

"Dioxins in the enlarged EU – is there a need for specific action",  
International workshop, 02 February 2005, Brussels

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

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**ELICC**

**Consortium: Environmental Levels in Candidate Countries**

**BiPRO**

Beratungsgesellschaft für  
integrierte Problemlösungen

Funded: European Commission, DG Environment

Supervision: Gunter Umlauf, JRC



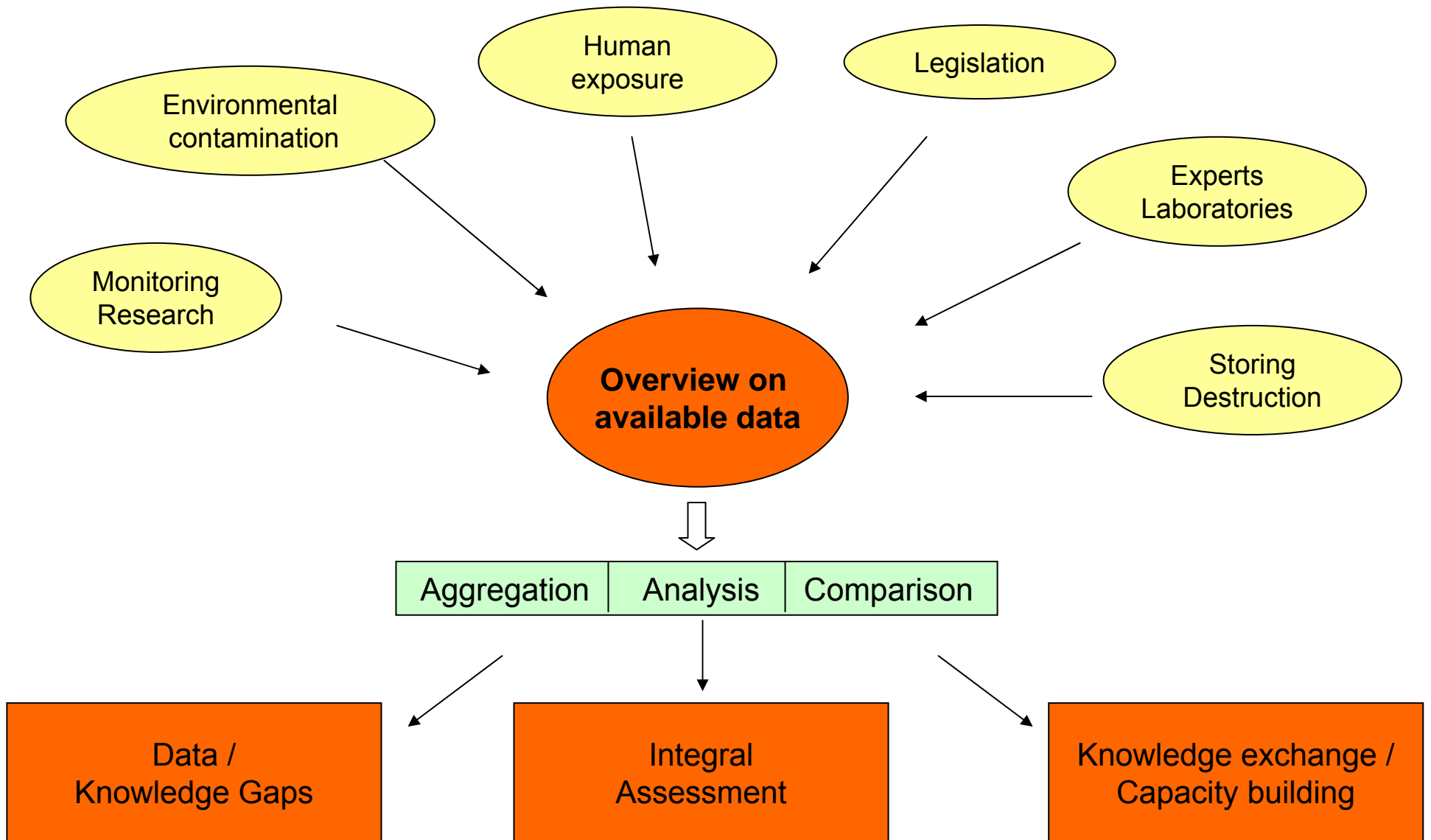
# Background for Activities of the European Commission

Community strategy for Dioxins, Furans and PCBs (COM(2001)593)  
which aims

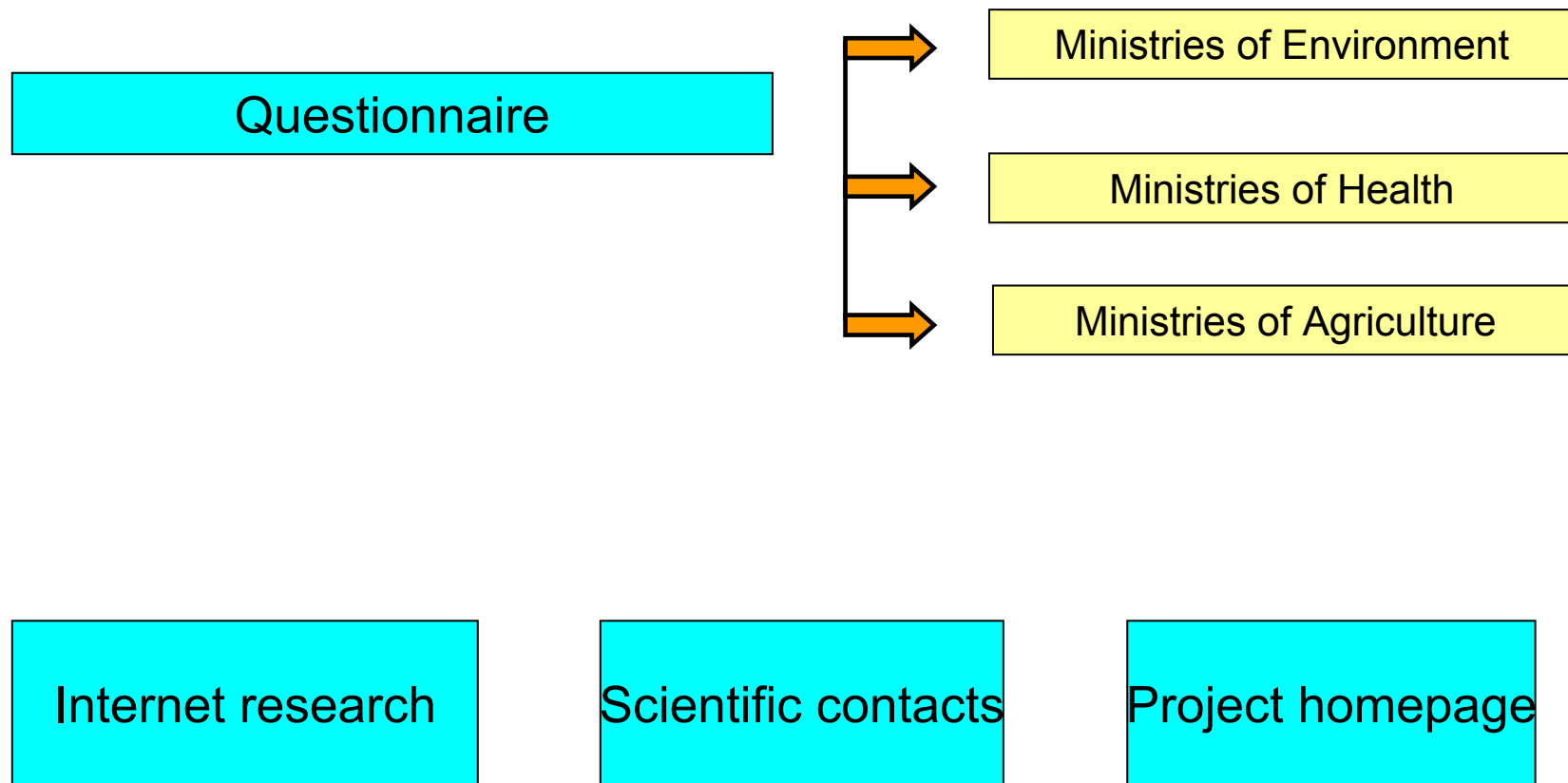
- to reduce the presence of dioxins and PCBs in
  - the **environment** and
  - in **food and feed**
- in order to **reduce the human exposure and body burden**

Council Conclusion of 12 December 2001 which supports the Community Strategy and which stresses the need to involve Accession Countries

# Project objectives



## Methods for information collection



# Structure: Bi-directional Approach

## Comparative overview for all countries



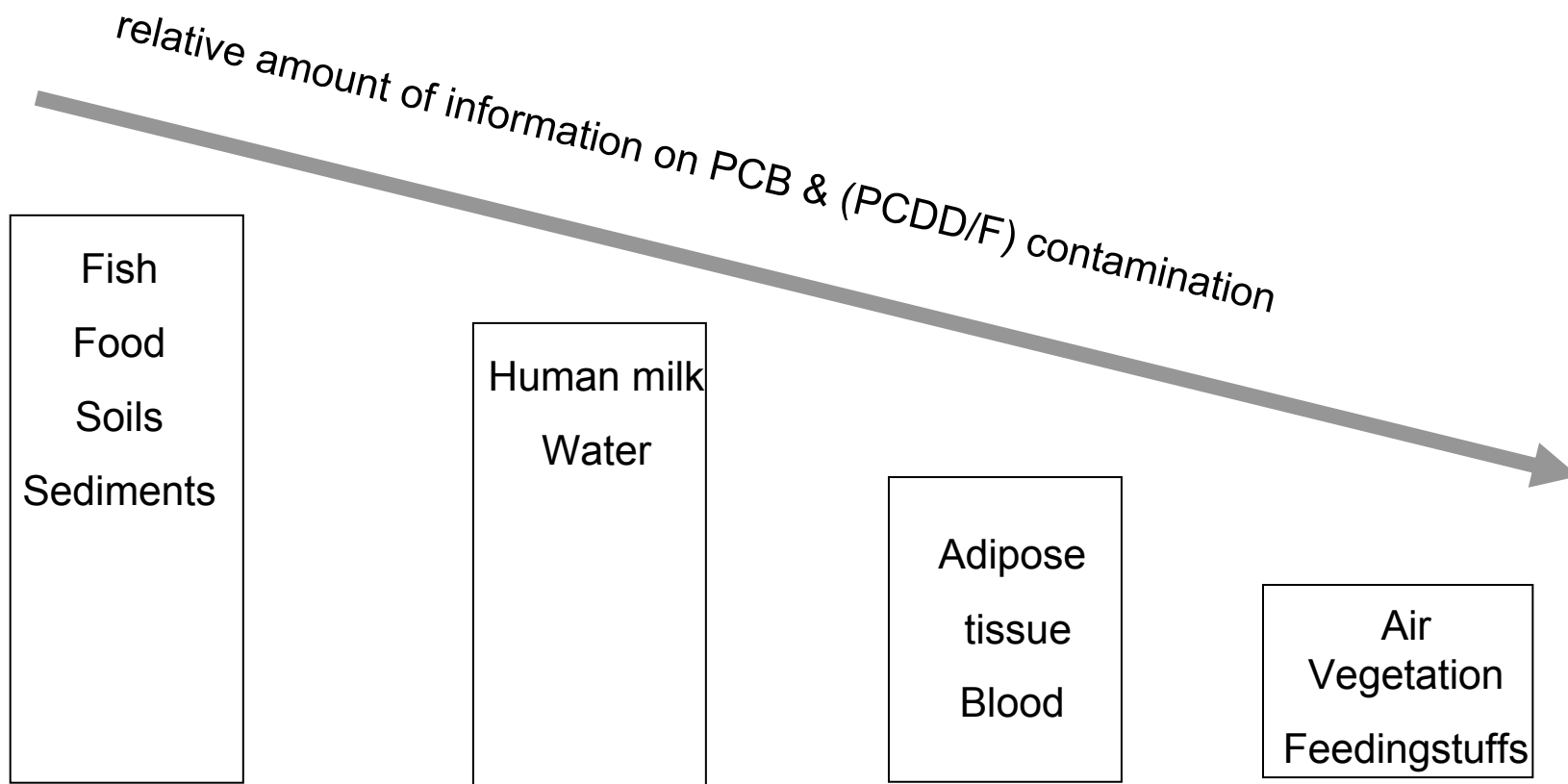
- Contamination
- Monitoring
- Capacity
- Legislation
- Plannings

