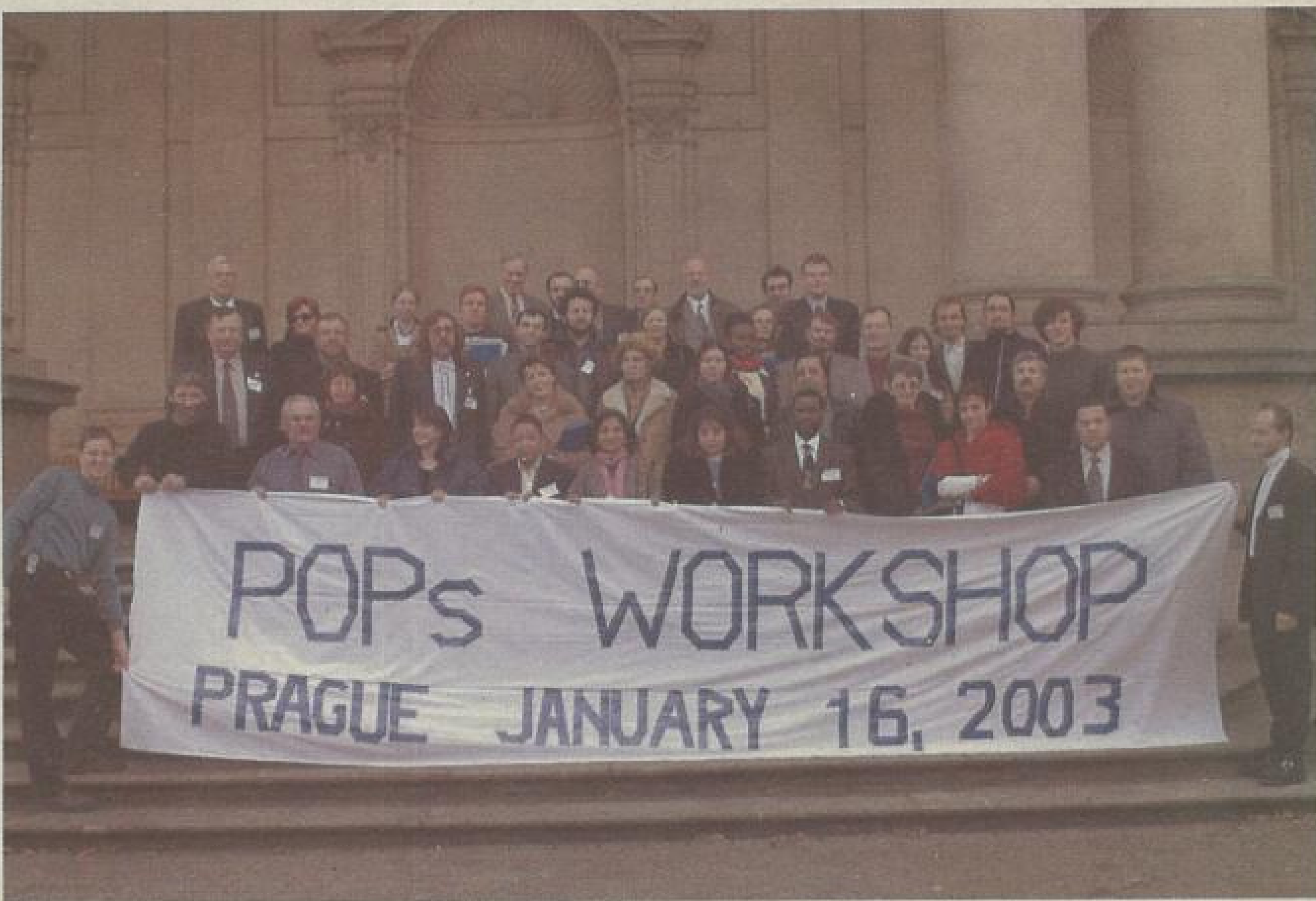
International Workshop

on Non-Combustion Technologies for Destruction of POPs

PRAGUE, January 15 – 19, 2003



Mezinárodní seminář

o nespalovacích technologiích likvidace perzistentních organických látek

PRAHA, 15. - 19. ledna 2003

TABLE OF CONTENTS

FOREWORD

Persistent organic pollutants such as DDT, heptachlor and other pesticides or polychlorinated biphenyls have been considered a miracle of science but turned to insidious toxics. Although they do not appear in the environment in concentration causing immediate death, still their ability to slowly disrupt major functions of living organisms is quite threatening. Through the ratification of Stockholm Convention the world governments have shown their willingness to remove POPs from the environment. Still, its implementation will cause many disputes among ecologists, scientists and government officials about how to safely destruct the old stocks of pesticides and PCBs.

Many countries face the problem of PCBs stockpiles in old voltage transformers and condensators or large amounts of PCB's stored in barrels. Stockpiling of polychlorinated biphenyls increases risk of their emissions to the environment. From a superficial point of view, their incineration seems as a very effective method of disposal, but the fact is that incineration process creates further harmful substances released to the environment. Is there any suitable solution? New technologies are emerging to deal with the problem of PCB and other hazardous chemical stockpiles. Some of these technologies do not offer a complete solution (they are unable to dispose PCBs present in the soil etc.). Other technologies have emitted low levels of POPs in air or other emissions. To judge the effectivness of these new technologies objectively, the effectiveness must be considered from the point of view of absolute destruction of POPs (so called destruction efficiency = DE).

In the complete evaluation of the technologies, some of chemical methods of destruction (for instance Gas-Phase Chemical Reduction Process or Base Catalyzed Dechlorination) appear to be a better solution than waste incineration or combustion of waste with a content of PCBs in cement kilns. These methods are to be tested in the Philippines (for the destruction of PCBs which remain stockpiled on U.S. military bases) and in the Slovak Republic at a former PCBs production site.

Incineration of chlorinated substances (including PCBs, hexachlorbenzene, DDT and other POPs) creates dioxins, PCBs and hexachlorbenzene discharged in emissions to the atmosphere. They are present in bottom ash and fly ash or in wastewater from waste incinerators. Due to the presence of these chemicals in the emissions, incineration cannot be considered as technology fulfilling the requirements of the Stockholm Convention on persistent organic pollutants. The Stockholm Convention requires that disposal of old stocks of hazardous chemicals should not cause emissions of other hazardous substances to environment. Dioxins, PCBs and hexachlorbenzene have been included in the list of hazardous products, which should be minimized with the aim of elimination.

Both the construction and operation of incinerators equipped with effective filters for controlling air emissions of dioxins are very expensive. Some 100 000 000 EURO was spent on building an incinerator with a capacity of 45 thousand tones of waste per year in Germany. Thus, in order to reclaim the initial investment the incinerator must be continuously supplied with hazardous waste, which in turn leads to further environmental pollution. That's why the NGOs united in the Dioxins, PCBs and Wastes Working Group of IPEN promote non-combustion technologies for POPs elimination.

To discuss not only various problems associated with dioxins, PCBs and other persistent organic pollutants but also to demonstrate alternatives for their safe and ecological elimination, the IPEN Dioxins, PCBs and Wastes Working Group organized an international conference on "Non-combustion technologies for elimination of POPs". The organization part of this international meeting was undertaken by Czech Environmental Association Arnika. The conference took place in Prague, January 15 –17, 2003 and was enabled thanks to financial and organizational support of United Nations Industrial Development Organisation (UNIDO). The conference was organized under the auspices of Jan Ruml, the Vice-Chairman of the Senate, and we were very grateful to him for the opportunity to hold the main session in the historical building of the Senate of the Czech Republic.

The Prague conference was followed by second Annual Meeting of European Working Group of IPEN that took place in Litice by Ceska Lipa from 17 to 19 of January, 2003.

Both meetings were made possible thanks to financial support granted by UNIDO and other foundations and institutions: IPEN, Global Greengrants Fund, DOEN Foundation and Phare-Access EU. We express our gratitude to all of the above-mentioned institutions, foundations and programs for their kind support.

I am also very thankful to other people without whose support and assistance the organization of both seminars would not have been possible. My thanks belong to especially Jack Weinberg (IPEN co-chairman), Zoltan Cziser (UNIDO), David LaRoche (consultant for UNIDO and GEF), Morag Carter (co-chairman for IPEN Working Group on dioxins, PCBs and Waste), Jarmila Johnová a Marie Kouřilová (both Senate of the Czech Republic), Karolina Růžičková (Health Care Without Harm Europe) and the entire team of my colleagues in Arnika (Petr Hrdina, Antonín Slejška, Lenka Mašková, Martin Skalský, Marek Jehlička, Petr Uchytil, Oldřich Jarolím, Petr Braun a Milan Návoj). And last but not least, I express my gratitude to all lecturers for their contribution to successful completion of both meetings.

In the following pages we have tried to assemble presentations of individual lecturers from both international meetings in the Czech Republic.

Jindřich Petrlík,
Director of Toxics and Waste Programme of Arnika Association
and the co-chairman of the Dioxins, PCBs and Wastes Working Group of IPEN

International Workshop on Non-Combustion Technologies for Destruction of POPs

Upper Chamber of the Czech Parliament Building (Valdstejn Palace)

Prague - January 16, 2003

Financial support from the United Nations Industrial Development Organization (UNIDO), the International POPs Elimination Network (IPEN), Global Greengrants Fund, DOEN Foundation, Phare-Access EU and Ministry of the Environment of Czech Republic

OPENING SPEECH BY THE VICE-CHAIRMAN OF THE SENATE OF CZECH REPUBLIC, JAN RUML

Ladies and gentlemen,

First, welcome in the Senate, the Upper Chamber of the Parliament of the Czech Republic. I am very happy to see the Senate of the Czech Republic as a hosting institution of this international conference and the fact that it was organized under my auspices is just a small contribution that I was able to do. It is a pleasure to see here the Minister of Environment of the Czech Republic, Libor Ambrozek. I am also very delighted to welcome here the representative David LaRoche of United Nations Industrial Development Organisation (UNIDO) who contributed financially to the realisation of this conference. And finally, I would like to welcome all of you who traveled to our beautiful city of Prague from all over the world.

During the last few years, clean and healthy environment became a key issue of our political debate. It is because clean and healthy environment is considered an essential value for the country, I come from. And it is us – politicians who often make decisions affecting the future state of the environment while creating the appropriate legislature or ratifying the international agreements. Last year, the Parliament of the Czech Republic voted for several important legislative Acts and international agreements. Among them, there was the Stockholm Convention about the integrated pollution prevention control. I am glad that I was among those senators who contributed to the ratification of Stockholm Convention on persistent organic pollutants and to the adoption of the Right to free information on toxic pollutants in the Czech Republic. Both of these legislative Acts move us forward not only to cleaner environment but also to the European Union.

Last year, the immense floods affected the lives of many Czech citizens. The waters from Vltava River reached the building of the Senate. The water flooded also Spolana Neratovice, a chemical plant 20 km from Prague and thus revived the problem of old ecological burdens from the past. In light of toxic chemicals leakage from this plant (including dioxins), the ratified legislative measures became even more crucial. The flood caused a leakage of PCBs (polychlorinated biphenyls) from un unknown source. Thank to financial support of several nongovernmental organizations, PCBs were detected in large concentration in the waters of Elbe River as well as in the vegetables and fruits grown and animals kept in the surrounding villages. I hope that with the support of UNIDO, the campaign for implementation of the Stockholm Convention will bring significant progress in elimination of toxic pollutants in our country. I wish people would stop using such dangerous substances in the future.

All living creatures on this planet suffer because of the presence of toxic chemicals. It is certainly important to find out where they are present but it is even more crucial to eliminate their escape into the environment and stop their production. In light of this, I consider essential the so-called 'Precautionary principle' as applied in the EU environmental policy. I am very happy that this principle was successfully implemented in the Stockholm Convention.

Similarly, an important issue is raised when considering the production of materials, whose waste disposal creates dangerous toxic pollutants. Apart from PCBs we should deal with reduction of PVC (polyvinyl chloride) use in order to fulfill one of the Stockholm convention principles – dioxin elimination.

As we can see in the Czech Republic, many problems of toxic pollutants are connected with the waste incineration, including materials containing dioxins and PCBs. If my information is correct, dioxins emerge during incineration process and therefore, they can again cause environmental pollution. That is why I consider very important the exploration of new and safer methods for hazardous waste disposal. And this conference will certainly contribute to this goal. It would be helpful if our Minister of Environment, Mr. Ambrozek incorporated the conclusions of this conference into the currently elaborated Waste Management Plan and chose to support other waste disposal technologies than incineration.

The Czech Republic belongs among the countries that ratified the Stockholm Convention. Now, we have to take the next step – implement its requirements and assist with its ratification in other Central European countries. I am sure such international meetings contribute to this objective.

To quote the United Nations General Secretary, Kofi Anan: "Dioxins, PCBs and other persistent organic pollutants move around ignoring national borders." That's why it is crucial to cooperate on an international level in our effort for POPs elimination. Let me wish you the much needed international cooperation and a pleasant stay in our historical building of Wallerstein Palace as well as in Prague and the Czech Republic.

Thank you for your attention.

OPENING SPEECH BY MINISTER OF THE ENVIRONMENT OF CZECH REPUBLIC, RNDr. LIBOR AMBROZEK

Ladies and gentlemen,

I am pleased to welcome all of you at the international conference devoted to very important topic – the elimination of persistent organic pollutants, known as POPs. We are meeting in the Senate of the Parliament of the Czech Republic – in the building, where on May 9, 2002, the Senate agreed on of the ratification of the Stockholm Covention on POPs by the Czech Republic. Three months later on August 6, 2002, the ratification document was deposited and our country became a Party to the Convention joining another 15 countries around the globe. At the time being, there are 25 Parties to the Convention – a half of the number required for entering into force of the Convention. It means a long way to go and I would like to assure you that our government is going to contribute to the process both at the international and at the national level.

Since June 1998 until the Stockholm Conference in May 2001, the Czech Republic has played an active role in the preparation of the Convention, participating not only in the Intergovernmental Negotiating Committee, but also delegating internationally recognized experts to deal with technical and scientific aspects. It is worthy to mention that, despite of obvious difficulties related to the economic transition, the Czech Republic became a member of so called POPs club in 2000 – its financial contributions have been internationally recognized.

Let me take the opportunity to acknowledge the role of all, who have shared the difficult task to negotiate the Convention. The Intersectoral Committee for Chemical Safety should be mentioned. It involves representatives of all interested stakeholders – ministries, industrial sector and NGOs. In particular, I would like to express my thanks to Arnika, a member of International POPs Elimination Network (IPEN) for the preparation of this conference and for its continuous effort to collaborate on the implementation of measures set in the Convention.

Ministry of Environment as a central authority of the state administration in the area of protection of the environment against the effects of dangerous substances and preparations, is responsible for setting up a legal framework. I should note that at the time being, Czech legislation creates relatively good conditions for the implementation of the Convention. Some obligations of the Convention are transposed by the Act No. 157/1998 Coll., on Chemical Substances and Preparations, and its regulations and by the Act No. 185/2001 Coll., on Waste Management. More recently, the Act No. 86/2002 Coll. on Air Protection and the Act No. 76/2002 Coll. on Integrated Pollution Prevention and Control and Integrated Pollution Register (entering into force on January 1, 2003) will enable the full implementation.

In accordance with the Article 7 of the Convention, Czech Republic has started the preparation of the Implementation plan immediately after the signature of the Convention. Project entitled "Enabling activities to facilitate early action on the implementation on the Stockholm Convention on POPs in the Czech Republic" funded by Global Environment Facility (GEF) and United Nations Industrial Development Organization (UNIDO) was assigned to RECETOX TOCOEN and Associates in 2001 to develop a National Implementation Plan. This document is due to be submitted to the Government by the end of 2003. It should be noted that the Czech Republic was the first country in Europe in which such project was embedded. The agency responsible for the project is now coordinating the efforts of other countries in the Region of Central and Eastern Europe.

The first step – the thorough and updated inventory of POPs existing in the country to identify the priorities of implementation – was completed last year. The inventory is consisting of enormous amount of data. A detailed analysis is currently being conducted in order to prepare the priority setting for the Implementation Plan. This will happen by the end of March 2003. However, based on the preliminary evaluation, I am able to identify one of the top priorities right now.

Similarly to other European countries, the elimination of so called old environmental burdens seems to be the most difficult task in the Czech Republic. Althought most members of the "dirty dozen" (compounds covered by the Convention) have been banned many years ago, a heavy contamination was found in several "hot spots" across the country. Let me just mention on example the objects in the facility of Spolana, located some 30 km north of Prague, heavily contaminated by dibenzo-p-dioxines (DIOXINES) and dibenzofuranes. I really appreciate the fact that the last section of the presentations is devoted to this case.

To achieve the goals laid down in the of the Convention – to reduce or eliminate the releases from both the unintentional production and from existing deposits – the investigation and discussion of methods of DESTRUCTION of these substances is obviously of crucial importance. I am not going to pretend to be an expert in this field, but I understand that the NON-COMBUSTION technologies have substantial advantages over the incineration processes. At least, the risk of the production of other unwanted POPs is being diminished. On the other hand, as a member of the Government facing tremendous expenditures for the remediations, I am aware that the economical feasibility should not be neglected.

Ladies and gentlemen,

I believe I have highlighted the reasons why I consider this conference so important. I trust that the presentations delivered by recognized experts and the follow-up discussions will establish a solid base for further considerations. Let me again express my gratitude to the organizers and to all experts who have accepted the invitation to participate. On behalf of the Government, I would like to ensure you that the recommendations of the conference will be taken into account during the Implementation plan development. I shall not be able to stay the whole day, but I have asked my colleagues to participate and I am looking forward to receive a Report from the conference.

Finally, I want to wish you a fruitful and collaborative meeting.

Thank you for your attention.

Precautionary Principle and POPs

International Workshop on Non-Combustion Technologies for Destruction of POPs

Prague, Czech Republic – 16 January 2003

Darryl Luscombe (PhD)

GREENPEACE

A Chemical Crisis?

- Tens of thousands of chemicals are produced commercially every year.
- Only a small fraction of these chemicals has been thoroughly studied and evaluated for basic toxicity.
- Thousands of chemicals are released into the environment with little or no knowledge about their impact on the environment, including human health.
- There is an even greater lack of information regarding their degradation products and the effects of mixtures of chemicals once released to the environment.

How did this happen?

- The traditional policy and legislative approach, called the assimilative capacity approach, or permissive approach, has contributed to the problem.
- This approach is based on "permissible" quantitative release levels of harmful substances under the erroneous assumption that the receiving environment could dilute and disperse them and thereby render them harmless.
- Actions to prevent harm are usually taken only after significant proof of harm is established, at which point it may be too late.

Risk Assessment

~ developed in the 1970's to bridge the gap between uncertain science and the political need for decision-making to limit harm.

~ originally developed for mechanical problems such as bridge construction, in which the technical process and parameters are well-defined and can be analysed

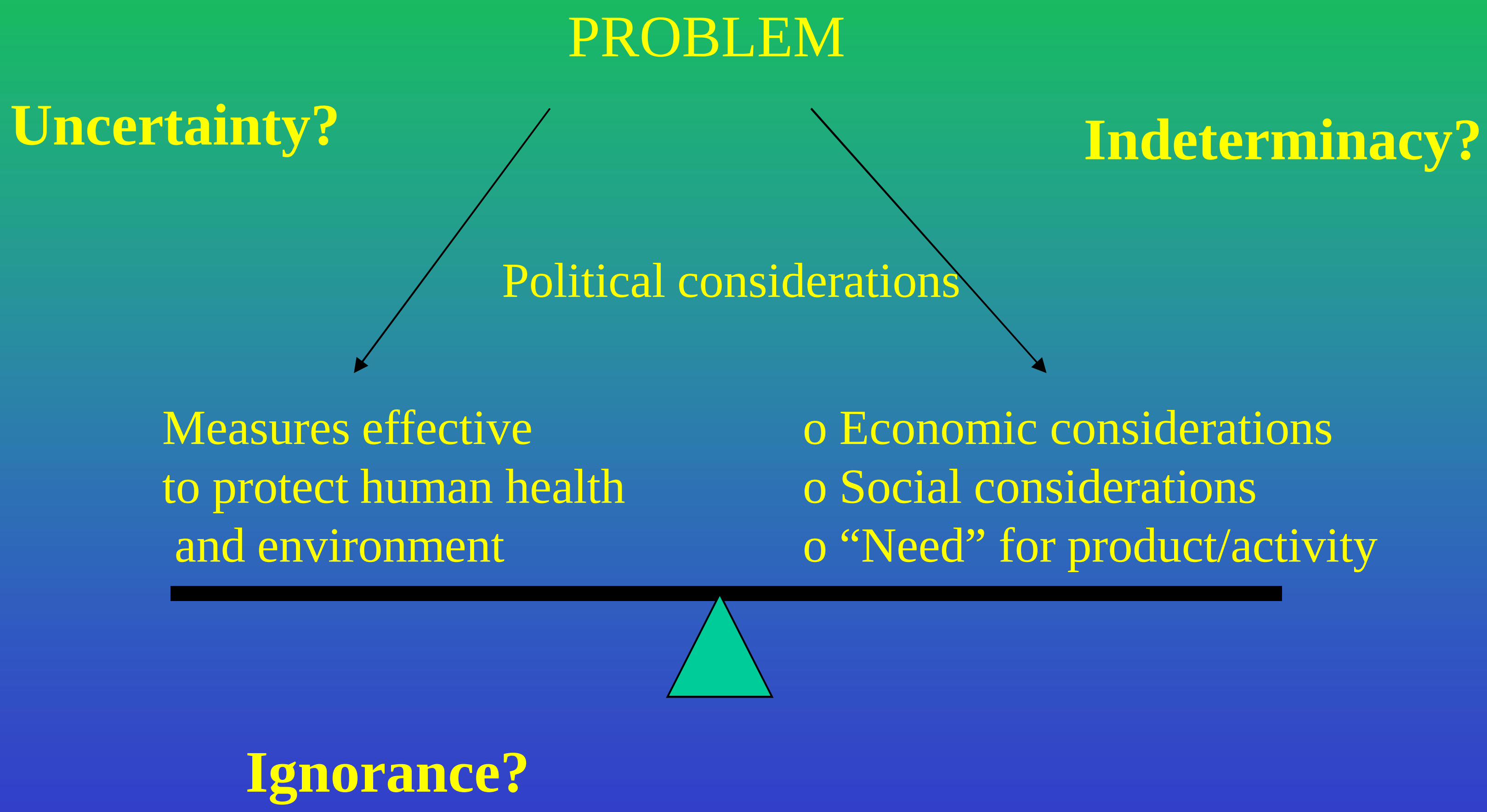
~ was directed to the role of predictor of extremely uncertain and highly variable events.

~ risk assessment and other "sound science" approaches to decision-making are highly reliant on policy and scientific assumptions, which are frequently unscientific, value loaded or subjective.

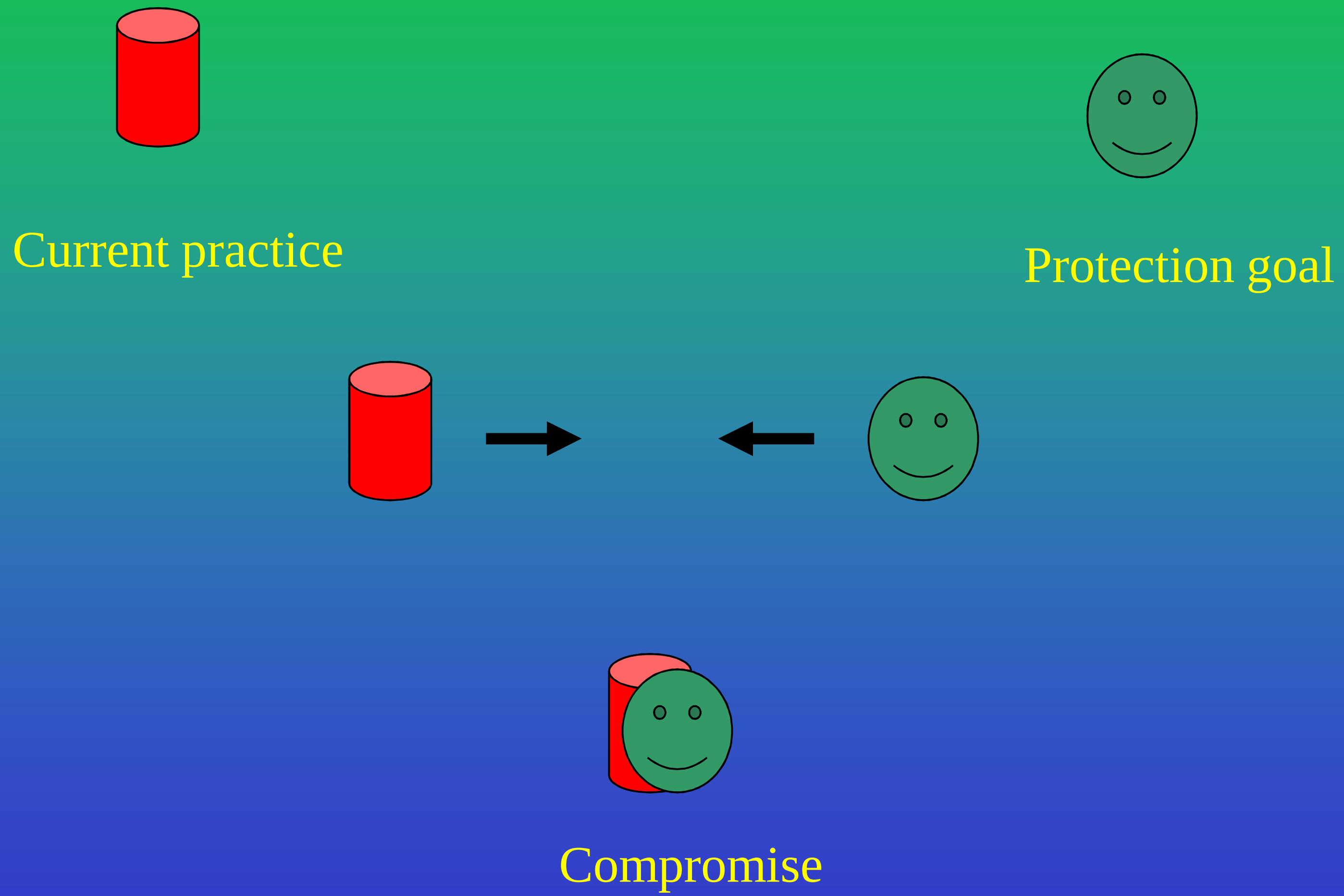
Risk Assessment

- ~ assumes “assimilative capacity” and/or “acceptable risk”
- ~ attempts to quantify and analyse problems rather than solving them.
- ~ are susceptible to, or ignore uncertainty in its many guises.
- ~ permits dangerous activities to continue under the pretence of “acceptable risk.”
- ~ is costly and time-consuming.
- ~ is fundamentally undemocratic.
- ~ puts responsibility in the wrong place.
- ~ poses a false dichotomy between economic development and environmental protection.

Is risk management “balancing”?



Protection goal - “balancing” process



The Precautionary Principle

- ~ resulted from increasing recognition that ecological systems cannot be comprehensively observed and that impacts cannot, therefore, be fully regulated and controlled.
- ~ recognises scientific and technical limitations and promotes regulatory action in the absence of full evidence of a cause effect relationship.
- ~ allows incomplete data, uncertainty and indeterminacy to be taken into account in a meaningful way in the decision making process
- ~ avoids "paralysis of analyses" by removing excuses for inaction on the grounds of scientific uncertainty.

What is the Precautionary Principle?

- Most commonly cited definition stems from UNCED (Principle 15 of the Rio Declaration 1992):

  "Where there are threats of serious or irreversible damage, lack of full scientific certainty ***shall not be used as a reason for postponing*** *cost-effective measures to prevent environmental degradation"*

The Components of Precaution

- Taking precautionary action before scientific certainty of cause and effect.
- Setting goals.
- Seeking out and evaluating alternatives.
- Shifting burdens of proof.
- Financial responsibility.
- Duty to monitor, understand, investigate, inform, and act.
- Developing more democratic and thorough decision-making criteria and methods.
- Implementation through clean production & substitution (materials, products, technologies, techniques)

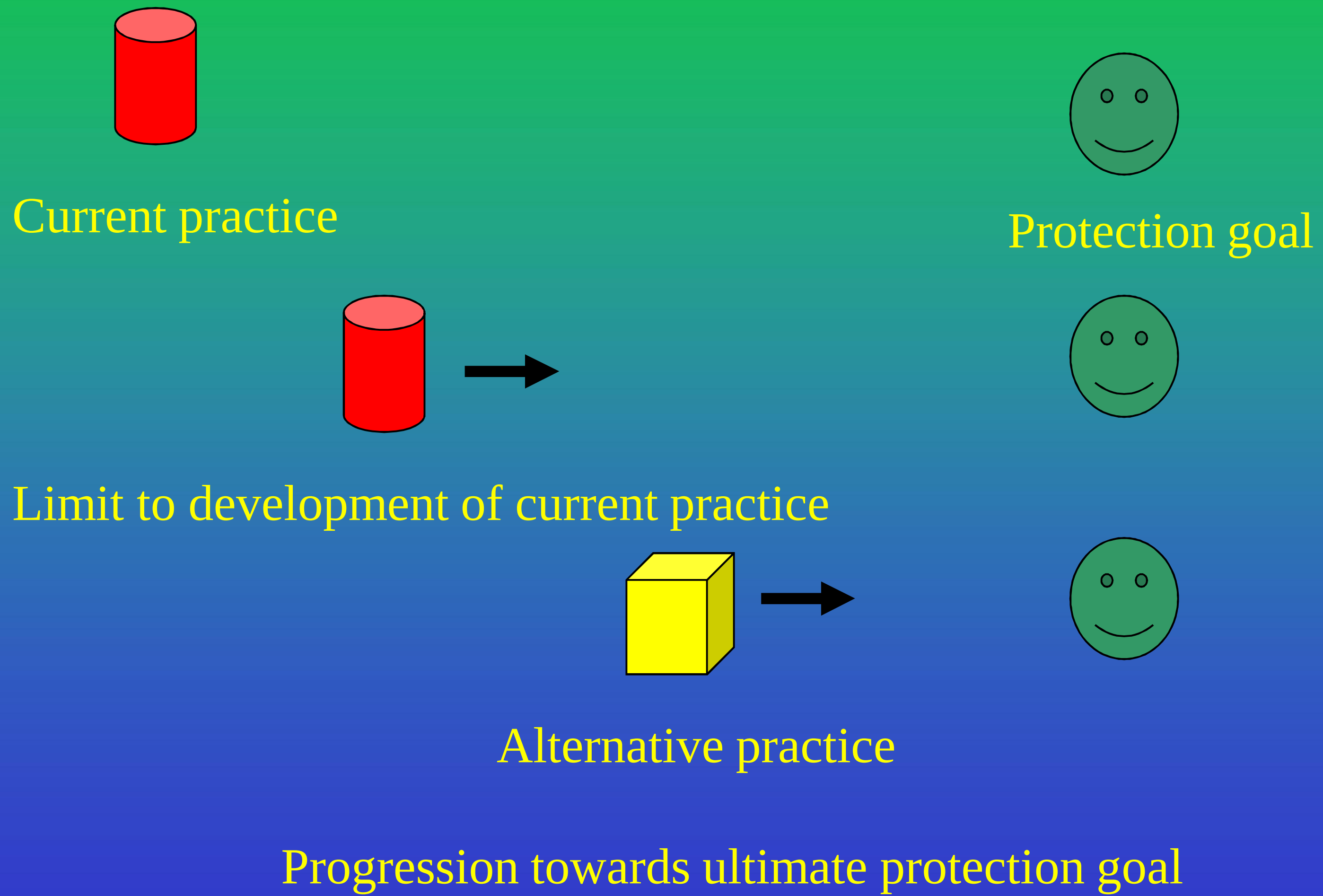
Is the Precautionary Principle “Sound Science”?

- The precautionary principle is a scientifically more robust and strengthened approach because it recognises, and takes into account the limitations of scientific information.
- Sound scientific methodology and assessment require consideration of both what we know and what we do not know.
- The assimilative capacity approach has failed precisely because it failed to acknowledge and accommodate the limitations in scientific information.

Conclusions #1

- Key component is need for technological, economic and social developments to exert progressively lower impact on the environment
- Implies that “balance” is not achieved by any one measure, but progressive improvements are required
- Although ultimate protection goals may not currently be achievable, they should not be weakened in order to bring them within reach

Protection goal - precautionary process



Conclusion #2

- Need to recognise that, in any attempt to “balance” environmental risks and benefits, uncertainty, indeterminacy and ignorance will always have the greatest weights
- Any “balance” deemed to be achieved will only hold within the limited dimensions of the risk scenario studied
- “Balancing” may be an attractive but deceptive process

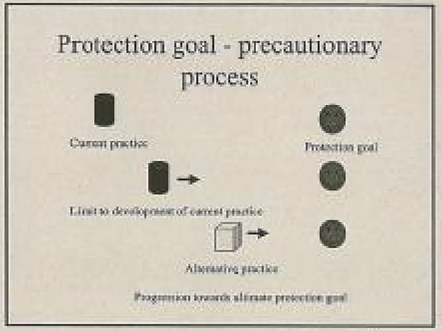
Conclusion #3

- Ecosystem sustainability and rights of future generations are not negotiable - they will either be achieved or not
- Problem is that we will not know whether we have been successful until it is too late to rectify
- In terms of public and environmental policy, therefore, precautionary protection is justifiably more important than achieving a “balance” of all interests

Common sense

It is common sense to realise that we can not continue to release persistent harmful substances to the environment, without expecting significant and irreversible harm, not only to today's generation, but also for generations to come.

