissue)	15	1995	0.945	0.630	0.075	4.480	∑ 7 PCBs	
		21/67	1996	0.414	0.279	0.035	3.318		
		21/67	1997	0.938	0.550	0.175	3.923		
		21/67	1998	0.585	0.680	0.075	0.970		
		18/52	1999	0.491	0.183	0.081	3.348		
		21/57	2000	0.573	0.147	0.048	4.320		
CZ	Otter		1991-92		130 000	19 000	260 000	Σ 7 PCBs	Sjöasen et al 1997
LV	Otter		1991-92		2 300	400	10 000	Σ 7 PCBs	Sjöasen et al. 1997
PL	black cormorant		1991-92	34 000 (n=1)				total PCBs	Falandysz et al. 1994a
	white tailed sea eagle	coastal				66 000	480 000		Falandysz et al. 1994a
		inland				4 600	32 000		
		coastal	1996	1 100 000 (n=1)					Falandysz et al. 2000a
		inland		15 000 (n=1)					
RO	Cormorant (muscle)	2/4	2000			622.8	2 231.0	Σ 18 PCBs	Covaci et al. 2002
SK	Wild game	total 1 000	1987-97		24-203	1.0	2.200	Σ 9 PCBs	Kocan et al. 1998

Annex IV: Human exposure and tissue levels

Content

Glossary

Σ TEQ = PCDD/F &PCB TEQ

n.d. = not detected

LOD = Limit of detection

Contamination - Food

Levels of PCDD/Fs & dl PCBs — foodstuffs									
	Food group	samples per year	Year	Determined values [pg TEQ./g fat]					
				Arith. mean	Median	Minimum	Maximum	Notes	Reference
CZ	vegetable oils	4	2001	0.988	0.995	0.76	1.2	PCDD/F-PCB-TEQ	Control samples of State Agricultural and Food Inspection CR; Holoubek et al. 2003a
	animal products	6	2001	2.063	1.6	0.98	5.5		
	various fishes	10	2002	0.365	0.225	0.16	1		
EST	fish	8	2002	1.4	1.45	0.6	2.6	WHO-TEQ/g wet weight	EERC; Ministry of Social affairs
SK	Bacon	10	2002	0.28303		0.00334	1.43806	PCDD-WHO-TEQ	Slovak National Food Monitoring National Food Research Institute; Slovak NPOPsInv 2003
		10	2002	0.59302		0.19929	1.41663	PCDF-WHO-TEQ	
				0.876				PCDD/F-TEQ	
	Pork	10	2002	0.05018		0.00039	0.44054	PCDD-WHO-TEQ	
	Beef	10	2002	0.593		0.199	1.417	PCDF-WHO-TEQ	
	Meat mixed			0.64				PCDD/F-TEQ	
	eggs	14	2002	0.28757		0.00714	1.80104	PCDD-WHO-TEQ	
		14	2002	3.1523		0.0028	30.0331	PCDF-WHO-TEQ	
				3.44				PCDD/F-TEQ	
	fish	2	2002			0.302	0.348	PCDD-WHO-TEQ	
		2	2002			0.259	0.0303	PCDF-WHO-TEQ	
						0.56	0.65	PCDD/F-TEQ	

Levels of Indicator PCBs -- foodstuffs									
	Food group	**samples per year**	**Year**	**Determined values [ng./g fat]**					
				Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	
CY	Meat		1999	<LOD: 1-5 ng/g fat				Σ 15 congeners	Micharelidou and Ziegler. State General Laboratory unpublished data 1999-2000
			2000					Σ 7 PCBs	
	Milk		1999	<LOD: 0.6 ng/g fat				Σ 15 congeners	
			2000					Σ 7 PCBs	
CZ	beef	about 200	2001		17			Σ 7 PCBs	State Veterinary Administration CR; Holoubek et al. 2003
	pork	440			11				
	meat tins	?			10				
	consumer milk	about 60			12				
	cheese	about 100			8				
	butter	40	2002	8.2	8.1	n.d.	29		
	see above	see above	1990-2000		see figure 5-3 chapter 5				
EST	Butter		1999			5.2	8.8	Σ 7 PCBs	Ministry of Social Affairs; Ott Roots 2003 a-d
	Meat					5.1	9.6		
	imported meat					21	23		
LT	Bovine meat	59	2002	<LOD = 40				Σ 7 PCBs	State Food and Veterinary Service; annual report (unpubl.)
	Porcine meat	40							
	Wild animals	47							
	Poultry	6							
	Farmed fish	4							
	Milk	35	2002	<LOD = 40				Σ 7 PCBs	State Food and Veterinary Service; annual report
	Eggs	31							
LV		119	2000	< 160 (characteristic)					Latvian Health Indicators Latvian; Environmental Agency

Levels of Indicator PCBs — foodstuffs									
	Food group	**samples per year**	**Year**	**Determined values [ng./g fat]**					
				Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	
	freshwater	54	1998 – 2000	Presence of PCB in 101 samples; 63% of the samples PCB within 1-138 ng/g				Σ 7 PCBs	Public Health Agency – Latvia (unpubl.)
	saltwater	87							
	smoked sea fish	19							
MT	cattle renal fat	1	2001	17				Σ 7 PCBs	Malta National Meat residue Programme (personal communication)
	pig renal fat	2		17		17	17		
	fish aquaculture (muscle)	2		< 40					
	fish wild (muscle)	3		232 (upper bound); 205.3 (lower bound)		< 40	616		
	cattle renal fat	1	2002	8				Σ 7 PCBs	
	pig renal fat	2		< 12					
	fish aquaculture (muscle)	3		159.66		44	247		
	fish wild (muscle)	7		421.7		48	958		
PL	Cow milk	285	1994	3				Σ 7 PCBs	National Farm & Food products Monitoring Programme of the Ministry of Agriculture; annual reports in Polish; NPOPsInv 2003
	Cow milk	52	1998	0.1					
	Eggs	220	1994	< 1					
	Fish	42	1998	3.4					
	Citrus fruits	64	1996/97	0.2					
	Vegetable		1996	0.2					
	Pork		1998-2000	1.2		0	660		
	Cattle		1998-2000	3.6		0	130		

Levels of Indicator PCBs –- foodstuffs									
	Food group	**samples per year**	**Year**	**Determined values [ng./g fat]**					
				Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	
PL	Wild boar and roe		1998-2000	5.9		0	30	Σ 7 PCBs	National Farm & Food products Monitoring Programme of the Ministry of Agriculture; annual reports in Polish; NPOPsInv 2003
	Cow milk		1998-2000	2.4		0	80		
		101	2000	2.3					
	Carp	100	1998-2000	27.8		0	280		
	Meat products		1998	269.1					
			1999	212.0					
		392	2000	152.4		25	328		
	Bovine fat	150	2000	3.6					
	Pork fat	200	2000	1.2					
	Vegetable oils		1998	178.6					
			1999	228.4					
		224	2000	130.0		96	152		
	Margarine		1998	125.9					
PL	Margarine		1999	201.5					
		244	2000	135.1		29	437		
	Rape seeds		1998	414.4					
			1999	229.3					
		223	2000	138.8		35	331		
	Goose		2000	159.2		86	334		
	Turkey		2000	177.9		38	335		
	Lamb		2000	123.4		83	169		
	Broilers		2000	-		184	265.6		

Levels of Indicator PCBs — foodstuffs									
	Food group	**samples per year**	**Year**	**Determined values [ng./g fat]**					
				Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	
PL	Raw fish products. including cod liver	252	2001 / 2002	460		40	3645	Σ 7 PCBs	
	4 main fish species			190		27	420		National Farm & Food products Monitoring Programme of the Ministry of Agriculture; annual reports in Polish; NPOPsInv 2003
	Tinned fish			120		21	920		
	Tinned cod fish			660		300	1600		
	Smoked fish			90		24	750		
	Salted fish			84		36	196		
	Pickles			69		31	200		
SK	Beef, pork, lard, butter, milk, eggs, poultry, fish	total 138 from 5 different regions	1993-95		see figure 5-1 in chapter 5			Σ 7 PCBs	Kocan et al. 1995b
	pork, salami, sausages, lard, beef, milk, butter, chicken, eggs	total 695 from Michalovce and Strokov district	1997-98					Σ 9 PCBs	Kocan et al. 1999
SLO	Fish - Krupa	2 spring	1984-95			116 000	118 000	total PCBs	Fazarinc et al. 1992
		2 mid river	1984-95			32	1 800		
		2 river estuary	1984-95			54	3 300		
		12 spring	1991			7 200	177 000		
		18 mid river	1991			970	77 000		
		18 river estuary	1991			210	5 800		
	Cow milk	31	1991			0.9	33.6		

Levels of Indicator PCBs -– foodstuffs										
	Food group	**samples per year**	**Year**	**Determined values [ng./g fat]**						
				Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**		
SLO	Eggs	47	1991			0.6	85	total PCBs	Fazarinc et al. 1992	
	Checken	18	1991			2	530			
	Pork	6	1991			1.6	15.7			
	Game	2	1991			0.06	7.3			
	Bacon	27	1991			0.9	32.7			
	Pork fat	41	1991			0.8	59.2			
	Nuts	15	1991			0.09	21.9			
	Beans	15	1991			0.01	7.85			
	Fruit and vegetables	34	1991			0.01	25			