## Detailed information on specific topics



- Time trends
- Local specificities
- Congeners
- Other

# Priorities of Monitoring & Research



## Monitoring/Research related to PCBs

<b>PCBs :</b>	<b>Air</b>	monitoring in CZ, sporadic local measurements SK, PL; single old data EST, LV, LT
	<b>Water</b>	regular monitoring of surface water in CY, CZ, HU, LT, PL, SK, SLO
	<b>Sediments</b>	systematic monitoring in main water courses in CY, CZ, HU, LT, PL, SK; local measurements in SLO, LV
	<b>Soils</b>	countrywide measurements CZ, HU, SK; some data from BG, PL, RO, SLO; first data LV
	<b>Vegetation</b>	data from CZ, (SLO, PL)
	<b>Wildlife</b>	data from CZ, EST, LT, M, PL, SK, RO, SLO
	<b>Food</b>	monitoring in majority of countries except of BG, HU, RO, TR; only sporadic in CY
	<b>Feed</b>	CZ, SK, ?
	<b>Total diet</b>	CZ, SK, HU
	<b>Human milk</b>	measurements in BG, CZ, HU, LT, RO, PL, SK
	<b>Adipose tissue</b>	measurements in CZ, PL, SK, HU, TR
	<b>Blood</b>	data from CZ, SK, PL, LV, SLO, RO

## Monitoring/Research related to PCDD/Fs

<b>PCDD/Fs :</b>	<b>Air</b>	countrywide system in CZ; sporadic local measurements in SK, PL
	<b>Water</b>	single local measurements in CZ, PL
	<b>Sediments</b>	only data from CZ and SK
	<b>Soils</b>	countrywide measurements in CZ, HU; some data PL, EST
	<b>Vegetation</b>	data from CZ, (SLO, PL)
	<b>Wildlife</b>	measurements in CZ, EST, LV, M, PL
	<b>Food</b>	monitoring in CZ, SK, M,
	<b>Feed</b>	CZ, SK, ?
	<b>Total diet</b>	CZ, (SK)
	<b>Human milk</b>	monitoring in BG, CZ, EST, HU, LT, RO, PL, SK
	<b>Adipose tissue</b>	CZ
	<b>Blood</b>	SK



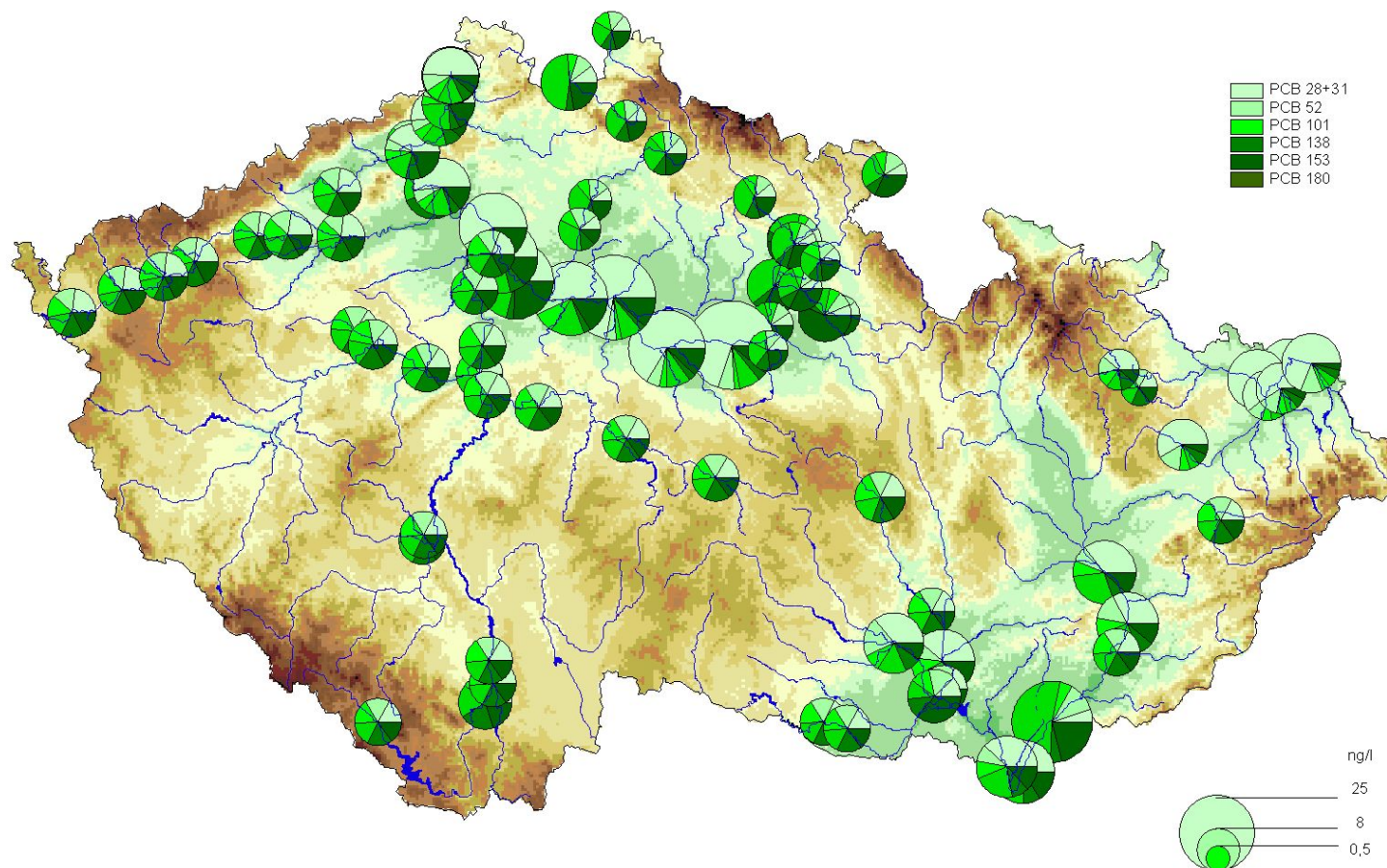
# Air Monitoring for PCDD/F in the Czech Republic



Source: (Holoubek et al 2003a)

# Water Monitoring of PCB in the Czech Republic

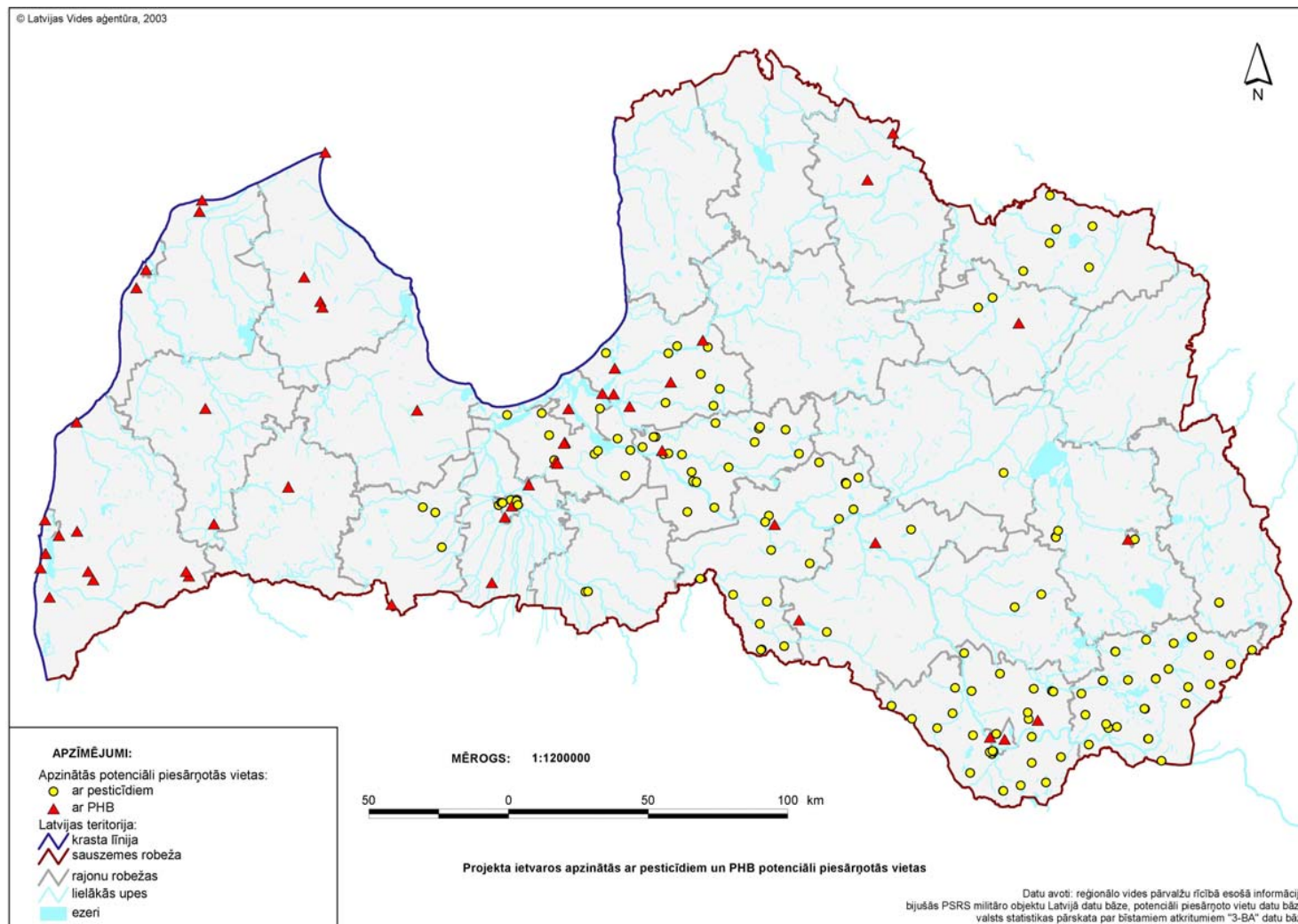
Absolutní zastoupení průměrných ročních koncentrací PCB ve vodě s jejich poměrným zastoupením v roce 2001



Source: (Holoubek et al 2003a)