Common sense alone should dictate an approach based on the prevention and phase out of substances that are toxic, persistent and bioaccumulative



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Stockholm Convention # Implementation on the Global and National Levels # Case of PCBs

☺ Ivan Holoubek

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International Workshop on Non-Combustion Technologies for Destruction of POPs
Upper Chember of the Czech Parlament, Prague, CR, 16/01/2003

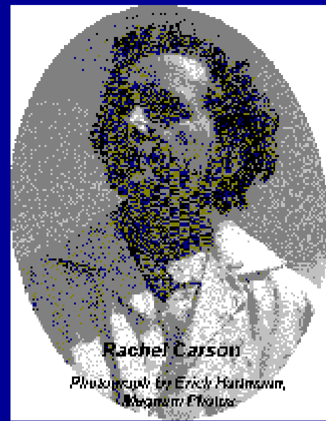
Contents:

- Stockholm Convention
- Overview of Regionally Based Assessment of PTS Project (UNEP/GEF)
- Overview of Enabling Project (UNIDO/GEF)
- Case of polychlorinated biphenyls (PCBs)
- Regional POPs Projects and problems
- Environmnental POPs trends in the CR

Stockholm Convention

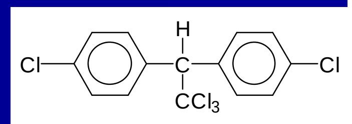
Stockholm, Sweden, May 22-23, 2001

Stockholm Convention



Persistent Toxic Substances

- **Persistent**
- **Bio-accumulative**
- **Toxic**
- **Transboundary Movement**
- **POPs a sub-group**



R - T & A

Stockholm Convention

ü **Persistent**

Ø **Resists degradation in the environment**

Ø **Other chemicals, even though degrading faster in the environment, are persistent due to continuous release**

Stockholm Convention

ü **Bio-accumulative**

Ø **Concentrates in fatty tissue (lipophilic)**

Ø **Bio-accummulation factor in animals dependent on the Log K_{ow} – a measure of the affinity of chemicals to lipids**

Ø **Chemicals to be included – Log K_{ow} > 3 but molecular weight < 1000 Daltons**

Ø **Chemical accummulates up the food chain**

Stockholm Convention

✓ <u>Toxicity</u>

- Chemicals show chronic toxicity properties including : developmental, reproductive, carcinogenic, immunotoxic and neurotoxic activities in humans and wildlife
- ADI values are compared to NOEL/LOEL values to establish risk from exposure
- Substances with acute toxicity and with continuous release/exposure to be considered

Stockholm Convention

ü **Transboundary Movement**

Ø **Chemicals transported through erosion, flood plains, water, biota etc.**

Ø **Chemicals are semi-volatile**

Ø **Evaporate over warmer regions and condense in colder atmospheres**

Ø **Can affect regions where use is non-existent**

Stockholm Convention

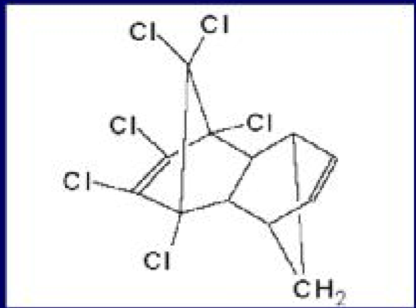
Stockholm Convention - The “Thirty Dosen“ includes:

- **Pesticides - aldrin, DDT, dieldrin, endrin, chlordan, heptachlor, HCB, mirex, toxafen**
- **Industrial products – PCBs**
- **By-products of industrial and combustion processes - PCDDs, PCDFs**

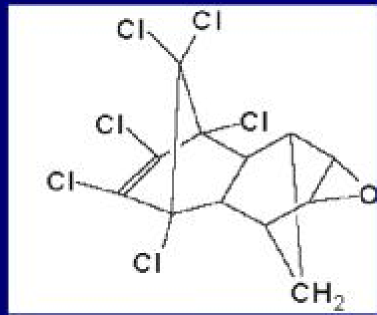
R - T & A

Stockholm Convention

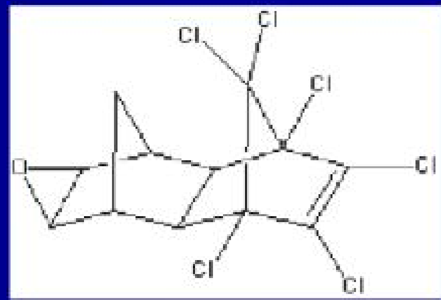
ALDRIN



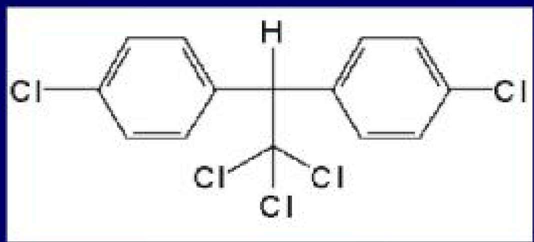
DIELDRIN



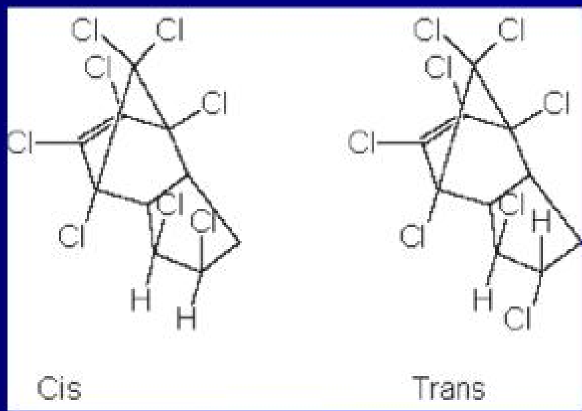
ENDRIN



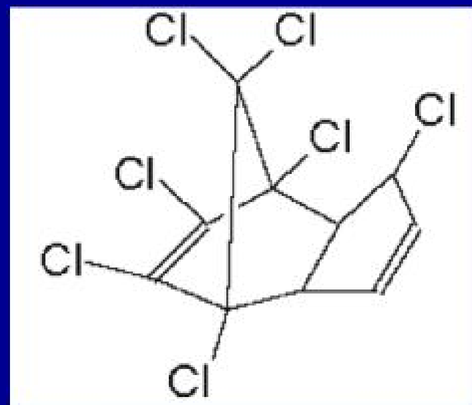
DDT



CHLORDAN

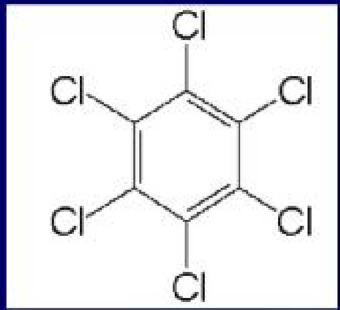


HEPTACHLOR

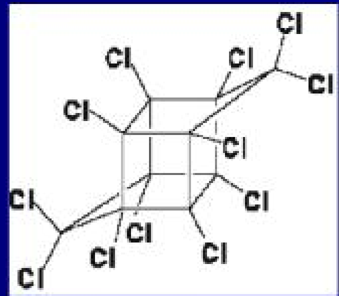


Stockholm Convention

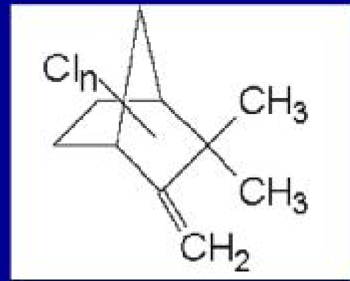
HCB



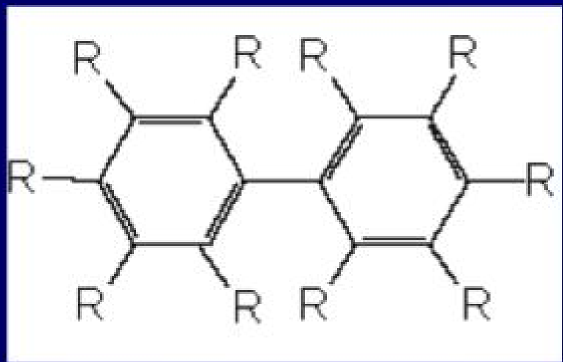
MIREX



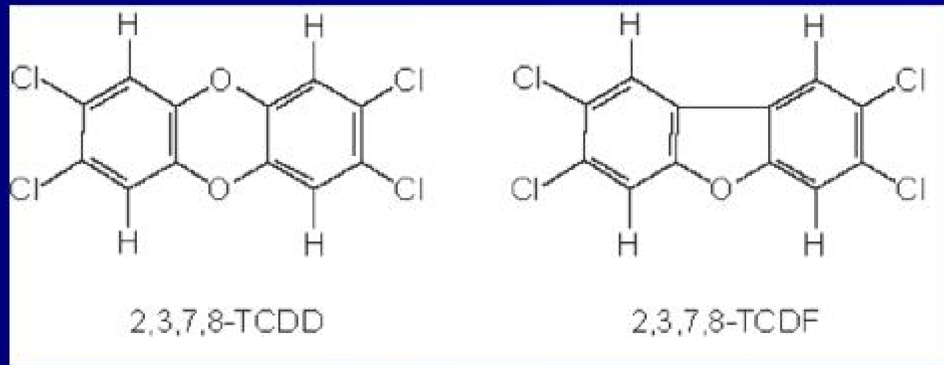
TOXAPHEN



PCBs



PCDDs/Fs



Stockholm Convention

POPs a sub-group

- **International Treaty recently established in South Africa to reduce and eliminated these 12 chemicals**
- **Project to investigate the available data on these and other persistent toxic substances**
- **Some other possible substances: chlordecone, polycyclic aromatic hydrocarbons (PAHs), pentachlorophenol, organo tin, endosulphan, lindane, short chained chlorinated paraffins**

UNEP/GEF Project:

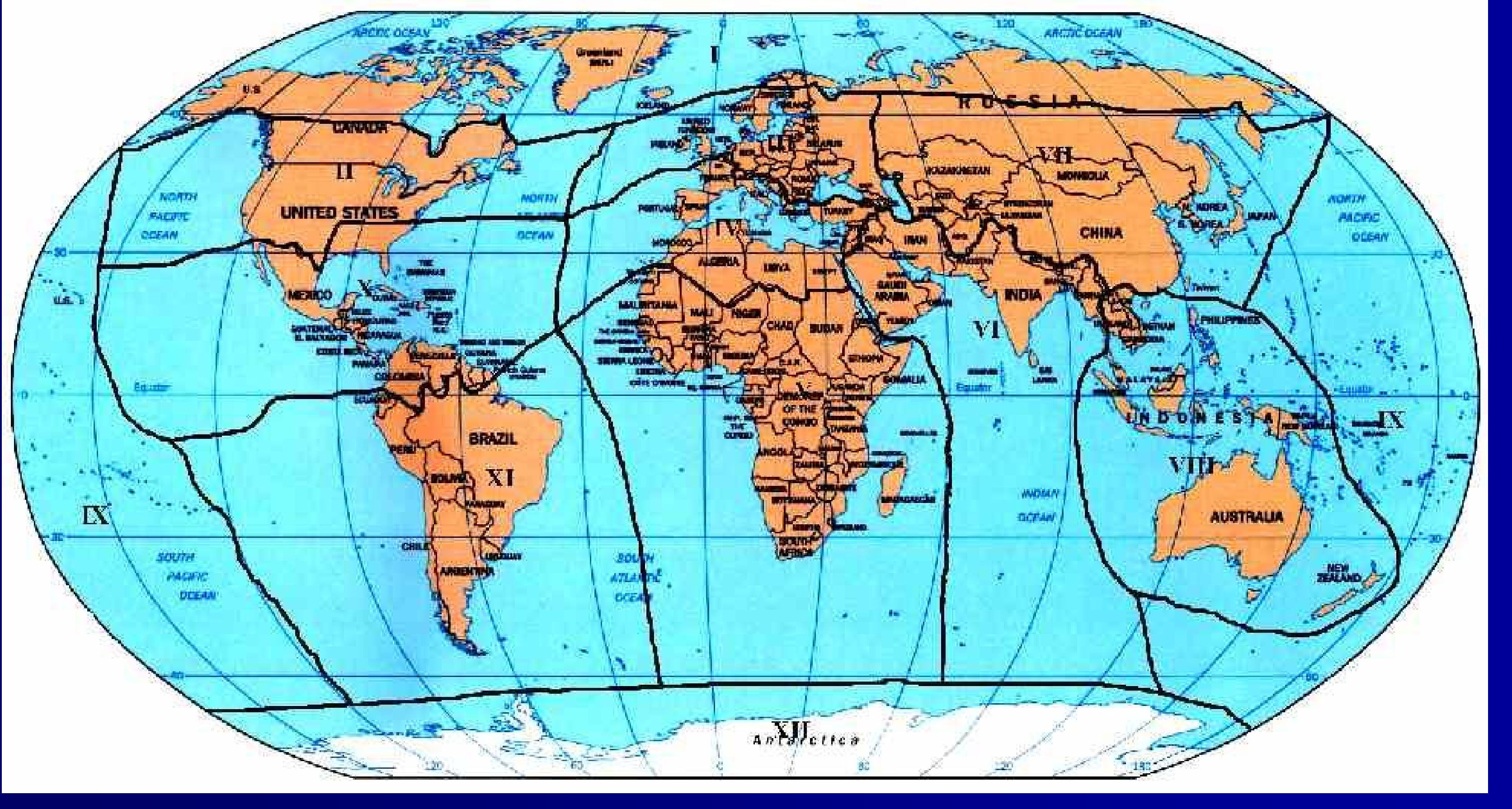
„Regionally Based Assessment of Persistent Toxic Substances“

PROJECT OVERVIEW

Objectives

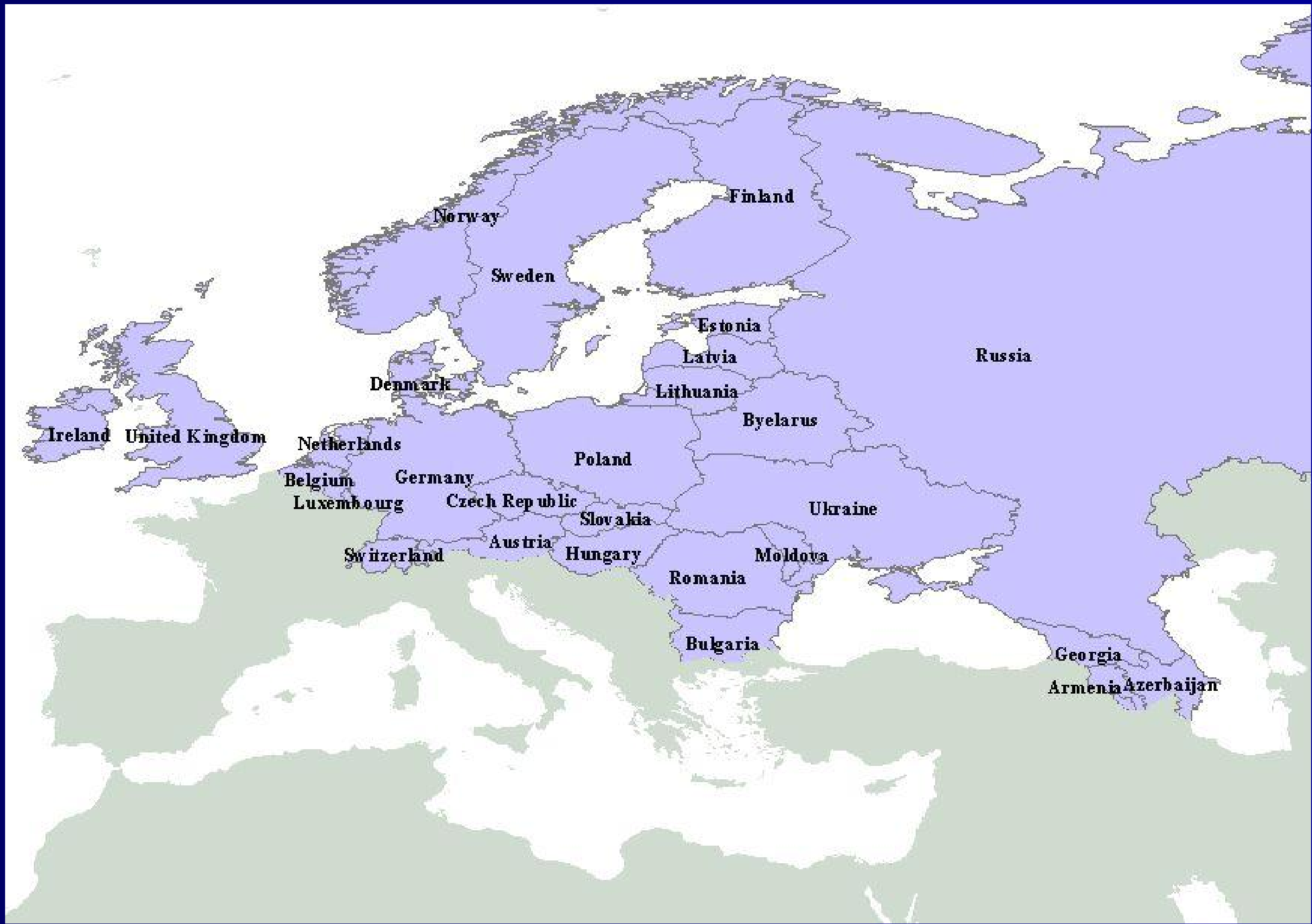
- ü Measures damages and threats of PTS
- ü Provide GEF and UNEP rationale to assign priorities for future action on chemical issues
- ü To determine differences in priority among regions

12 Regions



R - T & A

Region III Europe



Project Results

- ü Identification of sources of PTS in the regions
- ü Assessment of impact of PTS on human health and the environment
- ü Assessment of transboundary transport of PTS
- ü Assessment of root causes of PTS problems and capacity to manage regionally
- ü Identification of regional and global priority PTS environmental issues

Regional Team

Regional coordinator: **Prof. Dr. Ivan Holoubek**
RECETOX - TOCOEN & Associates,
Brno, CR

Members:

Dr. Ruth Alcock – Univ. Lancaster, UK

Dr. Eva Brorström – Lundén, IVL, Gothenburg, Sweden

Dr. Ott Roots, MOE, Tallinn, Estonia

Prof. Dr. Valeryj Petrosjan, Lomonosov State University, Moscow, Russia

+ 40 other European POPs experts

Global and Regional Reports

- **POPs website of UNEP Chemicals:**

http://www.chem.unep.ch

- **Website of UNEP/GEF RBA PTS Project:**

http://www.chem.unep.ch/pts/

- **RECETOX website of Regional Team III - Europe:**

http://recetox.muni.cz/

Enabling activities to facilitate early action in the implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs Convention) in the CEE countries

POPs Inventory Established and National Infrastructure and Capacity Assessed

Verification that this outcome is achieved is as follows:

- **Task teams constituted for inventories;**
- **More trained people on inventories and assessments of POPs;**
- **Better communication among stakeholders;**
- **More information and better inventories on production, distribution, use, stocks, contaminations and releases of POPs;**
- **Accurate information of the available national resources, capacities and infrastructure;**
- **Better information on available indigenous technologies;**
- **Clear information on the necessary changes in the legislation, monitoring, enforcing system;**
- **Better information on the exposure of the human population by POPs.**

POPs Inventory Established and National Infrastructure and Capacity Assessed

The preparing of the inventory will have the following steps:

- **Preliminary inventory of production, distribution, use, import and export;**
- **Preliminary inventory of stocks and contaminated sites; assessment of opportunities for disposal of obsolete stocks;**
- **Preliminary inventory of releases to the environment;**
- **External independent review of initial national POPs inventories.**

POPs Inventory Established and National Infrastructure and Capacity Assessed

The inventory will also content:

- **Assessment of infrastructure capacity and institutions to manage POPs, including regulatory controls; needs and options for strengthening them;**
- **Assessment of enforcement capacity to ensure compliance**
- **Assessment of social and economic implications of POPs use and reduction; including the need for the enhancement of local commercial infrastructure for distributing benign alternative technologies/products;**
- **Assessment of monitoring and R&D capacity;**
- **Identification of POPs related human health and environmental issues of concern; basic risk assessments**

Preliminary National POPs inventory (CR)

1. **Goals of the project**
2. **Characteristics of Pollutants**
3. **Production, stocks**
4. **Hot spots, contaminated sites**
5. **Sources**

   - Overview

   - Emissions and emission inventory

   - Diffuse sources, volatilization from soils

   - Traffic

Preliminary National POPs inventory

6. Occurrence in the environment, human exposure

- Ambient air
- Deposition
- Waters/sediments
- Soils
- Feeds
- Sewage sludges
- Biota
- Foods
- Human exposure
- Diet exposure

Preliminary National POPs inventory

7. **Technologies and biotechnologies for POPs disposal**
8. **Monitoring**
9. **Research**
10. **Legislature**
11. **National capacities**

Priorities Set and Objectives Determined

Verification that this outcome is achieved is as follows:

- **Better understanding of the POPs related issues;**
- **Accepted priority criteria;**
- **Identified and updated national objectives;**
- **Raised public awareness;**
- **Better communication among the stakeholders;**
- **Identified task teams for developing proposals according to the objectives.**

Priorities Set and Objectives Determined

Activities for outcome:

- **Development of criteria for prioritisation;**
- **Determination of national objectives in relation to priority POPs or issues;**
- **Organization of a national priority validation workshop.**

National Implementation Plan and Specific Action Plans on POPs Formulated

Verification that this outcome is achieved is as follows:

- **Detailed NIP;**
- **Trained teams for developing management options in the mirror of the objectives;**
- **Detailed proposal for the adoption of alternative technologies for disposal of POPs;**
- **Costs and benefits of the management options;**
- **Action Plans on the most urgent and high priority issues;**
- **Proposal with budget and timelines for the execution of the NIP;**
- **Information exchange and education strategy with budget.**

National Implementation Plan and Specific Action Plans on POPs Formulated

Activities for outcome:

- **Training and assign mandates to task teams to develop proposals for addressing priorities;**
- **Identification of management options, including phasing out and risk reduction options;**
- **Need for introduction of technologies, including technology transfer; possibilities of developing indigenous alternatives;**
- **Assessment of the costs and benefits of management options;**
- **Defining expected results and targets;**
- **Development of a detailed implementation plan, including an action plan for un-intentional by-products, PCBs and, where appropriate, for DDT and other POPs as prioritised;**
- **Expert review of Implementation Plan;**
- **Preparation of initial funding request package for implementation, including cost estimates and incremental costs;**
- **Development of a national strategy for information exchange, education, communication and awareness raising.**

Case of polychlorinated biphenyls

(PCBs)

Polychlorinated biphenyls

All Parties must cease production of new PCBs, eliminate the use of in-place PCB-containing equipment by 2025.

The continued use of such transformers, capacitors, *etc.* is a "specific exemption" and subject to conditions, such as use only intact/non-leaking equipment and restrictions, such as not permitted in food or feed processing areas.

All Parties must make efforts to identify, label and remove from use equipment containing more than 0.005 % (50 ppm) of PCBs.

Higher priority should be given to those with higher levels of PCBs.

Polychlorinated biphenyls

Further, all Parties must: not trade PCB, except for the purpose of environmentally sound waste management, not recover liquid with more than 0.005 % of PCB for reuse, and achieve the environmentally sound management of PCB wastes as soon as possible but not later than 2028.

Progress reports will be required every five years.

Polychlorinated biphenyls

Control Provisions for Unintentionally Produced POPs

The unintentionally produced POPs are specified in Annex C and are: polychlorinated dibenzo-p-dioxins (PCDD), polychlorinated dibenzofurans (PCDF), polychlorinated biphenyls (PCB), and hexachlorobenzene (HCB)

To achieve continuing minimization of POPs byproducts, an action plan has to be established within two years after entry-into-force of the Convention for this Party

Polychlorinated biphenyls

Although most information is available for dioxins and furans, it is assumed that the major sources of PCDD/PCDF are also sources of PCB and HCB.

The Convention specifies four source categories, which should be addressed with priority:

- waste incinerators, including co-incineration of municipal, hazardous, medical wastes, and sewage sludge;
- cement kilns firing hazardous wastes;
- production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching;
- thermal processes in the metallurgical industry (secondary copper, sinter plants in the iron and steel industry, secondary aluminum, and secondary zinc).

Polychlorinated biphenyls

An additional list of 13 other sources contains 11 more combustion sources, which also can release POPs byproducts; *e.g.* open burning, residential combustion sources, fossil-fuel utility boilers, crematoria, cable smouldering, *etc.* but also textile and leather dyeing (with chloranil) and finishing (with alkaline extraction).

Ways of distributing of PCBs

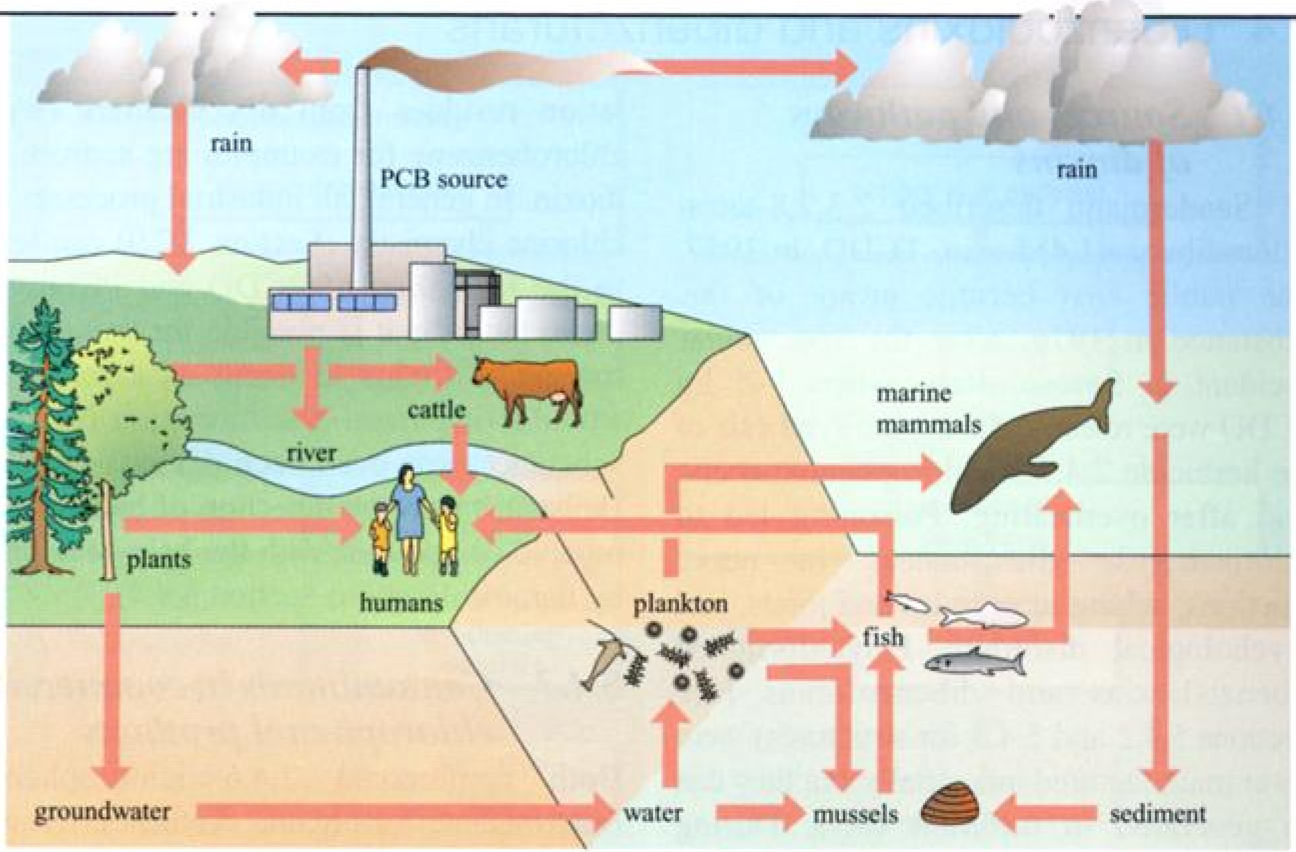


Figure 5.3.5 Ways of distributing polychlorinated biphenyls (PCBs)

Environmental fate of PCBs

- **physical- chemical properties - inert, insulting, lipophilic - widely used in industry**
- **excellent properties for industry hazardous properties for environment and biota - persistent, lipophilic, toxic - accumulation, bioaccumulation, biomagnification**
- **detection in environmental samples - Jensen, 1966**
- **31 % of global production - releases to the general environment (Tanabe, 1988)**
- **persistence, widespread use - global transport and distribution à contamination - detection in rural and pristine areas**

Bioaccumulation of PCBs

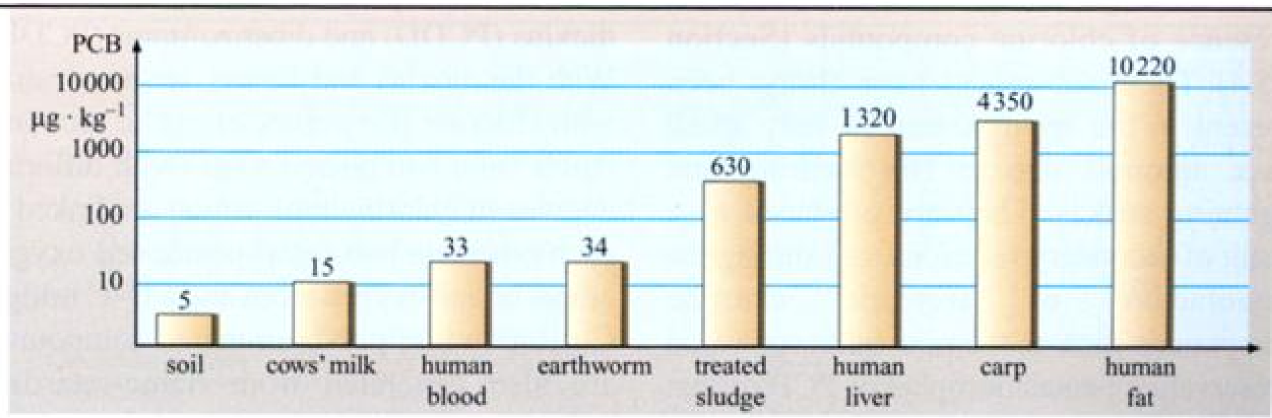
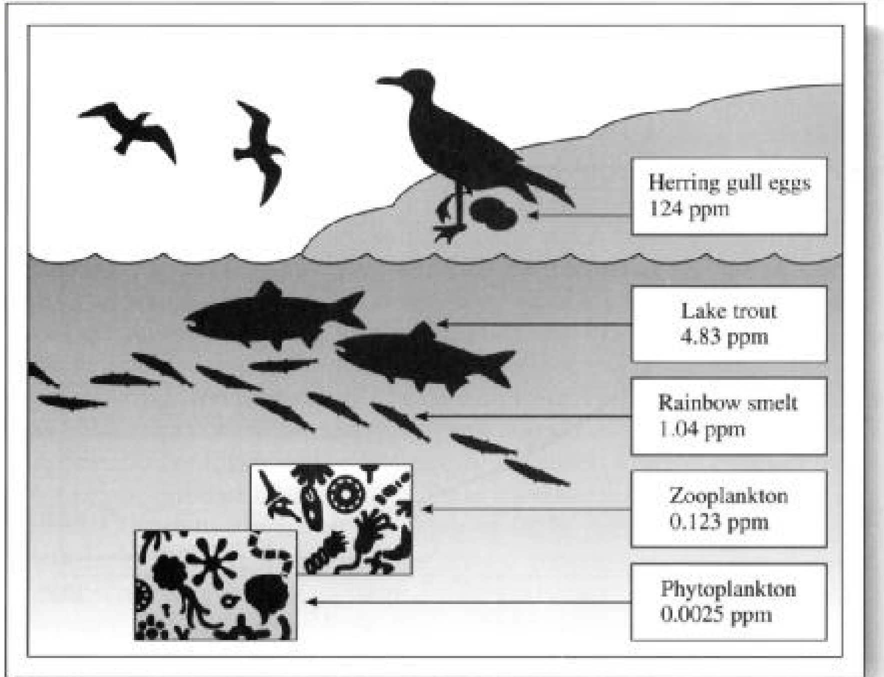


Figure 5.3.6 Bioaccumulation of PCBs

Figure 6-7
The bioaccumulation and biomagnification of PCBs in the Great Lakes aquatic food chain. (Source: *The State of Canada's Environment*. 1991. Ottawa: Government of Canada.)



R - T & A

Production and import/export

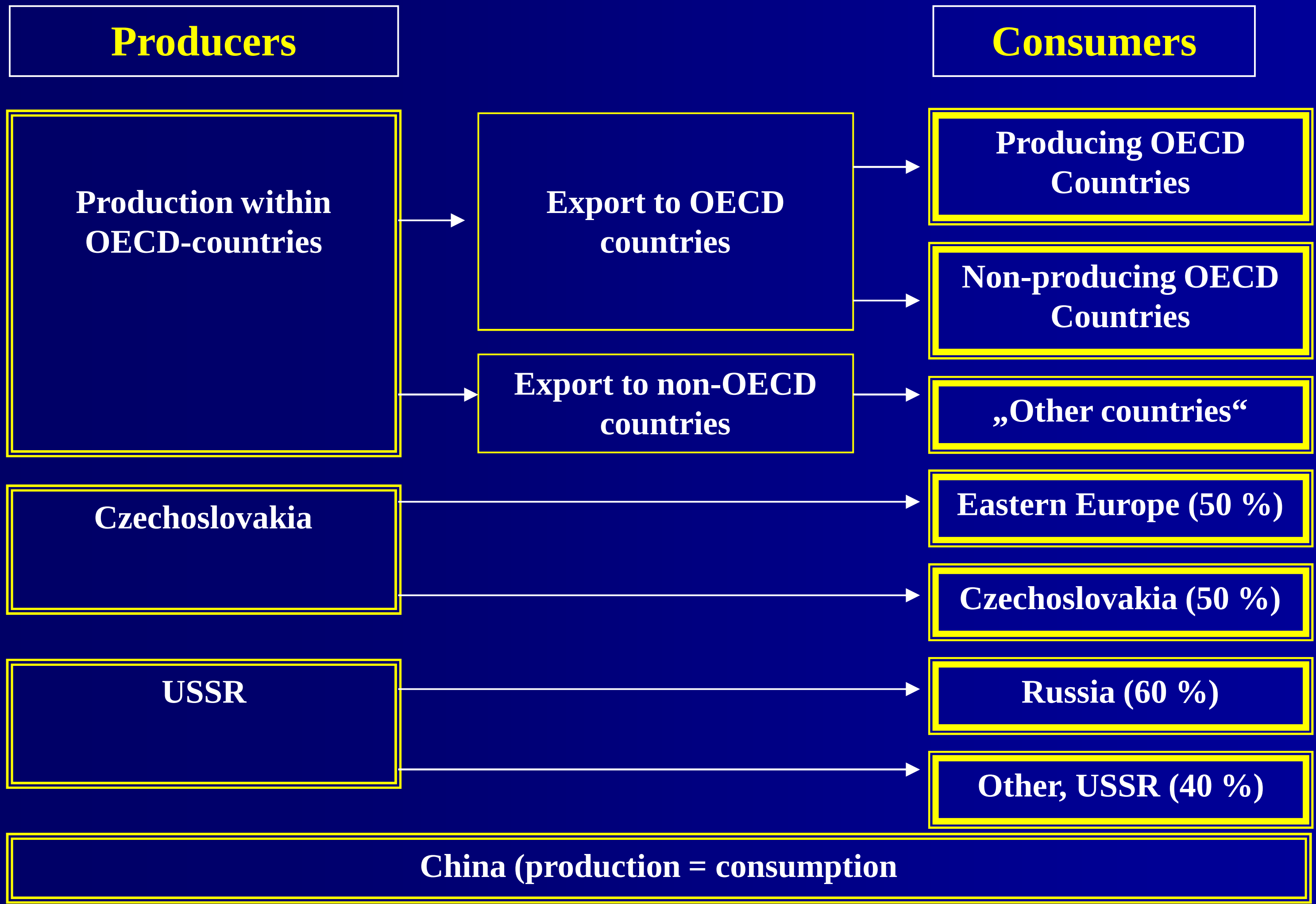
- 1929 - Monsanto Chemical Company
- 1929 - 1985 - ca 1 200 000 tons
- > 1/2 - USA, ca 15 % FRG, ca 10 % France…
- Stop of production - 1977 - 1985
- Closed systems
- Various estimation - WHO, OECD - 900 000 - 1 200 000 t

?? Natural sources - volcanoes; subunits of PCBs - components of two glycopeptides from *Amylocolatopsis* sp.

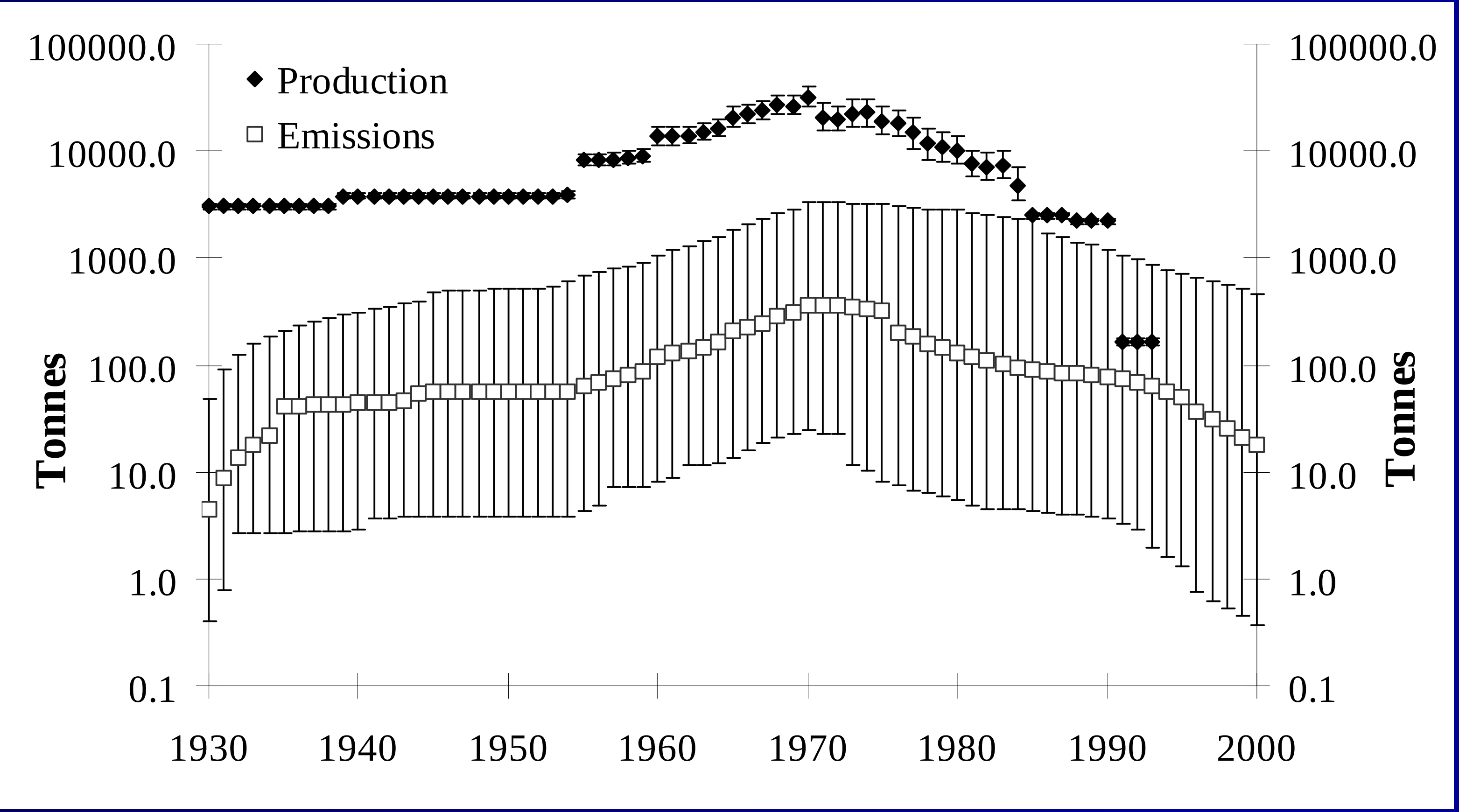
Total PCBs production in [t] as reported in the literature

Country	Start	Stop	Amount
USA	1930	1977	641 700
Japan	1954	1972	58 787
West Germany	1930	1983	159 062
France	1930	1984	134 654
Spain	1955	1984	29 012
UK	1954	1977	66 542
Italy	1958	1983	31 092
Czechoslovakia	1959	1984	21 482
USSR	1939	1993	173 800
China	1960	1979	8 000
Total	1930	1993	1 324 131

Overview of the spatial distribution of global PCBs consumption



Temporal trend in the estimated annual global production (left y-axis) and emissions (right x-axis) of S PCB22 from 1930 to 2000. Vertical lines indicate High and Low production and emission estimates.