Contamination – Human breast milk

Levels of PCDD/Fs and dl PCBs in human breast milk										
	Matrix	**Number of sites**	**Total number of samples**	**Year**	**Determined values [pg /g fat]**					
					Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	
BG	Human milk	3	10/pool	2001-2002		6.14	5.08	7.11	PCDD/F -TEQt	Van Leeuwen et al. 2002; WHO 3rd round
						1.77	1.30	12.28	PCB-TEQ	
CZ	Human milk	Benešov, Žďár n.S., Plzeň, Ústí n.L	25/pool; 100	1998	11.30	11.25	9.92	12.82	PCDD/F-TEQ	National Institute of Public Health ; Holoubek et al. 200a
					20.82	21.55	17.7	22.5	PCB-TEQ	
		Prague	15	1999	21.4				PCDD/F-TEQ	
		8	86	1999			10.24	22.7	PCDD/F-TEQ	
							17.39	45	PCB-TEQ	
		Kladno	11/pool	1992	15.25	12.1			PCDD/F-TEQ	WHO/ECEH 1996
		Uherské Hradiště				18.4				
		Kladno				6.0			PCB-TEQ	
		Uherské Hradiště				9.4				
		3	10/pool	2001		7.78	7.44	10.73	PCDD/F-TEQ	Van Leeuwen et al. 2002; WHO 3rd round
						15.24	14.32	28.48	PCB-TEQ	
CZ	Human milk	7	86	2000	29.0 – 94.2	27.8 – 64.6	14.6	234.1	**Σ TEQ**	
EST	Human milk	Tartu, Tallinn	12	1991	17.5		13.5	21.5	Nordic PCDD/F-TEQ	Mussalo-Lindstrom 1995
		urban		1993	14.4				PCDD/F-TEQ	Vartiainen et al. 1997
		rural		1993	12.4				PCDD/F-TEQ	
LT	Human milk	Palaanga	12	1992-93		16.6			PCDD/F-TEQ	WHO/ECEH 1996
		Anykshchiai				14.4				
		Vilnius				13.3				

Levels of PCDD/Fs and dl PCBs in human breast milk										
	Matrix	**Number of sites**	**Total number of samples**	**Year**	**Determined values [pg /g fat]**					
					Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	
LT		Palaanga				20.4			PCB-TEQ	WHO/ECEH 1996
		Anykshchiai				20.7				
		Vilnius				20.5				
HU	Human milk	Budapest	20	1992-93			8.5	8.6	PCDD/F-TEQ	WHO/ECEH 1996
		Scentes	10			7.8				
		Budapest	20			1.7			PCB-TEQ	
		Scentes	10			1.4				
		3	10/pool	2001-2002		6.79	5.26	7.46	PCDD/F-TEQ	Van Leeuwen et al. 2002; WHO 3rd round
						2.87	2.38	4.24	PCB-TEQ	
PL	Human milk	Brzeg Dolny	10	2001	2.44				dl PCBs Σ 12 congener	Lulek et al. 2002
		Tarnow	10		2.12					
		Wloclawek	10		2.05					
RO	Human milk	3	10/pool	2001-2002	8.86	8.37	12.0	PCDD/F-TEQ		Van Leeuwen et al. 2002; WHO 3rd round
					8.06	8.05	8.11	PCB-TEQ		
SK	Human milk	Michailovce	10	1992			15.1	15.2	PCDD/F-TEQ	WHO/ECEH 1996
		Nitra				12.6			PCB-TEQ	
		Michailovce	10			13.3			PCDD/F-TEQ	
		Nitra				6.1			PCB-TEQ	
		4	10/pool	2001-2002		9.07	7.84	9.87	PCDD/F-TEQ	Van Leeuwen et al. 2002; WHO 3rd round
						12.60	10.72	19.49	PCB-TEQ	

Levels of Indicator PCBs in human breast milk										
	Matrix	**Sites/ Number of samples per year**	**Total number of samples**	**Year**	**Determined values [ng.g^{-1} of lipid]**					
					Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
BG	Human milk	3	10/pool	2001-2002		42	32	52	Σ 7 PCBs	Van Leeuwen et al. 2002; WHO 3rd round
CZ	Human milk	292		1994	1 600				Σ 7r PCBs	Monitoring of health status of Czech population Holoubek et al. 2000a
		385		1995	1 400					
		295		1996	900					
		367		2002	884	799				
	Human milk	4 regions:	282	1994	352		183	629	PCB 153	Černa. et al. (2003)
			407	2001	139		70	273		
	Human milk	Kladno	11	1992-93	532-533					WHO/ECEH 1996 2nd round
		Uherske Hradiste	11		1068					
EST	Human milk			1984	12.0		6	17	**ng/ml**	Ott Roots
HU	Human milk	Bekes	20 /county	2001-2002		89	35	150	Σ 7 PCBs	National Institute of Food Hygiene and Nutrition
HU	Human milk	Borsod-Abauj-Zemplen				59	21	504	Σ 7 PCBs	National Institute of Food Hygiene and Nutrition
		Barabya				45	14	161		
		Komaron-Esztergom				41	14	294		
		Budapest				45	9	252		
		Szablcs-Szatmar-Bereg				39	11	79		
		Zala				26	13	63		
		Veszprem				28	8	507		

Levels of Indicator PCBs in human breast milk										
	Matrix	Sites/ Number of samples per year	Total number of samples	Year	Determined values [ng.g^{-1} of lipid]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
HU		Hajdu-Bihar				23	4	36	Σ 7 PCBs	National Institute of Food Hygiene and Nutrition
		Györ-Moson-Sopron				50	12	151		
	Human milk	3	10/pool	2001-2002		34	29	59	Σ 7 PCBs	Van Leeuwen et al. 2002; WHO 3rd round
		Budapest	20	1992–93		61-65			∑ 6 PCBs	WHO/ECEH 1996
		Scentes	10			45-47				
LT	Human milk		92	1995-1998	450				Σ 7 PCBs	Report to Lithuanian Ministry of Health
		Palanga	12	1992–93		361			∑ 6 PCBs	WHO/ECEH 1996
		Anykshchiai	12			287				
		Vilnius	12			322				
PL	Human milk	Warsaw	356	1999			4	12	ng/ml	Czaja et al. 1999
		industrial	1	2001	22.0					Czaja et al. 2002
		rural	1	2001	13.1					Czaja et al. 2002
	Human milk	up to 25 years	118	1996	34.1		1	21.85	ng/ml	Czaja et al. 1997
	Human milk	25-30 years	77	1996	58.4		1	39.05		Czaja et al. 1997
	Human milk	over 30 years	58	1996	63.5		1.3	388.1		Czaja et al. 1997
	Human milk	rural	143	1996	12.8		1	60.6		Czaja et al. 1997b
	Human milk	urban	110	1996	13.1		1	74.1		Czaja et al. 1997b
	Human milk	Wielkopolska region	28	2001	166.3				Total PCBs; Σ 14 PCBs	Szyrwinska, Lulek 2002
		Wielkopolska region	28	2001	7				**ng/ml**	

Levels of Indicator PCBs in human breast milk										
	Matrix	**Sites/ Number of samples per year**	**Total number of samples**	**Year**	**Determined values [ng.g^{-1} of lipid]**					
					Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
PL		Wielkopolska region	12 (28)	2000-2001	77.6		22.5	132.7	Σ 12 PCBs	Szyrwinska, Lulek 2002
RO						173	165	198	Σ 7 PCBs	Van Leeuwen et al. 2002; WHO 3rd round
SK	Human milk	4	10/pool	2001-2002		443	331	621	Σ 7 PCBs	Van Leeuwen et al. 2002; WHO 3rd round
	Western Slovakia		96	1990 – 2002	39 – 1 315		21	2 027		Control monitoring of Regional Branches of National Institute of Health
	Middle Slovakia		37	1989 – 1994	524 – 1 363		249	3 024		
	Eastern Slovakia		1 254	1986 - 1996	1 290 – 2 770		230 - 950	4 830 – 28 740	(as Delors)	
			> 550	1997 - 2001	171 – 2 095		48	8 264		
SK	Human milk	Bratislava	67	1993–94		900			∑ 6 PCBs	Kocan et al. 1994
		Michalovce				1 320				
		Myjava				820				
		Nitra				750				
		Velky Krtis				590				
		Michalovce	10	1992-93		1015				WHO/ECEH 1996
		Nitra	10			452-453				

Contamination – Adipose tissue

Levels of PCDD/Fs and dl PCBs in adipose tissue										
	Matrix	Number of sites	Total number of samples	Year	Determined values [pg /g fat]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
CZ	Adipose tissues	4	61	1996 - 1999		98:0	28.0	480	PCDD/F-TEQ	National Institute of Public Health ;Monitoring of health status of Czech population since 1994 in 4 regions 2 rural, 2industrial; NPOPsInv Czech Republic (Holoubek et al. 2003a
		Benešov, Žďár n.S., Plzeň, Ústí n.L.	29	2001		21.8	8.6	82.6	PCDD/F-TEQ	
		Benešov, Žďár n.S., Plzeň, Ústí n.L.	29	2001		34	18	138	PCB-TEQ	
		Ostrava	12	1997	32.3				PCDD/F-TEQ	
					44.2				PCB-TEQ	

Levels of Indicator PCBs in adipose tissue										
	Matrix	Sites	Total number of samples	Year	Determined values [ng./g- fat]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
CZ	Adipose tissue		99	1994/95	1 210	4 760			Σ 7 PCBs	National Institute of Public Health ;Monitoring of health status of Czech population since 1994 in 4 regions 2 rural, 2industrial NPOPsInv Czech Republic (Holoubek et al. 2003a
			61	1996-97		2980				
		Benešov, Žďár n.S., Plzeň, Ústí n.L.	29	2000 - 2001		2 239				
HU	Adipose tissue		28	2000	226.59 ± 197.20		53.26	875.00	Σ 37 PCBs	Van Bavel et al. 2003
PL	Adipose tissue	Wielkopolska region	7	2001	276..07		76.6	472	Σ 14 PCBs, wet weight	Szafran et al. 2002a
SK	Adipose tissue	Bratislava	68	1993-94	1 730				Σ 6 PCBs + 8 mono-ortho PCBs	Kocan et al. 1994a
		Michalövce	68		6 870					