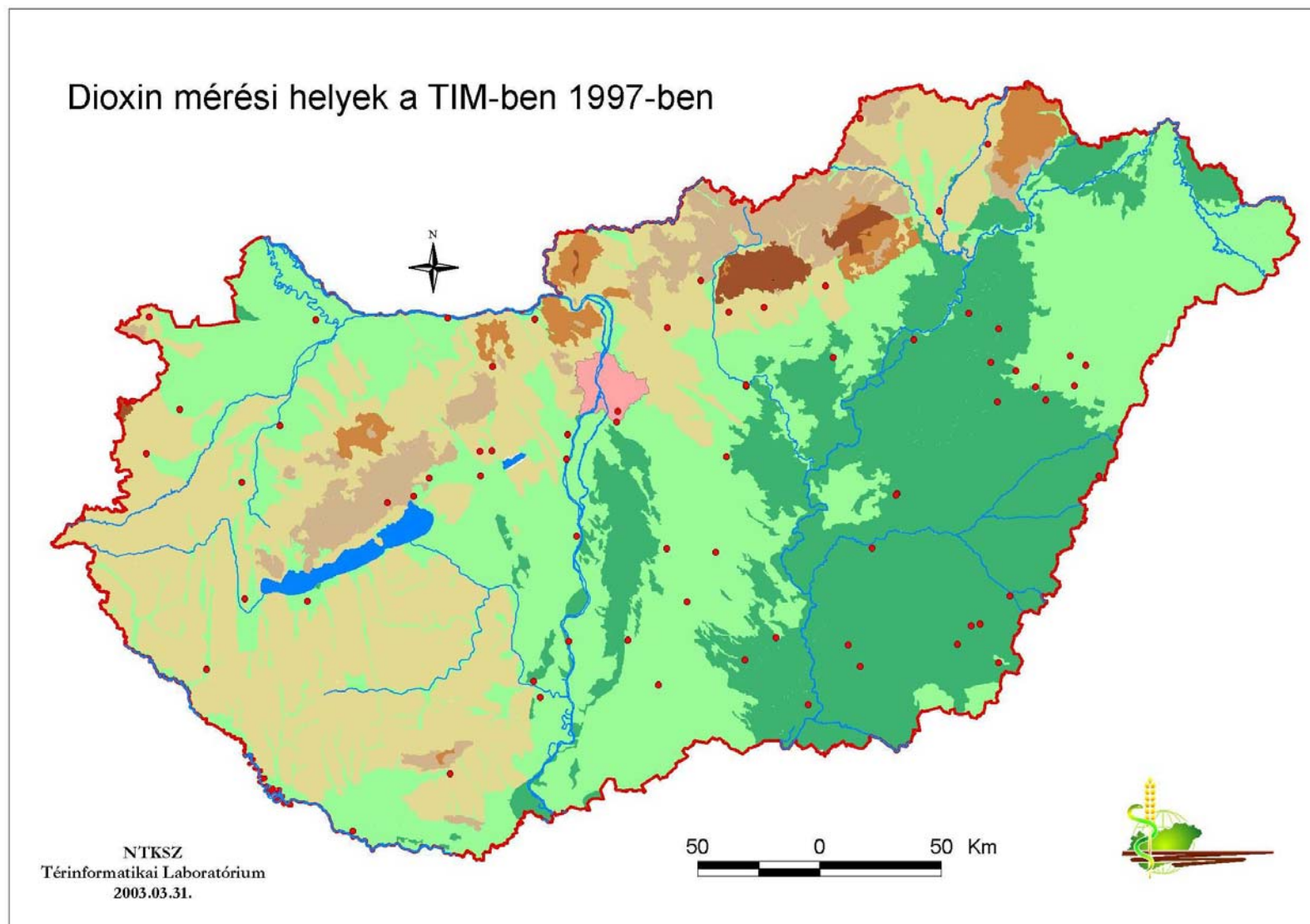


# Soil investigations for PCBs and Pesticides in Latvia 2003

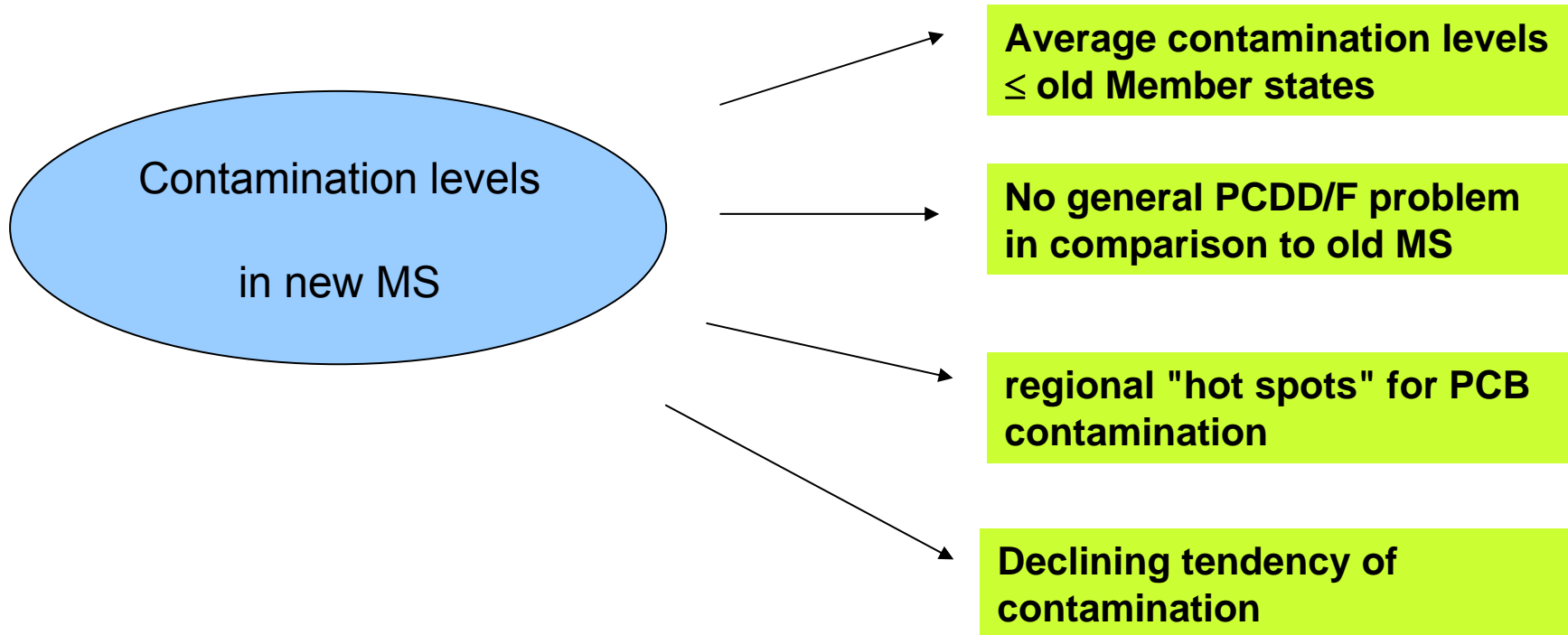


Source: LEA 2003

# Soil monitoring for PCDD/Fs in Hungary 1997



# Results of the project I



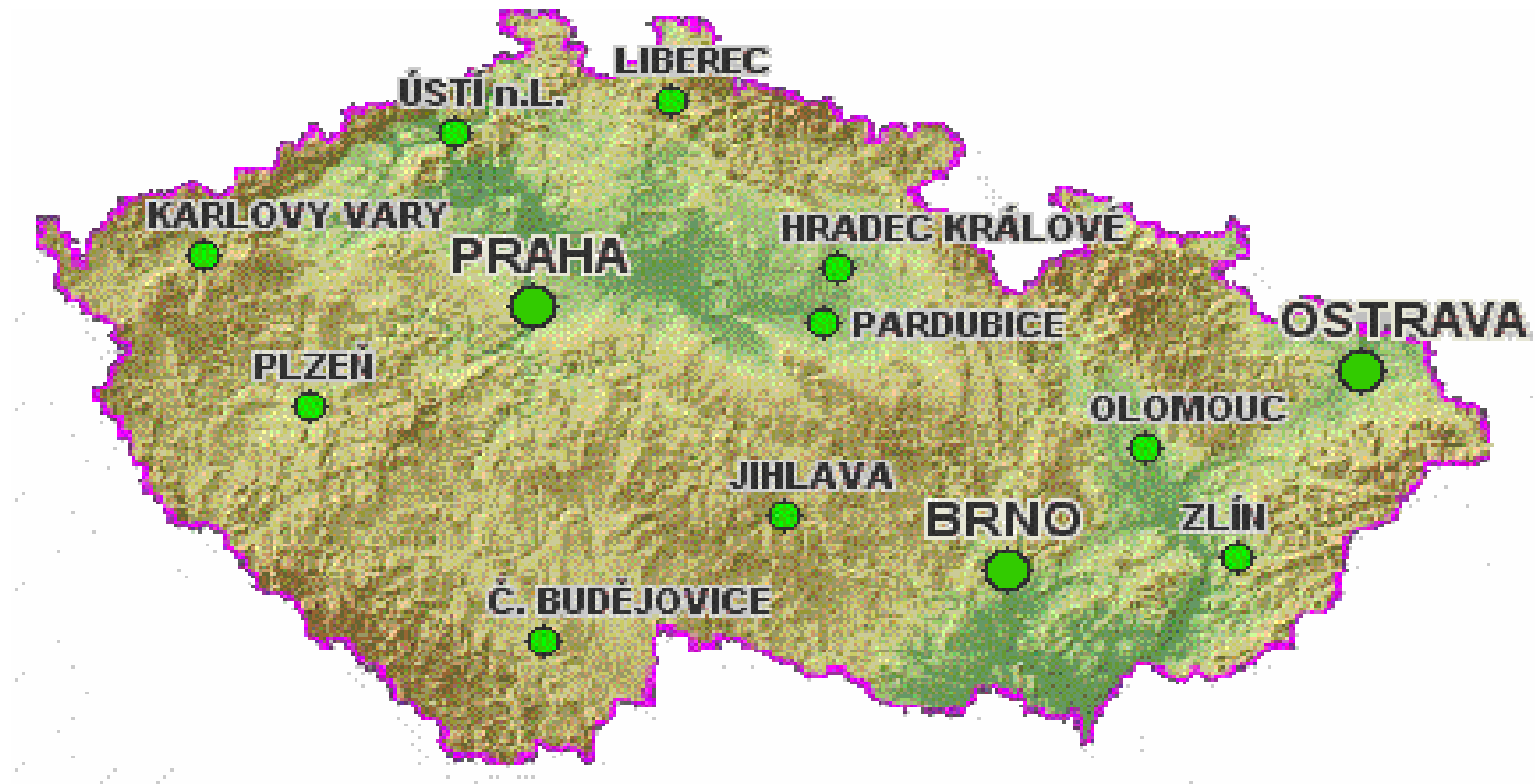
## Relative Contamination levels in New Member States I

Compartment	CZ	EST	HU	LT
<b>Air PCDD/Fs</b>	local winter problems ?	n.d.	n.d.	n.d.
<b>Air PCBs</b>	elevated background levels	European average	n.d.	European average
<b>Water PCBs</b>	Middle European average;	n.d.	European average some minor hot spots for Groundwater	low contamination
<b>Sediments PCDD/Fs</b>	European average	n.d.	n.d.	n.d.
<b>Sediments PCBs</b>	hot spot problem	n.d.		low contamination
<b>Soils PCDD/Fs</b>	European average	insufficient data low contamination	no serious contamination	n.d.
<b>Soils PCBs</b>	European average	n.d.	low contamination	n.d.
<b>Wildlife PCDD/Fs</b>	European average	European average	n.d.	n.d.
<b>Wildlife PCBs</b>	elevated contamination	low contamination	n.d.	European average
<b>Food PCBs</b>	European average	European average	n.d.	European average
<b>Dietary intake</b>	elevated intake for PCDD/Fs	n.d.	n.d.	n.d.
<b>Human milk</b>	hot spot problem	European average	low contamination	elevated levels for PCBs
<b>Adipose tissue</b>	elevated levels		low contamination	
<b>Human blood</b>	European average	n.d.	n.d.	n.d.