R - T & A

Environmental re-cycling

The basic trends of usage and emissions to the environment - four steps (Jones, de Voogt, 1999):

(1) synthesis and development for use earlier in this century (1930s)

(2) increasingly widespread use in Europe and North America and other industrialized regions through the 1950s and 1960s

(3) concern over environmental persistence and food chain accumulation in the 1960s/early 1970s, resulting in restrictions in usage in Europe and North America, and

(4) reductions in emissions in Europe, North America and other industrialized regions arising from the bans/controls in the 1970s through the 1980s and 1990s

Environmental re-cycling

This general pattern may be unrepresentative of the global emission profile - when the chemical is used extensively outside of Europe and North America - a global shift in the place of manufacture.

Trends in emissions with maximum in 1950s and 1960s - fundamental implications for concentration trends in air, soil, water and sediments and direction of fluxes between these compartments for PCB capable of dynamic, multimedia exchange.

Control/reduction of air concentration based on reduction of primary sources - volatilization ("outgassing") of recyclable PCBs from the terrestrial and aquatic compartments.

Environmental re-cycling

This process depends on a number of factors:

- size of reservoir of compound in the soil/sediment/water compartments,

- persistence in the soil/sediment compartments,

- physical-chemical properties of compounds

- free exchange of the compound which has been deposited in the past.

- **compounds primarily associated with particulates - outgassing will be limited and concentrations/burden of soil or water will tend to remain high/increase**
- **compounds readily enter the gas phase, outgassing will result in the soil/water body concentration/burden declining.**

The global distribution and contamination

Present trends - declining of environmental levels

Several ways PCBs enter the environment:

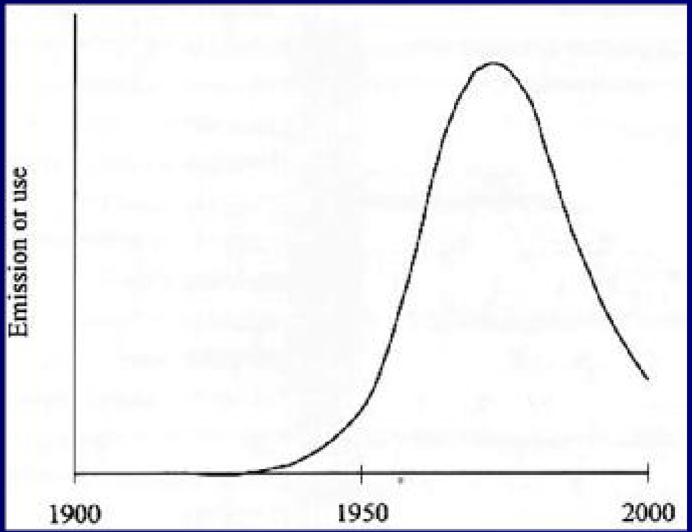
- direct waste discharges from manufacturing facilities and industry which employed large amounts of PCBs

- today - hot spots occur at locations where types of operations where centered (Balkan)

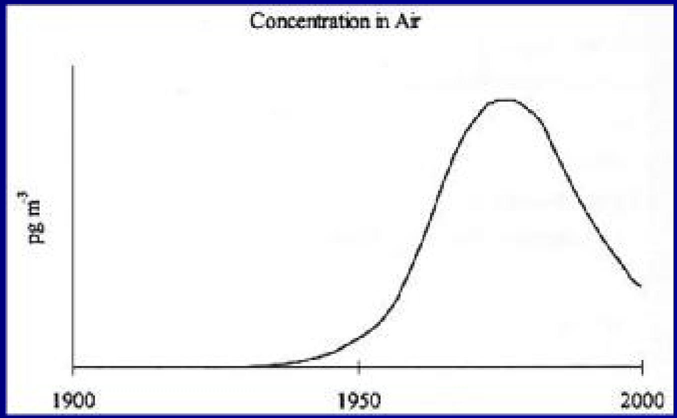
- these "old loads" - secondary sources of contamination - direct emissions from historical sites - the large reservoirs of PCBs - soil and sediments of lakes and rivers near these historical storage - hazardous landfills, place of operation, etc.

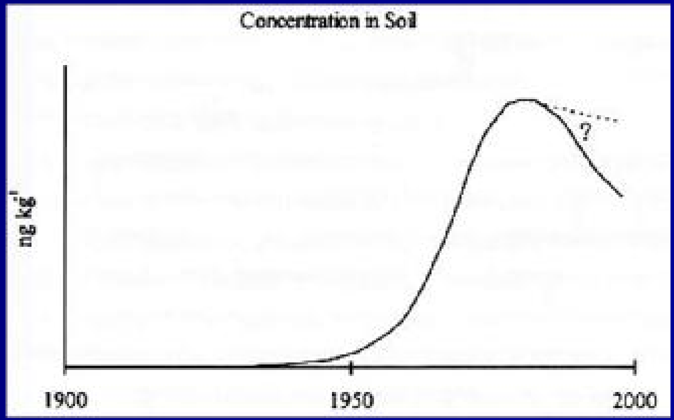
The global distribution and contamination

Typical POPs time trend



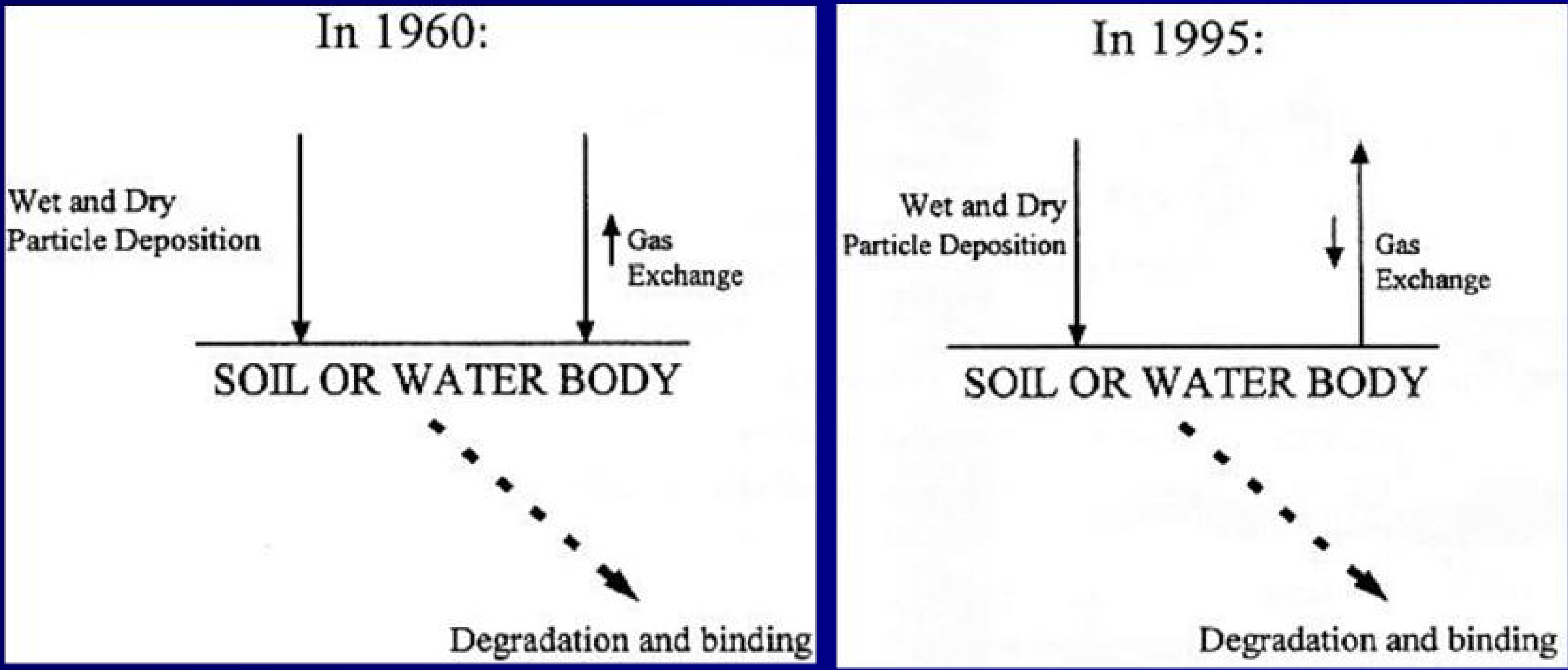
Typical POPs soil residues



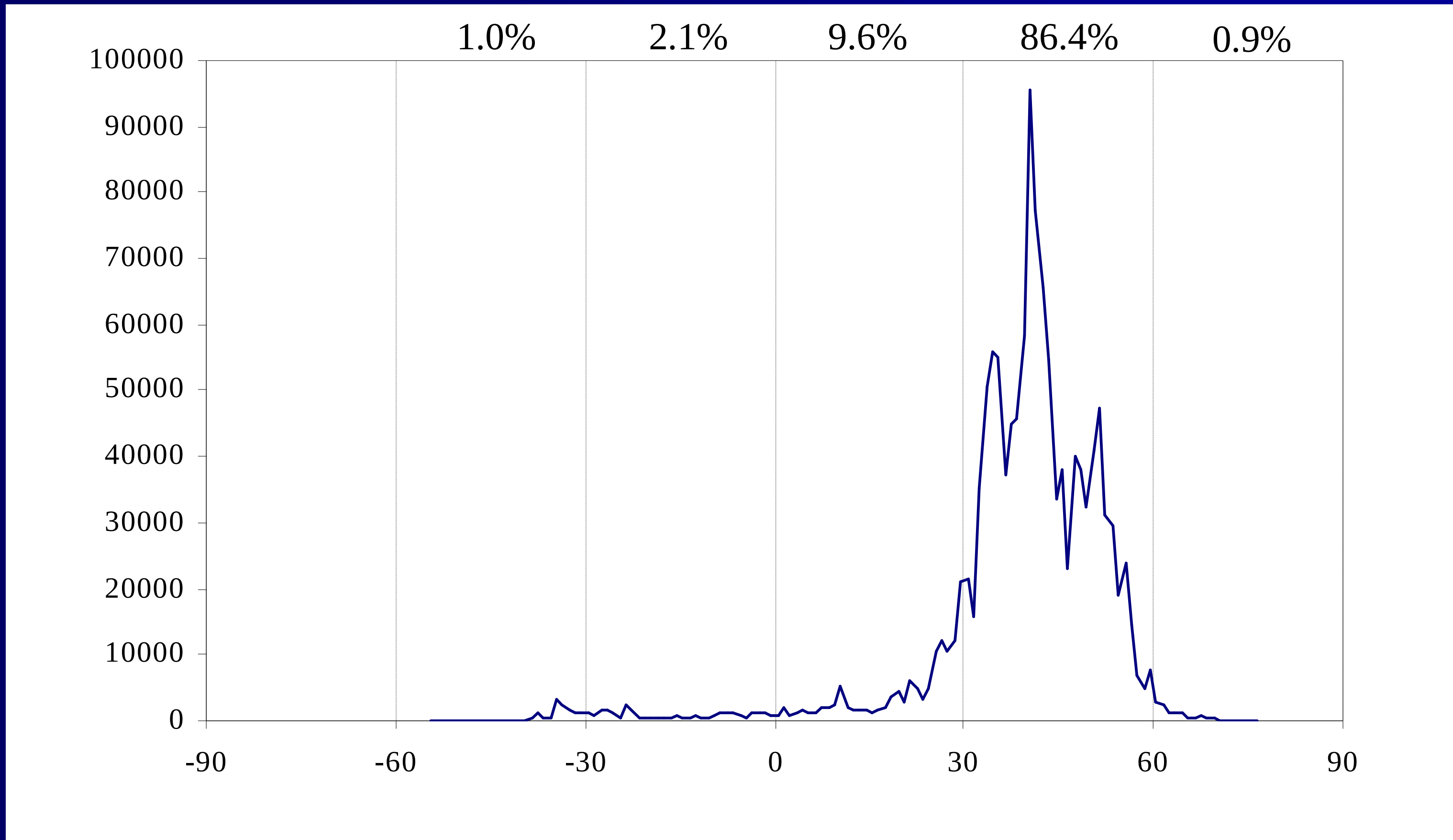


R - T & A

Air – soil exchange processes

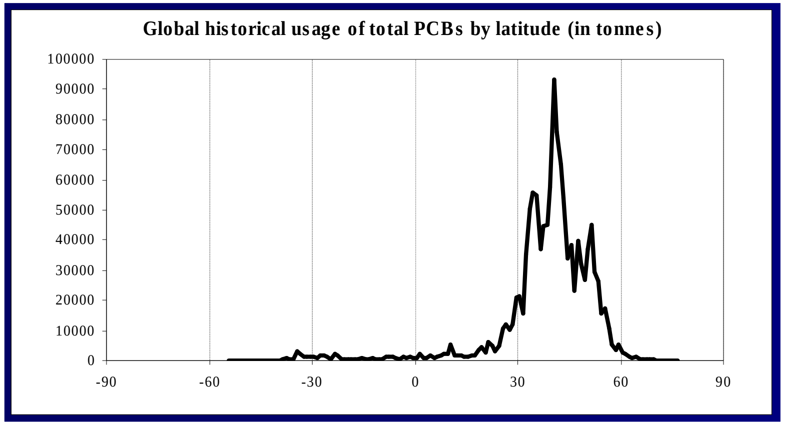


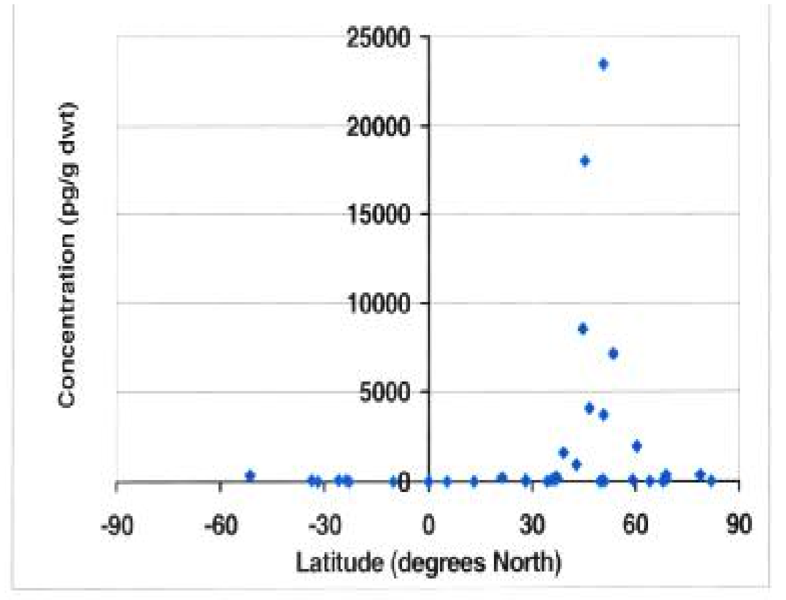
Estimated cumulative consumption of total PCBs by latitude (in tonnes/degree).



R - T & A

The global distribution and contamination



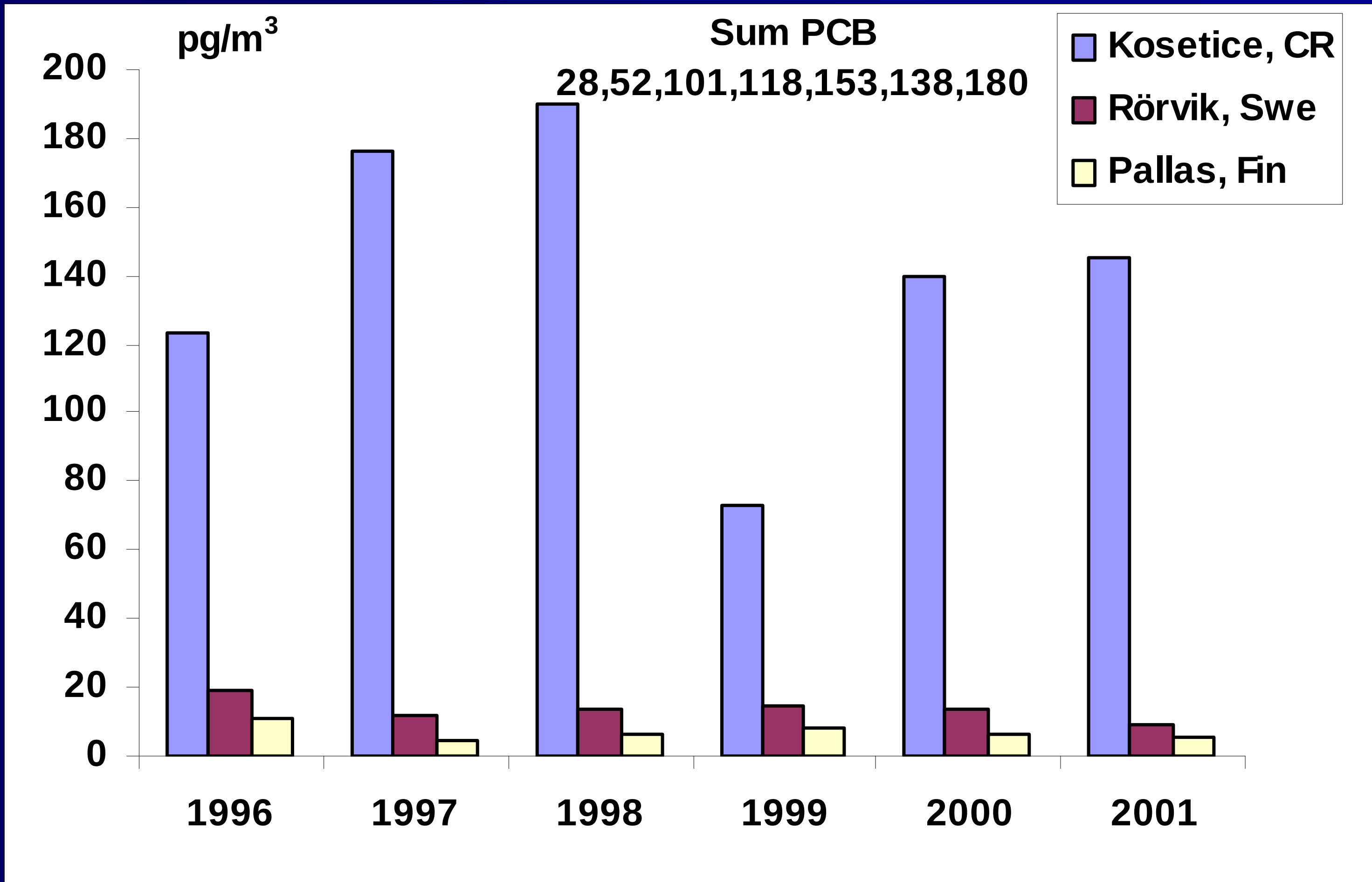


Global historical usage of total PCBs by latitude [t]

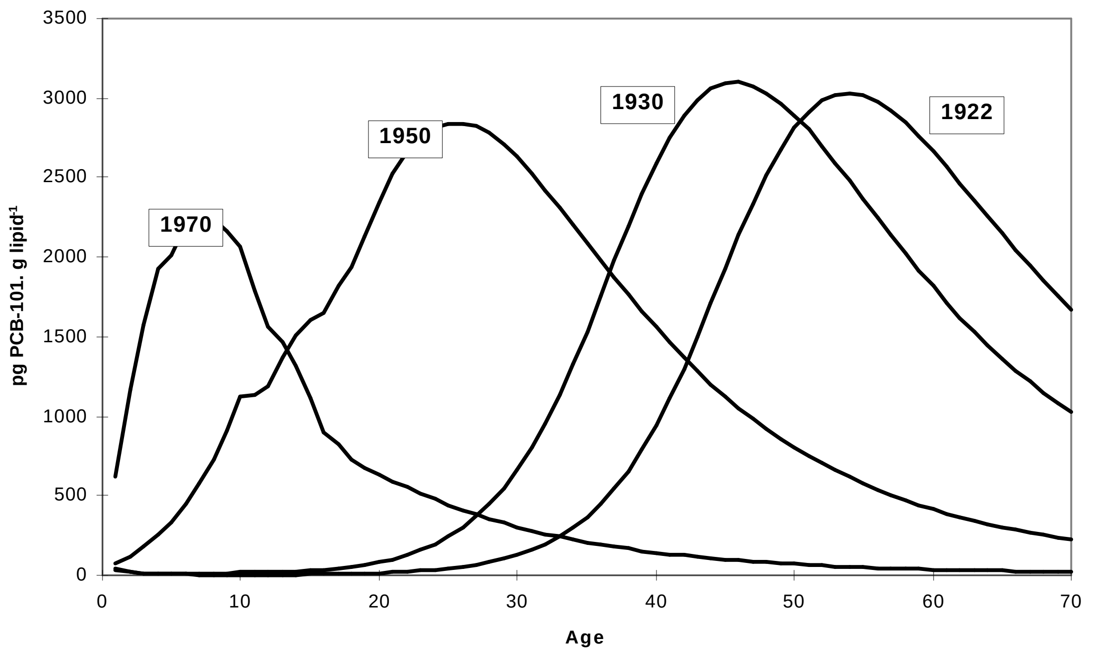
Levels in soils

R - T & A

Annual average atmospheric concentrations of PCBs (sum of seven) from three European sites 1996-2001

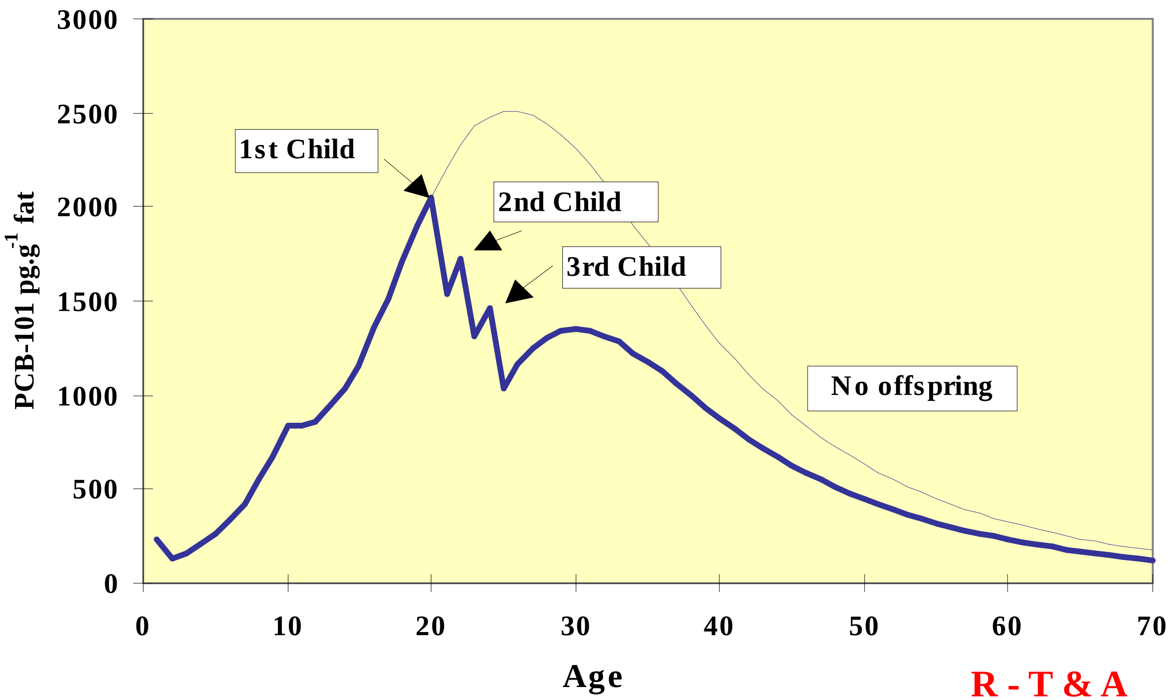


R - T & A



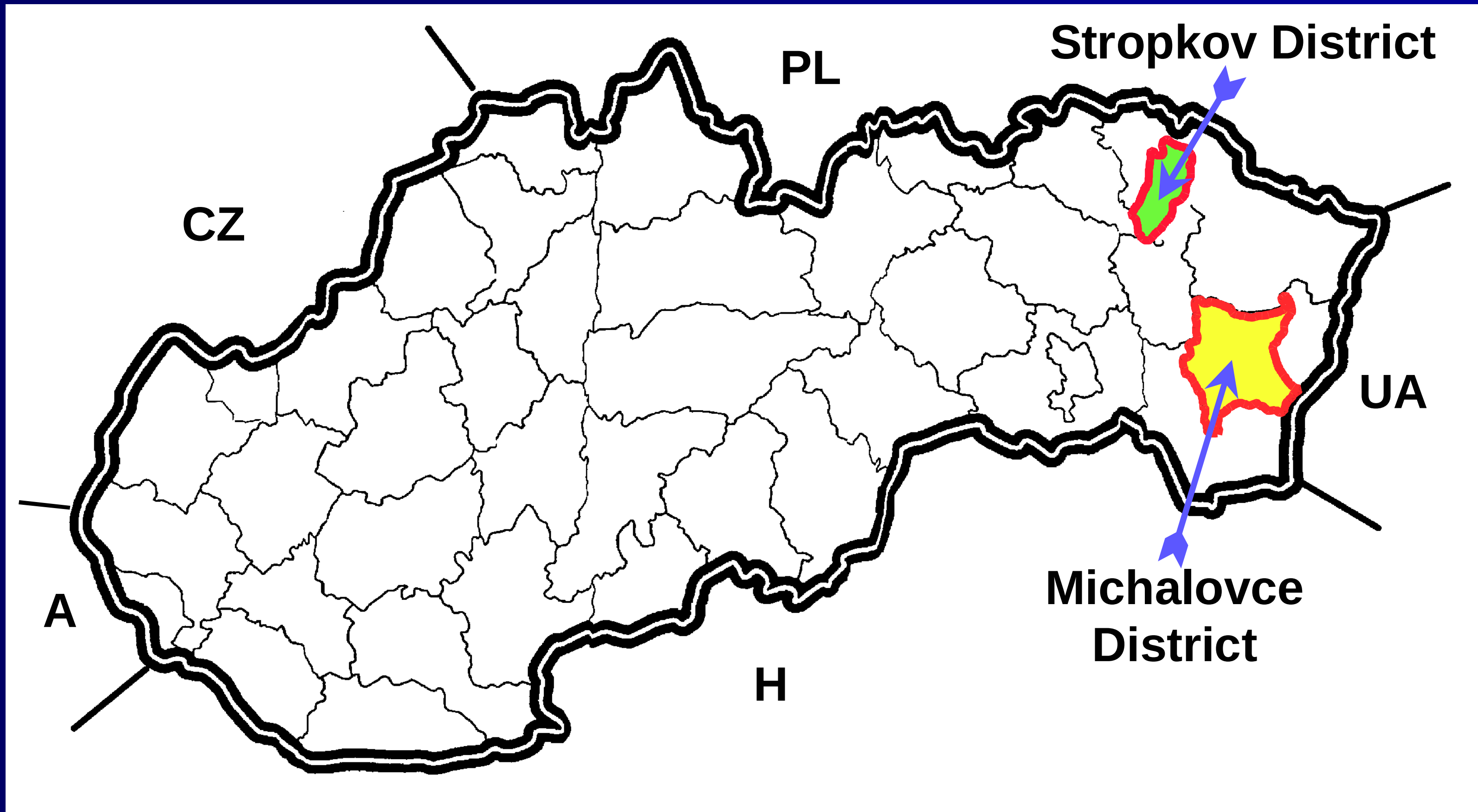
Predicted tissue concentrations of PCB-101 For different age classes in the UK born 1920 to 1990

Effect of offsring on maternal PCB-101 Body fat burden for a woman born in 1950 and having no chlidren or 3 Children at age 20, 22 and 24



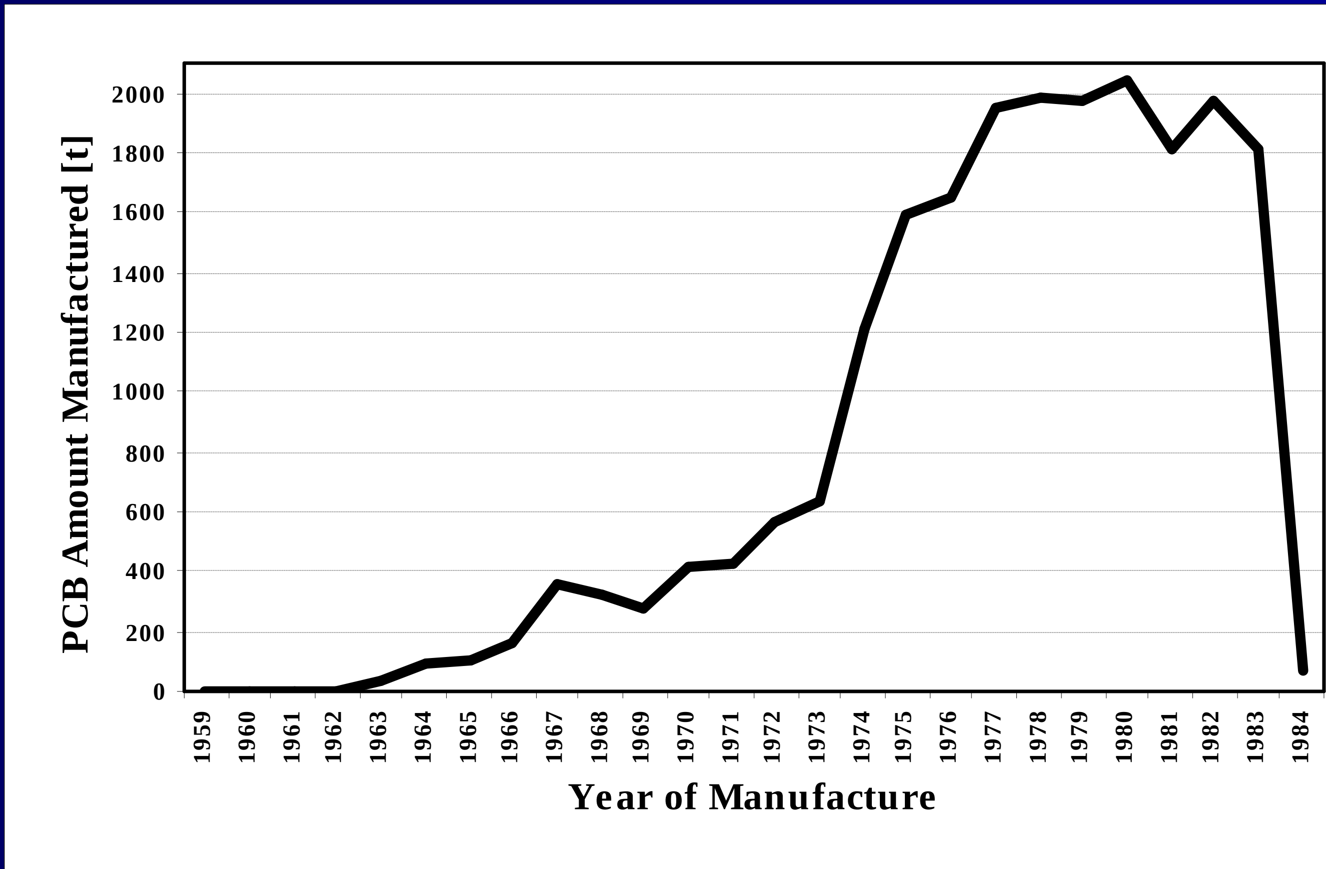
R - T & A

Slovakia



R - T & A

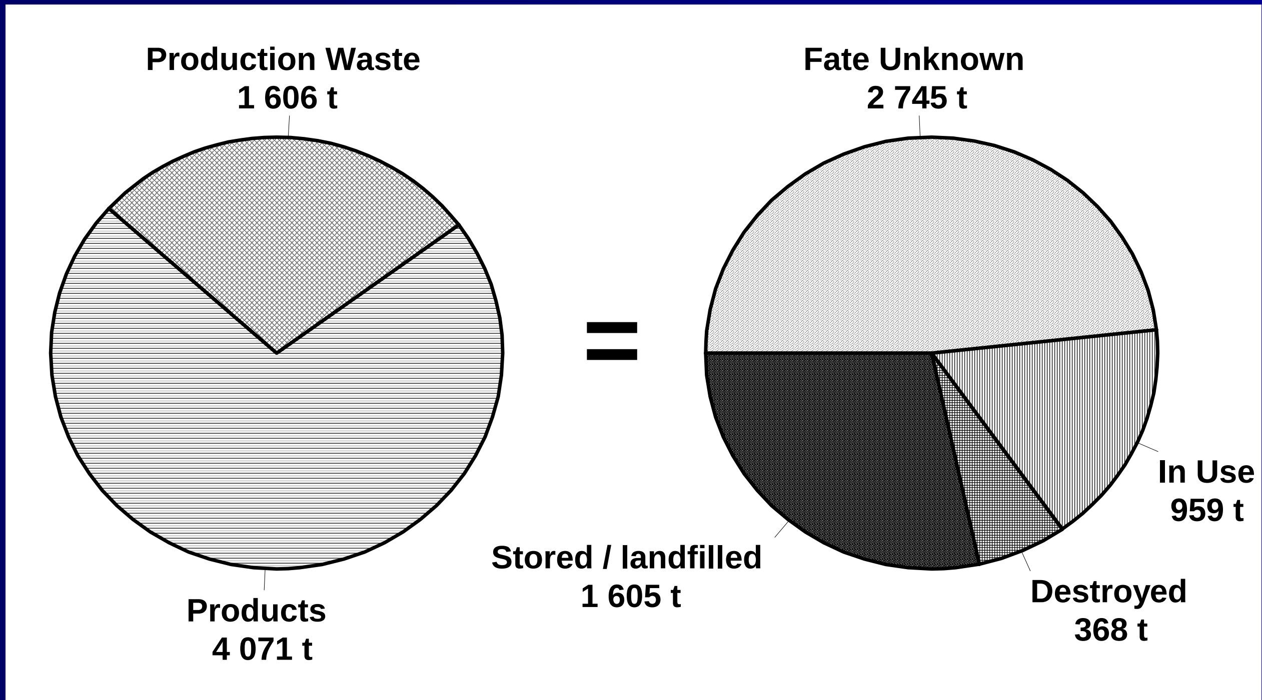
PCBs in the Slovak Republic



PCBs in the Slovak Republic

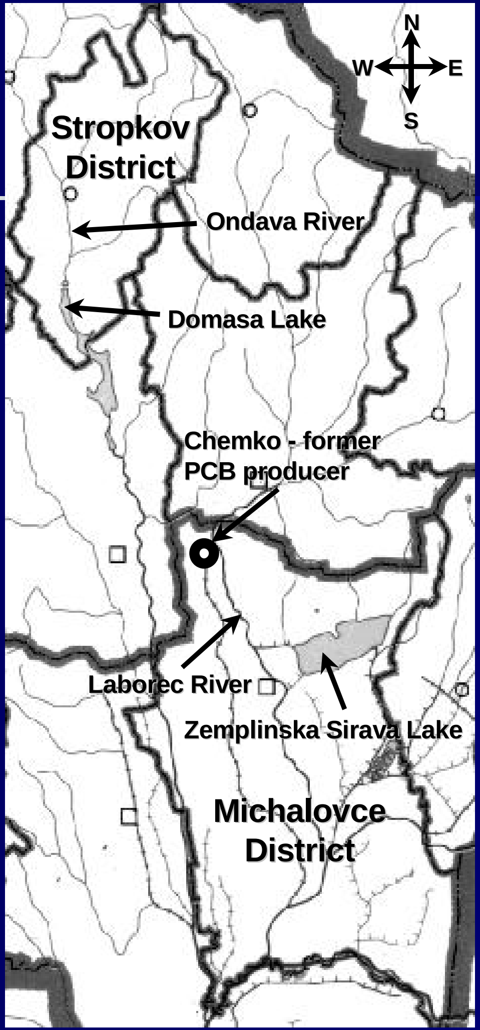
A specimen of waste from PCB production stored in the premises of a former Slovak producer

PCBs in the Slovak Republic

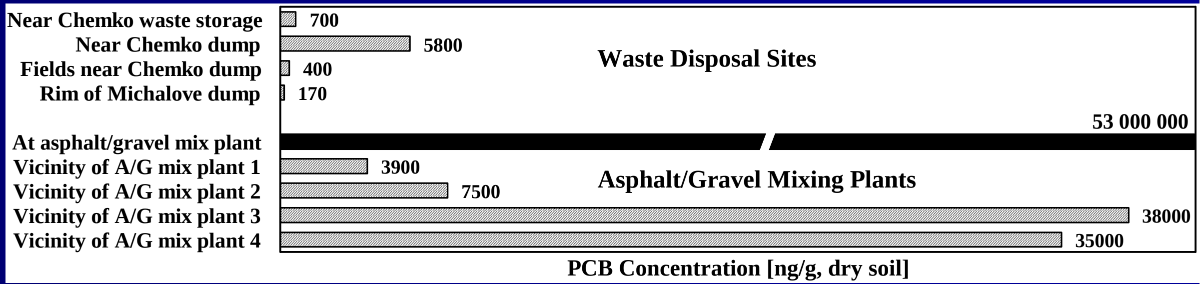


Inventory estimation of PCBs used in Slovakia (a November 1997 situation)

PCBs in the Slovak Republic



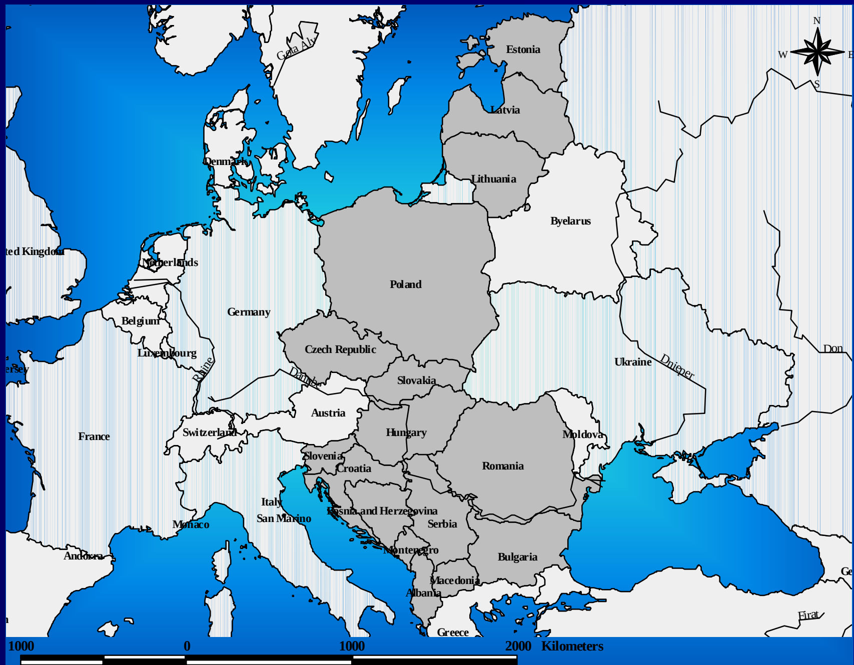
More detailed map of the polluted and control areas with rivers and lakes; the population of the Michalovce district is 108 000 and the Stropkov one 20 500



PCB levels (the sum of all congeners) in soil samples collected in the vicinity of asphalt/gravel mixing plants and the waste disposal sites of the Chemko chemical factory.