Levels of Indicator PCBs in adipose tissue										
	Matrix	**Sites**	**Total number of samples**	**Year**	**Determined values [ng./g⁻ fat]**					
					Arith. mean	**Median**	**Minimum**	**Maximum**	**Notes**	**Reference**
SK	Adipose tissue	Myjava			1 180				Σ 6 PCBs + 8 mono-ortho PCBs	Kocan et al. 1994a
		Nitra			1 720					
		Velky Krtis			1 140					
SLO	Adipose tissue	local population Bela Krajina	2	1984			250 000	500 000	total PCBs	Fazarinc et al. 1992
			2	1984/86			270 000	320 000		
			2	1987/89	9 700					
TR	Adipose tissue		32	2000	275..3				Σ 7 PCBs	Cok et Satiroglu 2003
			29	1999-2000	383..3					
			29	1999-2000	265..6					

Contamination – Blood

Levels of PCDD/Fs and dl PCBs in human blood										
	Matrix	Number of sites	Total number of samples	Year	Determined values [pg /g fat]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
SK	Blood serum	6	30	1994 - 1998	21.5	19.9	10.2	58.0	Co-Planar PCBs	Kocan et al
					9.9	8.8	2.9	29.3		
	Blood serum	MWI Bratislava	4	1995 - 1997	24.5		15.5	45.1	PCDD/F-TEQ	
		Chemko Strážské	3		61.3		30.0	92.1		
		MWI Bratislava	4		9.3		3.5	22.4	PCB-TEQ	
		Chemko Strážské	3		56.9		21.7	104..5		

Levels of Indicator PCBs in human blood										
	Matrix	Sites/ Number of samples per year	Total number of samples	Year	Determined values [ng.g^{-1} of lipid]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
CZ	Blood	Round 400	1 557	1994 – 1996, 1998			2 240	3 100	**ng/ml**	National Monitoring Institute of public health
							646	884		
	Placenta	Round 450	1 750	1994 – 1996, 1998			286	490		
	Blood		147	2002	1 561	1 297				
LV	Blood plasma	53		1998-2000		1.2			PCB metabolite	Sjödin et al. 2000
						4.5				
PL		3/54	around 150	2002		69.95	25.87	493.31	PCB 153	Jaraczewska et al. 2003
						54.66	16.52	341.77	PCB 138	
						41.68	5.43	193.45	PCB 180	

Levels of Indicator PCBs in human blood										
	Matrix	Sites/ Number of samples per year	Total number of samples	Year	Determined values [ng.g^{-1} of lipid]					
					Arith. mean	Median	Minimum	Maximum	Notes	Reference
SK	Blood serum	1; Professional exposure Chemko Strážské	6	1995 - 1997	18 532	16 677	3 829	33 299		Kocan et al. 1999
	Blood serum	Michalovce District (former producer area) /	322	1997 - 1998	4 372	2 319	257	183 515		
		district Stropkov (control area)	205		995	878	/ 252	6 365		
	Blood serum	total	2047		1 955.12	1065	191	46 630	Σ 15 congener	EU 5 FP PCBRISK project Slovakia; Trnovec et al. 2003
		employees	101		7 300		6 329	8 271		
		local males	115		5 017.6					
		local females	110		3 562.1					
		control	102 males		1 452. 5					
			105 females		1 032.8					
		children 8-9 years	433		528.23	321	26	6 311		
SLO	Blood	occupationally exposed	17	1984	481		(S.D. 520)		ng/ml	Črnivec et al 1986, Fazarinc et al 1992, Harlander 1986, Zupaničiči 1994
			6	1985	50		(S.D. 21)		ng/ml	
			17	1986	36.7		S.D. 45			
			18	1987	19.4		S.D. 9.8			
	Blood	local population Bela Krajina	11	1984			80	500	ng/ml	
			10	1984/86			35	480	ng/ml	
			40	1991			0.01	4.99	ng/ml	

Annex V: Legislation – Experts – Plannings

Content

1.1 Overview on national capacities related to expertise and infrastructure

National capacity	Expertise		Infrastructure		
	Research Institutions	Local experts	Analysis laboratories	Destruction facilities	Storing capacities (Landfills)
BG	- Executive Environmental Agency - National Institute of Meteorology and Hydrology - Bulgarian Academy of Science - (Institute of Geophysics)	- Svetlana Zhekova (MOEW) - Nikolai Miloshev (Academy of Science, Inst. of Geophysics) - Valery Serafimov Georgy Mirinchev - Ivanka Todorova - Ekatarina Kulisheva - Radka Dikova (Executive Environment Agency)	**No accredited Dioxin laboratory**	None/Insufficient 3 small incinerators (Oil refinery Burgas; paint production plant Rouse; < 8,000 t/a)	None no regional landfills; existing local landfills not compliant to EU/ Dir. 99/31
CY	1)State General Laboratory Ministry of Health; 2) Department of Labour (Inspection); 3)Environment Service 4) Geological Survey Department	1a) Stella Canna Michaelidou, Popi Ziegler, Maro Christodoulidou 1b) C. Michael, E. Demetriou 2) Stelios Georghiades 3) Kostas Papastavros, Elena Christodoulidou 4) Antonis Charalambides	1a) Lab Envir. Chem (I) (water, sediment) and Lab of Pesticide Residues (food) 1b) Lab Envir Chem (II) (oil capacitors, effluents, soil and marine environ) and Control Effluents **accredited or near to accreditation for PCBs, no laboratory for dioxin analysis.** 4) Laboratory - ground water and landfill monitoring	**?**	**?**

National capacity	Expertise		Infrastructure		
	Research Institutions	Local experts	Analysis laboratories	Destruction facilities	Storing capacities (Landfills)
CZ	- RECETOX (Research Centre for Environmental chemistry and Ecotoxicology), Masaryk University, Brno - Veterinary Research Institute Brno, Lab. of Department Chemistry and Toxicilogy - Biochemical toxicology and ecotoxicology - Institute of Chemical Technology - Central Institute for Supervising and testing in Agriculture - Research Institute for Soil and Water Conservation - National Institute of Public Health in Ostrava - Centre of Food chains, National Institute of Public Health, Specialised laboratories for Total Diet Study - analyse congeners PCBs and screening method for dioxins - National Institute of Public Health Brno	Ivan Holoubek Jana Klánová Zdeněk Šimek Luděk Bláha Pavel Čupr Jakub Hofman Miroslav Machala Miroslav Cigánek Jana Hajšlová Vladimár Kocourek Jan Poustka Kateřina Holadová Monika Tomaniová Jiři Zbíral Radim Vácha Tomáš Ocelka Jiří Ruprich Ivo Říha Pavel Kořínek	**Dioxins &PCBs** (Labs using HRGC-HRMS): -National Institute of Public Health in Ostrava - National POPs Reference lab - Tomáš Ocelka -AXYS Varilab, s.r.o., Vrané nad Vltavou - Jiří Mitera -ECOCHEM, s.r.o., Praha - Luboš Holý (Lab using HRGC-LRMS): -Research Institute of Organic Synthesis, Pardubice Ivan Kolb **PCBs** : -RECETOX (Research Centre for Environmental chemistry and Ecotoxicology) - Ivan Holoubek for additional 33 laboratories see below **table 1-2**	Moravian chemical plant (destruction of PCBs) Cement kilns (destruction of used motor oils with limited contents of PCBs)	

National capacity	Expertise		Infrastructure		
	Research Institutions	Local experts	Analysis laboratories	Destruction facilities	Storing capacities (Landfills)
EST	- -Estonian Environmental Research Centre (EERC) - -Tartu University, Marine Institute (Dr Juris Aigars) - -Health Protection Inspectorate	- Ott Roots (EERC) Monitoring Co-ordinator - Martin Minjajev (MoA)	1) Tartu Laboratory of Health Protection Inspectorate 2) Central Laboratory of Chemistry of Health Protection Inspectorate 3) Estonian Environmental Research Centre By 1 April 2003 all 3 laboratories are accredited according to EN-ISO 17025 standard and participating regularly in international proficiency testing schemes **no dioxin laboratory**	**insufficient** old district heating plant with simple dust abatement system	**?**
HU	- Water Resources Research Centre Plc. (VITUKI) - Environmental Technologies Ltd. Budapest - KGI Institute for Environmental Management - National Centre for Public Health "Fodor József" (FJKK) - National Institute of Environmental Health (NIEH) - National Institute of Food Hygiene and Nutrition (NIFHN)	Environment: - Dr Tihamer Tajthy, air pollution with PCBs/dioxins - Dr Ferenc Laszlo (VITUKI) surface and groundwater monitoring - Dr Laszlo Kovacs Managing director, (Env. Techn. Ltd) waste incineration - Tamas Lotz project manager /POP (KGI) Health: - Dr Guyla Dura, Director (NIEH) - Judit Szaniszlo, Head of Laboratory - Dr Judit Sohar, Head of Dep.. (NIFHN), PCB congener	**Dioxins/PCBs** Central National Public Health Laboratory Budapest (FJOKK) **PCBs:** Metropolitan National public Health Laboratory Budapest (ANTZS) Balint Analitika Ltd. Budapest National Agricultural Laboratory Budapest (OMMI) Environment Protection Inspectorate Györ Environment Protection Inspectorate Veszprém Department of General and Analytical Chemistry of the Technical University Budapest Palota Environment Protection Ltd. Budapest	**1.1.1.1 Sufficient** Hazardous waste incinerators in Dorog and Gyor	**?**