## Relative Contamination levels in New Member States II

Compartment	LV	PL	SK	SLO
<b>Air PCDD/Fs</b>	n.d.	local winter problem	european average	n.d.
<b>Air PCBs</b>	european average	european average	european average	hot spot problem ?
<b>Water PCBs</b>	n.d.	european average	hot spot problem surface and ground water	hot spot problem groundwater?
<b>Sediments PCDD/Fs</b>	n.d.	european average	european average	n.d.
<b>Sediments PCBs</b>	hot spot problem	moderately elevated	hot spot problem	hot spot problem ?
<b>Soils PCBs</b>	hot spot problem	hot spot problem	hot spot problem	european average
<b>Wildlife PCDD/Fs</b>	european average	european average	n.d.	n.d.
<b>Wildlife PCBs</b>	european average	european average	hot spot problem	n.d.
<b>Food PCDD/Fs</b>	european average	n.d.	european average	n.d.
<b>Food PCBs</b>	european average	elevated levels for poultry and vegetable oil	hot spot problem	hot spot problem ?
<b>Human milk</b>	n.d.	european average	hot spot problem	n.d.
<b>Adipose tissue</b>	n.d.	low contamination	hot spot problem PCBs	n.d.
<b>Human blood</b>	elevated levels for high fish consumers	european average	hot spot problem for PCDD/Fs and PCBs	data not comparable

# Hot spots for PCB contamination in the Czech Republic



Holoubek, UNIDO Regional Workshop Brno, 2003



## Hot spot air concentration of PCDD/F in Poland

### ➤ Winter mean

Krakow: 2,580-5,740 fg I-TEQ/m<sup>3</sup>

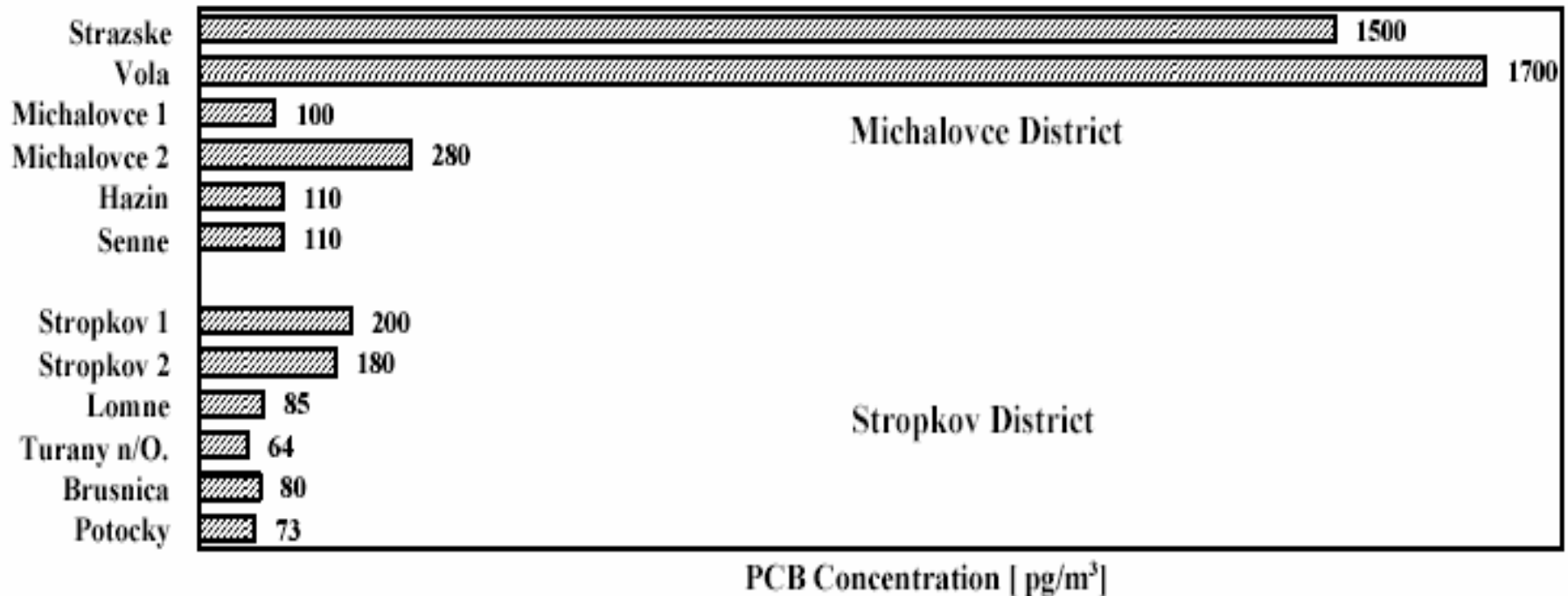
European average range: 50-400 fg I-TEQ/m<sup>3</sup>

### ➤ Summer mean

Krakow: 60-120 fg I-TEQ/m<sup>3</sup>

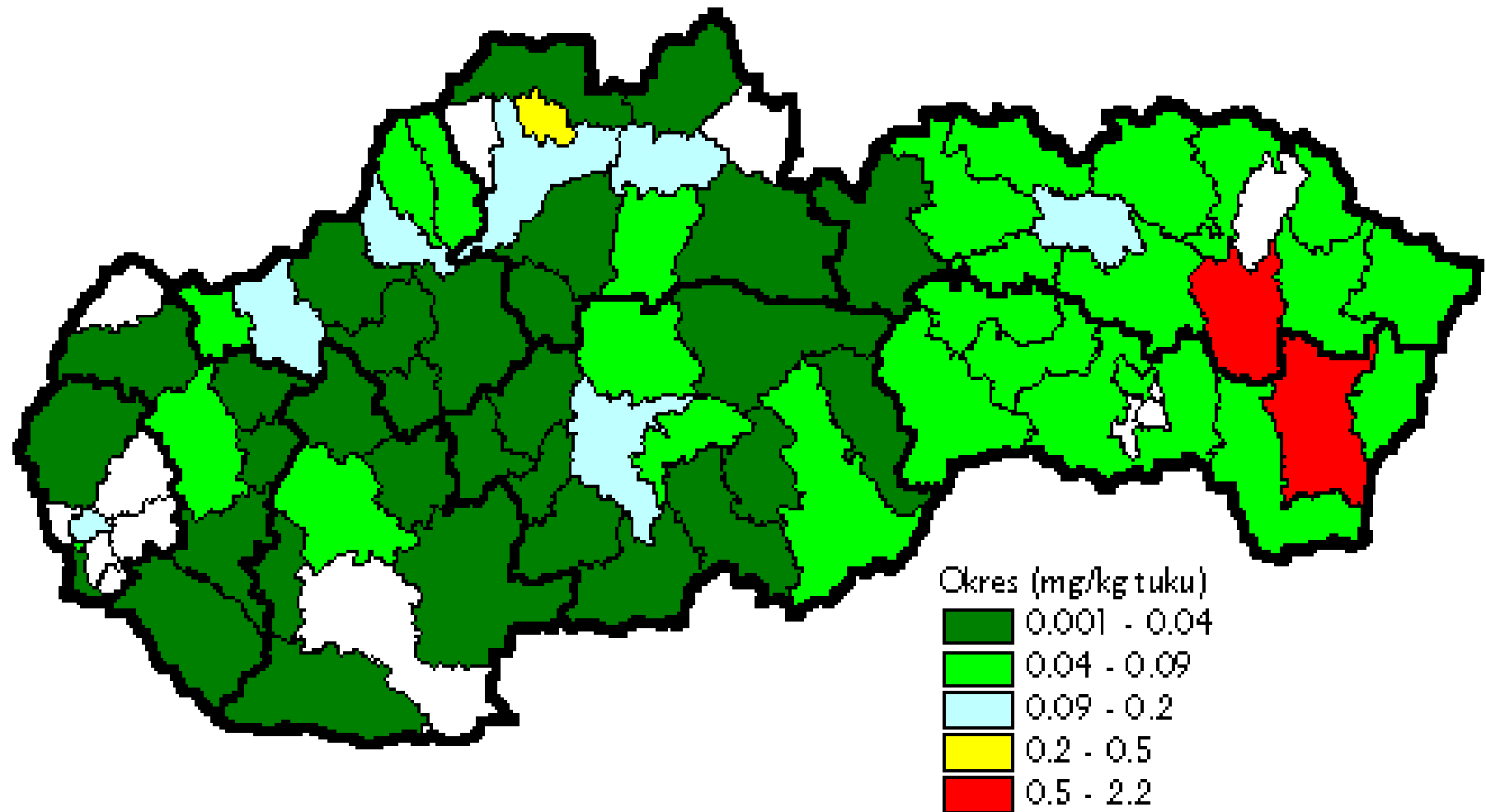
European average range: 1-150 fg I-TEQ/m<sup>3</sup>

# Hot spot PCB concentrations in ambient air in the Slovak Republic



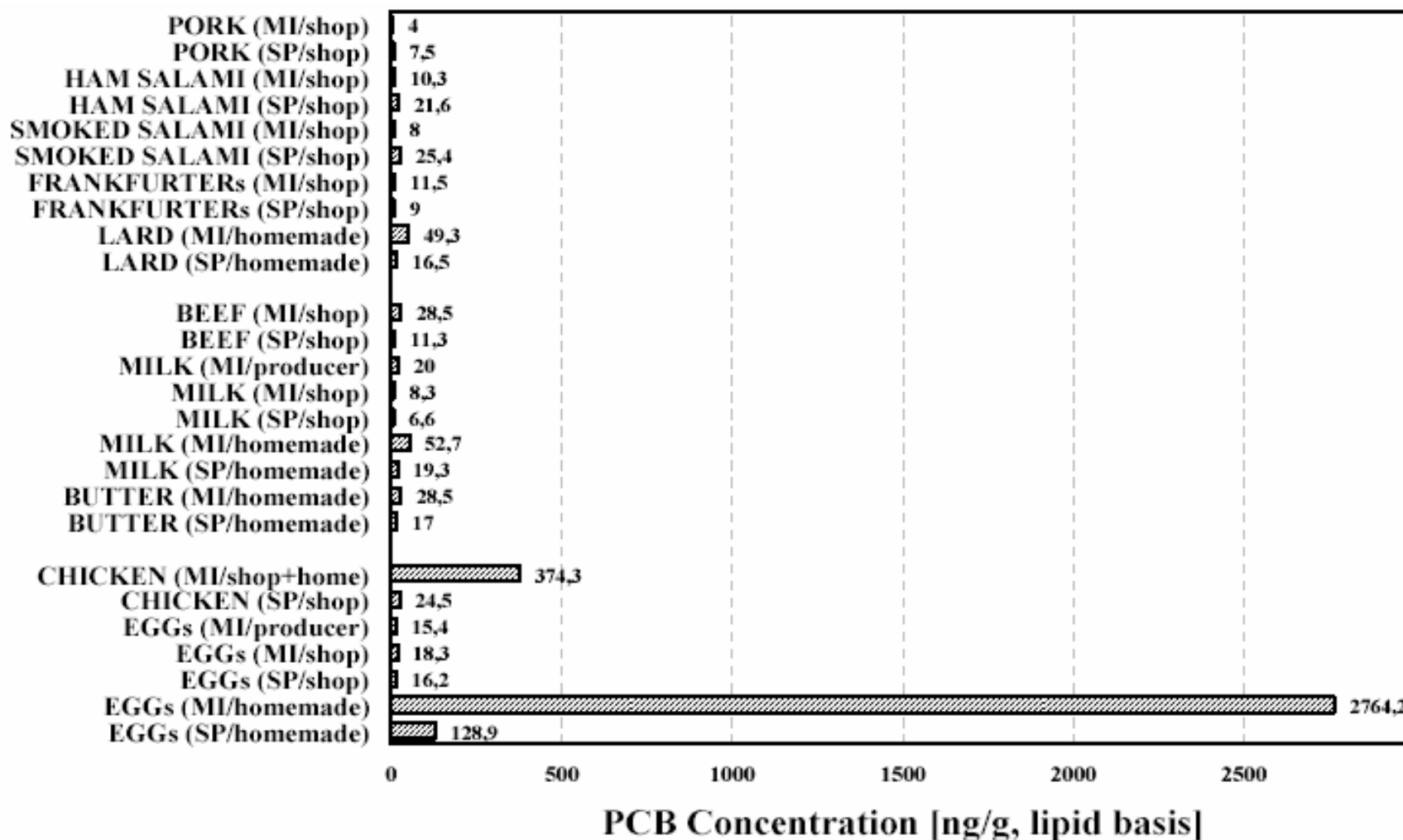
total PCBs in residential areas of the districts of Michalovce and Stropkov 1997 (Kocan et al. 2000,2001)

# Regional hot spot contamination of wildlife in the Slovak Republic



Regional differences in PCB contamination of wild animals in SK from 1987 – 2001 (data in  $\mu\text{g/g}$  fat tuku=fat)  
(Source: Slovak NPOPSInv 2003).