Regional POPs projects and problems

Persistent, Bioaccumulative and Toxic Chemicals in Central and Eastern European Countries - State-of-the-Art Report



TOCOEN REPORT No. 150a
Brno, Czech Republic, May 2000

3rd Version - September 01, 2004

http://recetox.muni.cz/

Authors:

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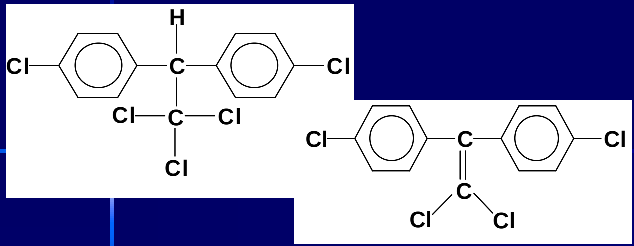
R - T & A

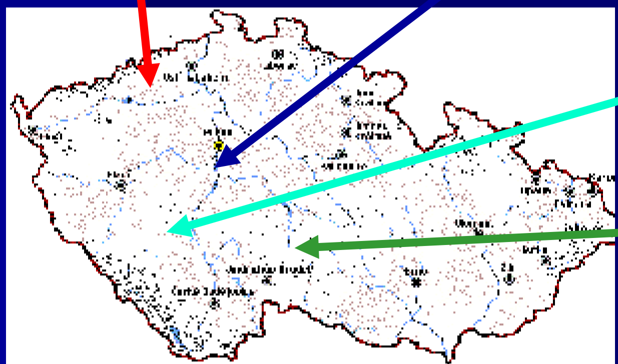
Gradient of DDTs contamination as a results of using in former GDR round 1985



% of DDT in DDTs in Czech soils – mountains near to german border – 1995 – 72 – 100 %

Middle Bohemia – 41 – 68 %

- **Distribution pattern of DDT and its metabolites (DDE, DDD) after massive applications in GDR forests in 1983/4**
- **Higher percentage of parent DDT in DDTs – marker of new usage**
- **In 1983/4 on the territory of the former GDR 260 000 ha of forests were treated with high amounts of DDT/lindane preparations from aircraft to combat the black-arched moth (*Lymanthria monacha*).**



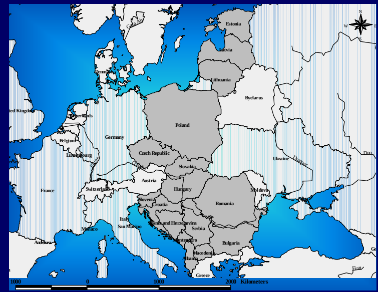
South Bohemia – 33 – 61 %

Regional background observatory Košetice – 15 %

Regional Hot spots

R - T & A

Hot spots



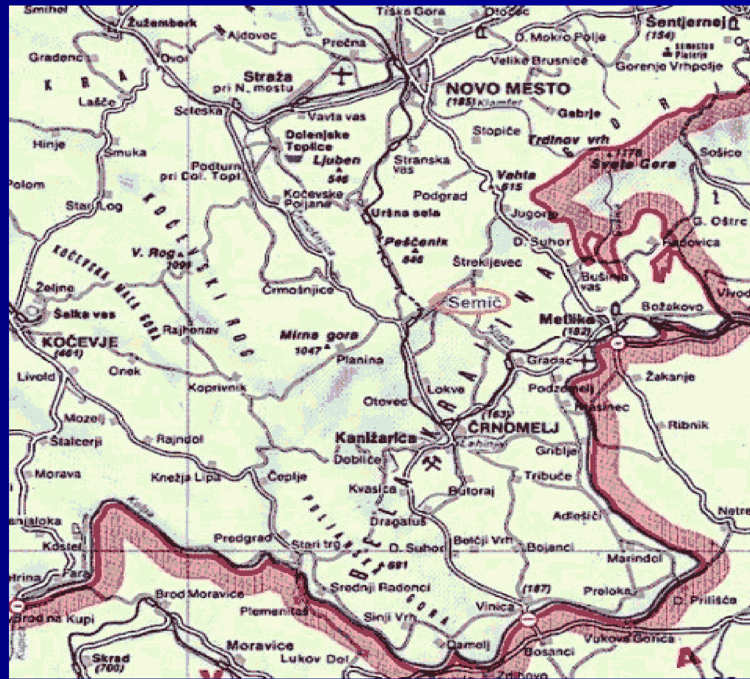
- F Chemical and petrochemical industry
- F Waste disposal
- F PCBs wastes
- F Obsolete pesticides
- F Waste lagoons
- F Contaminated soils and sediments
- F Waste incinerators
- F Unspecified sources
- F Military bases
- F Wars areas

Regional contamination – Danube river basin

R - T & A

Slovenia

AUSTRIA
HUNGARY
ITALY
CROATIA
Maribor
Velenje
Kranj
Celje
LJUBLJANA
Nova Gorica
Novo Mesto
Izola
Piran
Koper
Gulf of Venice



NOVO MESTO
Straža
Dolenjske Toplice
Stopiče
Podgrad
Semič
Metlika
KOČEVJE
Kanižarica
ČRNOMELJ
Vinica
Moravice

The area around Semič contaminated by PCBs from a capacitor and electrical equipment factory

Semič

- **Accident in Semič ?? No, it was result of ignorance and any care about environment**

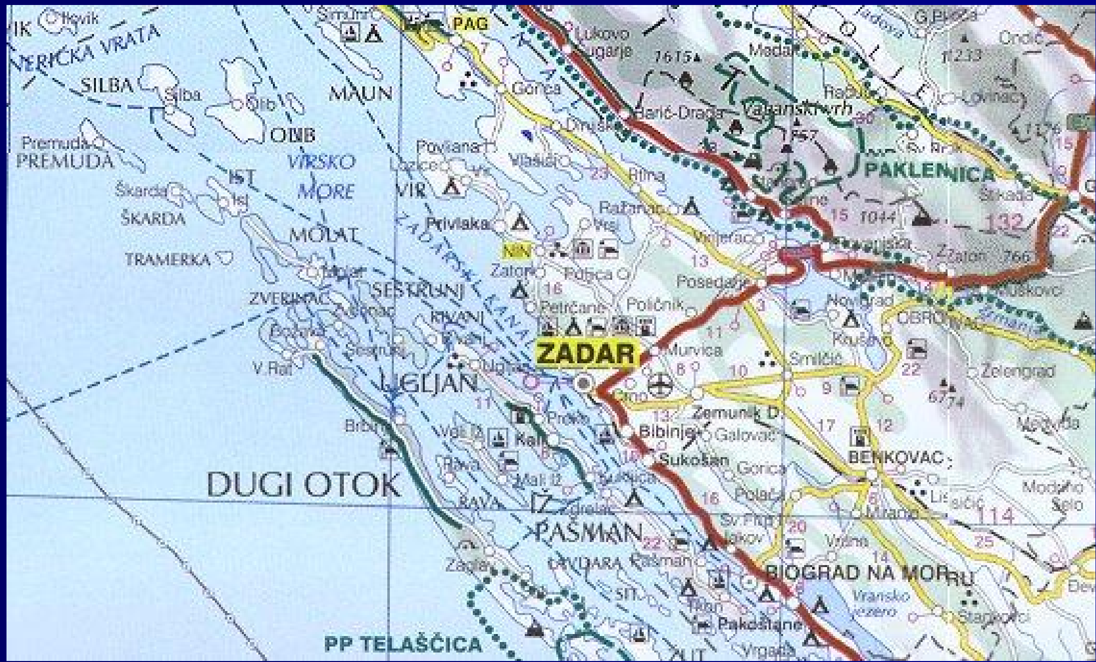
The plant "Iskra" has used various PCBs oils from 1962 to 1985.

65 to 75 tons were put off on inadequate land sites (mostly in karstic hollows) inside the plant or near vicinity.

In waterproof concrete dumpsite was put off about 30 to 50 tons of PCBs wastes collected from karstic hollows and other sites.

It is estimated that between 30 and 40 tons of PCBs wastes still exist inside the karstic area of Bela Krajina county.

Croatia



SILBA
MAUN
PREMUDA
OLIB
VIRSKO MORE
VIR
ŠKARDA
MOLAT
TRAMERKA
ZVERINAC
SESTRUNJ
RIVANJ
ZADAR
UGLJAN
DUGI OTOK
IŽ
PAŠMAN
PAKLENICA
BENKOVAC
BIOGRAD NA MORU
PP TELAŠČICA
PAG
NIN

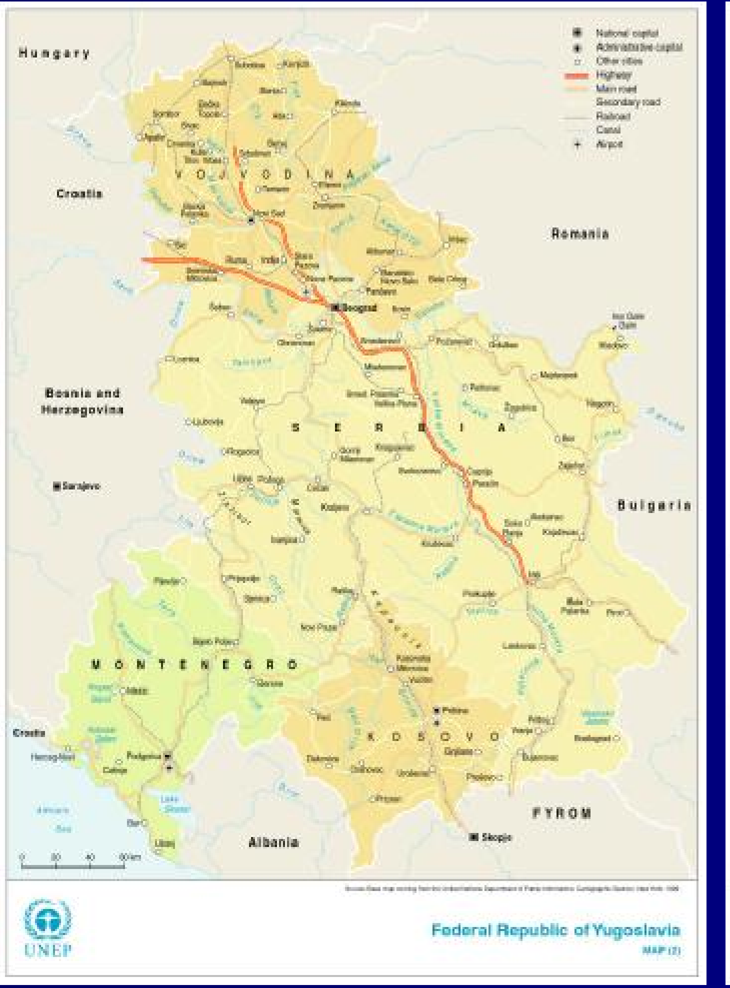
R - T & A

Details of destroyed chemical factory near Una spring

Details of destroyed E.T.S.

R - T & A

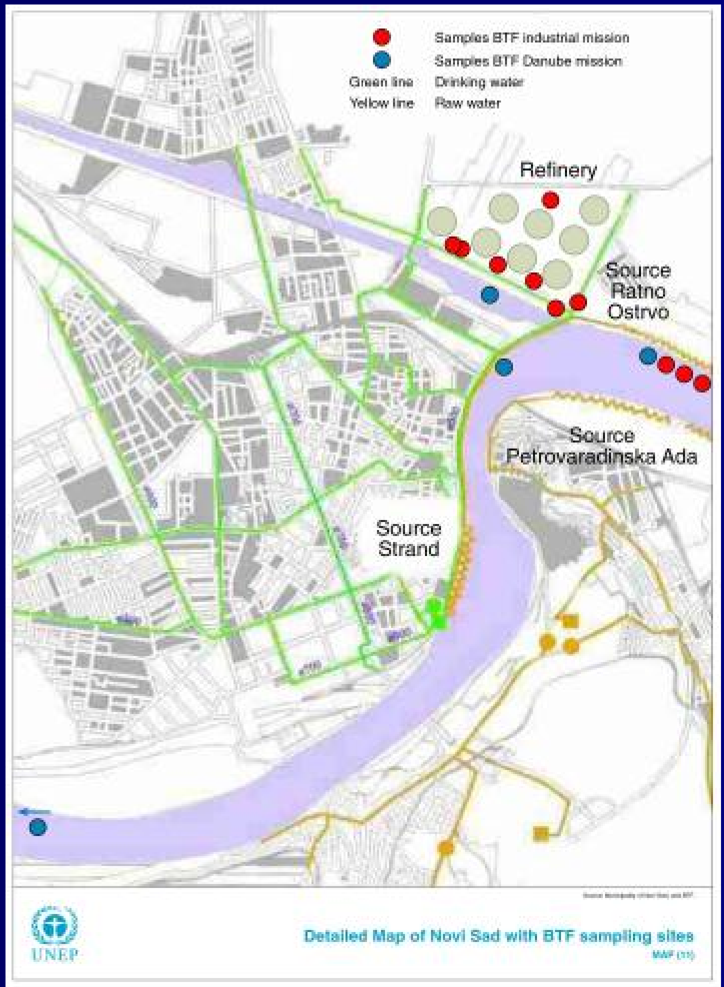
Serbia



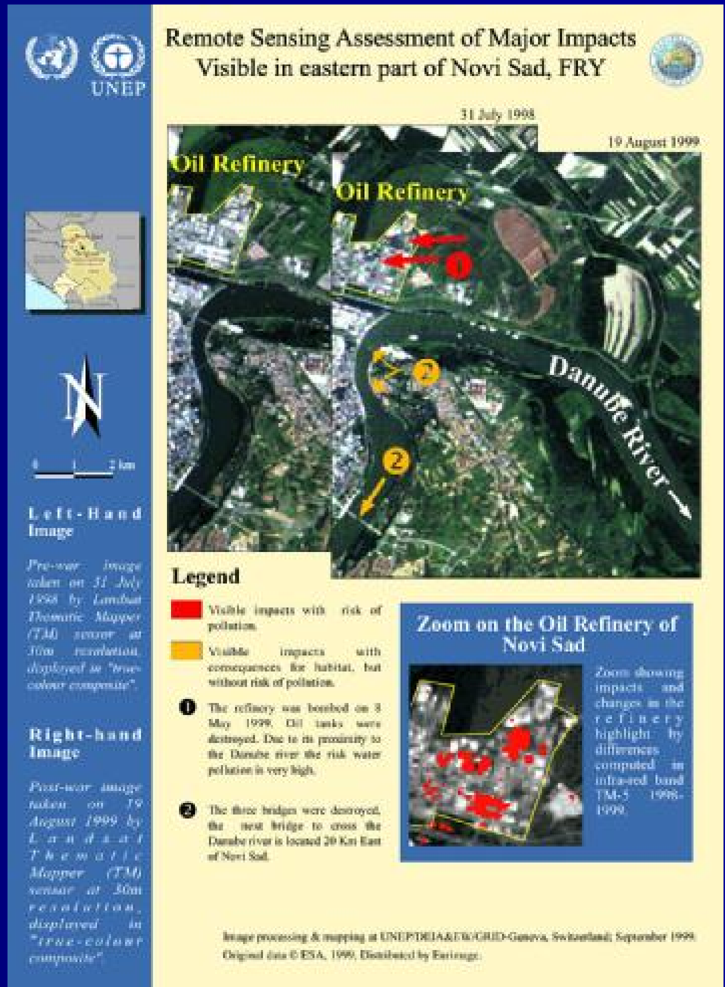
Federal Republic of Yugoslavia

Targeted Sites with potential negative environmental impacts

Serbia



Samples BTF industrial mission
Samples BTF Danube mission
Green line Drinking water
Yellow line Raw water
Refinery
Source Ratno Ostrvo
Source Petrovaradinska Ada
Source Strand
UNEP
Detailed Map of Novi Sad with BTF sampling sites

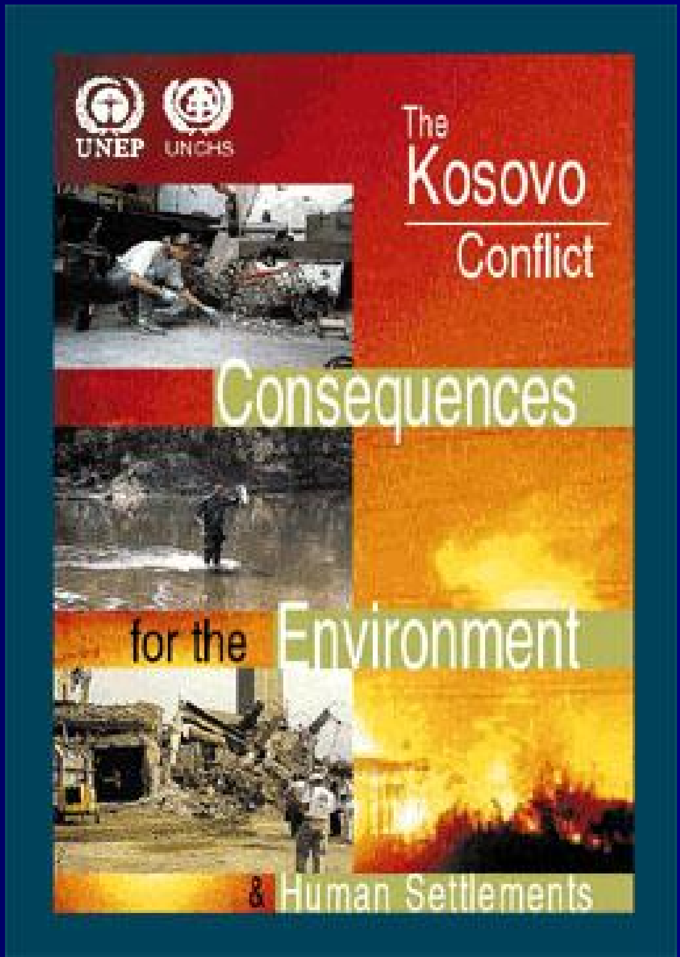


UNEP
Remote Sensing Assessment of Major Impacts Visible in eastern part of Novi Sad, FRY
31 July 1998
19 August 1999
Oil Refinery
Oil Refinery
Danube River
0 1 2 km
Left-Hand Image
Pre-war image taken on 31 July 1998 by Landsat Thematic Mapper (TM) sensor at 30m resolution, displayed in "true-colour composite".
Right-hand Image
Post-war image taken on 19 August 1999 by Landsat Thematic Mapper (TM) sensor at 30m resolution, displayed in "true-colour composite".
Legend
Visible impacts with risk of pollution.
Visible impacts with consequences for habitat, but without risk of pollution.
The refinery was bombed on 8 May 1999. Oil tanks were destroyed. Due to its proximity to the Danube river the risk water pollution is very high.
The three bridges were destroyed, the next bridge to cross the Danube river is located 20 Km East of Novi Sad.
Zoom on the Oil Refinery of Novi Sad
Zoom showing impacts and changes in the refinery highlight by differences computed in infra-red band TM-5 1998-1999.
Image processing & mapping at UNEP/DEIA&EW/GRID-Geneva, Switzerland; September 1999.
Original data © ESA, 1999, Distributed by Eurimage.

R - T & A

Serbia

The Kosovo conflict



APOPSBAL

Assessment of the selected POPs (PCBs, PCDDs/Fs, OCPs) in the atmosphere and water ecosystems from the waste materials generated by warfare in former YUGOSLAVIA

R - T & A

APOPSBAL

- The level and hydrogeological fate of some POPs in several Croatian, Bosnian & Herzegovina and Kosovo areas as a consequence of war damages
- The level and hydrogeological fate of some POPs in several FR Yugoslavian areas as a consequence of war damages
- The level and atmospheric transportation of some POPs in Croatian, Bosnian & Herzegovina, and FR Yugoslavian areas as consequence of war damages
- Investigation of intake and some ecotoxicological consequence of exposure of living organisms to POPs in some FR Yugoslavian and Croatian areas as consequence of war damages
- Laboratory and field PCBs biotransformation studies for remediation of soil contaminated by transformer station oil-spill

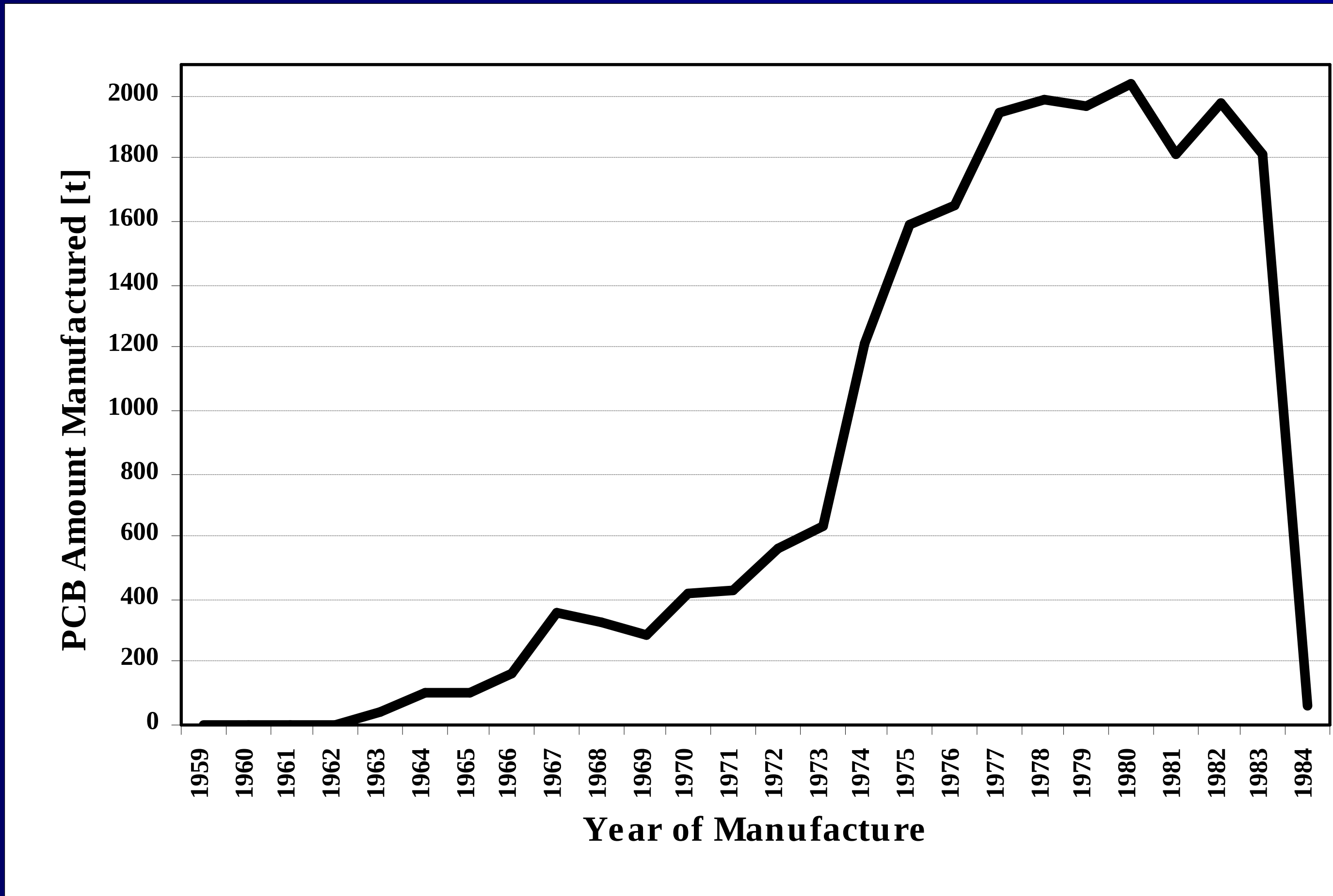
Environmental POPs trends in the Czech Republic

PCBs production

The production started in 1959 with Delor 106 (corresponds to the composition of Aroclor 1260) that was prepared for a Czechoslovak paint factory (Barvy a laky, Uherske Hradiste) as a surrogate for imported Aroclor and Clophen.

In 1967, the production of Delor 103 (~ Aroclor 1242) for capacitors and in 1968 Delor 105 (~ Aroclor 1254) launched.

PCBs called Delor (Delotherm, Hydelor) were produced in the Chemko chemical plant in Strazske (Michalovce District) from 1959 till January 1984



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PCBs production

When the PCB production in Chemko Strazske was terminated in January 1984 officially 21 482 tonnes of PCBs were produced [Kocan et al. 1998]

9 869 tonnes, i.e. 46 percent, was exported mainly to former East Germany

The rest, i.e. 11 613 t was used inside former Czechoslovakia chiefly as heat exchanger fluids, capacitor and transformer dielectric fluids, and paint additives.

PCBs production

Delor 103 was used as a dielectric fluid in power capacitors produced in a Czech electrotechnical factory (ZEZ Zamberk) and Delor 105 in transformers produced also in the Czech Republic.

In addition in 1969 the production of PCB formulations called Hydelor and Delotherm started.

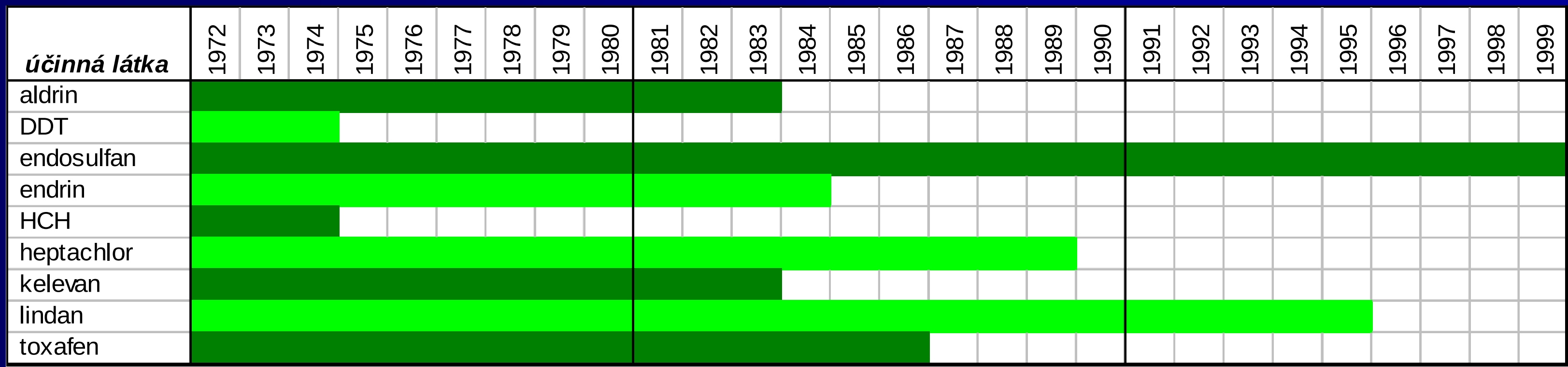
They were specially designed for hydraulic equipment and heat exchangers respectively.

Delors – contents of PCBs, PCNs, PCDFs

S	D103	D104	D105	D106
PCBs (99 kong.) [mg.g^{-1}]	1 277	1 291	1342	1 571
DLPCBs (4 kong.) [mg.g^{-1}]	2 940	3 277	467	151
PCNs (58 kong.) [mg.g^{-1}]	82	196	445	147
PCDFs (85 kong.) [mg.g^{-1}]	0	68	18	34

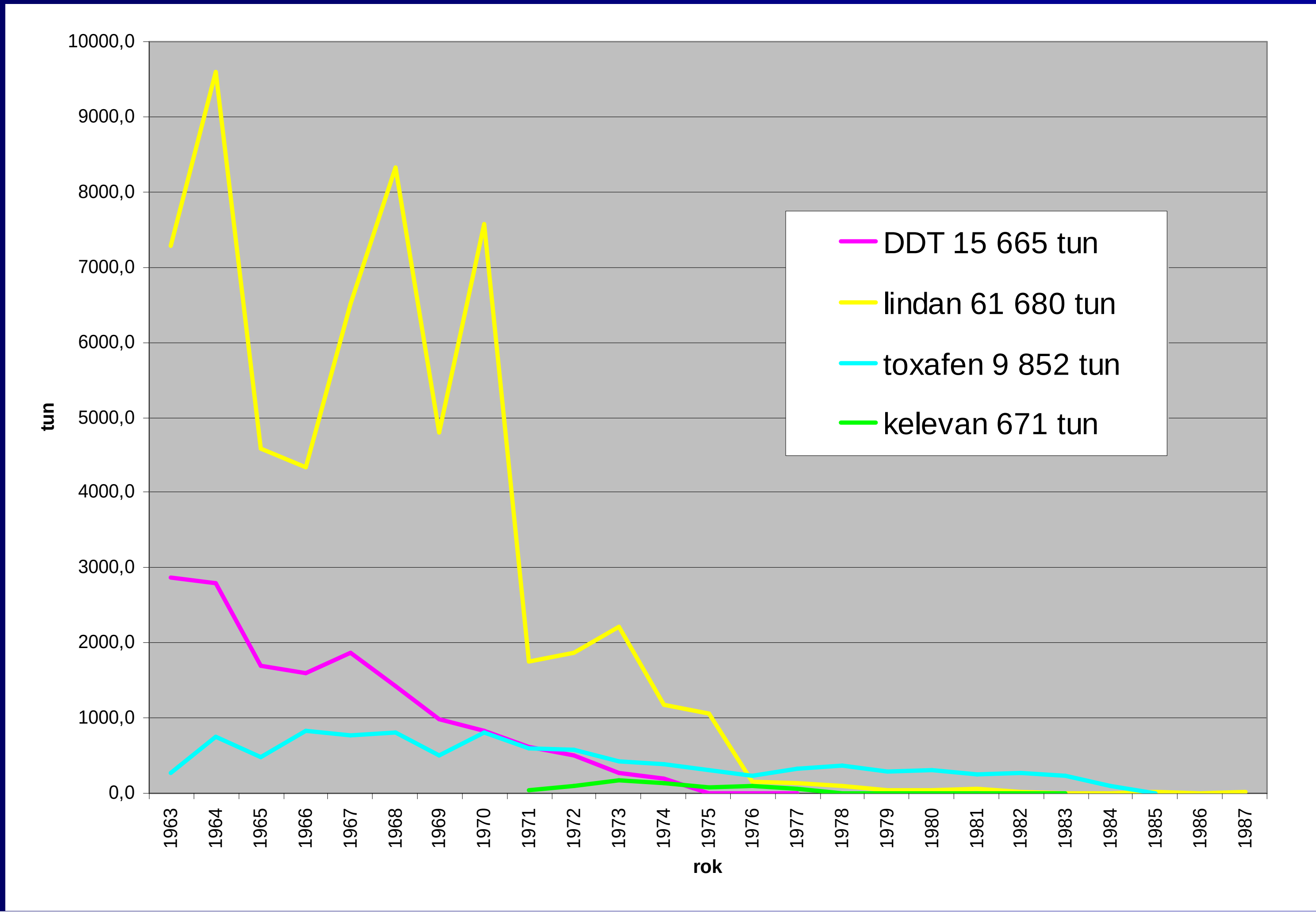
Overview of permitted pesticides - 1972 - 1999 [1]

Organochlorinated pesticides



[1] Státní rostlinolékařská správa: Seznamy povolených přípravků na ochranu rostlin 1972-1999

Consumption of selected OCPs in the former Czechoslovakia 1963 – 1987



R - T & A

OCPs production

The two largest producers of pesticides in the former Czechoslovakia were the Spolana Neratovice near Praha (still existing under the same name) and the Chemical Works of Juraj Dimitrov in Bratislava (CHZJD).

OCPs production

Active substance	Product	Years of production	Tons	Corresponding input of active substance in tons(or note)
		DDT		
	Cyklodyn	1955-1958	2 325	58 125
	Dynocid	1951-1974(!)	51 765	2 588.25 (not registered after 1973)
	Gamadyn	1957-1976(!)	65 437	2 963.11 (not registered after 1973)
		HCH technical		
	HCH techn. itself	1954-1977	57 979	perhaps the average production (for isolation of lindane and for HCH techn.-preparations)
	Cyklo-Powder	1952-1970	25 310	3,543.4 Included HCH tech. data???

Stocks, obsolete stocks, contaminated sites

There was a broad activity after 1989 as to the ecological liquidation of obsolete stocks; the result was a liquidation of the contents of most of such stocks found out.

Yet the approach in the 60th and earlier had been quite different in particular as the waste disposal concerns.

Efforts have been done in the 1st half of the 90th to find out all the contaminated sites.

Studies or other information as to it should be available at the Ministry of Environment or also of Agriculture.

Stocks, obsolete stocks, contaminated sites

Because the problems with pesticides to be liquidated started even at the beginning of the 60th, there were perhaps a large quantities of pesticides liquidated on the basis of such an approach.

This represents real time bombs and also makes a correct view of how much of pesticides were liquidated and in which ways also impossible.

Stocks, obsolete stocks, contaminated sites

After 1989 attempts have been done to make an ecological liquidation of the obsolete stocks.

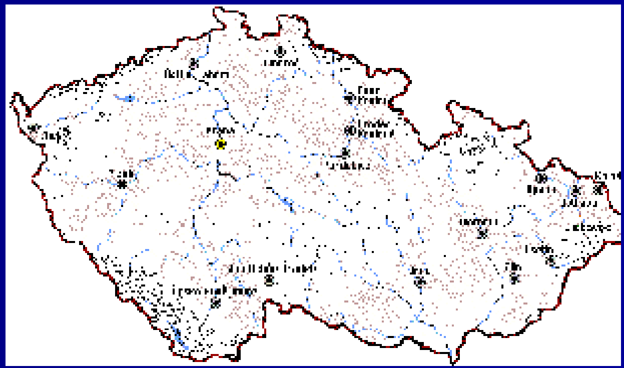
This has been done under conditions responding today's requirements i.e. technology, temperature etc., the first part of it was combusted in Ingolstadt (FRG).

According to the survey of the SPA the quantity of pesticides liquidated in this way was about 1 900 tons; 50 to 60 % of it were POP's pesticides (in most cases DDT and HCH).