National capacity	Expertise		Infrastructure		
	Research Institutions	Local experts	Analysis laboratories	Destruction facilities	Storing capacities (Landfills)
LT	- Environmental Protection Agency in Vilnius - State Food and Veterinary Service	- Dr Kazimieras Lukauskas, Director of (Vet. Service) - Rimautas Stukas (PCBs in breast milk & cord serum) - Roma Bartkeviciute (consumption habits)	Dioxins/PCBs Environmental Research Centre Laboratory (EPA); PCBs National Veterinary Laboratory (NVL) (DIN accredited)	None	**?**
LV	- Marine Monitoring Centre-University of Latvia - Latvian Environmental Agency (LEA) - State Environmental Inspectorate (SEI) - Central Statistical Bureau of Latvia - Public Health Agency, (PHA); MoH - National Board of Fisheries (NBF) ,MoA - Latvian Food Center (LFC) MoH - Institute of Occupational and Environmental Health (IOEH) - Food and Veterinary Service	- Dr Juris Aigars (Marine monitoring Centre) - Ilze Kirstuka (LEA) - Andris Roska (SEI) - Maja Snepste, Solvita Mucenience, (Dep. Non-infectious diseases, PHA) - Alla Selina, laboratory (PHA) - Dr. Marite Arija Bake (IOEH) - Alise Luse (NBF) - Maris Balodis (Veterinary & Food Department, MoA)	- Laboratory of the Veterinary Medicine Diagnostic Centre, MoA, since 2002 competent institution for analysis - Laboratory of Chemistry, - Laboratory of the Public Health Agency (at the moment no analyses due to lack of money) **No Dioxin laboratory**	None	Hazardous waste landfills following EU requirements shall be established until end of 2004

National capacity	Expertise		Infrastructure		
	Research Institutions	Local experts	Analysis laboratories	Destruction facilities	Storing capacities (Landfills)
MT	- Malta Environment and Planing Authority; - Occupational Health and Safety Authority (Maltese Focal Point for the European Agency for Safety and Health); - Malta Standards Authority (Foodstuffs, Chemicals & Cosmetics Directorate) - Department of Veterinary Services (DVS) - Environment Protection Directorate (EPD) - Food Safety Commission (FSC) - Chemistry Department of the University of Malta - Cleaner Technologie Centre Malta (CTC) - Food & Veterinary Regulation Division, MoE (FVRD)	- Dr. Carmel Vella (DVS) - Ray Piscopo, Charmaine Vassallo (EPD) - Charles Bonnici (Chief Health Inspector) - Martin Seychell (Foodstuffs Directorate) - Anton Pizzuto (CTC), UNIDO-project - John Attard Kingswell (Health Inspectorate Services) - Moira Bonello (FVRD)	Analyses are carried out by foreign Laboratory accredited to ISO17025	None	Acceptable Landfills have to be closed and replaced by an engineered landfill

<table>
<tr><th rowspan="2">National capacity</th><th colspan="2">Expertise</th><th colspan="3">Infrastructure</th></tr>
<tr><th>Research Institutions</th><th>Local experts</th><th>Analysis laboratories</th><th>Destruction facilities</th><th>Storing capacities (Landfills)</th></tr>
<tr><td>PL</td><td>- K. Marcinkowski Academy of Medicine, Chair Inorganic and Analytical Chemistry,
- Central Institute for Labour Protection - National Research Institute
- Pulp and Paper Institute Łódź,
- Institute of Industrial Chemistry, Warsaw,
- Institute of Chemical Coal Processing Zabrze,
- The Nofer Institute of Occupational Medicine
- Institute of Labour Medicine and Environmental Health Sosnowiec
- Institute of Non-Ferrous Metals
- Institute of Ferrous Metallurgy
- Institute of Meteorology and Water Management
- Marine Institute Gdańsk
- Institute of Plant Protection
- Institute of Environmental</td><td>List of Experts see: Annex II.3</td><td>PCBs/Dioxins:
WIOS Lublin (all media)
WIOS Olsztyn (only water)
Krakow Technical University Trace Analyses Laboratory (all media)
IMWM Gdańsk (all media)
Military Institute of Chemistry and Radiometry (all media)
National Foundation of Environmental Protection (all media)
Institute of Meat and Fat Industry (only water)

PCB:
List of Laboratories
see below table 1-3</td><td>Hazardous waste incinerator of the ANWIL Nitrogen Plant in Włocławek

Hazardous waste incinerator of the ROKITA Chemical Works in Brzeg Dolny</td><td>?</td></tr>
</table>

National capacity	Expertise		Infrastructure		
	Research Institutions	Local experts	Analysis laboratories	Destruction facilities	Storing capacities (Landfills)
	Protection - Institute of Organic Industry - Institute of Timber Technology - State Geological Institute - National Institute of Hygiene - Mining and Metallugical University - Krakow Technical University - Lodz Technical University - Warsaw Technical University - Wroclaw Technical University - Sea Fisheries Institute, Gdynia - Military Institute of Chemistry and Radiometry - „PROEKO" Company Ltd., Environmental Protection Consultants - -„Chemeko" Expert and Designing Services Enterprise, Co. Ltd.				
RO	- National Research-Development Institute for Environmental Protection (ICIM) - Regional environment Protection agencies - Polytechnic University of Bucharest - Public Health Institute - Institute of Military Medicine	**?**	10 Laboratories for PCB analysis (method corresponding ISO 6468) 1 Lab for Dioxin analysis. ICIM nominated National Reference Laboratory by MoE Laboratory of Public Health Bucharest and 4 regional laboratories will be equipped with new GC, GC/MSD, HPLC and LC/MSD (PHARE 2002) Any accredited Laboratories so far	**?**	**?**

National capacity	Expertise		Infrastructure		
	Research Institutions	Local experts	Analysis laboratories	Destruction facilities	Storing capacities (Landfills)
SK	1)Slovak National University of Health (former Institute of Preventive and Clinical Medicine); monitoring of air, water, sediments, soil, human exposure; National Reference Centre for Dioxin and related compounds 2)National Public Health Institute Public Health Institutes (Košice, Banská Bystrica, Bratislava) 3)Ecotoxicological Centre Bratislava 4)Food Research Institute	1)Anton Kocan 2)Oľga Miklánková 3)Martin Murin 4) Ing. Šalgovičová	**PCB / Dioxins**: Institute of Preventive and Clinical Medicine (National Reference Centre for Dioxins and Related Compounds) **PCB**: - Institute of Preventive and Clinical Medicine (National Reference Centre for Dioxins and Related Compounds - Slovak Water Management Company (River Catchment structure - Bodrog and Hornad, Hron, Vah) - Research Institute of Water Management (Water National Reference Centre) - RIWM - Research Institute of Pegology and Soil Protection - RIPSP - Slovak Agency of Environment; - Slovak Hydrometeorological Institute – SHMI - National Geological Institute of Dionýz Štúr – NGIDS - Central Institute for Supervising and Testing in Agriculture - CISTA - Food Research Institute - FRI - National Institute of Public Health Žilina - National Institute of Public Health - NIPH – Centre and regional branches (Trenčín, Trnava, Žiar nad Hronom, Žilina, Trenčín, Dunajská Streda, Senica, Prešov) - Public Health Institute Košice, Banska Bystrica and Bratislava	**?**	**?**

National capacity	Expertise		Infrastructure		
	Research Institutions	Local experts	Analysis laboratories	Destruction facilities	Storing capacities (Landfills)
SLO	Faculty for chemistry and Chemical Technology, Dept. for Analytical Chemistry; health & environment National Institutes of Public Health, Environmental Protection Institute - Maribor; health & environment National Institutes of Public Health, Environmental Protection Institute - Novo Mesto, health Institute Josef Stefan, health & environment National Chemicals Bureau, MoH, environment	Lučka Zupančič-Kralj Ernest Vončina, Zdenka Kodba Cenčič Dušan Harlander Svetozar Polic Vesan Ternifi Dunja Piškur Kosmač	**PCB/Dioxin**: Laboratories of Institute of Public Health **PCB:** Electroinstitute Milan Vidmar Petrol d.d.	**None**	**?**
TR	Refik Saydam Hygiene Centre - Poison Control Department	Meral Yeniova	**Insufficient capacitiy** (only 2x CG & 1 MS for PCB analysis)	**None**	**None**
	TÜBITAK Marmara Research Centre	Somnez Dagli	Mobile Laboratory for PCDD/F Analysis of Air Quality accredited in 2004		

1.2 Detailed list of Czech laboratories working in the field

Dioxin labs using HRGC-HRMS:

- National Institute of Public Health in Ostrava - National POPs Reference lab - Tomáš Ocelka
- AXYS Varilab, s.r.o., Vrané nad Vltavou - Jiří Mitera
- ECOCHEM, s.r.o., Praha - Luboš Holý

Dioxin labs using HRGC-LRMS

- Research Institute of Organic Synthesis, Pardubice - Ivan Kolb

PCBs labs:

- National Institute of Public Health in Ostrava - National POPs Reference lab - Tomáš Ocelka
- AXYS Varilab, s.r.o., Vrané nad Vltavou - Jiří Mitera
- ECOCHEM, s.r.o., Praha - Luboš Holý
- Research Institute of Organic Synthesis, Pardubice - Ivan Kolb
- RECETOX (Research Centre for Environmental chemistry and Ecotoxicology) - Ivan Holoubek
- Veterinary Research Institute Brno - Miroslav Cigánek
- Institute of Chemical Technology - Jana Hajšlová
- Central Institute for Supervising and testing in Agriculture - Jiří Zbíral
- Research Institute for Soil and Water Conservation - Radim Vácha
- Povodí Elbe, Hradec Králové - Ing. Medek
- Labtech , s.r.o. (experimental laboratories), - Dalibor Kolčava

- Vodní zdroje GLS Praha, Vítězslav Valenta
- ELCOM GROUP, a. s. - Ing. Doležal
- Water research laboratory spol. s r.o. - Ing. Šulíček
- ORGREZ a.s. - Ing. Brázdil
- MONITORING s.r.o. - Ing. Jankovská
- Water Research Institute Ostrav - Sviták
- Brown Coal Research Institute Most - Ing. Šafářová
- Vodní zdroje Holešov a.s. Ing. Chudárková
- Laboratory Morava, a.s., - Ing. Mikoška
- Czech Geological Institute, Brno - experimental laboratories - Zbyněk Boháček
- National Institute of Public Health, laboratoriy Klatovy - Dr. Krysl
- OKD DPB, a.s., Division EKOTECHNIKA - Václav Dombek
- National Institute of Public Health České Budějovice -
- ELDIAG, s.r.o. - Jan Votava
- ENVIREX, s.r.o. - Jan Vařák
- EMPLA, s.r.o. - Stanislav Eminger
- National Institute of Public Health Kladno - Marie Topinková
- Aneclab, s.r.o. - Jaroslav Kouba
- Analytical laboratories Plzeň s.r.o. - P. Vyhlídka
- Water research and ekological laboratory - A. Konečný