# Regional peak levels in food due to local hot spot contamination (Slovak Republic)



Levels in food products collected in the hot spot region of Michalovce (MI) and the control district of Stropkov (SP);

Source: Kočan et al. (1999)

## Historical hot spot contamination with PCB Slovenia

### ➤ Sediments (1991)

Krupa spring: 15,000000 ng/g

Krupa estuary: 630 ng/g

European average: 100-200 ng/g

### ➤ Fish (1991)

Krupa: 210-1770000 ng/g fat

European average: < 5000 ng/g fat

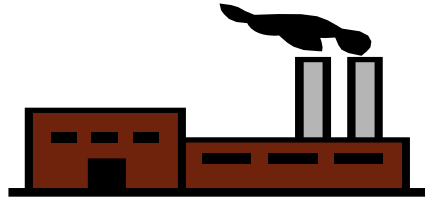
### ➤ Air (1991)

Bela Krajina: 30 000-140 000 pg/m<sup>3</sup>

European average: <500 pg/m<sup>3</sup>

Current contamination ?

# Sources for hot spot contamination in new Member States



- industrial processes
- transformer & capacitors
- domestic burning

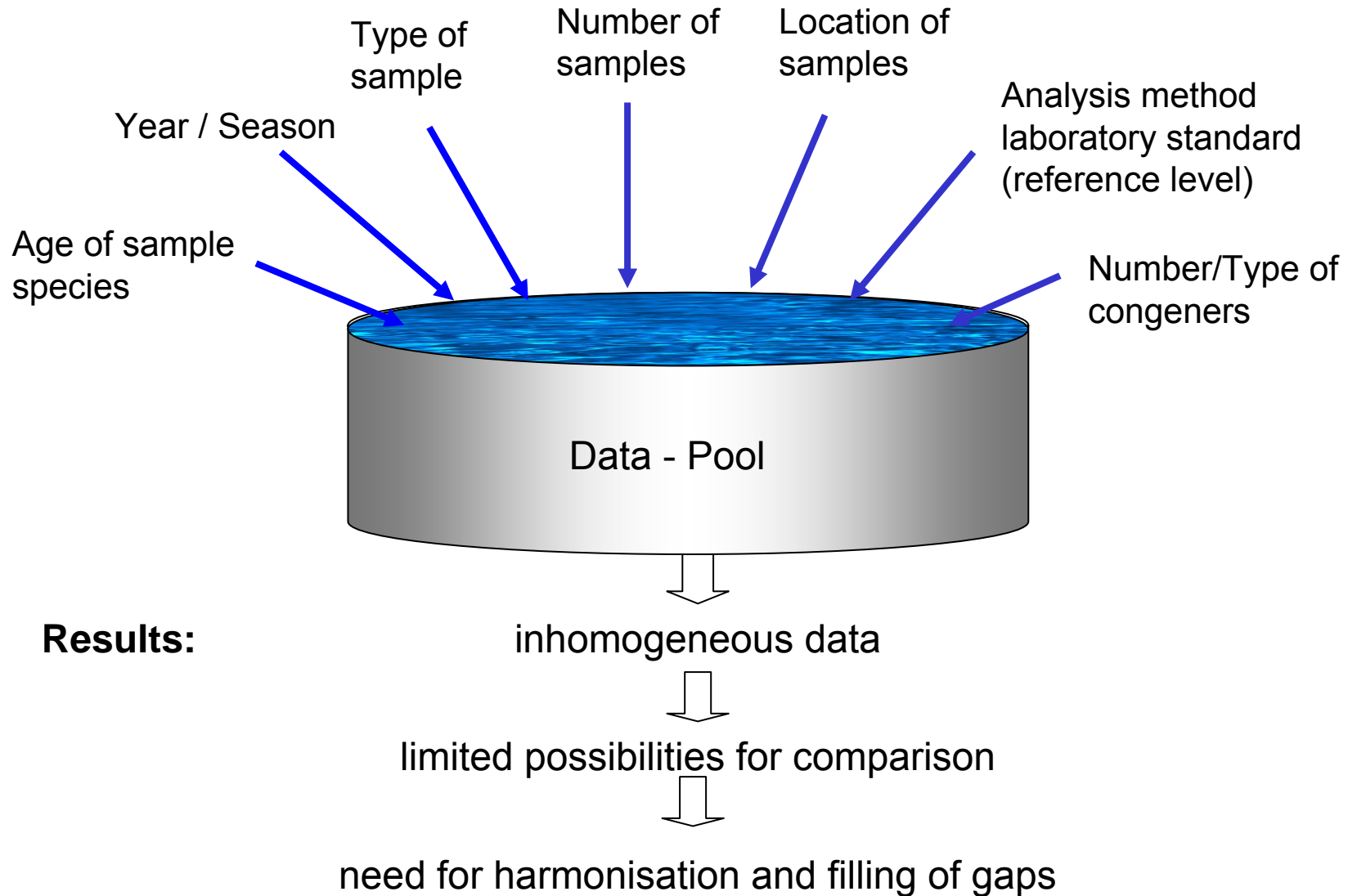
- historical production
- former military camps
- dump sites
- contaminated stocks / wastes

## **needs:**

- application BAT, BEP
- identification, collection, decontamination
- awareness rising
- remediation

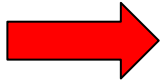
# Environmental contamination

## General aspects for comparison of contamination data



# Consequences for integral assessment

Best sources for comparison:



International studies with identical analysing laboratory



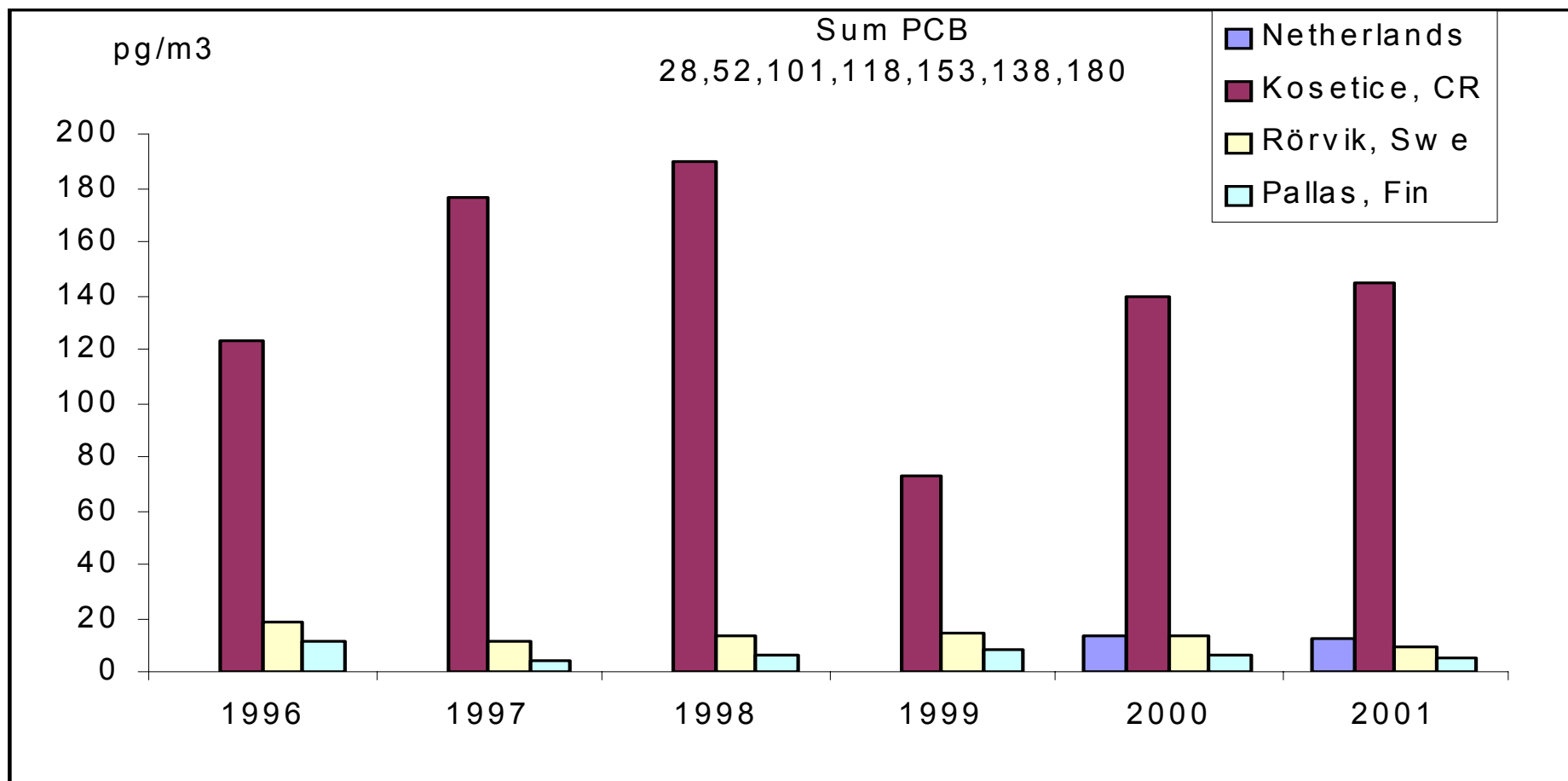
Studies comprising more than one country



Studies with analysis in reference laboratory meeting EU quality standards



# European Comparison of atmospheric background concentrations of PCB pg/m<sup>3</sup> (EMEP)



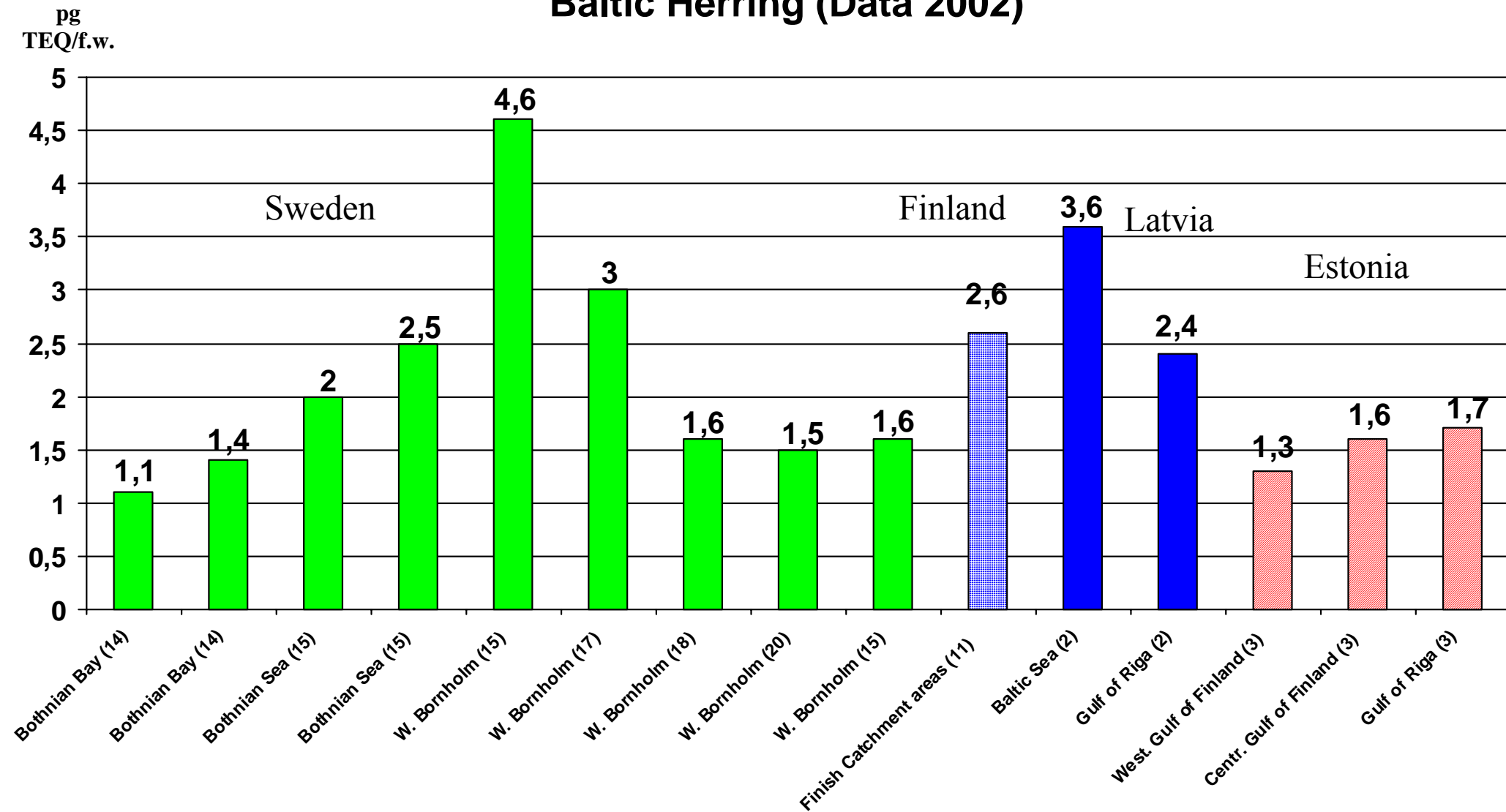
## European Comparison of PCDD/F Levels in Soils (pg-TEQ/g d.w)