Emission inventory of POPs in the CR

The main sources of POPs in CR:

- **combustion of fossil fuels and wastes (coal fired stations), local heating systems)**
- **metallurgy,**
- **heat coal conversion processes,**
- **production and use of coke, asphalt and coal tars,**
- **catalytic cracking,**
- **traffic**
- **waste waters,**
- **landfills,**
- **crematoria,**
- **PAHs and carbon black production,**
- **forest fires,**



Emission inventory of POPs in the CR

Emission factors and annual emissions of PCDDs/Fs from the main sources in CR		
Category of source (based on UN/ECE POPs Protocol, Anex VIII)	Emission factors [ng $TEQ.t^{-1}$]	Annual emissions [g $TEQ.y^{-1}$]
Municipal waste incinerators	490 (Brno) 8 625 (Praha)	1.14
Medical waste incinerators	4 013.3 480 – 2 065 000	0.022
Hazardous waste incinerators	0 – 11 930	
Sinter plants	3 839 - 20 535	73.12
Steel production	1 240	8.50
Secondary Al production	39 883	4.80
Power plants	$1\,463.1^{F}$ $1\,249.3^{P}$	6.01
Local heating	$3\,600 – 205\,680^{BC}$ $640 – 75\,276^{BR}$	389.80
Coke production		
Cement production	1.19 (1.9 – 1 040)	0.30
Lime production	2 387	2.86
Mobil sources - gasoline	50	0.146
- oil	20	
These sources - total		486.70
Estimation of total emissions		650

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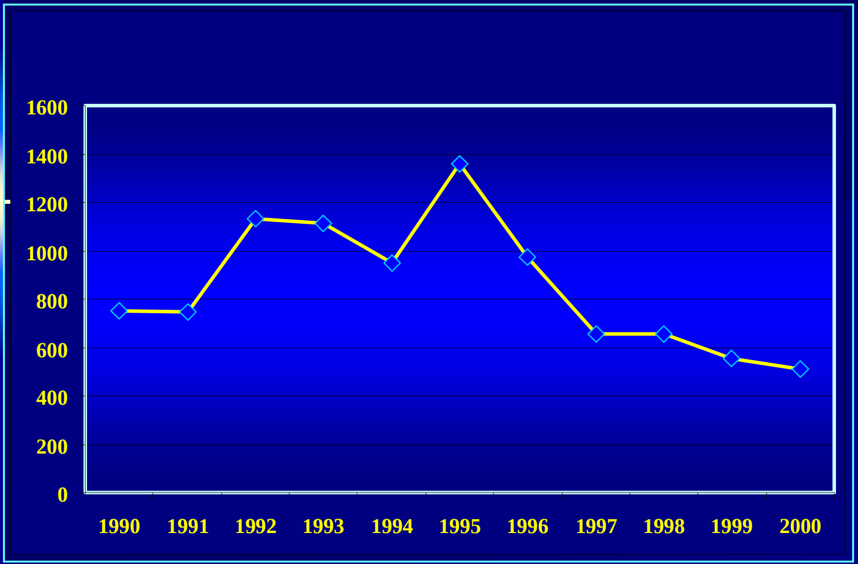
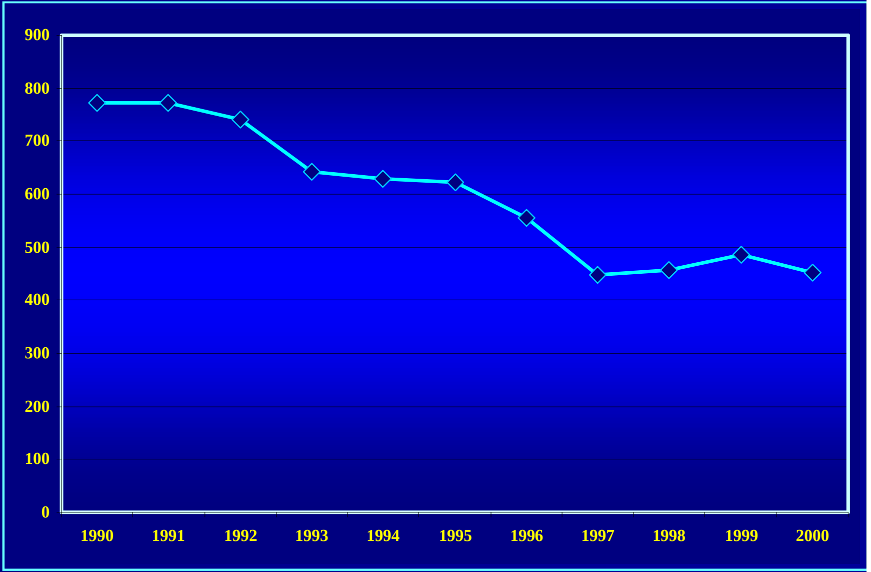
Emission trend of POPs in the CR – 1990 - 2000

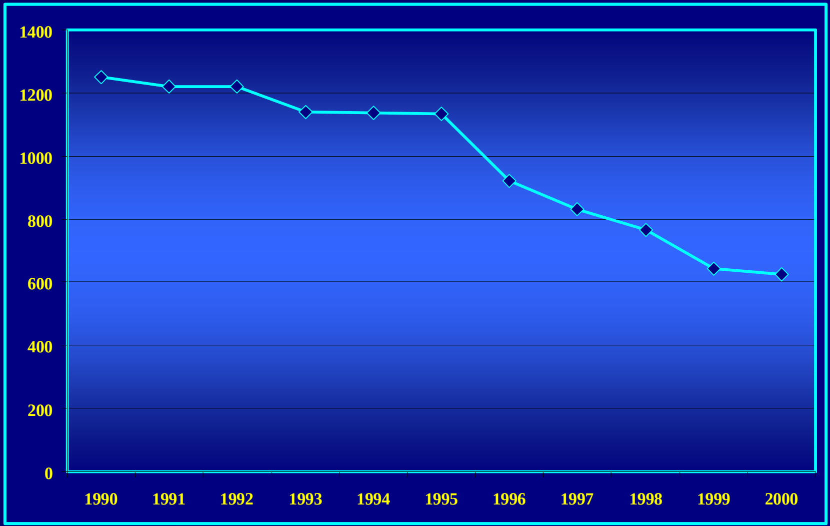
PAHs [t.y-1]



PCBs [kg.y-1]



PCDDs/Fs [g.y-1]



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Conclusions:

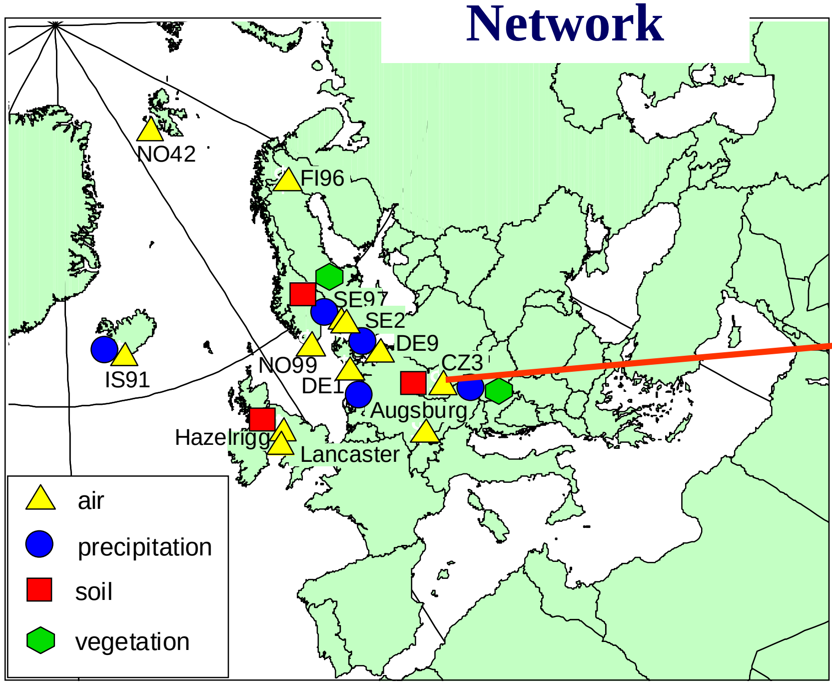
The most important sources of selected POPs in CR are:

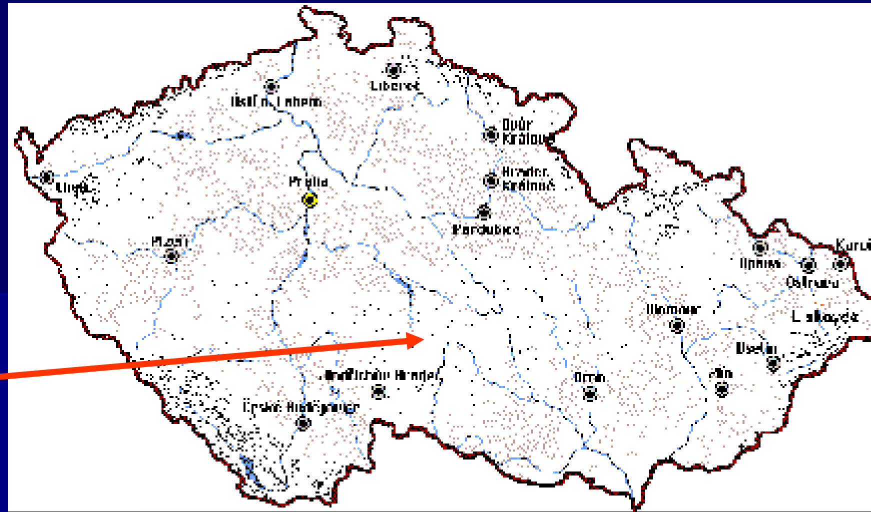
- **PAHs – local heating, coke production, mobil sources;**
- **PCBs – sinter plants, mobile sources, power plants;**
- **PCDDs/Fs – local heating, HWI;**
- **HCB – power plants, local heating, sinter plants**

Environmnetal contamination and human exposure by POPs in the CR

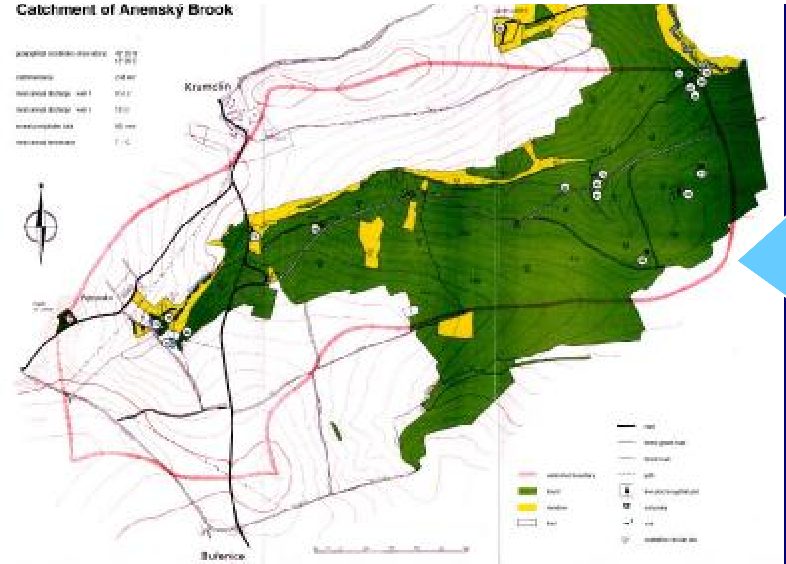
Regional monitoring of POPs

EMEP POPs Network



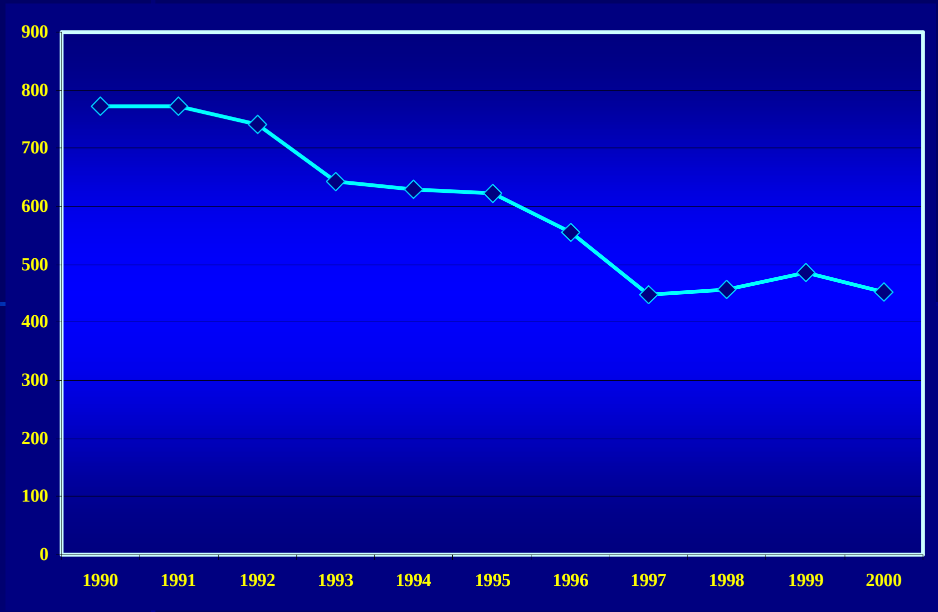


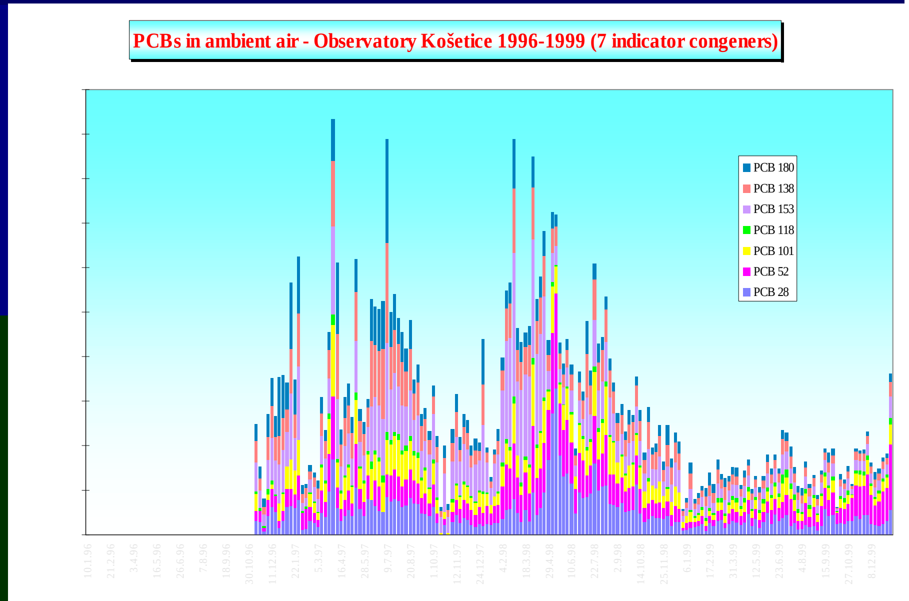
Observatory Košetice

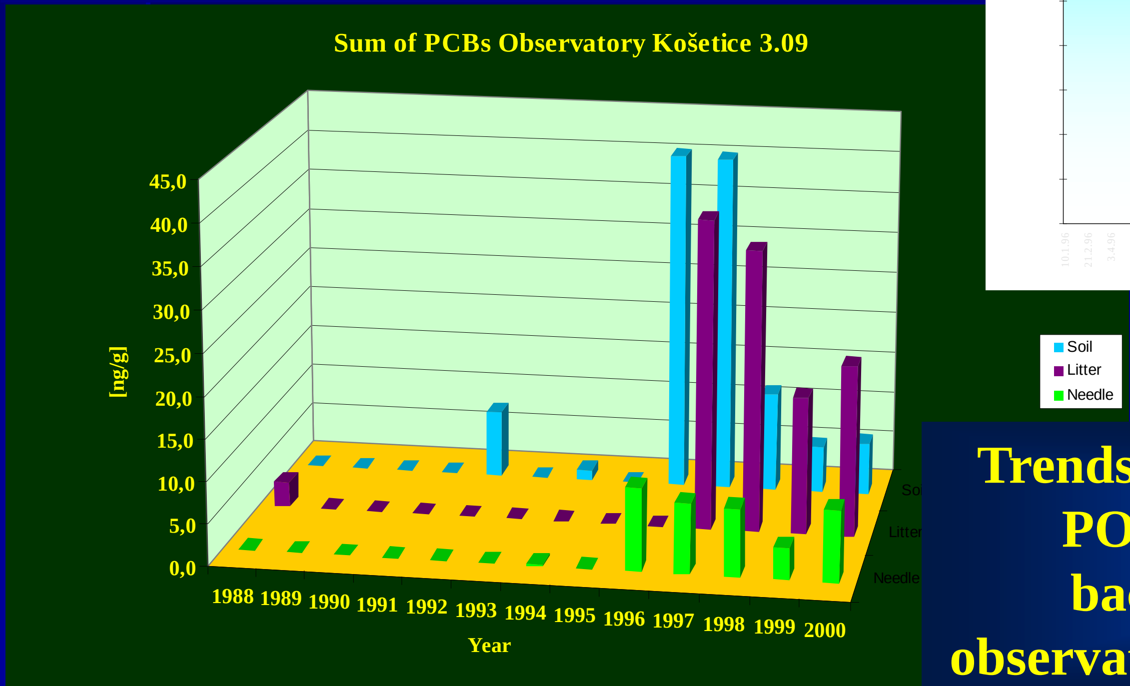


R - T & A

Regional monitoring of POPs





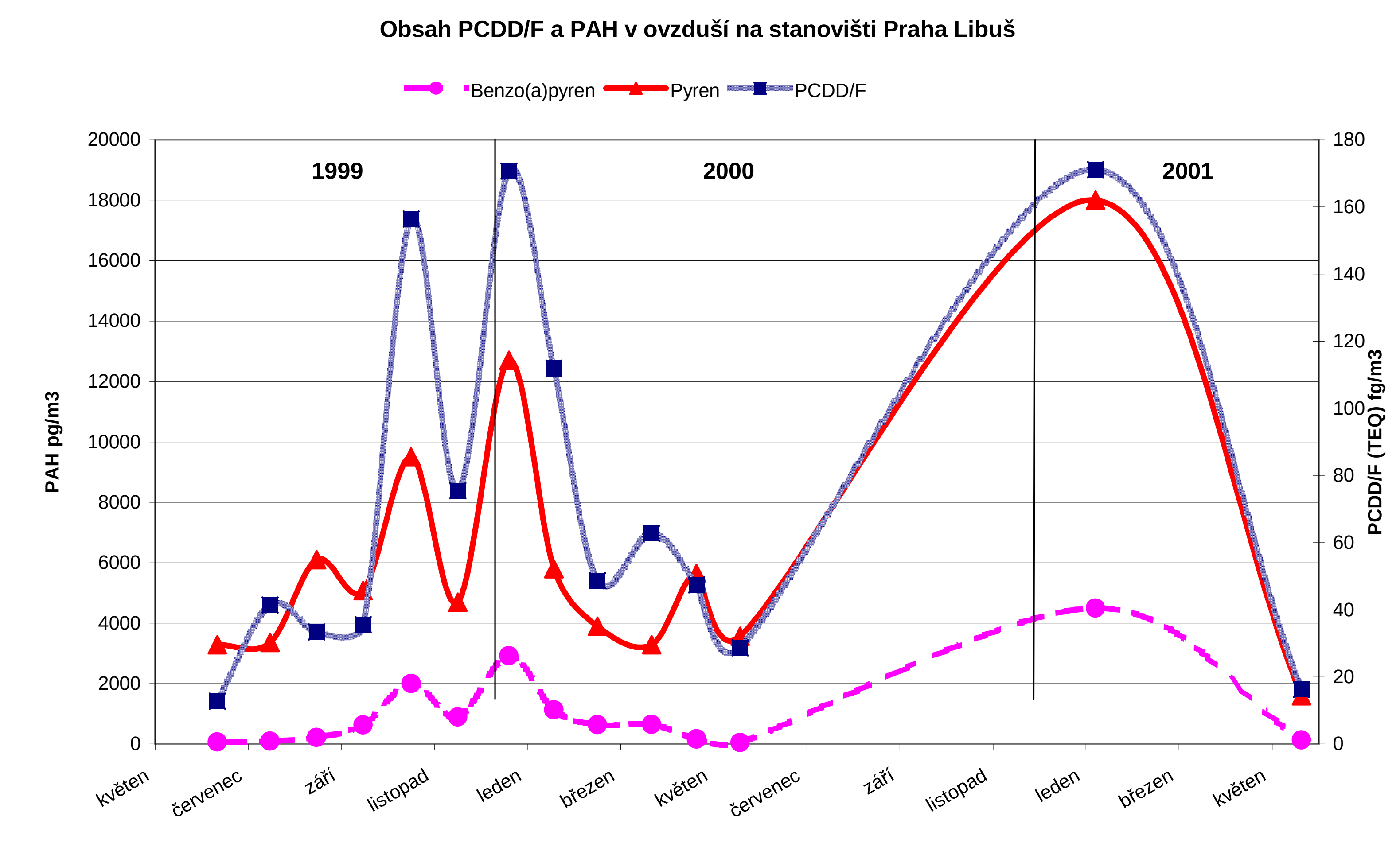


Trends of enivironmental levels of POPs in the CR – regional background monitoring – observatory Košetice – case of PCBs

R - T & A

Long-time measurements of POPs in Prague

AXYS – VARILAB spol. s r.o., 1999-2001



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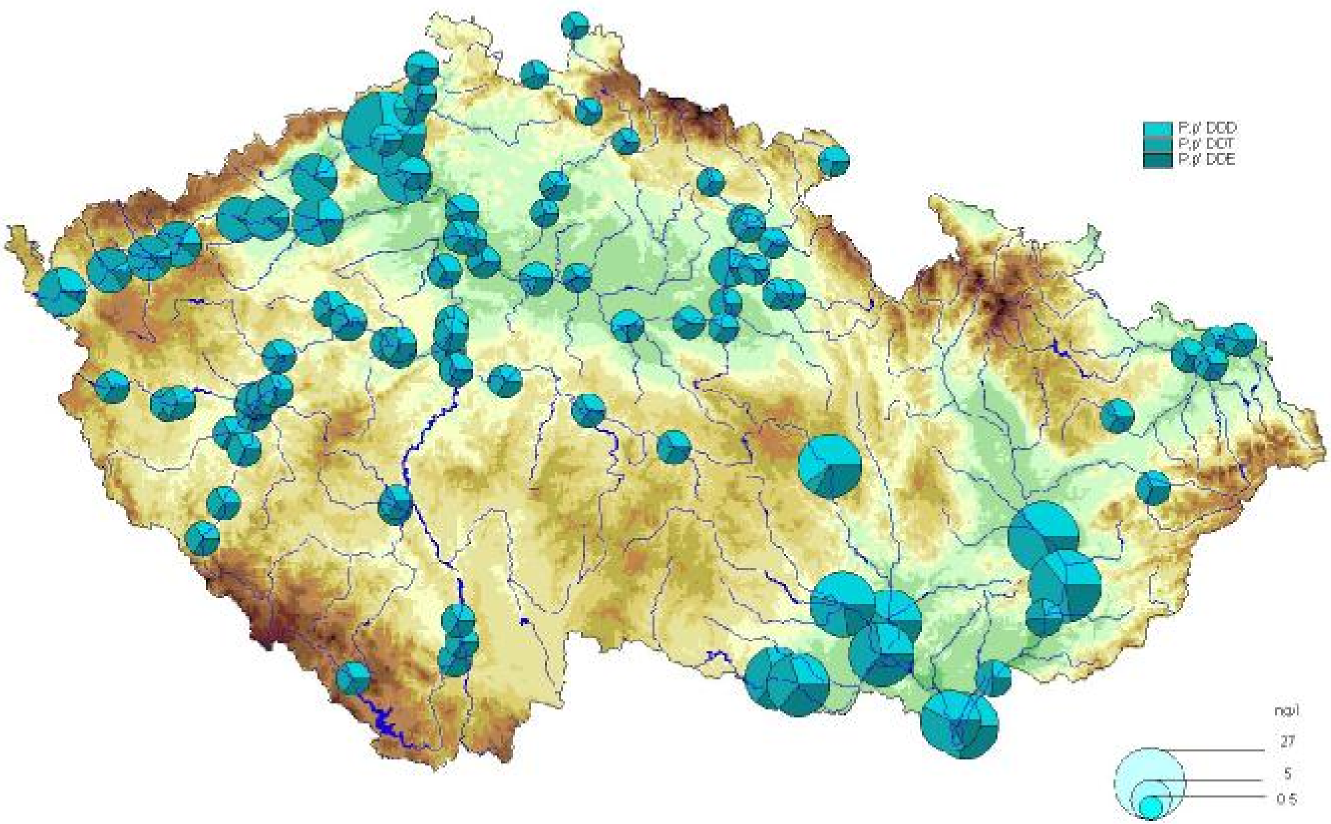
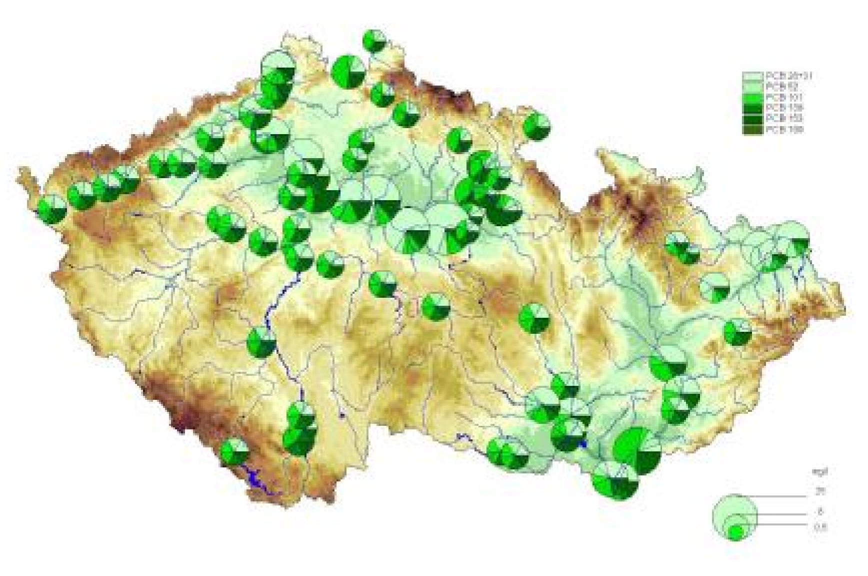
Levels of DDTs in surface waters - 2001

Absolutní zastoupení koncentrací pesticidů DDT ve vodě s jejich poměrným zastoupením v roce 2001

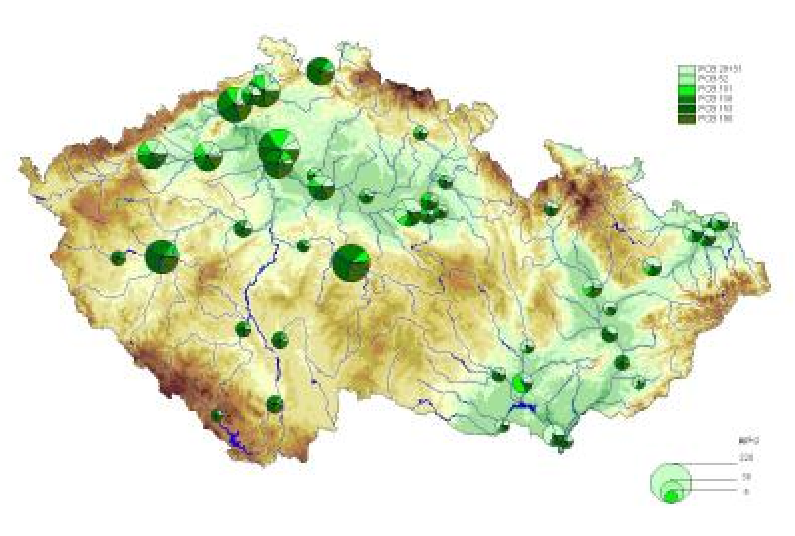


Levels of PCBs in surface waters and sediments - 2001

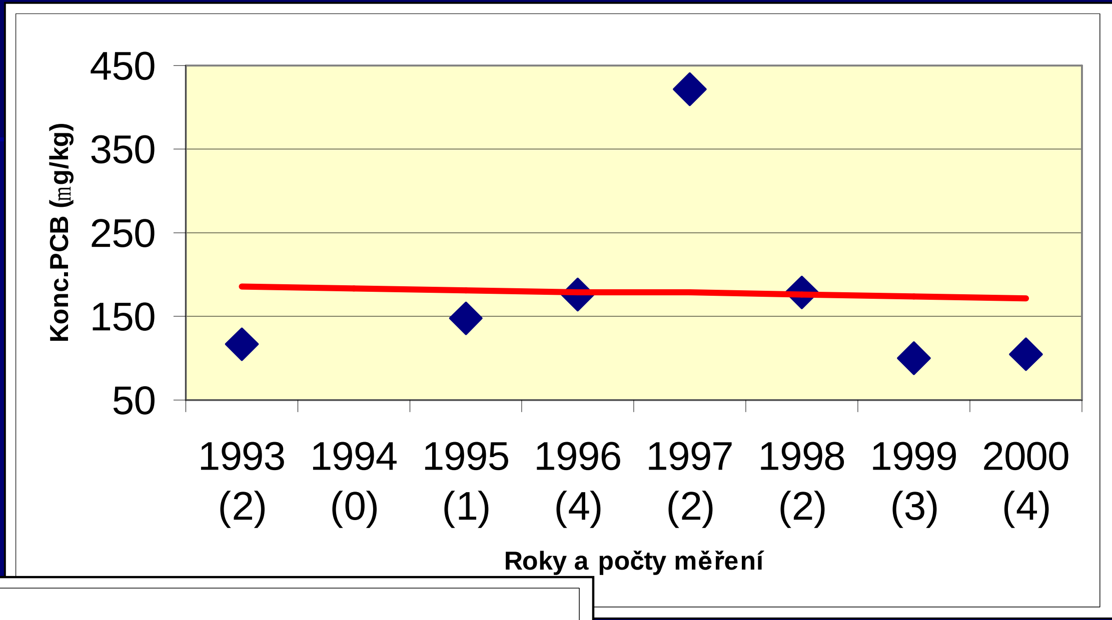
Absolutní zastoupení průměrných ročních koncentrací PCB ve vodě s jejich poměrným zastoupením v roce 2001

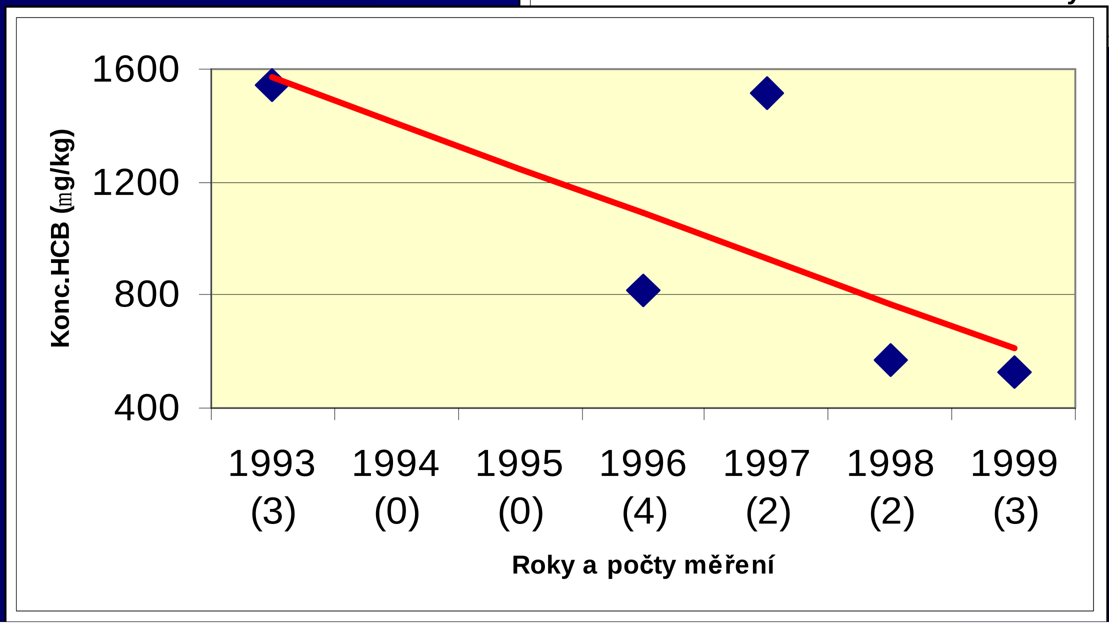


Absolutní zastoupení průměrných ročních koncentrací PCB v sedimentech s jejich poměrným zastoupením v roce 2001



Time trends the changes of concentration of POPs in Elbe sediments between Děčín and Hřensko (linear regression of results, Project Labe)