- National Institute of Public Health Olomouc - Vašek Sázel
- National Institute of Public Health Liberec - Eva Hubeňáková
- ÚNS - Laboratorní služby s.r.o. - M. Perný
- Sokolovská uhelná, a.s. - Milena Menclová
- BIOANALYTIKA CZ,
- Laboratories of State Veterinary Administration (7) and State Agricultural and Food Inspection ( )

1.3 Detailed list of Polish laboratories working in the field

No. of Laboratory	Laboratory	PCB	PCDD/F
1	WIOS Wrocław	all media	-
2	WIOS Bydgoszcz	surface water, (solid waste)* (bottom sediments)	-
3	WIOS Lublin	all media	all media
4	WIOS Białystok	water	
5	WIOS Katowice, Bielsko Biała Branch	water	-
6	WIOS Kielce	water	-
7	WIOS Olsztyn	water	water
8	WIOS Olsztyn, Elbląg Branch	water	-
9	WIOS Poznań	water	-
10	WIOS Poznań, Kalisz Branch	water	-
11	WIOS Poznań, Leszno Branch	(water)	-
12	WIOS Poznań, Konin Branch	water	-
13	WIOS Szczecin	water	-
14	WSSE Warszawa	water, foods	-
15	Krakow Technical University	all media	all media
16	IETU Katowice	water	-
17	IMWM Wrocław	(all media)	-
18	IMWM Gdańsk	all media	all media
19	IMWM Warszawa	(all media)	-
20	State Geologic Institute	water, precipitation, bottom sediments	-
21	State Hygiene Institute Warsaw	(plants) (foods)	-
22	Institute of Environmental Protection	water, solid waste, bottom sediments	-
23	Wrocalw Technical University	(water), (solid waste) (bottom sediments)	-
24	Gdansk Technical University	(air), water, (solid waste), bottom sediments, plants	-
25	Poznan Medical University	(solid waste), bottom sediments, (plants), foods	-
26	Institute of Marine Fisheries, Gdynia	foods	-
27	Military Institute of Chemistry and Radiometry	all media	all media
28	National Foundation of Environmental Protection	all media	all media
29	Institute of Meat and Fat Industry	(water)	(water)

(28 February 2003)

1.4 Research Institutions & Experts in Poland

Name of institutions	Contact persons
Research and development centres, consulting companies	
K. Marcinkowski Academy of Medicine Chair Inorganic and Analytical Chemistry, 60-780 Poznań, Grunwaldzka St. 6 Tel. (+48 61) 865-95-66	**Grzegorz H. Bręborowicz** Prof. Dr Hab. **Janina Lulek** Dr. Hab. (Director) Chair Inorganic and Analytical Chemistry
Central Institute for Labour Protection - National Research Institute 00-701 Warsaw, Czerniakowska St. 16 Tel. (+48 22) 623-46-81 Fax (+48 22) 623-36-95	**Danuta Koradecka**, Prof. Dr Hab. Med. (Director), **Jerzy Michalik**, Prof. Dr Hab. Eng. (independent expert reviewing the inventory report of the GEF Project), **Małgorzata Szewczyńska**, M.Sc.
Pulp and Paper Institute 90-570 Łódź, Skłodowskiej Curie St. 19/27 Tel. (+48 42) 638-03-51; 636-88-31 Fax (+48 42) 638-03-79	**Tomasz Malinowski**, Dr. Eng. (Director), **Małgorzata Michniewicz**, Dr. Eng.
Institute of Industrial Chemistry 01-793 Warsaw, Rydygiera St. 8, Tel. (+48 22) 633-92-91 Fax (+48 22) 633-92-91	**Jacek Kijeński** Prof. Dr Hab. Eng. (Director); **Jadwiga Mąkosa**, M.Sc., Ozone Layer Protection Bureau, **Andrzej Krześlak**, M.Sc., Eng., Country co-ordinator of the CHEMLEG Project,
Institute of Chemical Coal Processing 41-803 Zabrze, Zamkowa St. 1 Tel. (+48 32) 271-00-41 Fax (+48 32) 271-08-09	**Marek Ściążko**, Dr. Eng. (Director), **Krystyna Kubica**, Dr. Eng. (Director) Department of Physical, Chemical and Energetic Fuel Processing
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1.5 Legislation - Air

Air	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values: PCDD/F	Limit values: PCB	Recom-mended values	Responsible ministry	Enforcement organs
BG				Emission **0.1 ng TEQ/Nm^3**			Ministry of Environment	Executive Environment Agency
CY	Regulation 638/2002 Regulation 284/2003	94/67/EC 2000/76/EC		Emission: **0.1 ng TEQ/Nm^3**			Ministry of Environment	Environment Service
CZ	AHEM, No. 6/1986			Ambient air: **20 fg/ m^3**			Ministry of Health	
	Act. No.86/2002 Code		waste and waste oil incineration		Emission: **10ppm**		Ministry of Environment	
	Decree No. 354/2002 Code	2000/76/ES		Emission: **0.1 ng TEQ/m^3**			Ministry of Environment	
	Decree no. 353 and 356/2002 Code	84/360/EHS 96/61/EC			Emission: **0.1 ng TEQ/m^3**		Ministry of Environment	
	Regulation 178/2001		Working environment (NPK - P)	1 mg/.m^3				
EST	Integrated Pollution Prevention and Control Act (October 10, 2001)	96/61/EC (IPPC) 99/30/EC		Emission: **0.1 TEQ ng/m^3**			Ministry of Environment	Environmental Inspectorates
	Govern Reg. No. 36/1999	Dir. 79/1177EEC						
HU	GO 193/2001 (X.19) GO 21/2001 (II.14)	96/61/EC (IPPC)		Emission: **0.1 TEQ ng/m^3**			Ministry of Environment, Agriculture and Health	?
	MO 14/2001 (V.9) MO 3/2002 (II.22) MO 11/1991	96/62/EC		PCDD/Fs immission: **≤ 1 TEQ pg/m^3**;			Ministry of Environment	?
				Ambient Air: 1pg/24h				

Air	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values: PCDD/F	Limit values: PCB	Recom-mended values	Responsible ministry	Enforcement organs
LT	LAND 19-99	2000/76/EC	Order No. 342, 1999	Emissions: **0,1 ng TEQ/m^3** (6-8h avg. concentration)			Ministry of Environment	Environmental State Inspectorate
		Maximum permissible concentrations of air polluting chemicals in residential areas	Lithuanian Hygienic Norm. HN 35-2002 Order No. 512, 2002	PCB/PCDD/F ambient air daily average. **500 fg/m^3**			Ministry of Health	
			Order No. 698/2002 for waste oil incineration	Emissions: **0,1 ng TEQ/m^3** (6-8h avg. concentration)			Ministry of Environment	Environmental State Inspectorate
LV	Regulation No. 323/2001	2000/76/EC		PCDD/F emission: **0.1 ng TEQ/m^3**			Cabinet of Ministers	Environmental State Inspectorates
	Regulation on Air Quality (No. 286/2002)	96/62/EC		limit values and alert thresholds			Cabinet of Ministers	full implementation upon Accession
	Reg. No 379/2002 Stationary Sources	2001/80/EC						
MT	LN 336 of 2001 (entered into force by LN 50 of 2002)	2000/76/EC		Emission: **1.0 ng TEQ/m^3**				Malta Environment and Planning Authority
	LN 166 of 2002				PCB emission are controlled but not limited			Malta Environment and Planning Authority

Air	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values: PCDD/F	Limit values: PCB	Recom-mended values	Responsible ministry	Enforcement organs
PL	Environmental Protection Law EPL	2000/76/EC		**0.1 ng TEQ/m^3**			Ministry of Environment	
					workplace: **1mg/ m^3**		?	
RO	GD no. 128 waste incineration		MO 1144/2002 emission limit				Government	
SK	Air Protection Act No. 478/2002 Coll.	Air Quality Framework Directive; Annexes II & III and Provisions on Cooperation with 3. countries not covered	Regulation No. 46/2002			workplace : **0.7 ng/m^3**	National Council of Slovak Republic	
			Regulation No. 473/2000	Emission : **0.1 ng TEQ/m^3**;			Regulation of Government	
					Ambient air: **2 ng/ m^3** over 24h **6 ng/ m^3** for 30min			
SLO	OJRS No. 70/96, 29/00			Emission: **1g/year**				
	OJRS No. 28/2000, OJRS No. 50/01, 56/02, 80/02	2000/76/EC		Emission: **0.1 ng TEQ/m^3**				
TR				chimney gas limit: 1,4 - PCDDs: **20 mg/Nm^3**	chimney gas limit **0.1 kg/h**			

1.6 Legislation - Water

Water	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values	Target values	Recom mended values	Responsible ministry	Enforcement organs
BG								
CY								
CZ	: Nat. Standard ČNS 75 7221 and Dec. No. 82/1999 (surface water)			PCBs in surface water and water courses: **0,01 µg/l**				
	Decree No.290/1997			PCBs in Bottled drinking water: **0.01 µg /l**				
EST	Govern. Reg. No. 269, July 2001							
	Govern. Reg. 58, June 16, 1999				PCBs in ground water: 0.5 µg/l	PCBs in ground water: 1 µg/l		
	Govern. Reg. No. 36, January 1999	Dir. 79/1177EEC						
HU	MO No. 10/2000 (surface water)			**PCBs:** **Action limits:** increased sensitive area **0.05 µg/l** sensitive area **0.1 µg/l**, less sensitive area **1.5 µg/l**	PCBs: Pollution limit: **0.001 µg/l**	PCBs: Background: **0.0005 µg/l**	MoH, Ministry of Environment, MoA	Chief Inspectorate of Environment and Water
				PCDD/F -TEQ: Pollution limit: **0.3 pg/l** Action limit: - on the basis of risk assessment				
	MO 7/2002 monitoring, control						Ministry of Environment	
	GO 33/2000,	80/86/EC						
LT	Land 32-99		limit values for emission to water				Ministry of Environment	Environmental Protection Agency