Country	agricultural / rural	urban	Reference
Czech Republic	national background level 2.5 (0.1-14)		Holoubek et al. 2003
	1.3 (0.5-14.3)		
Hungary	median bound 0.98 (<0.9-18.6)		NPOPsInv 2003
Austria	1-64		Buckley-Golder et al. 1999
Belgium	2.1-8.9		
Germany	1-30		
	median all types of soil 4		Fiedler et al. 2002
France	0.09-1.0		ADEME, 1998
Greece	background 2		Martens et al., 1998
Ireland			Buckley-Golder et al. 1999
Italy		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	<1		Buckley-Golder et al. 1999
UK	< 1-87		

comparable range of contamination

Sources: Background report-UNEP regional report-Europe; UNEP Mediterranean Report

# European Comparison of PCDD/F contamination in 2-3 year old Baltic Herring (Data 2002)



Sources: Bjerselius et al., Isosaari et al.; Ott Roots/ Mart Simm; Latv. Nat. Food & Vet. Service (all 2003)

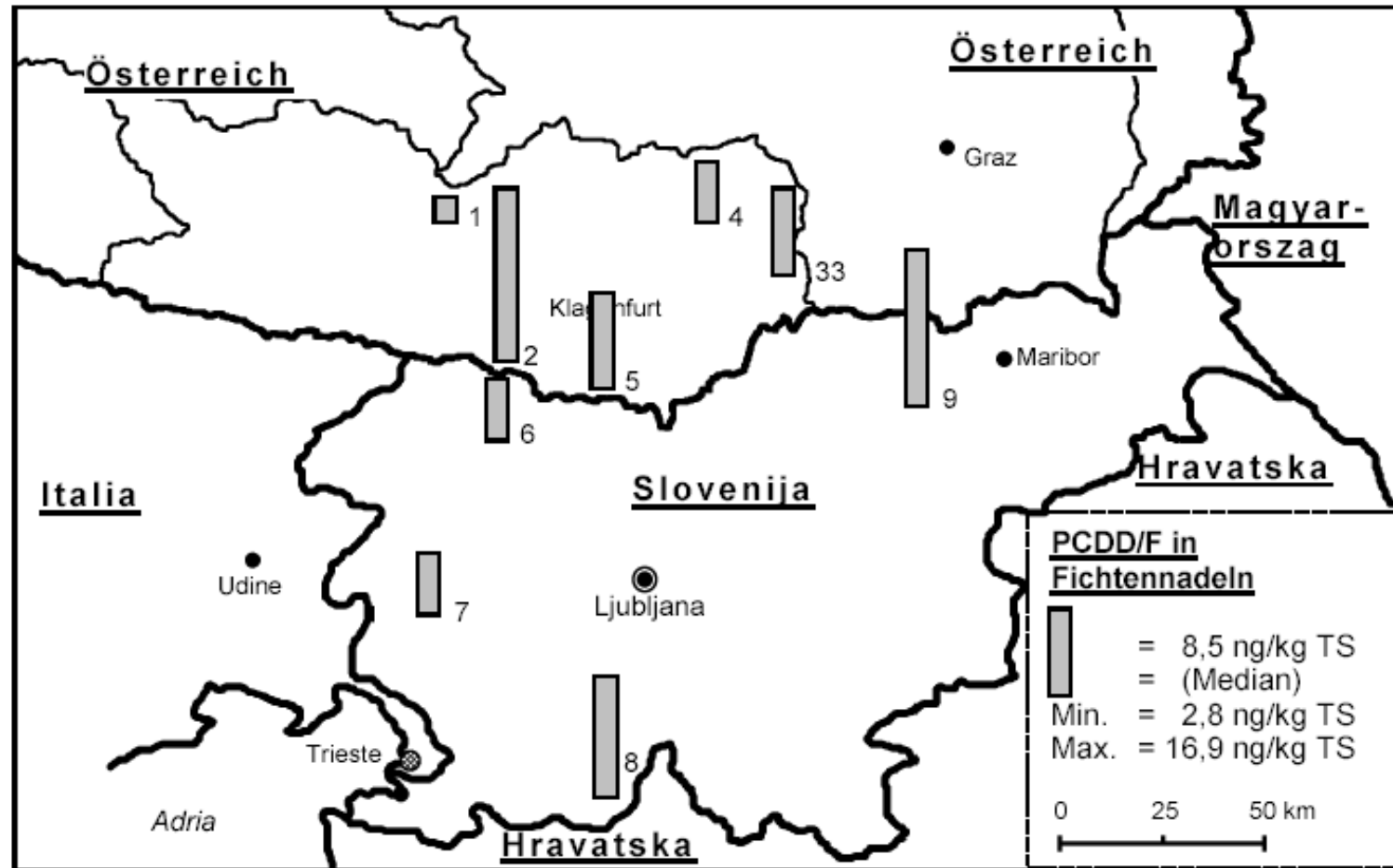
( ) number of samples

## European Comparison of PCB Contamination in Fresh water fish (ng/g fat)

Country	Species	Contamination level	Location	Reference
Czech Republic	perch	mean 2,940-2,545. 6 ( $\Sigma$ 7 PCBs)	national water courses	State Veterinary Administration
		mean 5,190-5,149 ( $\Sigma$ 20 PCBs)		
Estonia	perch	mean: 355.3-658.5 ( $\Sigma$ 11 PCBs)	Matsalu Bay	Ott Roots 2003
Poland	perch	mean 370-1,100 ( $\Sigma$ 8 PCBs)	Oder estuary	Falandysz et al. 2002
Romania	perch	mean 302.4 ( $\Sigma$ 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 ( $\Sigma$ 7 PCBs)	River Po	Vigano et al 2000
Czech Republic	chub	mean 2,904.5-4,547.8 ( $\Sigma$ 7 PCBs)	national water courses	State Veterinary Administration
	barbel	mean 5,640.5-20,135.2 ( $\Sigma$ 7 PCBs)		

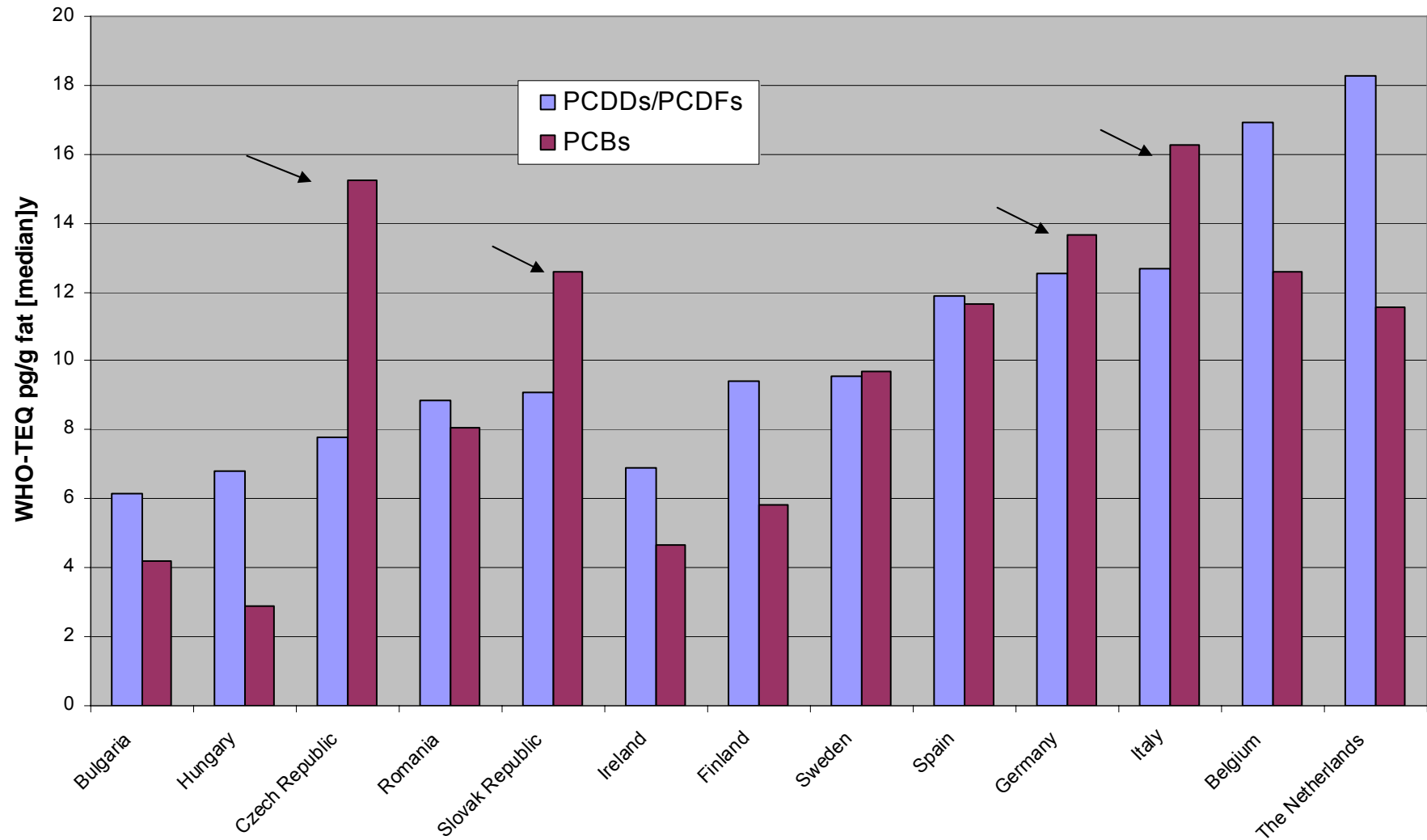
Contamination with Indicator PCBs ( $\Sigma$ 7-8) in fish species (muscle tissue) from different European Countries