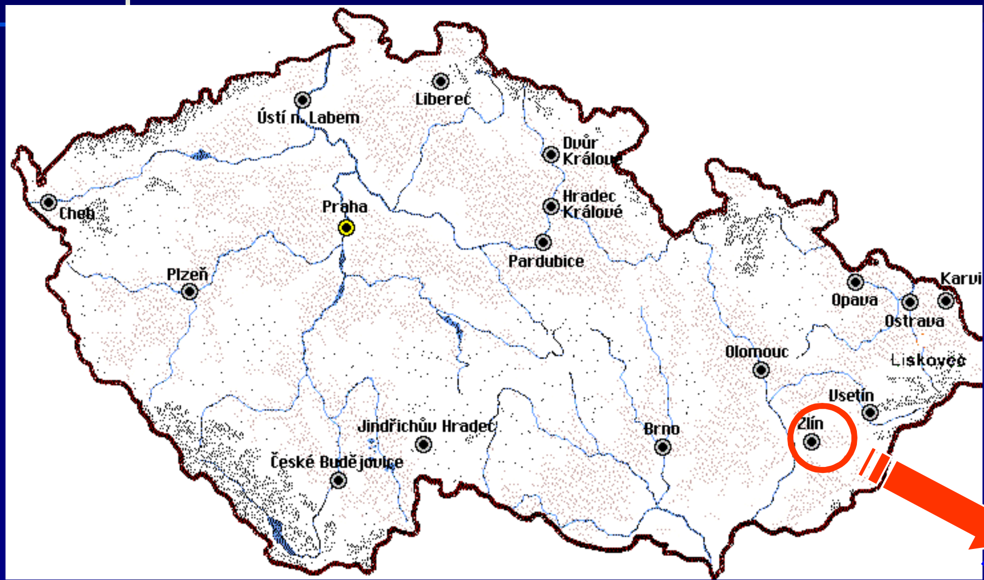


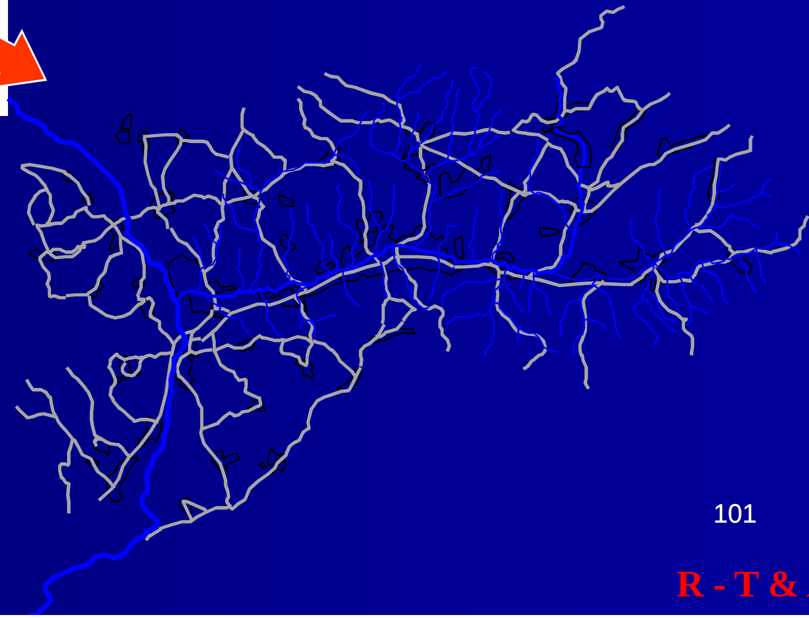


R - T & A

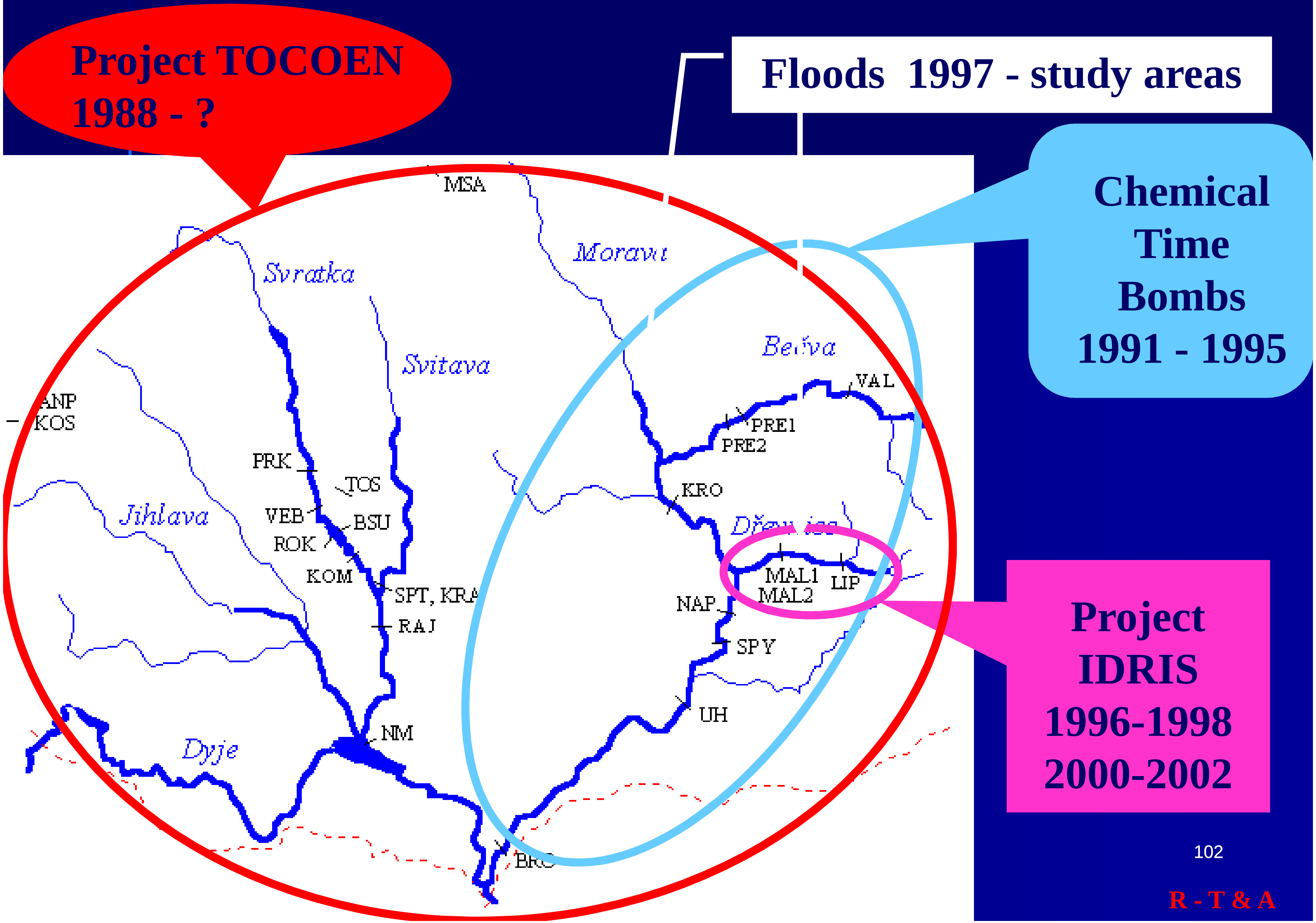
Project IDRIS - model case study

Morava River catchment area



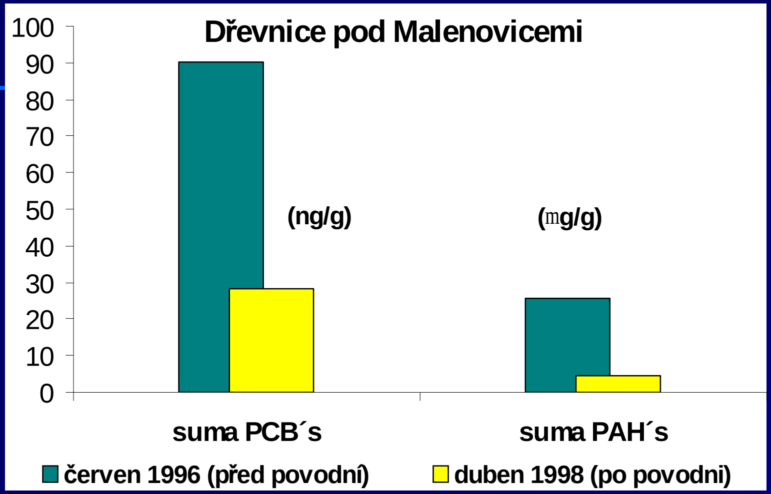


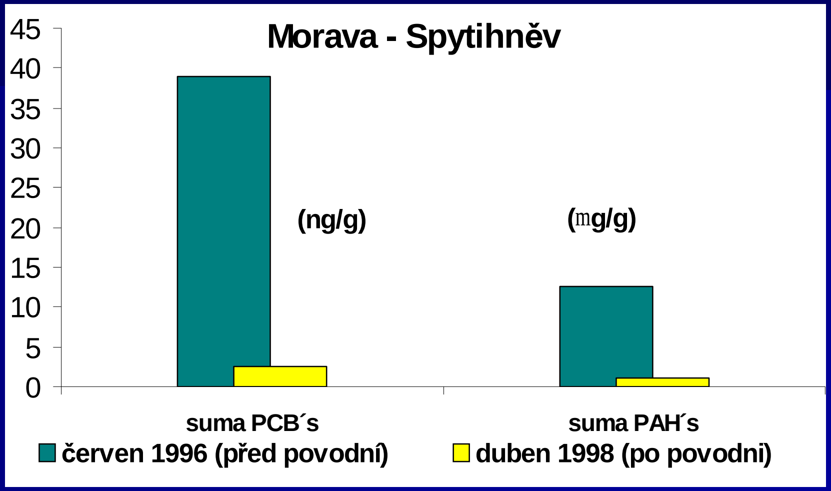
Morava river catchment area



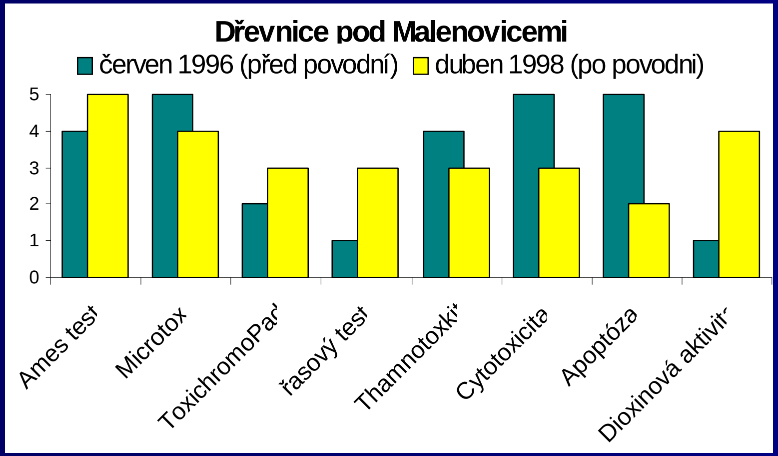
R - T & A

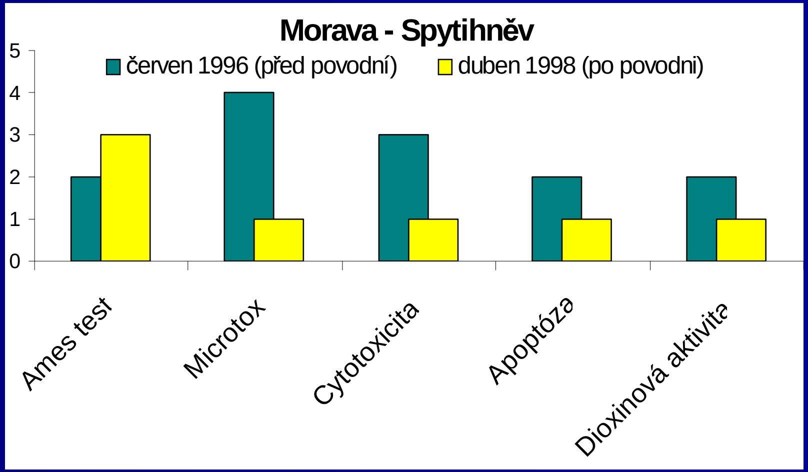
Evaluation of sediment contamination before and after floods (region Zlín 1996 - 1998)





Toxicity, mutagenicity and carcinogenicity (1 - the lowest risk, 5 - the highest risk)





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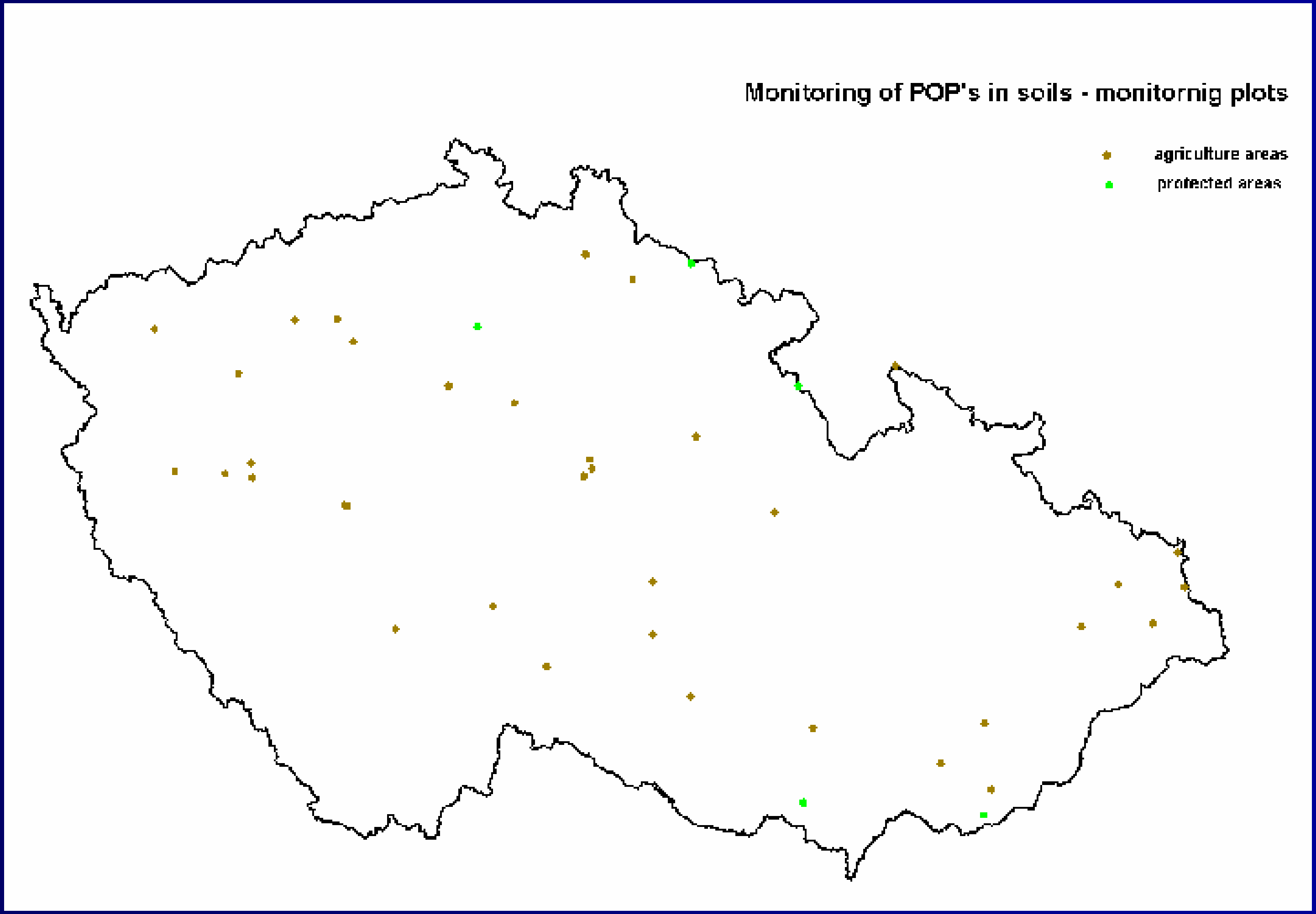
Monitoring of POPs in soils in the CR – monitoring plots



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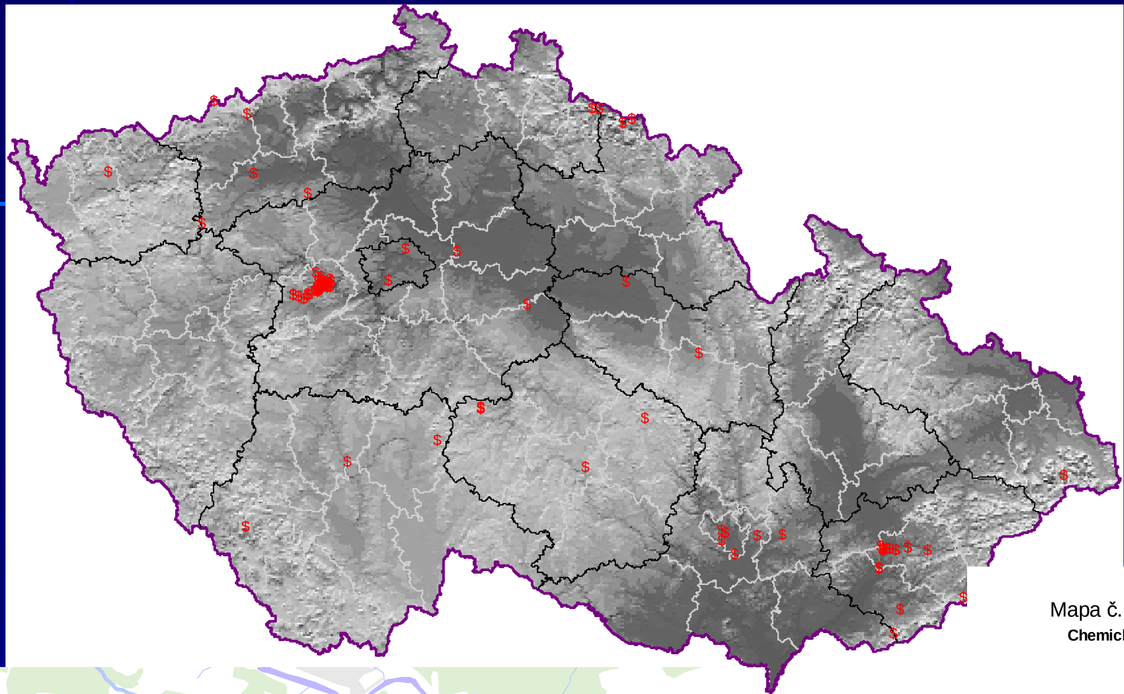
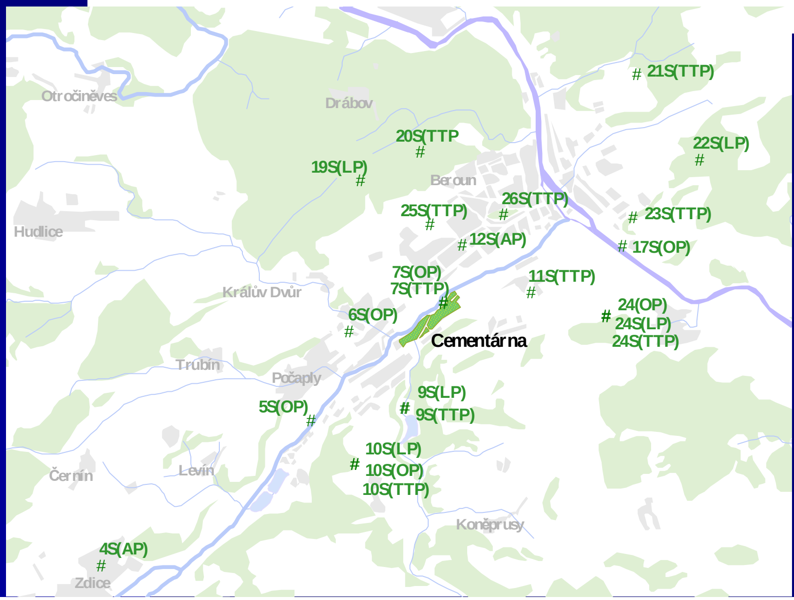
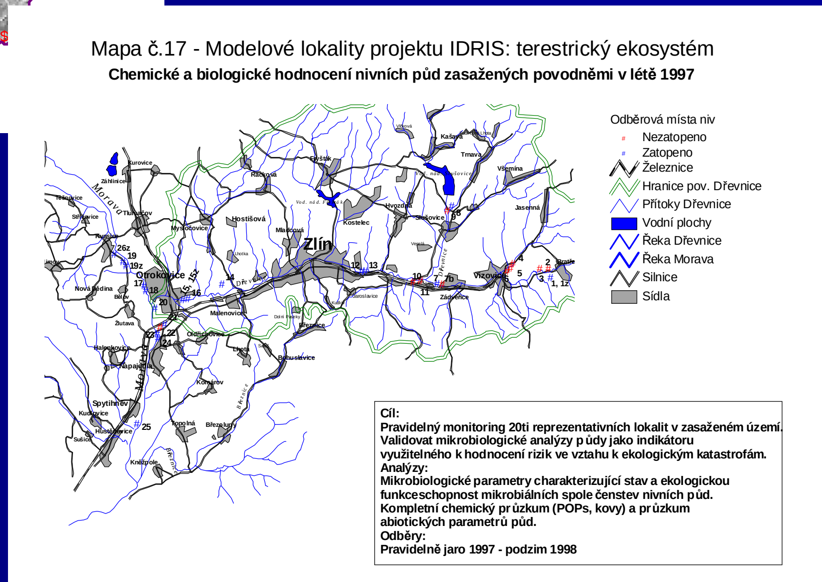
Soil projects of R – T & A

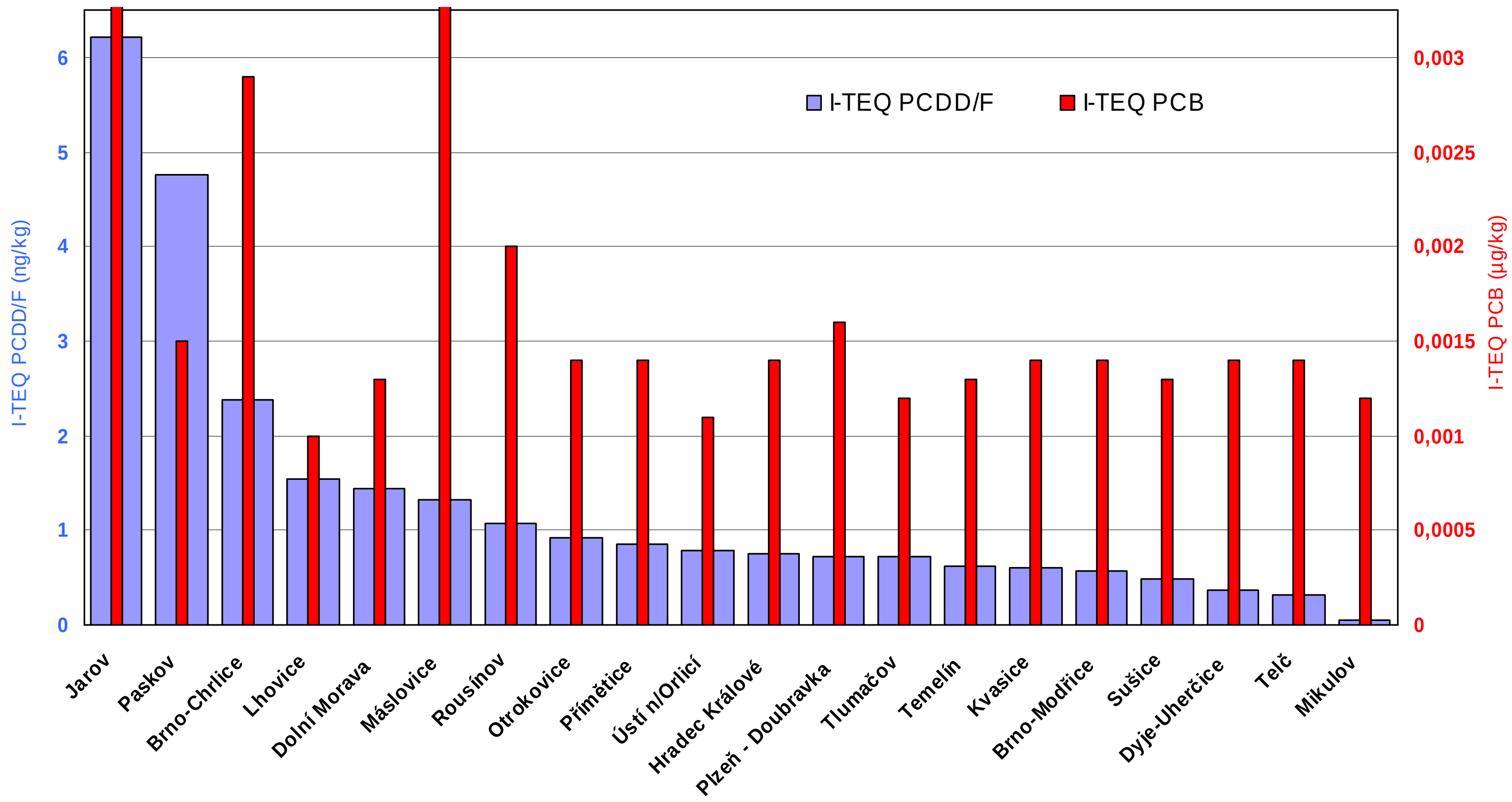






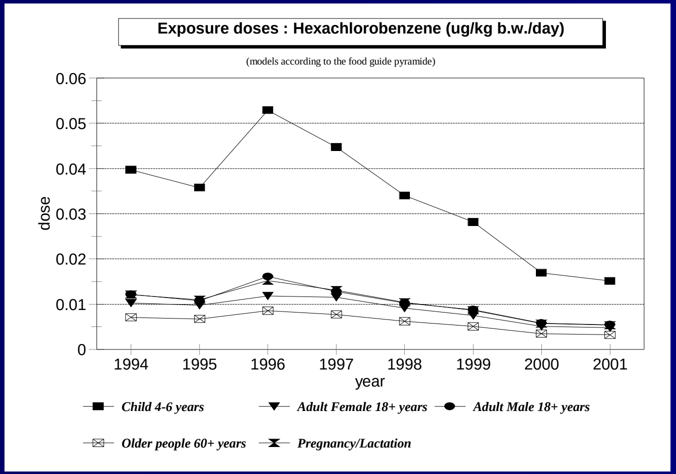
I-TEQ PCDDs/Fs and I-TEQ PCBs - 2001

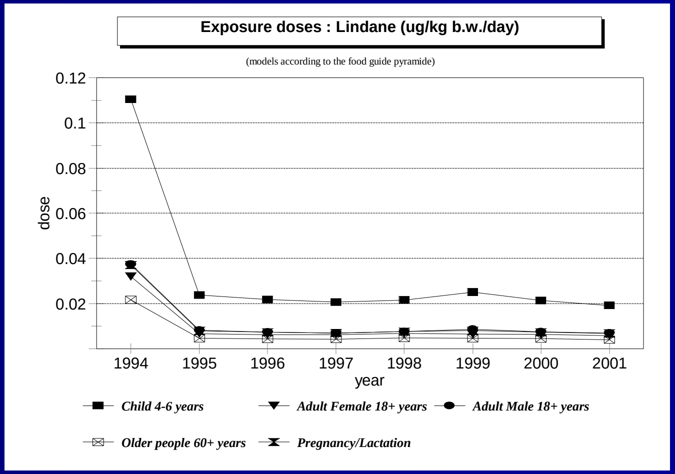
Příloha II-18: I-TEQ PCDD/F a I-TEQ PCB ve sledovaných lokalitách v roce 2001

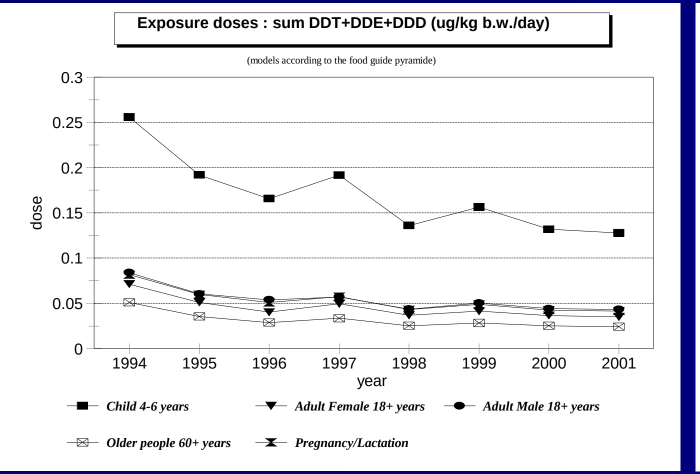


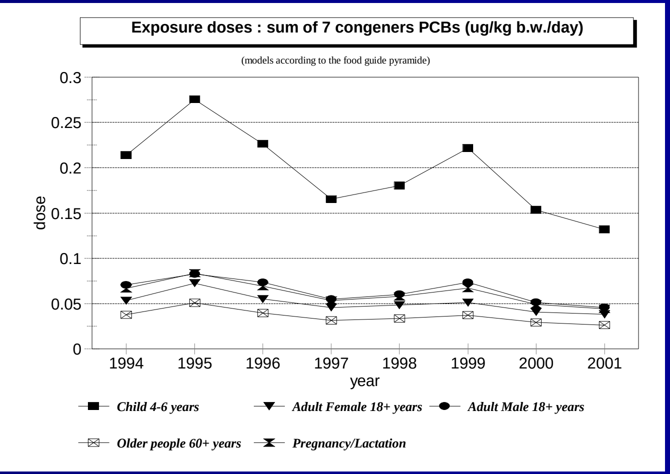
R - T & A

Evaluation of dietary exposure in the CR (CoFC SIH)









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Exposure of Czech population by POPs

WHO-coordinated exposure studies on the levels of PCBs, PCDDs and PCDFs in human milk

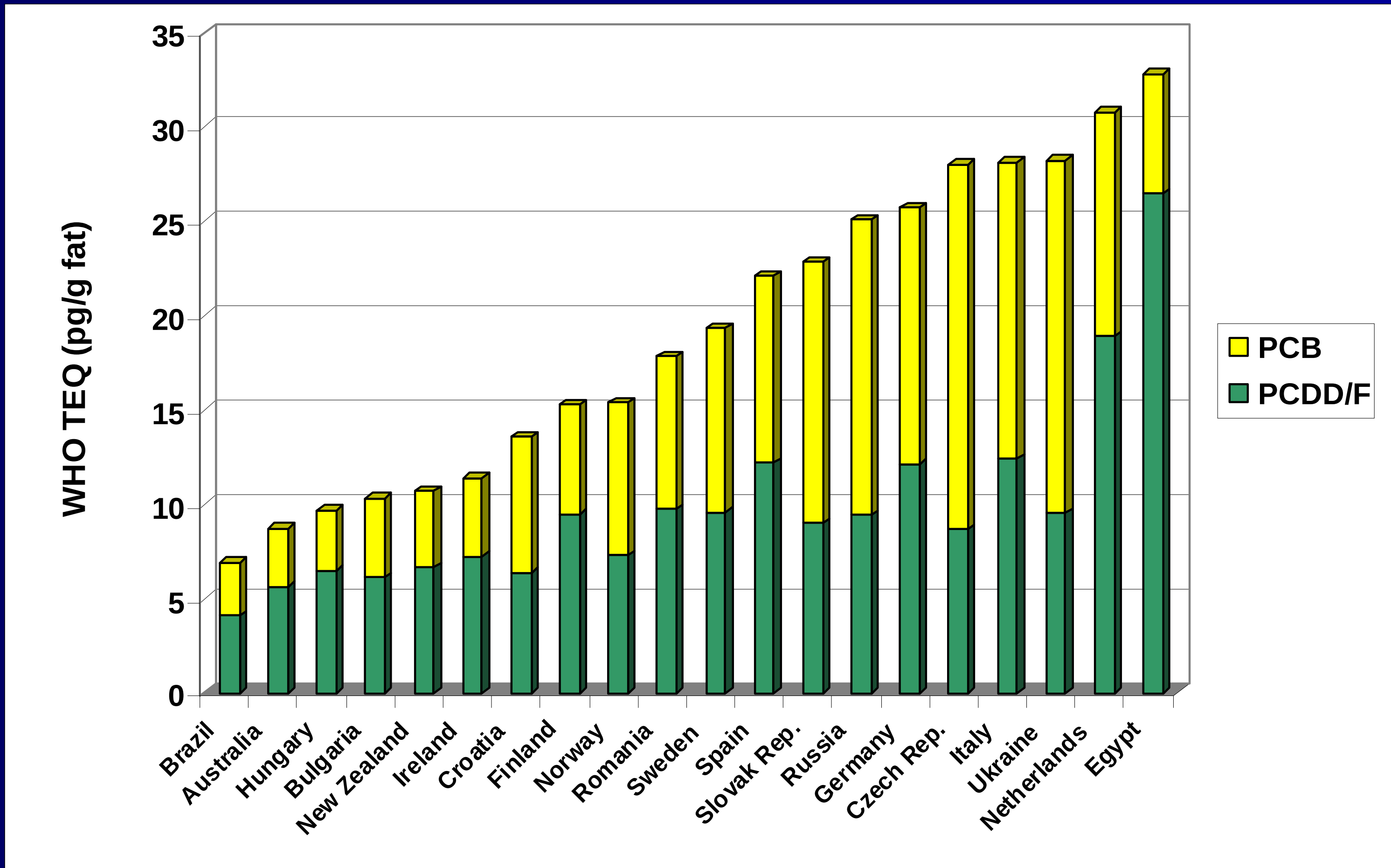
1st Round	**1987-1988**	**WHO-EURO**	**12 countries**
2nd Round	**1992-1993**	**WHO-EURO**	**19 countries**
3rd Round	**2001-2002**	**WHO-EURO** **GEMS Food** **IPCS**	**23 countries**

Exposure of Czech population by POPs

Countries participating in the 3rd round of the WHO-coordinated exposure study

Australia	New Zealand
Brazil	Norway
Bulgaria	Philippines
Croatia	Romania
Czech Republic	Russia
Egypt	Slovak Republic
Finland	Spain
Germany	Sweden
Hungary	The Netherlands
Ireland	Ukraine
Italy	USA
Luxembourg	

Levels of dioxins and PCBs to total TEQ in human milk in various countries



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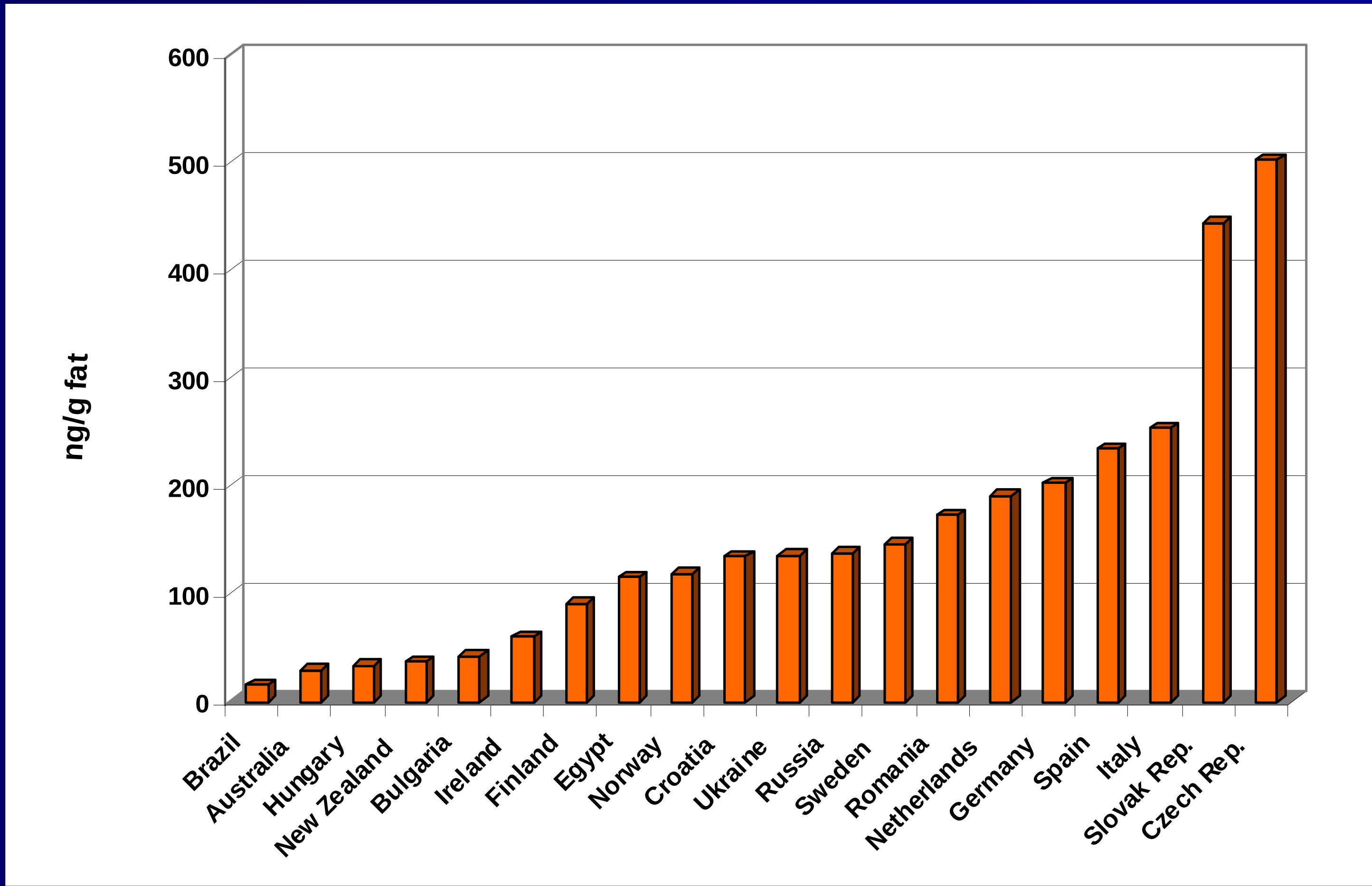
Levels (median) of indicator PCBs in human milk in various countries



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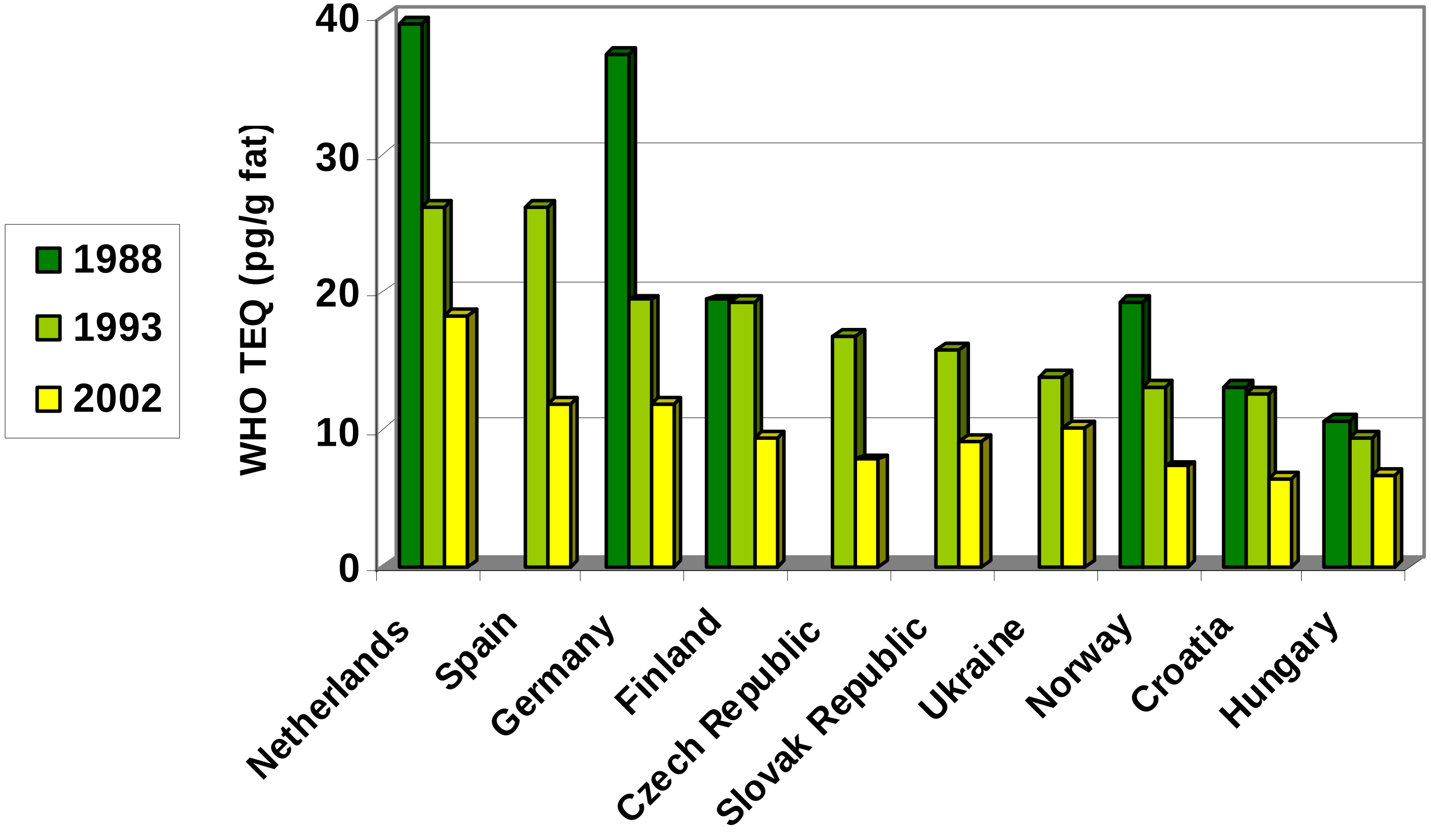
Temporal trend of PCDDs/Fs in human milk