Water	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values	Target values	Recom mended values	Responsible ministry	Enforcement organs
LV	Law on Water Management	2000/60/EC					Ministry of Environment	Monitoring programme shall be established until 2005; Full implementation expected 2015
	Reg. No 235 Drinking Water Quality;	98/83/EC						Full compliance with EU requirements shall be achieved 2015
	Reg. No 118/2002 Surface and Groundwater Quality							
	Reg. No 34/2002 Aquatic emissions, Law on Polution (2001) Reg. on Category A,B,C Poluting Activities (2002)	80/68/EC 76/464/EEC 78/659/EEC					Ministry of Environment	
MT	At present any regulations regarding PCDD/F & PCB immission or environmental levels							
PL	Environmental Protection Law EPL Act on Water Dz. U. 01.115.1229		drafts of regulations based on the EPL, e. g. measurments of emisssions				Ministry of Environment	
RO	MO 1144/2002		Limit values for POPs in water				Ministry of Environment	
	GD no. 100 (2002)		Quality norms for surface water intended for the abstraction of drinking water				Government	
SK	Act on Water No. 184/2002 Coll..		Regulation No. 242/1993 Coll	PCBs in surface water: **< LOD** (water courses) **0.025 µg/l** (other surface water)			Government	

Water	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values	Target values	Recom mended values	Responsible ministry	Enforcement organs
			Czechoslovak Technical Norm No. 757143	PCBs in irrigation water: **0.1 µg/l**		**0.05 µg/l** (acceptable)		
	Water Act 2002 Act on the Protection of Human Health 2001	Water Framework Directive						Full implementation expected 2015
	2002	98/83/EC Drinking Water Directive	Limit values for drinking water					
SLO	OJRS No. 46/97, 52/97, 54/98, 7/00, 52/00			total PCBs in drinking water: **0.1 µg/l**				
	OJRS No. 11/02 chemical status of surface water			PCBs (sum 28, 52, 101, 138, 153, 180) in surface water: **0.01 µg /l**				
	ORJS, No. 5/00 monitoring of groundwater							
TR								

1.7 Legislation - Soil

Soil	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values	Target values	Recom mended values	Responsible ministry	Enforcement organs
BG	Regulation No. 3 "Standard of admissible Content of hazardous substances in soil" (SG 21/2000)			PCBs: **0.005 mg/kg** - (background); **0.02 mg/kg** - (precautionary limit); **0.2 mg/kg** (maximum admissible limit) **1 mg/kg** (intervention limitl)				
CY	no information							
CZ	Directives of Ministry of Environment		Criteria for evaluation of soil and ground water contamination	PCBs: **0.02 mg/kg** - (background); **2.5 mg/kg** - (pollution limit); Action limit **5 mg/kg** (living areas) **10 mg/kg** (recreational) **30 mg/kg** (industrial)			Ministry of Environment	
				Dioxins (I-TEQ TeCDD.): **1 ng/kg** - (background); **100 ng/kg**- (pollution limit); Action limit: **500 ng/kg**-(living area) **1000 ng/kg** (recreational) **10,000 ng/kg** (industrial)				
	Regulation 343/2001 and 169/2002 (Decree 91/1996)	1999/29/EC and 2001/102/EC						
EST	Gov. Reg. 58/1999				PCB **0,1 mg/kg**	PCB **5 mg/kg** (living area) **10 mg/kg** (industrial	Ministry of Environment	
	Gov. Reg. No. 36/99	Dir. 79/1177EEC						
	Gov. Reg. No. 269/ 01							

Soil	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values	Target values	Recom mended values	Responsible ministry	Enforcement organs
HU	Joint Decree 10/2000 (VI.2.			PCB: Background: **0.02 mg/kg** Pollution limit: **0.1 mg/kg** Action limit: increased sensitive area **0.2 mg/kg**, sensitive area **1.0 mg/kg**, less sensitive area **5 mg/kg**			Ministry of Environment, Health and Agriculture	Chief Inspectorate National Services of Soil Protection
				PCDD/F (TEQ): Background: **0.5 ng/kg** Pollution limit : **5 ng/kg** Action limit: increased sensitive area **10 ng/kg** sensitive area **100 ng/kg** less sensitive area **1000 ng/kg**				
LT	no limits							
LV	no limits							
MT	no limits							
PL		-	soil and sediments	PCBs : **0.02 mg/kg** (protected areas) **0.02 mg/kg** (farm land, forests, residential and recreation areas) **2 mg/kg** (industrial and communication areas)				
RO	no information							
SK	Bulletin of MoA of SR No. 26, part 1/1994 Coll.				PCB: **<0.1 ng/kg** – (soil is not contaminated)			

Soil	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values	Target values	Recom mended values	Responsible ministry	Enforcement organs
SLO	OJRS No. 68/96			PCB : 0.2 mg/kg (limit threshold) 0.6 mg/kg (warning quantity) 1.0 mg/kg (critical quantity)			Ministry of Environment	Environmental Agency
	Agriculture act OJRS No. 54/00							
TR	no limit							

1.8 Legislation - Waste

Waste	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values	Target values	Recom mended values	Responsible ministry	Enforcement organs
BG	EU Legislation transposed							
CY	EU Legislation transposed							
CZ	Regulation 383/2001			PCBs: > 100 mg/kg - dump disposal is strictly prohibited; > 10 mg/kg - internal dump disposal is prohibited; > 0.2 mg/kg - the using in under ground places and on the surface is prohibited			Ministry of Environment	
	Regulation 97/2000 (Decree 309/1991	EC/96/61	(water from wastes gases treatment plants	PCDD/F: 0.3 ng/l				
	Decree 185/2001 Regulation 382/2001		Sewage sludges applied on agricultural soils	PCB: 0.6 mg/kg d.m				
EST	Regulation No. 71(1999)	96/59/EC	Management of PCB containing waste				Ministry of Environment	
HU	GO 102/1996 .	Basel Convention	hazardous waste management, classifikation, treatment, disposal, reporting etc					
	MO 4/2001 waste oil management	87/101/EEC 75/439/EEC					Ministry of Environment	
	MO 11/91, waste incineration			0,1 ng PCDD/F-TEQ/m³			Ministry of Environment	

Waste	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values	Target values	Recom mended values	Responsible ministry	Enforcement organs
	GO 203/2001 MO 9/2002 waste water	2000/60/EC		PCDD/F: 0.3 ng/l			Government Ministry of Environment	
	GO 193/2001 waste management						Government	
LT	Order No. 698, 2002 Rules on waste oils management		containing > 50ppm PCB/PCT				Ministry of Environment	
	LAND 19-99 Waste Incineration		MO 342/99	0,1 ng PCDD/F-TEQ/m³			Ministry of Environment	
	LAND 32-99		MO 387/99	Limit values for emission			Ministry of Environment	Regional Environment Protection Departments
LV	Law on Waste Management (2000) Law on Pollution (2001) Regulation No. 529/2001	75/442/EEC, 91/689/EEC, 94/67/EC, 1999/31/EC, 75/439/EC, 96/59/EC fully transposed since 2002	Management of certain hazardous waste types	Full implementation of landfill of Waste Directive planned until 2009 Permitting proceduers fully in place reporting system for 96/59/EC upon Accession			Cabinet of Ministers	For the landfill of hazardous waste Latvia has been granted a transitional period until the end of 2004
	Regulation No. 323/2001 s			Waste Incineration			Cabinet of Ministers	
	432 and 994/2002		permits for waste Management and Waste oil collectors					
	Classification (1997)						Cabinet of Ministers	
MT	LN 128 of 1997		subjects wastes to specific administrative controls					Malta Environment and Planning Authority

Waste	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values	Target values	Recom mended values	Responsible ministry	Enforcement organs
	LN 337 of 2001, LN 166 of 2002 Waste Management (Permit and Control)		defines PCBs as hazardous waste, and specifies its disposal controls					Malta Environment and Planning Authority
PL	Act on Waste (2001) Dz. U. 01.62.628 (Only PCBs)	IPPC BAT						
	Dz. U. 02.212.1799 dioxins and PCBs, e.g. in sewage		industrial wastewater discharged into municipal sewerage systems	PCBs: 0,1 mg/l wastewater			Ministry of Environment	
RO	GD no. 128/2002	relevant EU regulations transposed		no specific information	Waste incineration			
	GD no. 162/2002				Waste disposal			
	GD no. 662/2001				Waste oil management			
	GD no. 188				Waste water discharge in the aquatic medium			
	Law no. 265/2002 GD no. 856 (waste list)	Basel Convention (with its amendments)					Government	
	GD 173/2002		Management & Control of PCBs & similar products				Government	
SK		96/59/EC	Disposal of PCBs &PCTs					

Waste	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values	Target values	Recom mended values	Responsible ministry	Enforcement organs
SK	Act on Waste 2001 as amended 2002 and 2003	Full transposition of EU requirements		hazardous waste: PCB > 0.001%			Ministry of Environment	
		Dir 94/67/EC and 89/369/EEC will not be covered by Slovak Legislation	Permits & operating conditions for waste incineration plants					Complete implementation expected 2006
	Waste oil management	75/439/EEC as amended	Regulation 283/2001 Coll.	regeeneration of oils permitted < 0.005%				
	Act of Public Water supply and sewerage	80/68/EC, 76/464/EEC, 78/659/EC WWTP Directive (Urban waste water treatment plants)	Governmental order on Limit values for Waste Water Pollution Indicators	Full implementation of 80/86/EC and related Directives planned for 2006				A transitional period up to 2015 required for full implementation of the WWTP Directive
	Act on Sewage Sludge Application 2002	86/278/EEC Sewage sludge Directive	Full Implementation planned for 2004					
SLO	OJRS, No. 50/01 waste oil disposal	All relevant EU regulations transposed		no further information			Ministry of Environment	
	OJRS, No. 51/01 Wastewater monitoring							