# European Comparison of background contamination with PCDD/F in needles (Austria and Slovenia)



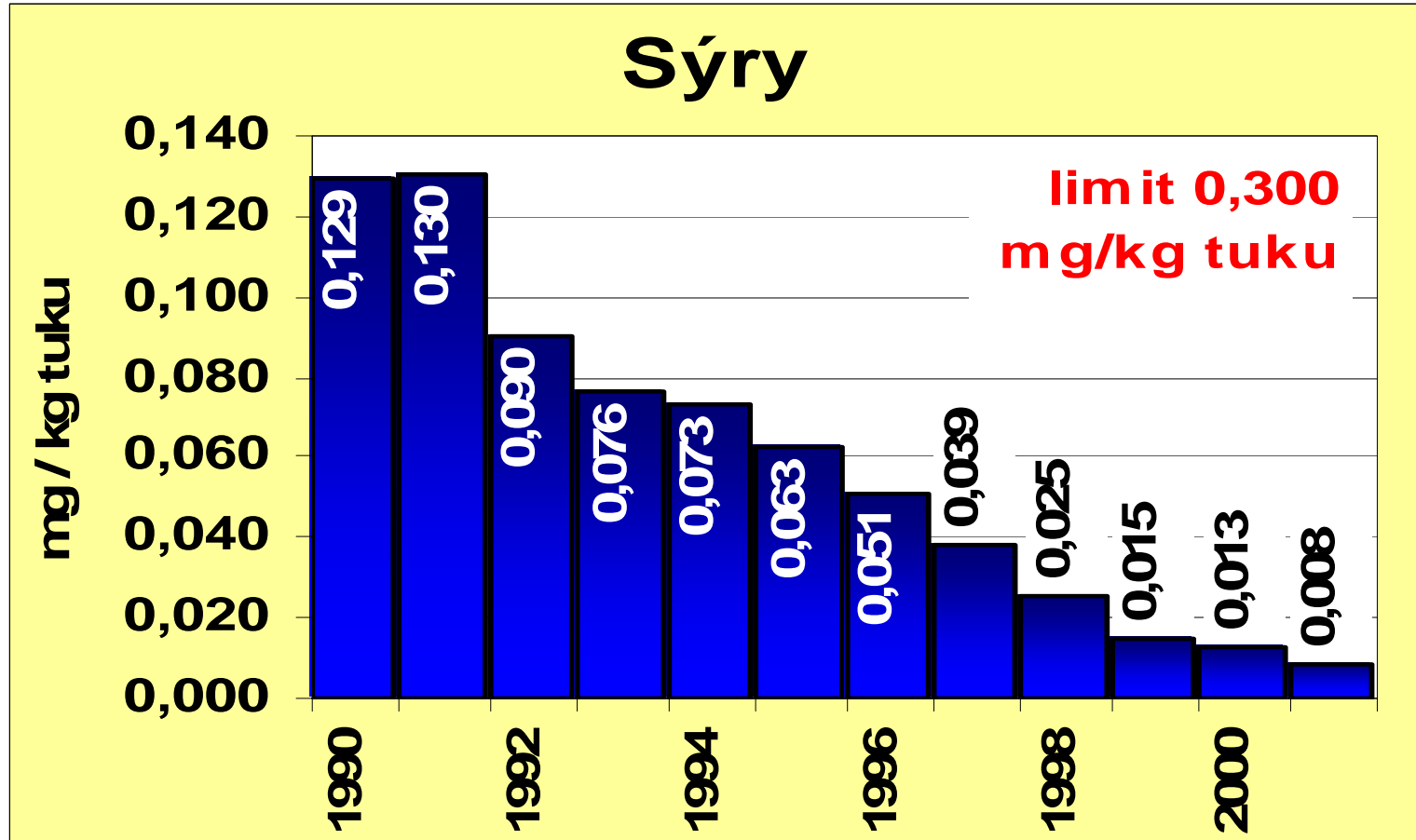
Source: Weiss et al. 2003

# European comparison of PCDD/F and PCB levels in Human milk ( WHO 2001/2002)



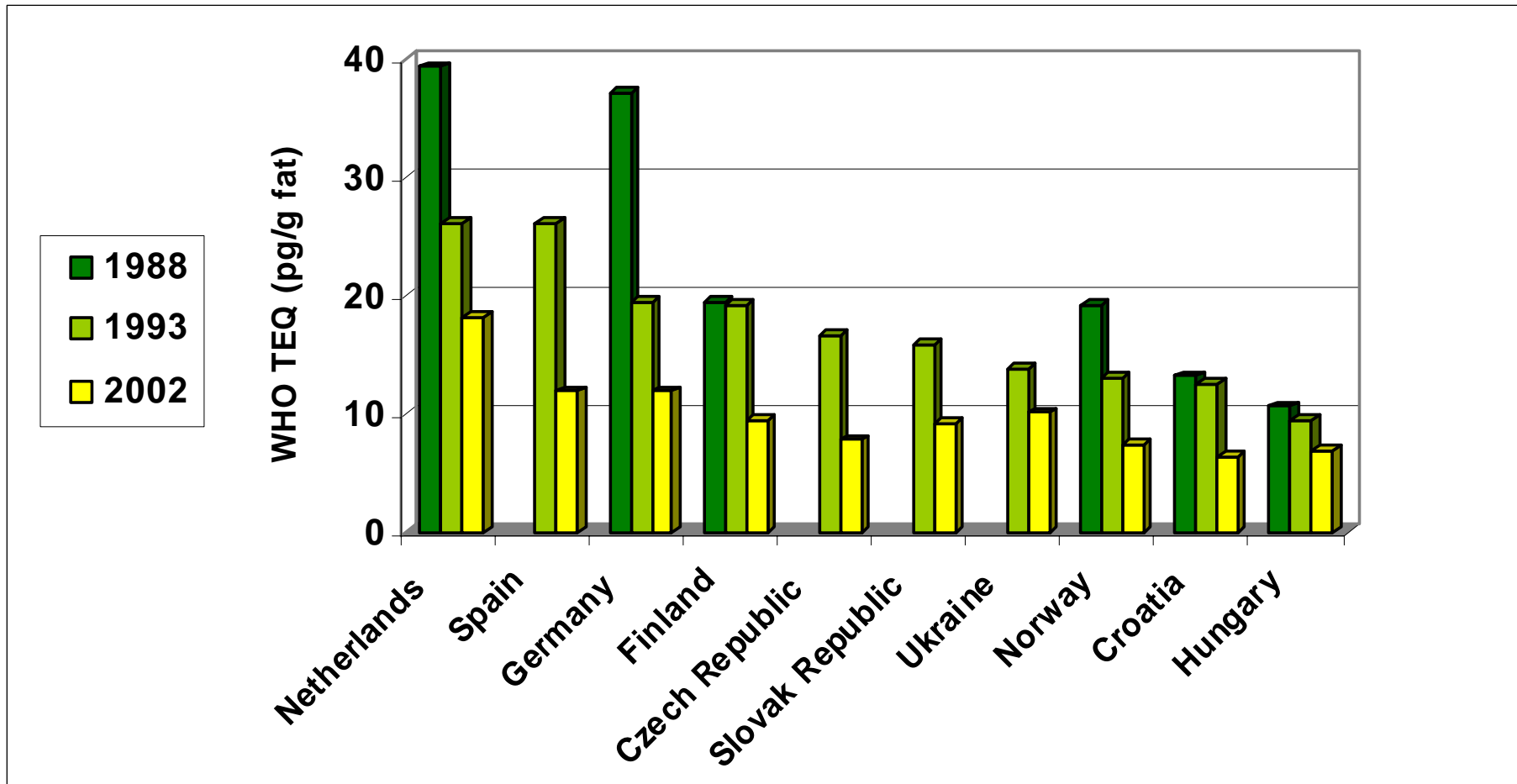
Source: Van Leuwen, R. Malish 2002 "WHO exposure study on the levels of PCBs, PCDDs and PCDFs in Human Milk" 3rd round

# Time Trends: PCB contamination in cheese from the Czech Republic



Source: (State Veterinary Inspection; Holoubek et al. 2003a)

# Time trends PCDD/F contamination in human milk (WHO)



Source: WHO studies - 1988, 1993, 2002



# Time trends: Water contamination with PCBs in major Polish rivers

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
<b>Mean</b>	<b>15.3</b>	<b>11.0</b>	<b>8.6</b>	<b>6.5</b>	<b>10.3</b>

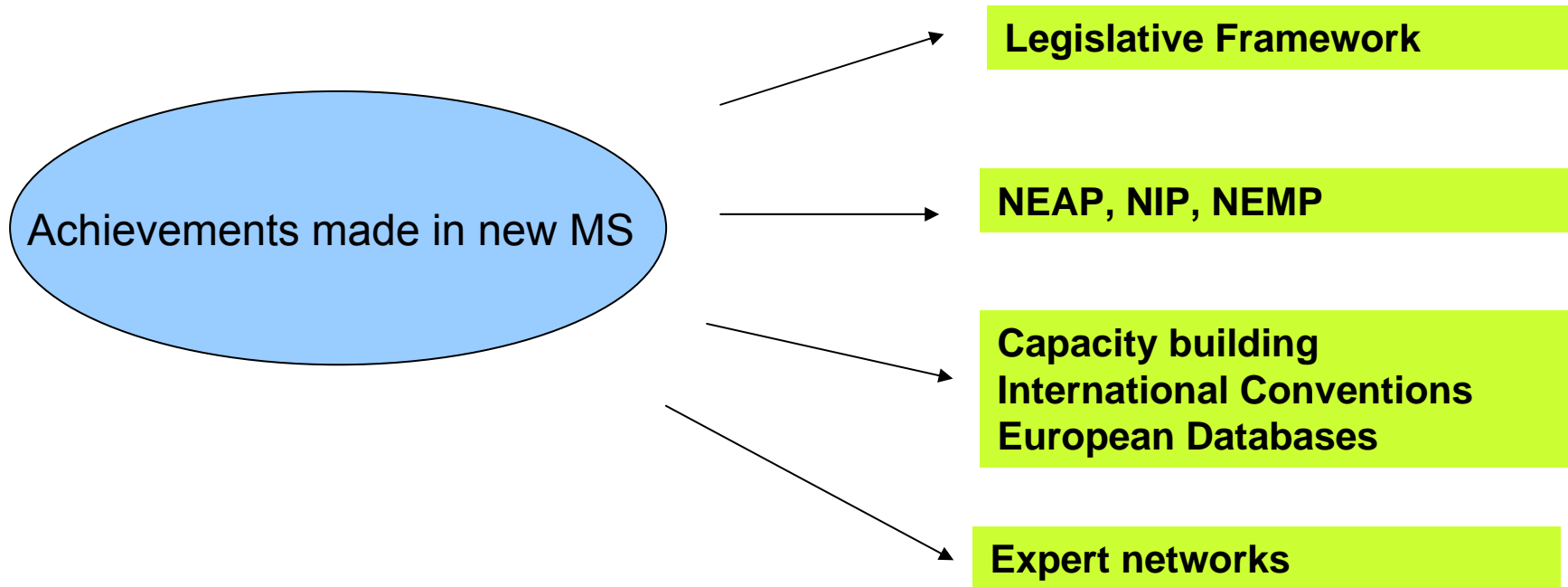
## Time trends: PCB contamination in soil in the Czech Republic

Sum of 3 congeners (138, 153, 180); topsoil [ng.g <sup>-1</sup> 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 <sup>-1</sup> 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

Holoubek et al. 2003a

## Results of the project II



## Legislation: Implementation of EU Directives

❖ 2000/76/EC (incineration of waste)	→	emission limits transposed
❖ 1996/59/EC (disposal of PCBs/PTCs)	→	partly problems with safe disposal and time limit for complete depletion
❖ 1976/769/EEC (marketing and use)	→	transposed; refilling not always forbidden
❖ 1996/61/EC (pollution prevention IPPC)	→	partly problems in meeting time limits
❖ 2000/60/EC (water framework)	→	transposed
❖ 2001/1002/EC (animal nutrition)	→	no information
❖ 2001/2375/EC (maximum levels in food)	→	only in some countries already implemented