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Hot spots

- Spolana Neratovice and other chemical factories
- Disposal sites
- Obsolete PCBs and OCPs
- Lagoons with sewage and waste sludges
- Contaminated soil and sediments
- MWI – Lysá nad Labem, Liberec, Praha, Ostrava…
- From the point of view of POPs still unspecified sources…
- Effects of natural catastrophs

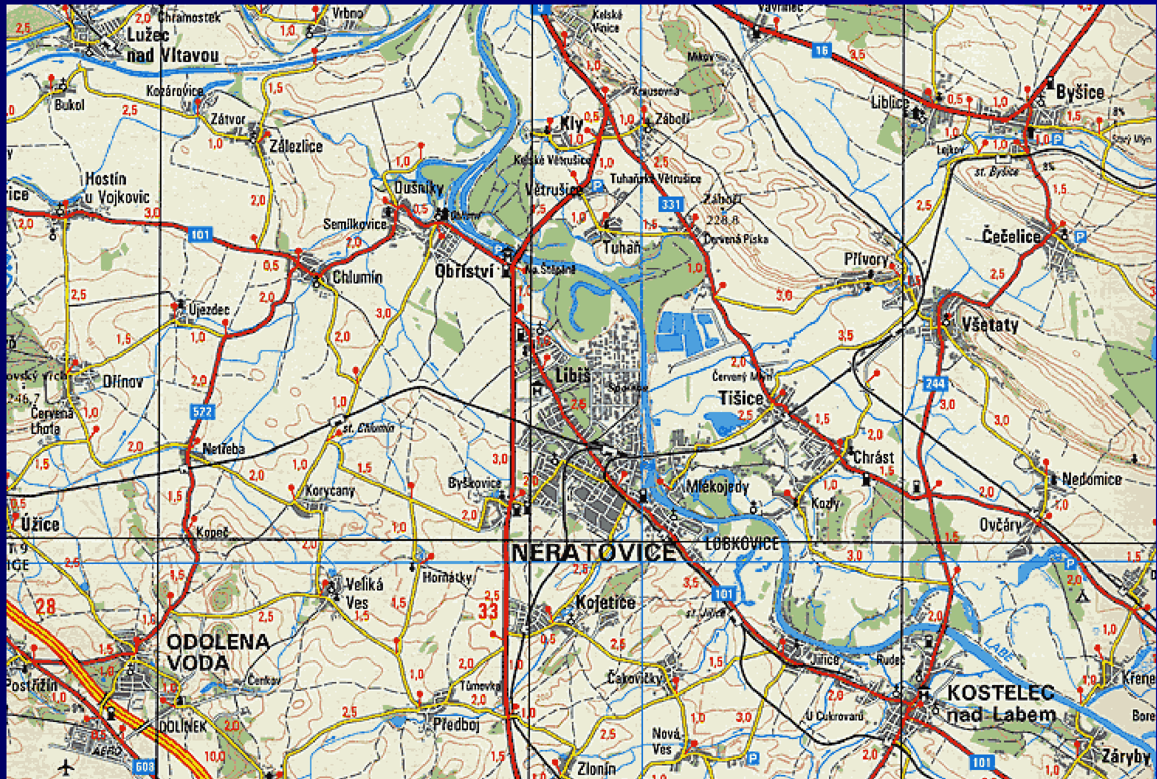
Hot spots

Spolana Neratovice:

- **1961 – production of HCHs (13% g) – pesticide mixtures and production of TrCBz) – TeCBz a HCB**
- **HCB – pentachlorophenolate Na – PeCP**
- **TeCBz – trichlorophenolate a – 245-T**
- **PCDDs/Fs contamination**

Hot spots

Spolana Neratovice



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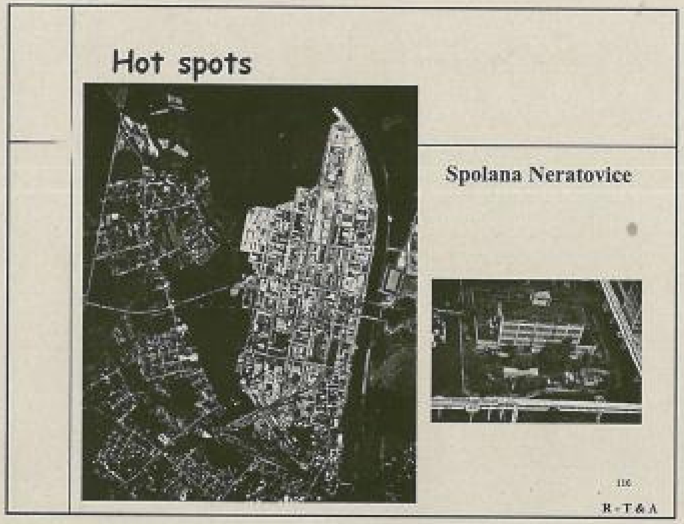

DIBENZO-p-DIOXINS, DIBENZOFURANS AND PCBs IN BREAST MILK IN SELECTED AREAS OF THE CZECH REPUBLIC IN EUROPEAN CONTEXT

V. BENCKO[1], M. ČERNÁ[2], L. JECH[3]

[1] Charles University of Prague, 1st Faculty of Medicine

Institute of Hygiene and Epidemiology

[2] National Institute of Public Health, Prague

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POLYHALOGENATED HYDROCARBONS BELONG TO **ENDOCRINE DISRUPTORS** FAMILY OF **XENOBIOTICS** CONSIDERED TO POSE A GROWING THREAT TO HUMAN HEALTH IN A GLOBAL SCALE.

THEY ARE THE **PRIORITY** ISSUE OF COMMON SCIENTIFIC EFFORT OF US EPA, EUROPEAN INSTITUIONS AND WORLD HEALTH ORGANISATION.

COMPELLING TRENDS IN THE GENERAL HUMAN POPULATION

INCREASED RATES OF **BREAST CANCER** ON THE ORDER OF **1% PER YEAR** OVER A **50-yr** PERIOD (Feuer & Wun, 1992).

A 400% INCREASE IN THE INCIDENCE OF **ECTOPIC PREGNANCIES**, 1970-87 (Nederlof et al., 1990).

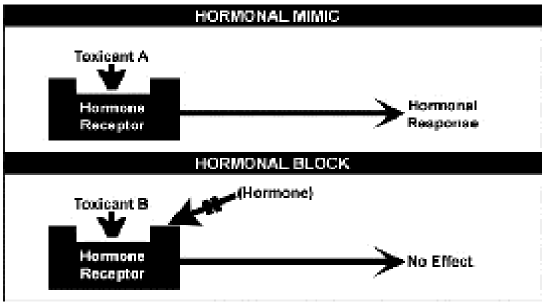
INCREASED INCIDENCE OF **ENDOMETRIOSIS**, AND DECREASED AGE OF ONSET (Berger, 1994)

A DOUBLING OF THE INCIDENCE OF **CRYPTORCHIDISM** IN THE UK, 1970-87 (Chilvers et al.,1984)

INCEASED INCIDENCE OF **TESTICULAR** AND **PROSTATE CANCER** ON THE ORDER OF TWO TO THREE TIMES (Adami et al., 1994)

SIGNIFICANT DECREASES IN SPERM COUNT WORLDWIDE OF APPROXIMATELY **50% SINCE THE 1930s**

(Auger et al., 1995; Carlsen et al., 1992; Sharpe & Skakkebaek, 1993)



EXOGENOUS CHEMICALS MAY ACT AT HORMONE ACTION SITES
(McLachlan, 1993)

MECHANISM OF ACTION

INTERACTION OF **Ah RECEPTOR**
WITH DIOXIN-LIKE XENOBIOTICS
ACTIVATED RECEPTOR - **TRANSCRIPTION OF GENES** INDUCING SYNTHESIS OF **ENZYMES** OF **I. & II. PHASE OF BIOTRANSFORMATION:**

* CYTOCHROM P450
* GLUTATHION-S-TRANSFERASE
* UDP-GLUCURONYL TRANSFERASE

↑ GLUCURONISATION CAUSE
- **THYROXINE EXCRETION** (T4) IN BILE
LEVEL OF T4 STIMULATES
BY FEED-BACK LOOP THS SECRETION WHICH TEND TO **IMBALANCE** OF **HYPOTHALAMUS – PITUITARY AXIS**

BEHAVIORAL CHANGES & IMPAIRMENT OF **COGNITIVE FUNCTIONS** DUE TO IMPAIRMENT OF **THYREOID FUNCTIONS**

MECHANISM OF CARCINOGENESIS OF TCDDF & COPLANAR PCB CONGENERS IS EPIGENETIC

PROLIFERATION & **DIFERETIATION OF CELLS AS A RESULT OF A HORMONAL IMBALANCE.**

DETECTION OF COPLANAR PCBs CONGENERS AND THEIR METABOLITES **ADDUCTS**

CONVICE FOR A POTENTIAL **GENOTOXIC EFFECTS**

INDIRECT EFFECT ON A BLASTIC TRANSFORMATION BY **MODULATION OF BIOTRANSFORMATION** OF CARCINOGENIC XENOBIOTICS (e.g. PAH, AFLATOXIN)

MATERIAL AND METHODS:

WHILE COLLECTING, PRESERVING, TRANSPORTING, AND ANALYSING THE BREAST MILK SAMPLES WE PROCEEDED ACCORDING TO **THE SAME STUDY PROTOCOL** USED BY **WORLD HEALTH ORGANISATION** WITH A SINGLE EXCEPTION IN OUR STUDY:

ANALYSIS OF INDIVIDUAL SAMPLES.

COLLECTION OF BREAST MILK SAMPLES:

THE SELECTION OF DONORS WAS LIMITED TO **PRIMIGRAVIDAS, STANDARD COURSE OF PREGNANCY**, BREASTFEEDING OF A **SINGLE CHILD**, **NURSING PERIOD** (2 WEEKS TO 2 MONTHS AFTER THE BIRTH), **PERMANENT RESIDENCY IN SPECIFIC AREA** DURING THE LAST **5 YEARS**.

MINIMUM SAMPEL QUANTITY 50 ml.

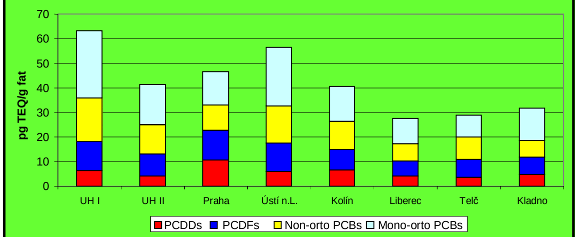
SIMULTANEOUSLY WITH THE SAMPLE COLLECTION, EVERY DONOR FILLED OUT A **QUESTIONNAIRE** WITH THE INFORMATION ABOUT HER **AGE**, DATE OF CHILD'S BIRTH, DATA ABOUT BODY MASS OF THE MOTHER AND CHILD, **DIETARY HABBITS** OF THE MOTHER, INFORMATION ABOUT HER **SMOKING** STATUS, **IATROGENIC** AND **OCCUPATIONAL** EXPOSURE.

EVERY DONOR WAS INFORMED ABOUT THE PURPOSE OF THIS STUDY AND SIGNED AN **INFORMED CONSENT** GIVING THE PERMISSION TO USE THE DATA FOR SCIENTIFIC PURPOSES.

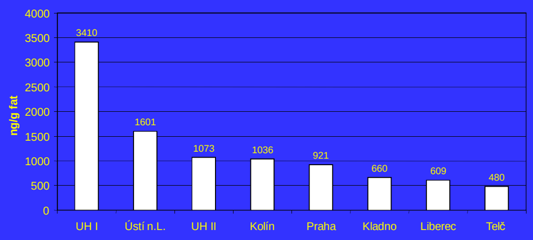
FROZEN SAMPLES WERE TRANSPORTED TO THE LABORATORY AND ANALYSED:
PCDD/Fs A NON-ORTHO PCBs
HR GC-MS CHROMATOGRAPHY
VG ULTIMA 2

FRACTIONS CONTAINING **OTHER CONGENERS OF PCBs**
GC-MS - VARIAN, SATURN

SHARE OF INDIVIDUAL CONGENER GROUPS TO THE TOTAL TEQ (MEDIAN)



SUM OF ALL PCBs (median)



PCDD/Fs AND INDICATOR CONGENERS PCBs (SUM IUPAC 28, 52, 101, 138, 180)
CONCENTRATION IN THE BREAST MILK FAT IN SELECTED EUROPEAN COUNTRIES
A = EXPOSED REGION B = CONTROL REGION

region:	PCDD/Fs TEQ pg/g FAT A	PCDD/Fs TEQ pg/g FAT B	INDICATOR CONGENERS PCBs ng/g FAT A	INDICATOR CONGENERS PCBs ng/g FAT B
WHO study 1993				
BELGIUM	26.6	20.8	261	276
CZECH REPUBLIC	18.4	12.1	1069	532
FINNLAND	21.5	12	186	134
CROATIA	13.5	8.4	220	218
LITHUANIA	13.3	14.4	322	287
HUNGARY	8.5	7.8	61	45
NORWAY	10.1	9.3	273	265
AUSTRIA	10.7	10.9	381	303
RUSSIA	15.2	5.9	197	102
SLOVAKIA	15.1	12.5	1015	489
SPAIN	25.5	19.4	452	461
GREAT BRITAIN	17.9	15.2	130	131

CONCLUSION:

CONGENERS OF PCBs WITH DIOXIN ACTIVITY CONTRIBUTE PRIMARILY TO THE TOTAL AMOUNT OF TEQ IN BREAST MILK FAT,
THE SHARE OF **PCDDs** AND **PCDFs** IS **NOT DECISIVE**.

REGIONAL DIFFERENCES WERE OBSERVED (ESPECIALLY FOR PCBs LEVELS) AS WELL AS **INDIVIDUAL VARIABILITY** OF THE SAMPLES.

EXPOSURE OF CZECH POPULATION TO THE COMPOUNDS WITH **DIOXIN-LIKE EFFECTS** IS **COMPARABLE** WITH OTHER EUROPEAN COUNTRIES**.**

AKNOWLEDGMENTS:

THE AUTHORS THANK FOR DEVOTED COOPERATION TO ALL PARTICIPATING COLLEAGUES IN LOCAL AND REGIONAL **HYGIENIC STATIONS** IN UHERSKÉ HRADIŠTĚ, KOLÍN, PRAGUE, KLADNO, LIBEREC, ÚSTÍ NAD LABEM AND JIHLAVA.

WITHOUT THEIR HELP IT WOULD HAVE BEEN IMPOSSIBLE TO ENSURE THE PROPER SAMPLE COLLECTION FOR THE

PROJECT VaV 520/6/99 SUPPORTED BY MINISTRY OF ENVIRONMENT OF THE CZECH REPUBLIC.

INCINERATION & HEALTH

International Workshop
on Non-Combustion Technologies
for Destruction of POPs

Prague, Czech Republic
16 January 2003

Darryl Luscombe and Pat Costner

GREENPEACE

INCINERATORS ENDANGER PUBLIC HEALTH AND THE ENVIRONMENT

ALL INCINERATOR RELEASES HAVE THE POTENTIAL FOR PUBLIC HEALTH IMPACTS

› STACK GAS
› FLY ASH
› BOTTOM ASH OR SLAG
› SCRUBBER WATER
› OTHER RESIDUES
› FUGITIVE EMISSIONS

MOST WIDELY KNOWN INCINERATOR POLLUTANTS OF CONCERN

- DIOXINS
- PARTICULATE MATTER
- ARSENIC
- BERYLLIUM
- CADMIUM
- CHROMIUM
- LEAD
- MERCURY
- ACIDIC GASES
- PAHs

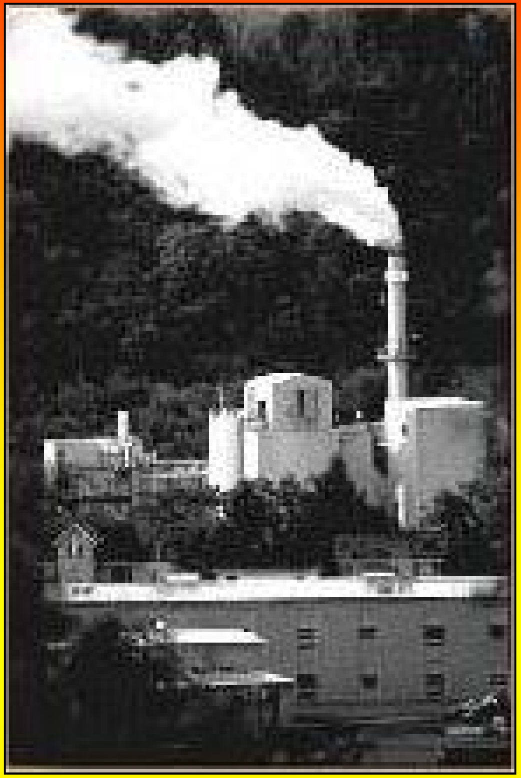
Source: National Research Council, 2000. Waste Incineration and Public Health, Washington, DC: National Academy Press

OTHER TOXIC POLLUTANTS IN INCINERATOR GASES AND RESIDUES

METALS: In addition to the six metals previously listed, 19 other metals have been identified in the wastes sent to incinerators or in incinerator stack gas and/or ash.

ORGANIC CHEMICALS: In addition to dioxins, scientists have detected innumerable organic chemicals in incinerator outputs. Among these so-called products of incomplete combustion (PICs) are hundreds of semi-volatile chemicals of which only 10-14 percent have been completely identified. Semi-volatile PICs are likely to be persistent in the environment and lipophilic (fat-loving).

TOXIC PROPERTIES OF INCINERATOR RELEASES



The following incinerator releases are mutagenic*

•stack gas,

•fly ash

•bottom ash

•airborne particles

* Mutagenic substances can damage DNA in cells. DNA damage can lead to mutations that may be important factors in the development of cancers.

HEALTH IMPACTS OF CHEMICALS IN INCINERATOR RELEASES

CANCER-CAUSING CHEMICALS (CARCINOGENS)

- ARSENIC
- CADMIUM
- DIOXIN
- PCBs

HEALTH EFFECTS OF DIOXINS

- Cancer: One dioxin (2,3,7,8-TCDD) is a known human carcinogen, while the other dioxins are possible human carcinogens;
- Neurodevelopmental effects: reduced cognitive function, increase in hyperactive behavior, adverse effects on attentional processes, increased prevalence of withdrawn/depressed behavior;
- Altered immune function;
- Central nervous system disorders;
- Chloracne and other skin disorders;
- Disrupts liver and kidney function;
- Alters hormone levels: thyroid, testosterone and estrogen;
- Reproductive effects: altered sex ratio, reduced fertility;
- Birth defects: hypospadias;
- Endometriosis.

According to the World Health Organisation, dioxin levels are such that *"subtle effects might already be occurring in the general population in developed countries at current background levels of exposure to dioxins and dioxin-like compounds."*

PEOPLE MOST LIKELY TO SUFFER HEALTH IMPACTS FROM INCINERATOR POLLUTANTS:

>>WORKERS,

>> LOCAL POPULATIONS,

>> REGIONAL OR SUPRA-REGIONAL POPULATIONS

INCINERATOR WORKERS

"..incinerator workers have been exposed to high concentrations of dioxins and toxic metals, particularly lead, cadmium, and mercury."

"Incinerator operators and maintenance workers, and those involved in the collection, transport, and disposal of fly ash and emission control equipment residues, have the potential to be most exposed to toxic substances associated with incineration."

Source: National Research Council, 2000. Waste Incineration and Public Health, Washington, DC: National Academy Press

INCINERATOR WORKERS:

- ü Biomarkers of contamination -hydroxypyrene, mutagens and thioethers -- in workers' urine with increased frequency and at elevated levels; Ma et al. (1992); Angerer et al. (1992); Scarlett et al. (1990); Van Doorn et al. (1981)
- ü Chemical contaminants in workers' urine and blood at elevated concentrations -- dioxins, PCBs, hexachlorobenzene, chlorophenols, benzene, toluene, xylene, arsenic, lead, mercury, and nickel; Kitamura et al.(2000); Schecter et al. (1999); Kurttio et al. (1998); Van den Hazel and Frankort (1996); Wrbitzky et al. (1995); Papke et al. (1993); Malkin et al. (1992); Angerer et al. (1992); Schecter et al. (1991).
- ü Increased death rates from cancer of the stomach, lungs and oesophagus; Rapiti et al. (1997); Gustavsson et al. (1993); Gustavsson et al. (1989)
- ü Increased death rates from ischemic heart disease; Gustavsson (1989) Chloracne, hyperlipidemia, decreased liver function, altered immune functions, altered sex ratio of offspring, hypertension, urinary abnormalities, small airway obstruction of the lungs, and abnormal blood chemistry. Kitamura et al. (2000); Schecter et al. (1999); Bresnitz et al. (1992).

PEOPLE WHO LIVE NEAR INCINERATORS

A newly published study of adolescent children who lived new two incinerators found as follows:

ü Elevated blood levels of PCBs, dioxins and metabolites of volatile organic compounds (VOCs) were in the children's blood.

ü Delayed sexual maturation was noted among these children;

ü Delayed breast development in girls was positively correlated with serum concentrations of dioxins;

ü Delayed genital development in boys was correlated with serum concentrations of PCBs;

ü Reduced testicular volume was found among the boys.

PEOPLE WHO LIVE NEAR INCINERATORS

ü Biomarkers of toxic exposure - thioethers-- were elevated in the urine of children living near a recently built incinerator. Ardevol et al. (1999)

ü Dioxin levels in blood increased by 10-25 percent during the two years following the startup of a new incinerator. Gonzalez et al. (2000)

ü PCB levels in the blood of children living near a German hazardous waste incinerator were elevated. Holdke et al. (1998)

ü Mercury levels in the hair of people living near a waste incinerator increased by 44-56% over 10 years and with greater proximity to the facility. Kurttio et al. (1998)

ü Elevated dioxin levels in blood were found in communities near incinerators in three studies, but dioxins were not elevated in two other studies. Miyata (1998); Deml et al. (1996); Van den Hazel and Frankort (1996); Startin et al. (1994)

PEOPLE WHO LIVE NEAR INCINERATORS, cont.

- ü Clusters of two cancers associated with dioxin exposure -- soft-tissue sarcomas and non-Hodgkin's lymphomas -- were found in one intricate study. Viel et al. (2000);

- ü Increased rates of deaths from childhood cancer, all cancers combined, cancer of the larynx, liver, stomach, rectum, and lung were found in a series of studies, but one study found no increase in death rates from larynx or lung cancer. Elliot et al. (2000); Knox (2000); Knox and Gilman (1998); Michelozzi et al. (1998); Elliot et al. (1996); Biggeri et al. (1996); Babone et al. (1994); Elliot et al. (1992); Diggle et al. (1990)

- ü Six studies found elevated occurrence of various respiratory effects near incinerators, while one study found asthma in children was not elevated. Lee and Shy (1999); Legator et al. (1998); Shy et al. (1995); Gray et al. (1994); ATSDR (1993); Wang et al. (1992); Zmirou et al. (1984).

PEOPLE WHO LIVE NEAR INCINERATORS, cont.

- Elevated rates of congenital anomalies were reported in two studies, while one study found eye malformations were not increased; Ten Tusscher et al. (2000); Aelvoet et al. (1998); Gatrell and Lovett (1989)
- Increased frequency of multiple births was reported in one study, while another found no evidence of increased incidence of twin births; Van Larebeke (2000); Rhydhstroem (1998)
- Altered sex ratios of births -- a deficit of male births -- was found in one study; Williams et al. (1992)
- Lower levels of thyroid hormones were reported among children near a toxic waste incinerator. Osius and Karmaus (1998)

PEOPLE LIVING IN REGIONS WITH MULTIPLE INCINERATORS

"THE COMMITTEE'S CONSENSUS JUDGMENTS ABOUT WASTE INCINERATION AND PUBLIC HEALTH… Implementation of … MACT [Maximum Achievable Control Technology] … is expected substantially to reduce emissions from the highest-emitting facilities. … However, on a broader scale, considering multiple facilities and broader populations, implementation of MACT is unlikely to alter the committee's relative degree of concern for the potential health effects due to pollutants such as dioxin and some metals, and the concerns would remain because these pollutants are persistent, widespread, and potent. Furthermore, there would be no change in the committee's degree of concern for potential worker exposures, because MACT alone would be unlikely to change their exposure."

National Research Council, 2000. Waste Incineration & Public Health. ISBN 0-309-06371-X, Washington, D.C.: National Academy Press.

BROADER POPULATIONS, cont.

"The wide dissemination of dioxins throughout the environment including the food supply, results in wide-spread exposures. Exposure indicators (such as blood and fat concentrations) arising from such exposures are close to the levels that, in some experimental systems, give rise to measurable biologic responses that might be related to adverse health outcomes. Thus, the committee has a substantial degree of concern for the incremental contribution to dioxins emissions from all incinerators on a regional level and beyond. ... The term "substantial" is used to express the committee's highest degree of concern about possible exposure that might lead to health effects among workers, a local population, or a broader population."

National Research Council, 2000. Waste Incineration & Public Health. ISBN 0-309-06371-X, Washington, D.C.: National Academy Press.

Waste Incineration is
- polluting,
- costly, and
- unnecessary.

There are far better ways to manage wastes.

In a world of shrinking resources, it is makes no sense to let valuable resources “go up in smoke,” and doubly so when the smoke carries persistent poisons.

FURTHER INFORMATION

G

Reports

* Incineration and Human Health
* Dioxin Elimination: A Global Imperative
* The Burning Question: Chlorine & Dioxin
* Chlorine, Combustion and Dioxins
* Technical Criteria for the Destruction of Stockpiled Persistent Organic Pollutants

Available from:

http://archive.greenpeace.org/~toxics/reports/reports.html

dluscombe@ams.greenpeace.org

International Workshop on Non-Combustion Technologies for Destruction of POPs

Prague, January 16, 2003

Hazardous Waste Incineration in the Czech Republic

Environmental Record

Jindřich Petrlík

ARNIKA

Hazardous waste incineration Czech Republic

- 50 - 60 hazardous waste incinerators
- 3 cement kilns burning waste
- 2,9% of hazardous waste is burned
- 18,2% of hazardous waste is buried
- hospital waste is hazardous
- one hazardous waste incinerator is dedicated to burn PCBs (in Ostrava)
- no special requirement for burning other POPs

Hazardous Waste Incineration Balance

RISKS

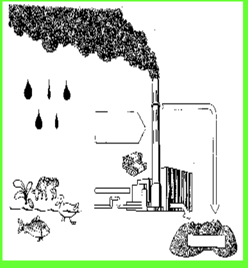
- **transport of hazardous waste**
- **economic hazard (too expensive)**
- **needs waste feeding**
- **additional investments**
- **lack of control and many pollution flows to control**
- **people don't like it**

"ADVANTAGES"

- **looks safe**
- **looks easy to manage**
- **is large enough for people looking for simple solutions (majority of decision makers)**
- **can produce some energy**
- **it makes money**

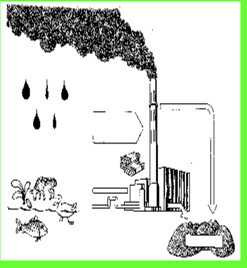
Incineration Impacts on Environment

- **Inside goes:**
  - **waste**
  - **money**
- **Outcomes:**
  - **air emissions**
  - **(toxic) waste**
  - **waste water**



Incineration Impacts on Environment

- **Air**
- **Water**
- **Waste**
- **Other effects**



(ng/m3)	m (g/y)	Year 2001 Top Ten worst incinerators according to PCDD/Fs emissions measurements (in TEQ) - one day per year measurements (data required from Czech Environmental Inspection) (year 2001) Waste incinerator name:
18,29	0,06	ČKD Praha DIZ a.s.
8,7	0,03	SPL, Jablonec nad Nisou
7,3	0,16	ICN a.s., Roztoky u Prahy
6,8	0,04	Hospital (NsP) Karviná
6,1		EKOTERMEX, Vyškov, Kettenbauer
4,35	0,01	Hospital Bulovka. Praha
3,8	0,04	Hostpital FN Motol, Praha
3,76	0	Snaha Brtnice
3,73	0,06	Hospital Olomouc
3,2	0,02	EKOKOMBEK s.r.o., České Budějovice

Underestimation in dioxin emission inventories

R. De Fré, M. Wevers
VITO, Vlaamse Instelling voor Technologisch Onderzoek, Boeretang 200, 2400 Mol, Belgium
ORGANOHALOGEN COMPOUNDS (1998)

Time of measurements	Measured concentrations of dioxins (PCDD/Fs) in ng TEQ/Nm^3 by 11 % O_2	
(day-month-year)	Continual sampling	Six hours sampling
29-12-97 – 12-01-97	13,4 (14,3)	
12-01-98 – 26-01-98	8,2 (12,9)	0,25
26-01-98 – 30-01-98	12,6 (10,1)	
09-02-98 – 23-02-98	2,11 (2,12)	
23-02-98 – 09-03-98	0,44	
9-03-98 – 23-3-98	0,33	0,12
23-03-98 – 06-04-98	0,8	

Standard six hours measurements underestimated real dioxin emissions 30 - 50 times.

Toxic Air Pollution

- Hazardous waste incinerators are large sources of toxic emissions of many other chemicals than only PCDD/Fs. But these compounds are not usually measured.

- Incinerator Břeclav 1998
- PCDD/Fs 0,91 ngTEQ/m^3
- PCBs 0,01 ngTEQ/m^3
- PAHs 23,46 ngTEQ/m^3
- HCB 10,28 ngTEQ/m^3

Water Pollution

Some incinerators produce waste water, with large scale of toxic compounds. There not too many measurements known or published in the Czech Republic. Big hazard can create some serious accidents like it happened at this incinerator - Ekotermex Vyškov in 2001, when the rive was polluted by toxic chemicals leaking during handling hazardous waste.

Soil contamination by PCDD/Fs near incinerator

HAZARDOUS WASTE INCINERATOR IN HOSPITAL OSTRAVA - PORUBA (MORAVIAN-SILESIAN REGION)

Air emissions PCDD/Fs concentration measured in 1997: 1,69 ngTEQ/m^3

PCDD/Fs measured in soil near incinerator by Axys Varilab (2001): 19,7 pgTEQ/g

(the highest dioxin contamination measured in the Czech Republic for study done in 1999 - 2001, just for correlation in Libiš near Spolana Neratovice the concentration 26 pgTEQ/g was measured this year)

Toxic Fly Ash on Long Travel

- **Liberec incinerator produce about 3.000 t of fly ash per year**
- **it is washed, but still includes dioxins on level 362 ngTEQ/kg**
- **it means 1.086 mgTEQ/year**
- **fly ash goes to landfill in mixture with bottom ash 30 km far**
- **waste water from landfill, which can include dioxins goes to treatment plant again 30 km far**
- **we did not find out, what does happen with sewage sludge after treatment**
- **State institutions gave up to control this long trip of dioxins**

Hazardous waste incineration Accident hazard

- 1993 **Fire in Motorpal Jihlava incinerator**
- 1997 **Explosion and fire in Emseko Zlín incinerator - whole incinerator destroyed**
- 2001
  - **Explosion in Plzeň - Na Slovanech incinerator, kiln partly damaged**
  - **Leakage of chemicals during handling them in Ekotermex Vyškov incinerator**
- 2002 **Fire of chemicals in ELO Hradec Králové incinerator**

Case study - Lysá nad Labem

- **Hazardous waste incinerator run by company Rean**
- **Capacity: 3.500 t/y**
- **Positive EIA statement according to Czech law**

Case study - Lysá nad Labem

- **The incinerator doesn't complain even with Czech legislation requirements**

- **It has not enough safe space to store waste before it's burned**
- **Insufficient groundwater and soil protection / polluted water can drain directly into the soil without cleaning**
- **It doesn't complain with required dioxin emissions limit**

Case study - Lysá nad Labem

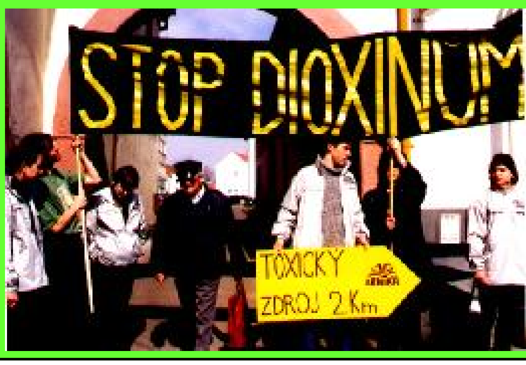
- **The incinerator doesn't complain with Czech legislation requirements**

- **Unclear statements about burn waste**
- **Also PCBs and DDT burn even incinerator is not dedicated to burn high chlorine content waste**
- **... but still is trusted by Czech institutions responsible for environment protection**

Main environmental problems

- **Overestimated capacity**
- **Poor control of the processes**
- **Common exemptions from existing legislation**
- **Uncontrolled toxic compounds releases**
- **Poor education of workers about possible health and environmental damages**

Our response



BY-PRODUCTS – THE CHALLENGE, by Jack Weinberg

Some provisions of the Stockholm Convention require phase-out and elimination of the production and use of certain pesticides and some other chemicals whose production and use in many countries has already stopped or has been in decline for decades. Some other provisions require proper disposal and destruction of residual stockpiles and wastes that contain these substances. The proper implementation of these provisions – an often challenging and costly task – will bring closure to some significant toxic legacies of the past.

On the other hand, Article 5 and Annex C of the Stockholm Convention fall into a different category. This Article specifies the measures Parties must take to reduce and eliminate releases of POPs that are produced as unintentional byproducts of certain human activities – dioxins, furans hexachlorobenzene (HCB), and polychlorinated biphenyls (PCBs). This Article (together with several other provisions, such as, for example, Article 8 on listing new chemicals; Article 13 on financial resources and mechanisms; the DDT provisions of Article 3 and Annex B; and some others) is very forward looking. It is not, at all, a legacy issue. Rather, Article 5 of the Stockholm Convention advances a future vision of sustainable development, cleaner production and chemical safety.

Over the past three decades, the EU, the U.S. and a few other countries have considerably reduced the rate at which dioxins[1] are released to the environment in their jurisdictions. As a result, the levels of dioxins found in the environment, in the food supply and in the body tissues of their human populations have declined from the historic high points reached in the 1970s. That's the good news.

The bad news is that, in these countries, dioxins are still present in the environment, in ordinary food, and in human bodies at levels with the potential to cause serious harm to human health and to the environment. Furthermore, it appears that many of the methods that were employed in these countries to reduce dioxin releases may be reaching limits of the kind imposed by the law of diminishing returns. In the absence of newer approaches and newer ways of thinking, the trend toward release reductions in these countries may be slowing or stopping. Dioxin levels in their environment, food supplies and human populations may be tending toward a plateau that is still unacceptably high: a plateau at levels that can still cause substantial health and environmental injury.

In these countries, the progress that has been made in reducing dioxin levels from their historic high points has required very large investments of both public and private funds. Public funds are often used for extensive dioxin monitoring and testing, and they are also used to put in place ambitious and expensive regulatory, control and enforcement regimes. Large expenditures of public and private funds are also used to install and operate costly pollution control equipment. Still, despite these measures and the

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1 Here and elsewhere, the term dioxins will be used as a short hand for dioxins, furans, PCBs and HCB when they are generated and released to the environment as a result of human activity. This short hand is for convenience, and it is not intended to suggest that the term dioxins can generally be used as a substitute for PCBs or HCB.

reductions they have achieved, the results are still unsatisfactory and large segments of civil society remains very dissatisfied with the performance of government and industry.

In most developing countries and countries in transition, however, the situation is very different. In many, if not most, it appears that the total release of dioxins to the environment is not declining, but may be rapidly rising, year after year. Dioxin sources, their rates of release, and the levels of dioxins in the environment, in food and in human populations have not been well documented because most developing countries and countries in transition lack both the funds and the technical capacity to monitor or test dioxin releases from facilities and/or monitor dioxin levels in the environment, in food and in humans. Without baseline data, and without capacity for monitoring and testing, it becomes very difficult for most countries to design and effectively implement measures to regulate and control dioxin releases.

In addition, many of the approaches used in the U.S. and EU to control and reduce releases from large stationary sources, such as waste incinerators, require massive capital and operating investments from the private sector, municipal authorities, national governments and others on a scale that is beyond the reach of comparable groups in most countries. In this regard, the approaches used by the U.S., the EU and some others to reduce dioxin releases from their historic high points may not be practically replicable in most of the rest of the world.

If the approaches used by the US and the EU to reduce dioxin releases from their historic high points cannot be widely replicated in other countries, then different approaches must be taken. Otherwise, the world trend will not be toward reduction of total dioxin releases to the environment. Rather, total dioxin releases may continue to rise with no end in sight. This is especially of concern if one assumes that current rising trends (in many countries) in the per capita production, use, and disposal of synthetic chlorinated materials (e.g. chlorinated plastics, pesticides, solvents, bleaching agents, etc.) will continue unabated.