Waste	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values	Target values	Recom mended values	Responsible ministry	Enforcement organs
	OJRS, No. 35/96, 29/00 Emission into wastewater			Total PCDD/Fs: **0,3 mg TEQ/l**				
	OJRS, No 32/00 waste incineration			no further information				
	OJRS, No. 15/00, 54/02, 18/03 disposal of PCBs							
	OJRS, No. 45/00, 20/01, 13/03 waste management							
	OJRS, No 01/00, 94/00 export, import, transit of waste							
TR								

1.9 Legislation – production and use of PCBs/other POPs

Production & Use of PCBs/ other POPs	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values	Target values	Recom mended values	Responsible ministry	Enforcement organs
BG	Transposition planned 2003	IPPC						transitional period until 2012
CY	**all EU regulations transposed**							
CZ	Production, export/import	Relevant EU directives transposed		except mono mono- and dichlorinated biphenyls,			Ministry of Environment	
	preparations including waste oils with a PCB or PCT content higher than 0.005% by weight							
	installation that contain more than 5 dm^3 PCBs							
EST	Reg. No. 99(1999)		production ,import, export, sale and use of PCBs				Ministry of Environment	deadline for elimination accord. to EU directive 2010
	IPPC-Act , 2001	96/61/EC		according to IPPC directive				
HU	MO 46/2000	Rotterdam Convention					Ministry of Health, Ministry of Environment, Ministry of Agriculture	
	MO 41/2000	76/769/EEC					Ministry of Health, Ministry of Environment	
	GO 112/1990 Import permission procedure						Government	

Production & Use of PCBs/ other POPs	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values	Target values	Recom mended values	Responsible ministry	Enforcement organs
HU	GO 101/1996, 102/1996	Basel Convention					Government	
	GO 193/2001 GO 21/2001	96/61/EC (IPPC) BAT					Government	
	MO 5/2001	96/59/EC, 2001/68/EC		Waste oil containing > 0,005% PCB Installation containing > 5 dm^3 PCBs			Ministry of Environment	
LT	Lithuanian Hygienic Norm, HN 36-1999		Marketing & use of PCBs prohibited.	Exemptions: - PCB containing equipment until functional time expires - replenishing of existing installations/equipment			Ministry by the Health Care (Order No. 94, 1999/02/26)	State hygienic Inspection Health Supervision Service
	(Order No. 351, 2000), amended by Order No. 128, 2003		import of hazardous chemicals requires permission				Ministry of Environment	Regional Environmental Protection Boards
LV	Law on Chemical Substances and Products (1998)						Cabinet of Ministers	
	Reg No.107/ 2000 (Classification, Packaging, Labelling)	67/548/EEC		Mechanisms to provide reports to the European Commission will be established upon Accession				
	Reg. No. 92/2001 (List of hazardous substances)							Full implementation of EU Directive committed until accession
	Reg. No 340/2002 (Import, Notification, Risk Assessment)	67/548/EEC						
	Reg No 304/2003	Rotterdam Convention 92/2455/EEC						Regulation will apply directly upon Accession

Production & Use of PCBs/ other POPs	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values	Target values	Recom mended values	Responsible ministry	Enforcement organs
	Regulation 158/2000			PCBs not allowed for new use or new equipment after 2002				
LV		96/61/EC (IPPC)	Full implementa tion of EPER until 2007					transitional period for existing installations until 2010
MT	LN 52 of 1986,:			ban on import, use and production				Occupational Health and Safety Authority
	LN 142 of 2000 : The dangerous Substances and Preparations (Restrictions) Regulations			Prohibit the use of: PCB except mono mono- and dichlorinated biphenyls PCTs preparation, including waste oils, with a PCB or PCT content higher than 0.005% by weight				Malta Standards Authority - Foodstuffs, Chemicals & Cosmetics Directorate
PL	Law on Chemical Substances & Preparations	acc. EU Legislation		prohibition for production, marketing, use, classification, labelling, reporting			Ministry of Economy	
	GD 173/2002			management and control of PCBs			Government	
	MO 356/2002, GD 490/2002			classification, labelling and packaging of hazardous substances				
	Law no. 645 (2002)	IPPC Directive						
SK	IPPC Act (2003)		EPER requirement s put in place 2003					Full Implementation foreseen 2011
SK	Act on Chemical Substances and Preparations 162/ 2001		Decree 2/2002	Classification, packaging and labelling				Ministry of Economy

Production & Use of PCBs/ other POPs	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values	Target values	Recom mended values	Responsible ministry	Enforcement organs
SK	Act No. 163/2001		Decree 7/2001	Ban of Import & Export of Preparation s > 0.005% PCBs				Ministry of Economy
			Reg. 67/2002	use of PCBs for service life and refilling permitted				
SLO	OJRS, No. 56/99 Health & safety at work.							
	OJRS, No 18/92 Licences for work with hazardous substances							
	OJRS, No. 13/85 Safety precautions for work with PCBs & PCTs							
	OJRS, No. 79/99 Transport of dangerous goods							
	1986		Decision of Republic Inspector of energy	Ban of PCBs for new transformers				
TR	**no information**							

1.10 Legislation - Food

Food	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs		Structure of authority and enforcement	
	National law	**Implemented international legislation**	**Guidelines**	**PCB mg/kg fat weight**	**PCDD/F WHO-TEQ pg/g fat**	**Responsible ministry**	**Enforcement organs**
BG							
CY	**all EU regulations have been transposed into national regulations**						
CZ	Decree No. 3/1999 Coll.		Regulation No. 466/2001 (dioxins in foodstuffs):			**Ministry of Health**	
	Decree No.290/1997			Bottled drinking water: **0.01 µ /l**			
	Decree No. 3/1999 Coll.		Reg. No. 2375/2001, 53/2002 (PCBs in foodstuffs)	milk **- 0.1 mg/kg** meat **- 0.2 mg/kg** egg **- 0.2 mg/kg** fish **- 0.1 - 0.3 mg/kg** (different species) fat **- 0.5 mg/kg**			
EST	Government Regulation No. 14, January 12, 2000		limit values for food			**Ministry of Health**	
		2375/2001/EC	limit values for food				control 2003 only in fish, meat and milk shall be included 2004
	Govern. Reg. 58, June 16, 1999			fish and products: **2.0 mg/kg**			
	Estonian Standard for Drinking Water (1995)						
	Requirements for Drinking Water (1996)						

Food	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs		Structure of authority and enforcement	
	National law	**Implemented international legislation**	**Guidelines**	**PCB mg/kg fat weight**	**PCDD/F WHO-TEQ pg/g fat**	**Responsible ministry**	**Enforcement organs**
HU	Hungarian Regulation 40/2000 (XII.20.)			1)Muscle, liver, fat meat products from cattle, sheep, pig, poultry: **0.5 mg/kg**; 2) milk, dairy product from milking animals: **0.5 mg/kg**; 3) egg (without shell) and egg products : **0.5 mg/kg**; 4) muscle, fat from game birds and mammalian games: **1.0 mg/kg**; 5) fish products: **1.0 mg/kg**; 6) fish liver and fish liver products: **3.0 mg/kg**		**Ministry of Health**	**National Public Health Centre**
LT	Hygiene Norm HN 54:2001	96/23/EC	Order of State Food & Veterinary Service No. 395			**Ministry of Health**	**State Food and Veterinary Service**
	All EU regulation related to human exposure(e.g. PCDD/F levels in food) will be adopted from January 2004						
LV	Regulation No. 292/1999 “on food contamination”	new limits conform to EU requirements are drafted		meat & meat products/fat **3,0** milk & milk prod./fat **1,5** bird´s eggs **0,3** fish **2,0**	meat & meat prod. **1,8 pg/g** milk & milk prod./fat **2,5pg/g** fish **5,0pg/g**	Cabinet of Ministers	Food and Veterinary Service (Ministry of Agriculture)

Food	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs		Structure of authority and enforcement	
	National law	**Implemented international legislation**	**Guidelines**	**PCB mg/kg fat weight**	**PCDD/F WHO-TEQ pg/g fat**	**Responsible ministry**	**Enforcement organs**
MT	Food Safety Act (Act XIV/ 2002)	EC/64/97 EC/104/2000 EC/23/96 EC/1651/2001	LN 392 of 2002 (Contaminants in Food Regulations - section 5)		**per fat weight:** Meat & Meat products including animal fat**:** Ruminants (Cattle, sheep): **3 pg/g** Poultry, farmed game: **2 pg/g** Pigs: **1pg/g** Liver and derived products: **6 pg/g** Milk &milk products including butter: **3 pg/g** Hen eggs & egg products: **3 pg/g** Mixed animal fat**: 2pg/g** Vegetable oil: **0,75 pg/g** Fish oil for human consumption: **2 pg/g** **per fresh weight:** Muscle meat of fish & fishery products & products thereof**: 4**	**Ministry of Health**	**Malta Standards Authority, Directorate of Foodstuffs**