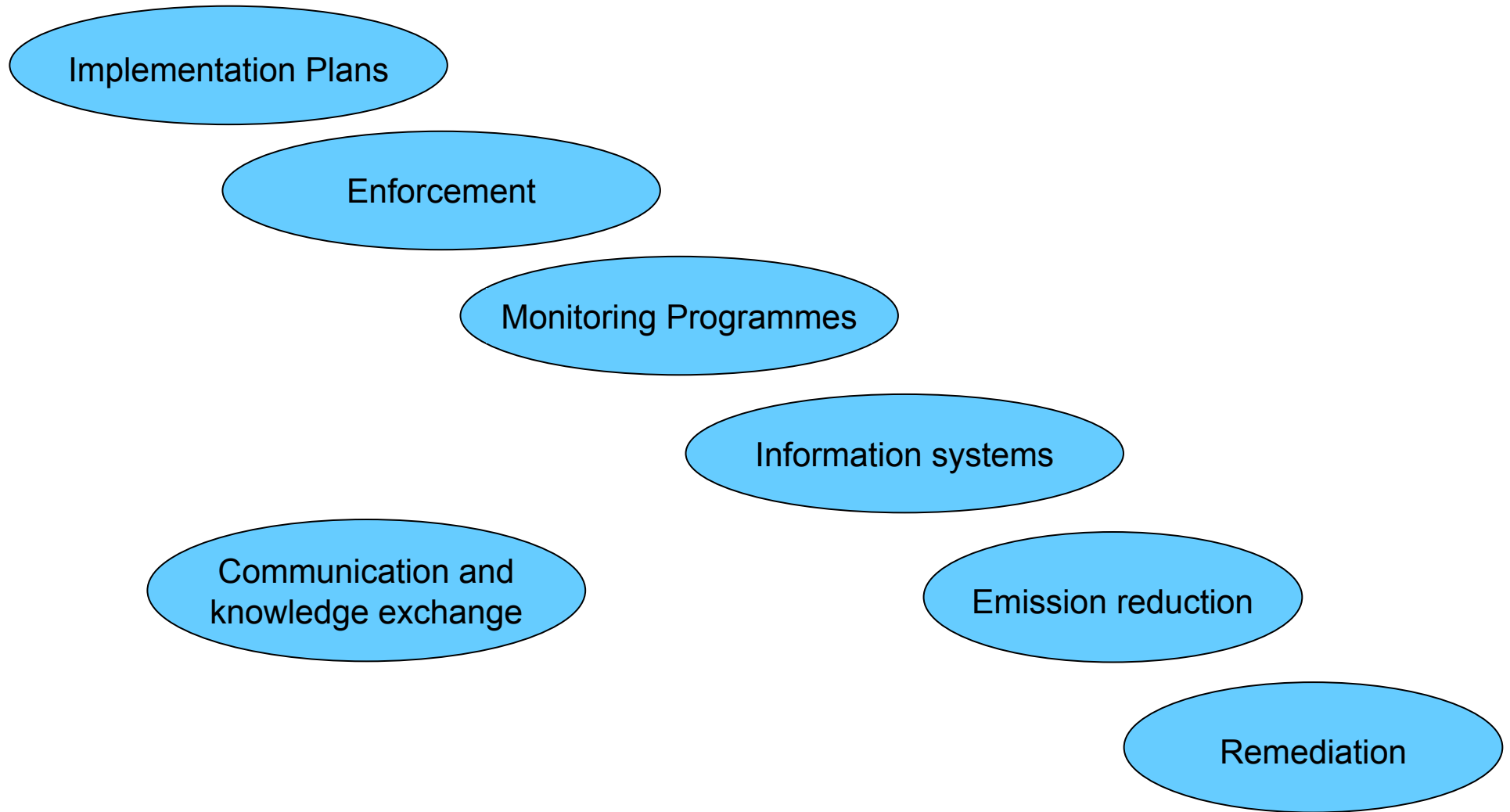
## **National legislation in additional compartments (Limit values and quality standards for PCBs and PCDD/Fs)**

- ⇒ water
- ⇒ soil
- ⇒ sewage sludge
- ⇒ ambient air
- ⇒ work place air
- ⇒ human blood levels

**National Legislation:**  
**Variations in national limit values for PCBs – Food**

Meat	200 – 3000 ng / g lipid
Milk	100 – 1500 ng / g lipid
Eggs	200 – 500 ng / g lipid
Fish	100 – 3000 ng / g lipid
Animal Fat	500 ng / g lipid

# Priorities related to PCDD/Fs and PCBs in New Member States



# Knowledge exchange & Capacity building

## ❖ Programmes in the framework of the European Union:

- PHARE/ Twinning, ISPA, LIFE

## ❖ Programmes in the framework of WHO:

- GEF funded projects to meet the obligations under the Stockholm Convention
- WHO human milk study
- GEMS-Food-EURO

## ❖ Regional Co-operations, international Conventions and Databases:

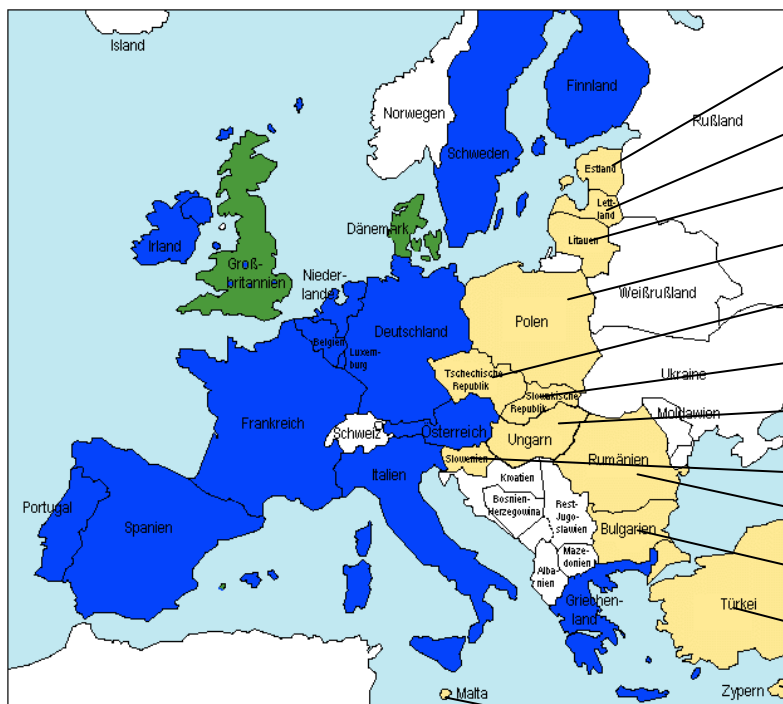
- Baltic Environmental Forum (BEF), DANCEE
- HELCOM, BARCOM (Medpol)
- EIONET, EUROWATERNET, EMEP, etc.

## ❖ Studies: (e.g.)

- Dioxins and PCBs: Environmental Levels and Human Exposure in Candidate Countries
- Dioxin Emissions in Candidate Countries

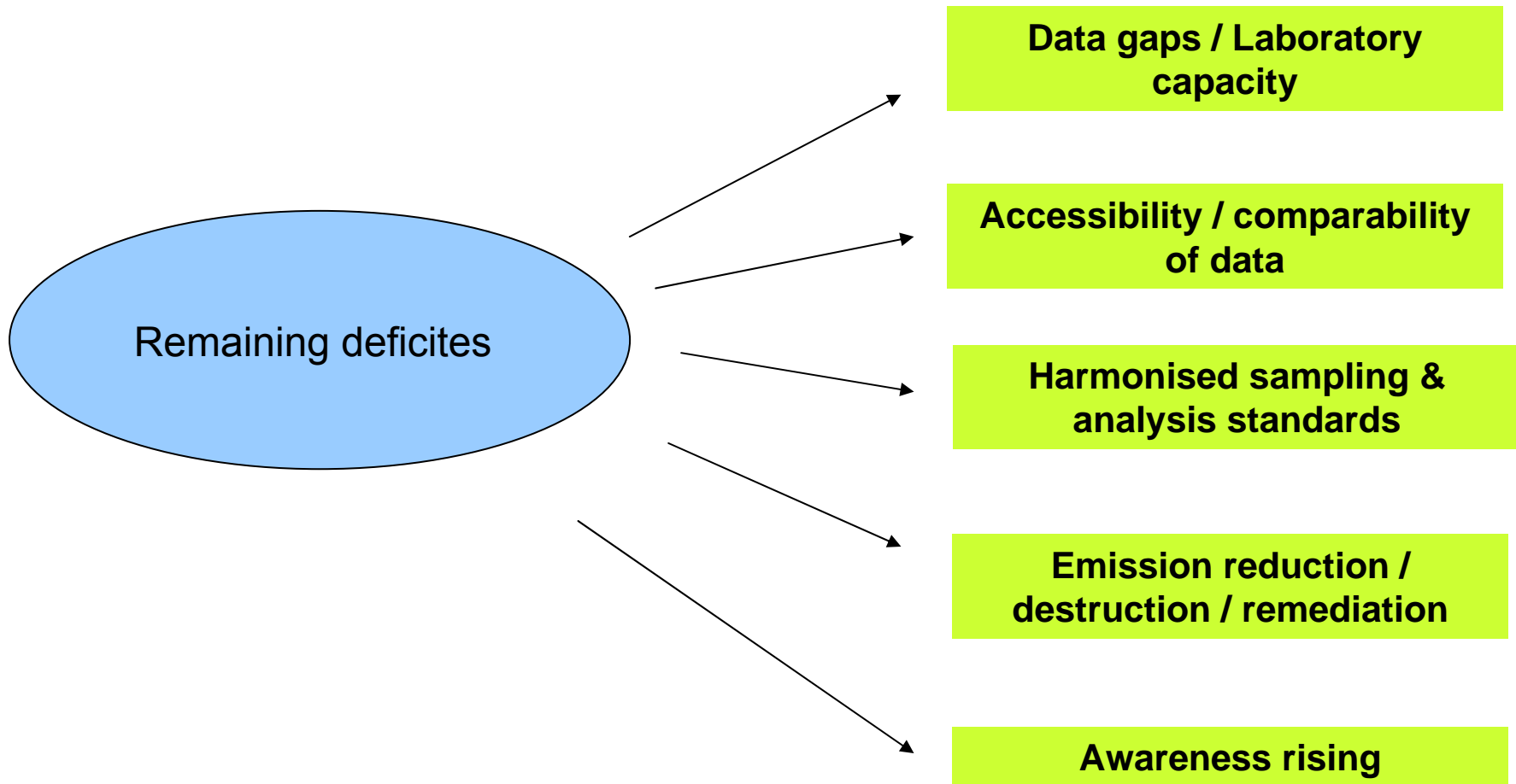


# Laboratory and destruction capacity for PCDD/Fs and PCBs in New Member States



Country	PCB Labs	Dioxin Labs	Destruction capacity
Estonia	3	0	0
Latvia	2	0	0
Lithuania	2	1	0
Poland	~ 30	5	(✓)
Czech Republic	~ 30	3	(✓)
Slovakia	?	1	planned
Hungary	8	1	✓
Slovenia	4	1	0
Romania	(10)	(1)	?
Bulgaria	?	0	0
Turkey	0	0	0
Cyprus	2	0	0
Malta	0	0	0

## Results of the project III



## **Outlook**

### **Monitoring, Contamination Data**

1. What has changed since accession in the new Member States? (Monitoring, Capacity)
2. Which shall be priority compartments / substances for Monitoring in EU 25?
3. How can better comparability of data be achieved?
4. How could monitoring be more efficient?
5. Which data could be used as indicators for environmental and human exposure?

## **Outlook**

### **Impacts and implications of regulatory measures**

1. What are the effects of recently adopted legal frameworks in new Member States (IPPC, Waste incineration, PCB disposal, Food and Feed limits)?
2. What are the impacts of the European POP regulation?

## Contacts for further information

Report: <http://europa.eu.int/comm/environment/dioxin/index.htm>

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Project Team: Anke.Joas@bipro.de