Food	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs		Structure of authority and enforcement	
	National law	**Implemented international legislation**	**Guidelines**	**PCB mg/kg fat weight**	**PCDD/F WHO-TEQ pg/g fat**	**Responsible ministry**	**Enforcement organs**
PL		Dir 2375/2001/EC 2002/69/EC	Ordinance concerning max levels for dioxins and dioxin-like PCBs	meat/meat products: **0,2 mg/kg** milk/dairy product <4% fat: **0,1 mg/kg** eggs (without shell): **0,2 mg/kg**	**Dioxins (will be replaced)** meat/ meat products: **500 pg TEQ/kg** Ruminants **3 pg /g fat** Poultry **2 pg /g fat** Pigs **1 pg /g fat** Liver **6 pg /g fat** Fish muscle and fishery products **4 pg /g fat** Milk & milk products including Butter **3 pg /g fat** Egg &egg products **3 pg /g fat** Mixed animal fat **2 pg /g fat** Vegetable oil **0,75 pg /g fat** fish oil for human consumption **2 pg /g fat**	Ministry of Agriculture & Rural Development and Ministry of Health	?
				Drinking water: **0.5 µg /l**			

Food	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs		Structure of authority and enforcement	
	National law	**Implemented international legislation**	**Guidelines**	**PCB mg/kg fat weight**	**PCDD/F WHO-TEQ pg/g fat**	**Responsible ministry**	**Enforcement organs**
RO	GD no.100 (quality norms for drinking water)	according to EU regulations				Government	
	MO 356/2001		maximum levels in products of animal origin			MAFF	
SK	Slovak Republic Food Code		Decree No. 414/2003 Dioxins & PCBs in foodstuffs			Ministry of Agriculture, Ministry of Health	Food research Institute
SLO	OJRS No. 52/00 Sanitary suitability of foodstuffs	2002/201/EC				Ministry of Health	
	OJRS, No. 60/02, No. 100/99 (Official control of foodstuffs)	2002/201/EC					
	52/97, 54/98, 7/00, 52/00 Drinking water	2002/69/EC		Total PCB: **0,1 mg/m^3**			

Food	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs		Structure of authority and enforcement	
	National law	**Implemented international legislation**	**Guidelines**	**PCB mg/kg fat weight**	**PCDD/F WHO-TEQ pg/g fat**	**Responsible ministry**	**Enforcement organs**
TR	Communiqué No. 2002/63 on Maximum contaminants levels in foodstuffs			fish liver - **2 mg/kg fat** fish egg – **3 mg/kg fat** meat **- 0.2 mg/kg fat** crustaceans – **2 mg/kg fat** spiny skins **- 2 mg/kg fat** mollusks – **2 mg/kg fat** fish – **2 mg/kg fat** milk and dairy products **- 0.1 mg/kg fat** egg **- 0.2 mg/kg fat** other baby and kid foods **- 0.1 mg/kg fat** food materials containing vegetable **- 0.1 mg/kg fat** baby food and formulation **-** **0.012 mg/kg fat**		**Ministry of Agriculture and Ministry of Health**	

1.11 Legislation - Feed

Feed	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values	Target values	Recom mended values	Responsible ministry	Enforcement organs
BG	**no information**							
CY	**no information**							
CZ	Dec. No. 169/2002 Coll.			PCDD/F PCBs			Ministry of Agriculture	
EST	Feedingstuff Act			no further information				
HU	**no information**							
LT	**no information**							
LV	**no information**							
MT	**no information**							
PL			Guideline of Chief Veterinary Surgeon	animal feeds/ additives to feed: 7-PCBs: 0,2 mg/kg fat				
RO	**no information**							
SK	**no information**							
SLO	**no information**							
TR	Feed Law	complying with EU limits	some feed additives	PCDD/F			Ministry of Agriculture	

1.12 Legislation – Human Exposure

Human exposure	Existing legislation, guidelines etc.			Limit values for Dioxins & PCBs			Structure of authority and enforcement	
	National law	Implemented international legislation	Guidelines	Limit values	Target values	Recom mended values	Responsible ministry	Enforcement organs
BG	no existing regulations							
CY	no existing regulations							
CZ	no existing regulations							
EST	no existing regulations							
HU	no existing regulations							
LT	no existing regulations							
LV	no existing regulations							
MT	no existing regulations							
PL				Air at workplace: **1mg/m^3 PCBs**				
RO	no information							
SK	Act No. 272/1994 Human Health Protection							
	Regulation 45/2002 Health Protection at Work			PCB in human blood: **0.05 mg/l**				
	Regulation 46/2002 Health Protection at work with carcinogenic &mutagenic factors			PCB (containing 54% Cl) Air at workplace. - **0.7mg/m^3**				
SLO	no existing regulation							
TR	no information							

1.13 Future Aspects

Future aspects	Capacity building		Enforcement		
	National Strategy on lowering dioxin/PCB levels	International communication/ Know-how transfer	Research Programmes	Monitoring Programmes	Priority actions
BG	Laws corresponding to EU-Directives **1999/29, 2002/32, 2001/102** expected to enter into force 2004. Draft of a new veterinary act with special attention to feedingstuffs and feed additives. Dioxin limit values for industrial sources in the framework of IPPC permission procedure (transition period for existing facilities until 2012) Implementation of permitting and monitoring requirements; Harmonization of waste classification; Improvement of analysis capacities			Official control of feedingstuffs and feed additives Monitoring scheme for waste incineration 2 times/year (according to legislation, but not yet implemented)	National Centre for treatment of hazardous waste accord. EU 91/68 (2005) Construction of filter and absorbing installations (2000-2005) NEP 2004 including emission limit values Reduction of dioxin emissions until 2010 (-22%)
CY	National action plan shall start 2005			Monitoring system for PCBs in water (surface and drinking) and some food items like milk will be maintained	- Monitoring of dioxin emissions is expected to start in 2004 - The uncontrolled burning of waste may continue for another 1 - 2 years until we implement a new scheme for the treatment of waste

Future aspects	Capacity building		Enforcement		
	National Strategy on lowering dioxin/PCB levels	International communication/ Know-how transfer	Research Programmes	Monitoring Programmes	Priority actions
CZ	Preparation of National Implementation Plan	Implementation of EC PCBs and Dioxin Directive and related others; implementation of EC Directives for Implementation of Stockholm Convention and POPs Protocol of UN ECE CLRTAP Preparation of legislation for sampling and analytical methods for official supervision of the dioxins and dioxin-like substances in the foodstuffs	Research focused on the chemical, biological and toxicological properties of old and new PTS, their human and ecological risk assessment, destruction technologies	Optimisation of existing national monitoring programmes, harmonisation with regional and global monitoring programmes, QA/QC programmes, monitoring of new types of pollutants other OCPs, PBDEs, SCCPs etc.)	- Remediation of contaminated sites and hot spots - Using and interpretation of existing and producing data - Establishment of POPs Centre and development of expert system connected with partial information systems
EST				Estonian Environmental Monitoring Programme	Continued fish monitoring
HU	Preparation of National Implementation Plan under the Stockholm Convention on POPs Strengthening of enforcement Decade of Health - National Public Health Program National Remediation Program	Improvement of Communication		Human milk monitoring Environmental contamination monitoring	Preparation of dioxin map Building of dioxin sample-bank Analysis of representative environmental and human biological samples Dioxin scrubber investment and reconstruction of Budapest Municipal waste Incinerator to be finished 2005
LT	Ministerial order on requirements for POPs collection and disposal and Plan on disposal to be adopted end of 2003				
LV	Preparation of National Implementation Plan under the Stockholm Convention (Deadline April 2004)	European Union PHARE twinning project "Strengthening Latvia´s Fisheries administration to		Establishing of systematic Monitoring scheme in different environmental compartments with emphasis on main releases	Training in use of the monitoring scheme

Future aspects	Capacity building		Enforcement		
	National Strategy on lowering dioxin/PCB levels	International communication/ Know-how transfer	Research Programmes	Monitoring Programmes	Priority actions
LV	Waste Management State Plan for 2003 - 2012	meet the requirements of the Common Fisheries policy" National and international dissemination of monitoring data			New limit values for food corresponding to EU Directive 2004
MT			Continuation of recording of dioxin concentrations in soil. Annual sampling in discussion	Monitoring programme for dioxin emissions from landfills (aerial emission and potential groundwater contamination)	Closing of existing landfills
PL	- Preparation of National Implementation Plan under the Stockholm Convention -Second Ecological Policy (2000) with Implementation Programme to the Second Ecological Policy (2002) -National Plan on Waste Management (2002) Implementation of Commission Directive 2002/69/EU	laying down the sampling methods of analysis of the official control of dioxins and the determination of dioxin-like PCBs in foodstuffs		Official monitoring of dioxin &dl-PCBs in foodstuffs	elimination of PCBs, dioxins and furans from the environment: e.g. Legal instruments prohibiting import & export, establishment of limit values or performance standards (BAT, IPPC) - 2002 - 2010 - modernization of combustion plants (e.g. hospital waste incinerators, cement kilns activities heading towards 2003 - 2010 - inventory of equipment containing PCBs (identification, labelling and removing from use equipment containing more than 0.05–10 percent or more than 5 litres PCB. Establish Monitoring system with reporting on elimination progress every 5 years

Future aspects	Capacity building		Enforcement		
	National Strategy on lowering dioxin/PCB levels	International communication/ Know-how transfer	Research Programmes	Monitoring Programmes	Priority actions
PL					-implementation of BAT (e.g. air pollution control technologies in secondary aluminium production)
RO	Preparation of National Implementation Plan under the Stockholm Convention				Identify PCBs in existing deposits Manage stockpiles as appropriate Promotion of air pollution control technologies to reduce PCDD/F emission
SK	National Implementation Plan under the Stockholm Convention (reference dead-line 2005)				
SLO	- Preparation of National Implementation Programme for POPs, - Ratification of Stockholm Convention, - Preparation of legislation for official monitoring of dioxin and dioxin-like PCBs in foodstuff		Review of Environmental PCB burden in White Carniola (Bela Krajina) 2003	Monitoring of dioxin & dl-PCBs in foodstuff	
TR		"Support to Food Inspection Services in Turkey" MEDA-project supported by EU HRGC-MS equipment for dioxin analysis will be purchased	Determination of Organochlorines (PCB and DDT) in water, sediment and some important fish species in Izmit Bay within the framework of MEDA		