It would be a tragedy if developing countries and countries in transition experience a rapidly rising trend in total dioxin releases and a corresponding rising trend in dioxin levels in their environments, food supplies, and populations. If this were to happen, it would impose an additional and substantial burden on the public health, environment and economies of countries struggling to alleviate poverty and achieve sustainable development. Still, there is valid reason for concern that dioxins in the environments of developing countries will continue to increase, approaching and possibly even greatly exceeding the historic high points that were experienced by the U.S. and the EU during the 1970s. In addition, the further down this track developing countries travel, the more costly it will become to reverse course.

Such a public health disaster can be avoided if the Stockholm Convention is appropriately understood and implemented, so that, as countries industrialize, priority consideration is given to *prevention* and *substitution*. Developing countries can avoid creating new dioxin sources and expanding existing sources, thereby minimizing total dioxin releases. In the long term, *prevention* is the most cost-effective approach, and it is the approach that is most compatible with sustainable economic development and poverty

alleviation.

Policies that are based on *prevention* and *substitution* represent a common sense approach. Measures to prevent dioxins from being produced are more desirable, more practical and, in the long-term, more cost-effective than introducing end-of-pipe measures that require national authorities to attempt the management and control of substances that they have no capacity to detect or monitor. This provides a strong motivation to support *prevention* and *substitution* measures that avoid dioxin formation.

Article 5 and Annex C of the Stockholm Convention establish a goal of the continuing minimization of dioxin releases and, where feasible, their ultimate elimination. They also establish, as a core strategy for achieving this goal, the design and implementation of policies of *prevention* and *substitution* based on the understanding that these should be given priority consideration over end-of-pipe approaches that attempt to manage and control dioxin releases.

CHAPEAU OF ARTICLE 5

Article 5 of the Stockholm Convention includes a list of seven measures (numbered a though g). In addition, many of the measures make reference to Convention text contained in an Annex C on *"Unintentional Production."* This list of measures is preceded by a Chapeau that states:

"Each Party shall at a minimum take the following measures to reduce the total releases derived from anthropogenic sources of each of the chemicals listed in Annex C, with the goal of their continuing minimization and, where feasible, ultimate elimination."

The NGO community takes this Chapeau text very seriously. The Chapeau states that all seven of Article 5's measures are obligations upon Parties to the Convention, and the Chapeau creates an overarching framework and a context in which these measures are to be understood and implemented.

Total Releases

The Chapeau addresses the ***total releases*** of dioxins, furans, PCBs and hexachlorobenzene (HCB) when these releases are derived from anthropogenic sources, that is, when they occur as a result of human activity.

The choices of both the word *"total"* and the word *"releases"* are significant and were intentional. These words were exhaustively debated. They each appear in the text as a result of agreements that were reached by the negotiators.

In the past, when most countries adopted regulations to control releases of dioxins, they have most often treated dioxins as a single-media problem. So, for example, regulations on stationary combustion facilities most commonly control dioxin *emissions* to the air without paying equivalent attention to dioxin releases to other media. Or, alternatively, regulations on pulp bleach plants have mainly focused on dioxin *discharges* to water without equivalent attention to releases to the air or other media.

In the negotiation of the Stockholm Convention, it was agreed that dioxins and other POPs are not single-media pollutants. POPs cycle between air, water and land, and can travel long distances in the environment as they cycle: this, in fact was the initial motivation for negotiating a global treaty.

So, it makes very little sense to promote measures that might encourage a facility to meet an air emissions limit value by shifting pollutants of concern into a water discharge or into a land transfer. Therefore, in the negotiation of the Stockholm Convention, it was agreed to consistently use the term ***"releases"*** which is generally understood to mean, "releases to any media." It was agreed generally not to use the term ***"emissions"*** which is commonly understood to mean, "releases to the air[2];" or to use the term ***"discharges"*** which is generally understood to mean, "releases to the water." As a result, the Stockholm Convention requires an all-media approach. The goal is to reduce and eliminate dioxin releases to all media: air, water and land.

The word ***"total"*** also has meaning. The measures should be designed to reduce (with the goal of continuing minimization, etc.) the totality of releases from anthropogenic sources (sources that result from human activity) and not just some releases from some sources.

Continuing Minimization and Ultimate Elimination

The final phrase of the chapeau is very substantive: ***with the goal of their continuing minimization and, where feasible, ultimate elimination.***

Practical problems arise when a business enterprise is required to reduce dioxin releases from a facility; or when a new facility is being proposed, and strict release limit value requirements are imposed.

If the enterprise is well managed, its managers will want to know: is this a one-time requirement? Or, will the authorities come back next year and the year after and demand further reductions?

This is a very important consideration that business managers must take into account when considering their investment strategies for choosing techniques or technologies that will potentially enable their facility or facilities to conform to dioxin-related regulations. The term ***"continuing minimization"*** should be a clear signal. The dioxin reduction standard required at any point in time should be understood as an interim measure – not an end point. The enterprise's management should expect that in the future, further reductions will be required.

This is relevant because, in most cases, an intelligent investment strategy must take into account not only the interim goals to be met next year and the year after, but also must take into account the longer term goals. A technology investment that allows an enterprise to meet its current dioxin release limit goals is a poor choice if the chosen technology is not compatible with future obligations to achieve further reductions at a later

2 In fact, the UNECE LRTAP Convention defines the term "emission" as releases to air.

date. In other words, the phrase ***"continuing minimization"*** tells investors to think long term -- plan for continuing release minimization and recognize that tomorrow's standards will be stricter than today's standards.

In addition, the goal stated in the Chapeau is: ***"where feasible, ultimate elimination."*** Measures to achieve this goal are spelled out in more detail in the provisions of Article 5 and Annex C.

If a facility produces dioxins, then the release of dioxins to the environment can never be totally prevented. Some amount will inevitably escape. End-of-pipe pollution controls can reduce the amount of dioxin released, but they cannot achieve elimination. The only practical way to eliminate dioxin releases is through ***substitution***. In this context, the term ***substitution*** means, that when a Party to the Convention is considering permitting a human activity (such as the construction and operation of a facility), and when this activity is likely to produce dioxins and release them to the environment, the Party should give ***priority consideration*** to alternative human activities that have the same or similar usefulness, but which do not generate dioxins and release them to the environment.

Finally, the term ***"where feasible"*** gives practical meaning to the term ***priority consideration,*** a term that appears in Annex C Convention text (and which will be discussed in more detail later). During the negotiations, all agreed that the term ***"feasible"*** includes technical, economic and other practical considerations. This suggests that when an alternative is available that is not likely to generate dioxins, and when it is generally comparable in cost, function and suitability to a proposed process likely to generate dioxins, the alternative can be considered to be economically, technically and practically ***feasible.*** Therefore, under these circumstances, elimination is feasible: the alternative should be selected, and the originally proposed process should not be permitted.

Substitution

According to Article 5, (c), each Party shall:

"Promote the development and, where it deems appropriate, require the use of substitute or modified materials, products and processes to prevent the formation and release of [dioxins] *taking into consideration the general guidance of prevention and release reduction measures in Annex C and guidelines to be adopted by decision of the Conference of the Parties."*

This text states that the Party, itself, decides when it is appropriate to require substitution. It also states that this decision should take into consideration guidelines on prevention and release reduction contained in Annex C.

Annex C, (Part V, B) provides guidance on Best Available Techniques. In subsection (b), as a preamble to "General release reduction measures," this text clearly indicates that ***substitution*** is preferred to end-of-pipe, release reduction measures; that ***substitution*** should receive ***priority consideration.*** The text states:

"When considering proposals to construct new facilities or significantly modify existing facilities using processes that release [dioxins], *priority consideration should be given to alternative processes, techniques or practices that have similar usefulness but which avoid the formation and release of* [dioxins]."

Finally, it should be noted that Article 5 (d) states that Parties shall promote the use of Best Available Techniques, and it states further that for certain "new sources," Parties shall require the use of Best Available Techniques.

Taken together, these provisions (together with Annex C, Part II) suggest that when a Party is presented a proposal to construct a new facility or significantly modify an existing facility of a type that has the potential for comparatively high formation and release of dioxins to the environment, it should require an ***Alternatives Assessment*** as a first step and an integral part in the application of Best Available Techniques.

An ***Alternatives Assessment*** begins with a valid survey to determine whether alternative processes, techniques or practices are available that have similar usefulness but which avoid the formation and release of dioxins. Then, if one or more such alternatives are identified, a further assessment should be made comparing the proposed new facility with the alternatives, giving consideration to matters such as: short-term costs; likely longer-term costs; similarity of usefulness; suitability for the task at hand; and other relevant economic, environmental and practical factors. If one or more of the alternatives is generally comparable or better, it should be given priority consideration and the construction of the originally proposed facility should be discouraged.

Incremental Costs

The implementation of measures spelled out in Article 5 and Annex C will, in many cases, require substantial financial and technical capacity. It is therefore important to recall that the Convention's financial and technical measures and obligations were very carefully negotiated. Many developing country Delegates to the negotiations stated clearly that while protecting the public's health and the environment from POPs is very important, the highest priority for their country is – and must remain – sustainable economic development and poverty alleviation. Many stated further that their country currently lacks the necessary financial and technical capacity to meet obligations proposed for inclusion in the Stockholm Convention. Many therefore expressed a reluctance to agree to obligations for which they lacked the technical and financial capacity to fulfill.

The solution to this dilemma was an agreement that the Stockholm Convention on POPs will include provisions for technical support and a financial mechanism – provisions sufficiently robust to enable developing countries and countries in transition to comply with Convention obligations that they would otherwise lack technical and financial capacity to meet. Furthermore, it was agreed that financial resources mobilized under the Convention would not be deducted from existing financial aid programs (e.g. for sustainable development, poverty alleviation, and other existing programs) but would be *"new and additional financial resources."* These agreements are spelled out in Articles 12, 13 & 14.

The key provision in relationship to financial mechanisms is Article 13, paragraph 2. This paragraph states that financial resources will be made available to:

"... enable developing country Parties and Parties with economies in transition to meet full incremental costs of implementing measures which fulfill their obligations under this Convention as agreed between a recipient Party and an entity participating in the mechanism..."

Financial assistance under the Stockholm Convention will be based on a calculation of the full ***Incremental Costs*** associated with implementing measures to fulfill their Convention obligations. In simple terms, ***Incremental Costs*** might be calculated as the difference between, on the one hand, the costs entailed by a country in meeting Convention obligations and, on the other hand, the amount that would have been spent by the country (for similar utility) if the country were not a Party to the Convention and had no obligations under it. However, the language also suggests that agreed ***Incremental Costs*** are as much the outcome of a negotiation as they are precisely calculable figures.

The ways that Parties and the financial mechanism agree to calculate ***Incremental Costs*** associated with implementation of Article 5 will have the greatest significance. For example, consider the following Convention text from Annex C, Part V (f) under the topic – General prevention measures relating to both best available techniques and best environmental practices:

"When considering proposals to construct new waste disposal facilities, consideration should be given to alternatives such as activities to minimize the generation of municipal and medical waste, including resource recovery, reuse, recycling, waste separation, and promoting products that generate less waste."

It may be relatively easy to calculate incremental costs associated with installing an expensive filter on a waste incinerator to reduce dioxin emissions in order to meet some hypothetical Convention obligation requiring dioxin emissions to be below some specified release limit value. In fact, vendors from the flue gas cleaning industry now attend every Sub Regional Workshop on POPs to promote their wares in expectation of new export business.

On the other hand, in many circumstances, the institution of new programs to promote or require waste separation, recycling, resource recovery, etc., will likely represent a more practical and effective approach in carrying out the Convention-required mandate "to reduce total releases" of dioxins, as called for in Article 5. Still, it may be more complex to calculate the ***Incremental Costs*** for these kinds of programs than it is for the ***Incremental Costs*** of buying an extra filter. The same thing is generally true for all of the ***Substitution*** measures that Parties are obliged to promote and require under Article 5 (c).

Best Available Techniques

Furthermore, some now argue that as used in the Stockholm Convention, the term "Best Available Techniques" (BAT), applies only to interventions based on investment in capital-intensive, high technology solutions. They want to suggest that alternatives that might be less dependent on imported capital goods and more dependent on domestic resources and labor power do not qualify as BAT, but should be considered Best Environmental Practices (BEP). If this argument is accepted, it sets in place a very bad trend.

Under the Convention, Parties are, under some circumstances, obliged to ***require*** the application of BAT. They are also obliged to ***promote*** the application of BEP, but they are never obliged to ***require*** BEP.

One might therefore assume that the Parties and the financial mechanism might, when calculating ***Incremental Costs,*** give more weight to those measures Parties are obliged to ***require;*** and they may tend to give less weight to those measures Parties are only obliged to ***promote.*** If this is the case, and if a trend is established in which BAT equals "capital-intensive" while BEP equals "labor-intensive," an unfortunate bias will have been created that is in no way based on actual Convention text.

The term ***"Best available techniques"*** is defined in Article 5 (f) as *"activities and their methods of operation."* The text states that the term *"techniques"* includes technology – both technology itself and the ways in which technology is used. But nowhere does the text say or imply that the term BAT applies only to technology-intensive applications. If that were the intent, the Stockholm Convention may have used the term "Best Available Technology." However, the chosen term is "Best Available Techniques."

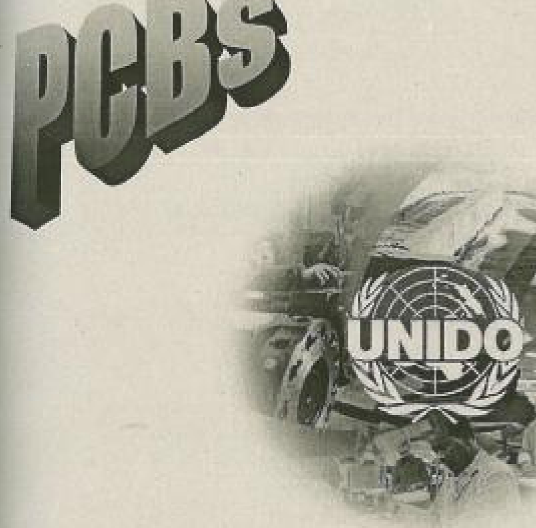
In some cases, this confusion of meaning may derive from translation difficulties. English Language dictionaries, however, define the word "technique" in various settings, as: the application of skill, including procedures and methods.

However, if a bias develops in which the term "BAT" becomes equated with capital-intensive interventions, this would be harmful and counterproductive.

Such a bias would be most beneficial to countries that mainly export capital equipment; such a bias would be much less beneficial to countries that mainly import capital equipment.

Many countries will be guided in selecting the measures they employ to meet obligations under the Convention – in large part – by their perceptions of how ***Incremental Costs*** under the Convention will be calculated, and their perceptions of what kinds of interventions will be most readily supported by the Convention financial mechanism. Article 5, and the priority it gives to *prevention* and *substitution* will be badly undermined if there is a trend to associate BAT exclusively with capital-intensive applications. If this happens, it will become difficult if not impossible to calculate ***Incremental Costs*** for measures that entail *prevention* and *substitution*, but much easier to calculate ***Incremental Costs*** for filters and other end-of-pipe interventions.

In the end, the effectiveness of the Stockholm Convention's Article 5 – to reduce and eliminate dioxin releases – will be more influenced by how ***Incremental Costs*** are to be calculated than by any other single factor. It is essential that the preference for *prevention* and *substitution* as articulated in the Convention text becomes reflected in the agreed methodologies that emerge to the calculation of ***Incremental Costs.***



Global Environment Facility

International Conference "Non Combustion Technologies for POPs" Prague, January 2003

Martin Murin, MSc.
Non-Comb Project – present stage in the Slovak Republic

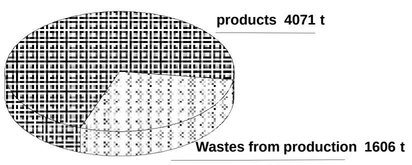
PCBs Inventories

1. Stockpiles
2. Wastes
3. Equipment containing PCBs
4. Polluted sites
5. Unintended emmissions

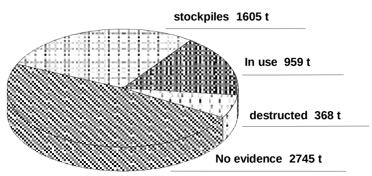
PCBs Stockpiles

- Residues from Production
- Residues / Sources for electric / hydraulic equipment
- PCBs in equipment not used yet
  - Information from
    - import / export
    - finalisation unit
    - Energo – companies
    - Statistical resources

Initial Inventory of PCBs in Slovakia (Kocan et. Al. 1998)



Initial Inventory of PCBs in Slovakia (Kocan et. Al. 1998)



PCBs Wastes

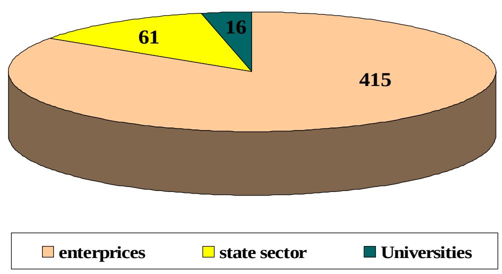
- Waste – electric or other equipment for destruction
- Waste dumpsides
- Waste oil
  - Evidence
  - Statistics
  - Control measures

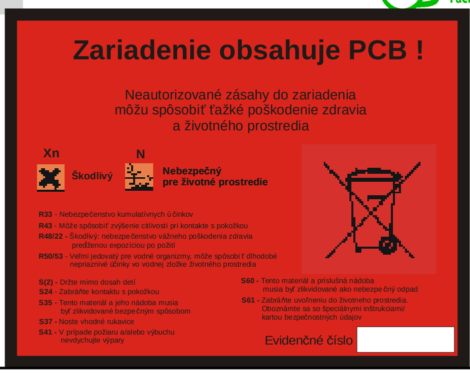
Equipment containing PCBs

- In use or stored for use
- Methodology / guidance document
- Voluntary cooperation of industry
- State programme
- Identification problems
- Control mechanisms

Subjects participating in Slovakia

(Total No. Of subjects 492)





Results – Slovakia 2001

Transformers	Condensers
BEZ Bratislava	ZEZ-SILKO Žamberk
ELPROM Sofia	Elektrické pece n.p. Praha
SEZ Žilina	ZEZ n.p. Praha
BEZ Brno	ZSE Praha

Priestor so zariadeniami obsahujúcimi PCB !

Results – Slovakia 2001 Other equipment

NZ 8 level – ETS Ostrava (vysokozdvizna plosina)
Oil iniciator Krompachy
H1.50XM manipulation car – Hyster UK
ND 9 – 031 transport manipulátor
EV 65433.12, EV 698.45.81, EV 717.33.73, EV 717 manipulation car – Balcancar
Kondensators distributor
Autožeriav AD 28 – ČKD Slaný
DESTA manipulation car
Dowthermová heating unit – Bertram, Switzerland
High frequency cabel ANKPOV, ANKOPJ

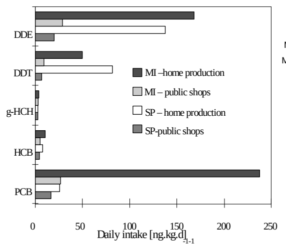
PCBs polluted sites

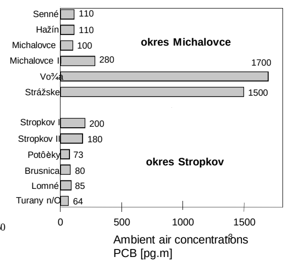
- **Production sites**
- **Formulation / Manipulation sites**
  - **e.g. asphalt finalisation**
- **Waste dump-sites containing PCBs wastes**
- **Areas impacted by PCBs pollution**

Slovakia – Zemplinska Sirava lake

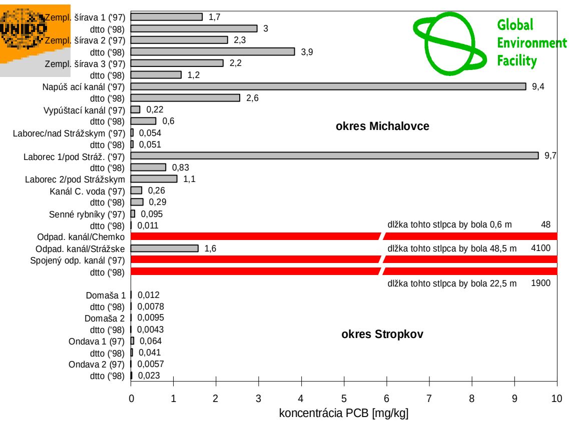
PCBs levels – Monitoring results Slovakia (Kocan et. Al. 1998)

Global Environment Facility





Global Environment Facility



PCBs to be destructed

Global Environment Facility

- Stockpile of PCBs in Chemko factory
  - 1000 tonns
- Capacitors and other PCBs equipment
  - 30 000 – 40 000 pcs (800 tonns)
- Polluted sediments and soil
  - 33 000 tonns

Financial plan

Global Environment Facility

- GEF donation
  - 5 Mio USD – destruction technology
- Chemko co-finance
  - 1.5 Mio USD – preparatio of the site
  - 2 Mio USD – operational costs (2 years)
- Slovak Republic co-finance
  - 4.5 – 5 Mio USD – sediments decontamination

The Stockholm Convention and POPs Destruction Technologies

International Workshop on Non-Combustion Technologies for Destruction of POPs

Prague, Czech Republic
16 January 2003

Darryl Luscombe (PhD)

GREENPEACE

Stockholm Convention

- The first global legally binding treaty on toxic chemicals
- Signed on 22 May 2001 by over 90 countries (now 151)
- Ratified by 25 Countries (as of 12 Jan 2003)
- Will enter into legal force when 50 countries have ratified the convention
- But all nations have agreed to begin acting immediately
- Initially targets 12 chemicals – the dirty dozen

Stockholm Convention

Requires:

…each country to reduce the total releases derived from anthropogenic sources of [POPs], with the goal of their continuing minimization and, where feasible, ultimate elimination.

Elimination

- Identify processes and materials in which by-product POPs are formed
- Avoid introduction of industries which cause formation of POPs
- Phase-out of processes and materials in which POPs are formed
- Remediate contaminated soils, sediments, groundwater to remove reservoirs

Cleaning up the mess - secondary sources

- Stockpiles of PCBs, pesticides, wastes
- Lands, sediments, groundwater, materials contaminated with dioxins and other POPs
- Essential that this is done in a way that doesn't result in formation or release of POPs
- Use of non-combustion destruction technologies

Stockholm Convention

Parties are to take measures so that POPs wastes are:

- ~ *Disposed of in such a way that the persistent organic pollutant content is destroyed or irreversibly transformed so that they do not exhibit the characteristics of persistent organic pollutants...*
- ~ *…not permitted to be subject to disposal operations that may lead to recovery, recycling, reclamation, direct reuse or alternative uses for POPs.*

Stockholm Convention

Parties must:

…promote the development and, where it deems appropriate, require the use of substitute or modified materials, products and processes to prevent the ***formation*** *and release of dioxins/furans and other by-product POPs.*

Criteria from Stockholm Convention

A suitable destruction process/technology therefore should:

- ~ Prevent the formation of dioxins, furans and other by-product POPs.
- ~ Prevent the release of dioxins/furans and other by-product POPs.
- ~ Not generate any wastes with POPs characteristics.
- ~ Not utilise any POPs disposal methods which are non-destructive, such as landfilling or recycling in any form.

Greenpeace Criteria

for the Destruction of Historical POPs Wastes

Destruction … must be accomplished in a manner that does not further degrade the environment.

1. An effective destruction efficiency of 100% - taking into account all inputs and releases;
2. Complete containment of all process streams to enable testing and reprocessing if necessary to ensure (1);
3. No uncontrolled releases from the process.

Further Considerations when Evaluating Technologies

- Eliminate inappropriate technologies (based on guidance/criteria)
  - E.g. formation of POPs/releases of POPs/POPs wastes/landfill etc
- Destruction Efficiency (based on inputs vs. all outputs)
- Ability to contain all process streams
- Ability to reprocess materials, residues, gases, liquids if required
- Availability of complete process information (analytical data)
- Track record/commercial availability
- Safety/OH&S
- Hazardous materials use
- Community acceptability

Available Technologies

GPCR - Ecologic	Incineration
Base Catalysed Dechlorination	Vitrification
Sodium reduction	Deep-well injection
Solvated electron	Plasma
Electrochemical	Solvent washing
Super Critical Water Oxidation	Landfill/burial
Ball milling	Solidification/stabilization
Molten salt	Land spreading
Catalytic hydrogenation	Molten metal*

Technology	Commercial scale	Countries where licensed and/or used for commercial treatment
Gas Phase Chemical Reduction	full	Australia, Canada, USA, Japan
Sodium reduction	full	France, Germany, UK, Netherlands, South Africa, Australia, USA, Saudi Arabia, Japan, New Zealand
Base Catalysed Dechlorination	full	Australia, USA, Mexico, Spain, New Zealand, Japan
Solvated electron	full	USA
Electrochemical	limited	USA, UK
Catalytic hydrogenation	limited	Australia
Super-critical water oxidation	limited	USA, Japan
Ball milling	demo/limited	Germany, New Zealand

GPCR – Eco Logic

- **Process:** Hydrogen reacts with chlorinated organic compounds, such as PCBs, at high temperatures/low pressure yielding primarily methane and hydrogen chloride.
- **Efficacy:** Demonstrated high destruction efficiencies for PCBs, dioxins/furans, HCB, DDT.
- **Applicability:** All POPs – including PCB transformers, capacitors, and oils. Capable of treating high strength POPs wastes. May not be economic for low level wastes
- **Licensed:** Australia, Canada, USA, Japan

GPCR – Eco Logic

- **Emissions:** All emissions and residues may be captured for assay and reprocessing if needed.
- **Concerns:** Use of hydrogen gas, although company has good environmental/regulatory track record. Fate of arsenic/mercury in system. Use of afterburner for burning product gas (methane).
- **Applicability under Stockholm Convention for POPs destruction:** Potentially suitable.

BCD

- **Process:** A non-conventional heterogeneous catalytic hydrogenation process which reacts organochlorines with an alkali metal hydroxide, a hydrogen donor and a proprietary catalyst to produce salts, water and carbonaceous residue.
- **Efficacy:** High destruction efficiencies have been demonstrated for DDT, PCBs and dioxins/furans.
- **Applicability:** DDT, PCBs, dioxins/furans. Limited to approximately 15-30% strength PCBs.

BCD

- **Emissions:** Solid residues may be captured for assay and reprocessing if needed.
- **Concerns:** Solid residues not fully defined. A fire in unit operating in Melbourne in 1995. Process difficulties in unit operating in Sydney.
- **Applicability under Stockholm Convention for POPs destruction:** potentially suitable if operated to maximum treatment effectiveness.
- **Licensing:** Commercially licensed in USA, Australia, Mexico, Japan and Spain.

Sodium reduction

- **Process:** Reduction of PCBs with dispersed metallic sodium in mineral oil. Has been used widely for in-situ removal of PCBs from active transformers. products of the process include non-halogenated polybiphenyl, sodium chloride, petroleum based oils and water (pH > 12).
- **Efficacy:** Destruction efficiency of the process has not been demonstrated. However the process has been demonstrated to meet regulatory criteria in EU, USA, Canada, South Africa, Australia, Japan for PCB treatment (eg. in Canada to [PCB] < 2 ppm for treated oil; and [PCB] < 0.5 ppm; [dioxins] < 1 ppb for solid residues).

Sodium reduction

- **Applicability:** PCBs to 10 000 ppm (also some vendors claim applicable to other POPs, but no data)
- **Emissions:** unknown
- **Concerns:** Lack of information on characterisation of residues. If used for in-situ treatment of transformer oils then will not destroy all PCBs contained in porous internals of the transformer.
- **Applicability under Stockholm Convention for POPs destruction:** potentially suitable, but further information required.
- **Licensing:** Widely available worldwide

Incineration versus Alternatives

<u>Incineration</u>

- Open system
- Generate/release POPs and other hazardous chemicals to air and land
- Generates large amounts of hazardous waste
- Thinking of the past
- Inappropriate for treating POPs under Stockholm Convention

<u>Alternatives</u>

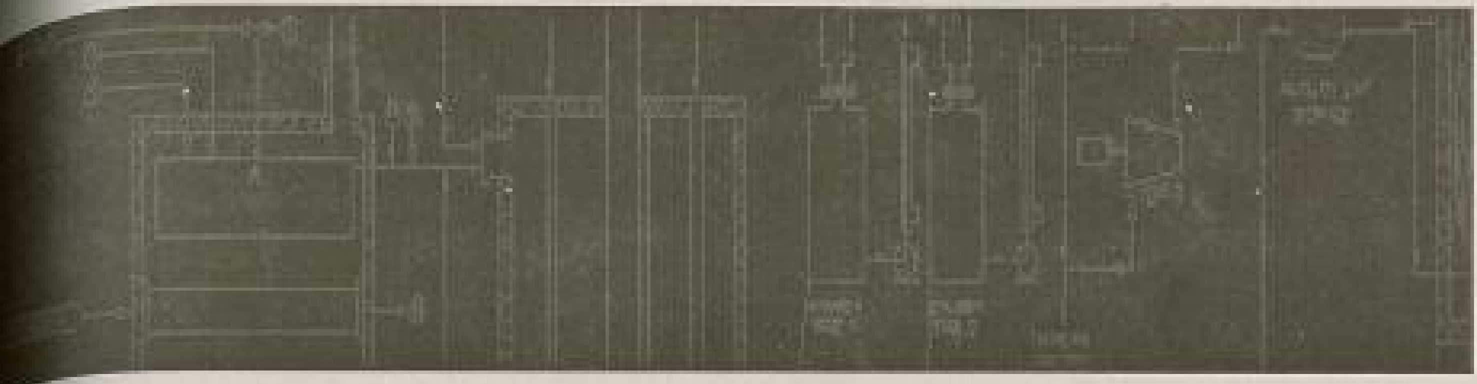
- Essentially closed systems
- Allow for testing and reprocessing
- Don’t generate POPs
- Capable of high destruction efficiencies
- Appropriate for treating POPs under Stockholm Convention

Summary

- Elimination of POPs is the ultimate goal.
- Many traditional disposal technologies are inappropriate for POPs disposal and in some cases are themselves major sources of POPs (e.g. incineration, landfilling, cement kilns, boilers, plasma, landfilling, deep well injection).
- Alternative non-combustion technologies are commercially available and come closest to meeting the spirit, intent and obligations of the Stockholm Convention for POPs destruction.
- However, these technologies should not become an excuse for the on-going production of POPs wastes.

Further Information

- Technical Criteria for Destruction of Stockpiled Persistent Organic Pollutants: http://www.who.int/ifcs/isg3/d98-17b.htm
- Greenpeace information on POPs and non-combustion technologies: http://archive.greenpeace.org/~toxics/reports/reports.html http://www.greenpeace.org
- Stockholm Convention homepage: http://www.pops.int



International Workshop on Non-Combustion Destruction Technologies of POPs

Gas-Phase Chemical Reduction:
Proven Technology for Safe and Complete Treatment of Legacy and Non-Legacy POPs Waste

Prague, the Czech Republic
January 15-17, 2003

Fred T. Arnold
CEO, Eco Logic Inc.

Clarity for the Supplier

- ***Metrics***

  Standards against which technology can be developed and calibrated to destroy hazardous waste in a safe and environmentally acceptable manner

- ***Measurement***

  Identification of an unbiased analytic methods which can be implemented for all outputs: gases, liquids and solids.

- ***Management***

  Requirement to control the system to achieve a permitted or desired outcome with a high degree of certainty.

Certainty for the Customer

- ***For Each Country***

  Ability to specify precise objectives and budget, issue or deny permits from within a predictable process and timeframe, and enforce performance standards.

Technology Terms of Reference (TOR)

Criteria, guidelines and standards for technology selection, deployment, operation and monitoring

- Has a very high (effectively 100%) destruction efficiency taking into account all inputs and releases to all media (solid waste as well as gaseous releases);
- Has complete containment of all process streams to enable testing and reprocessing, if necessary, to ensure that high destruction efficiency is maintained; and
- Does not produce dioxins or other POPs as an intrinsic characteristic.

Status of TOR Investigations

- The conclusion of the UNIDO/GEF Project is that technologies capable of meeting these criteria are available.
- Technology can be effectively operated under conditions that pertain in many, if not all, GEF-eligible countries.
- Regulatory and design initiatives are underway to deploy a non-incineration technology, Gas Phase Chemical Reduction, for destruction of PCB stockpiles in Slovakia.

"***After a careful analysis of proven available technological options of non-combustion alternatives to incineration of POPs gas-phase chemical reduction has been demonstrated to be the most effective such technology to destroy particularly difficult to treat PCBs contaminated waste such as transformers, capacitors and pallets. These particularly difficult to treat PCBs contaminated products form the bulk of a targeted stockpile that will be the subject of a GEF pilot demonstration activity in Slovakia"*** (UNIDO Nov. 2002)

" ... in assessing technologies for destruction of POPs wastes, and particularly for future phases of the program, the ASP will consider and actively encourage possible alternatives to incineration. A cross cutting component of ASP ... will address destruction technology options and will progress the debate gained by UNIDO through its execution of a GEF project to demonstrate non-combustion technology for destruction of POPs in developing countries." (IBRD Sept. 2002)

Eco Logic Overview

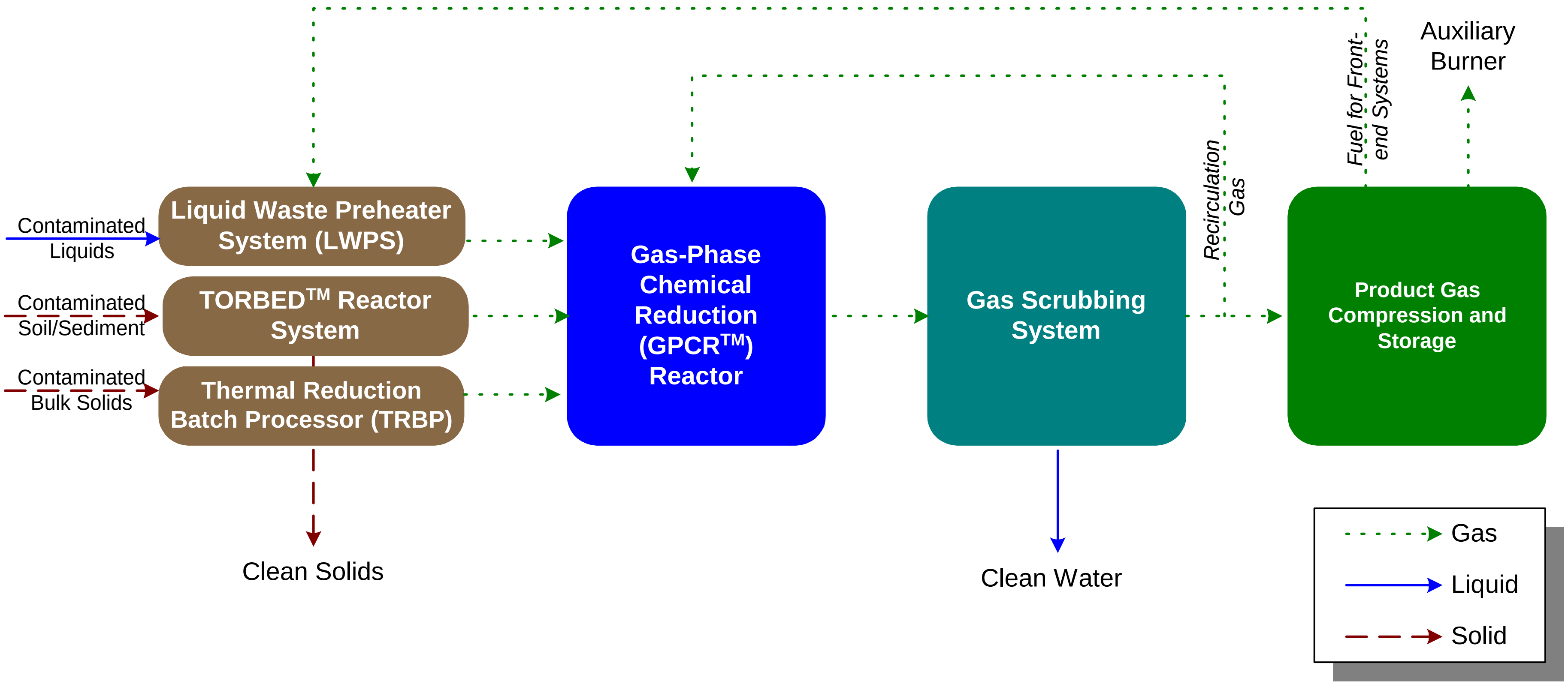
- ELI Eco Logic International Inc. was formed in Canada in 1986 to develop the Gas-Phase Chemical Reduction (GPCR) Process
- A process engineering organization
- Offices in Canada, the United States and Australia and partner offices in Japan
- Patented, broad-based technology, suitable for the treatment of a wide range of organic hazardous wastes, including all POPs
- Partnerships with engineering firms throughout the world

Technology Overview

Gas-Phase Chemical Reduction Process Diagram

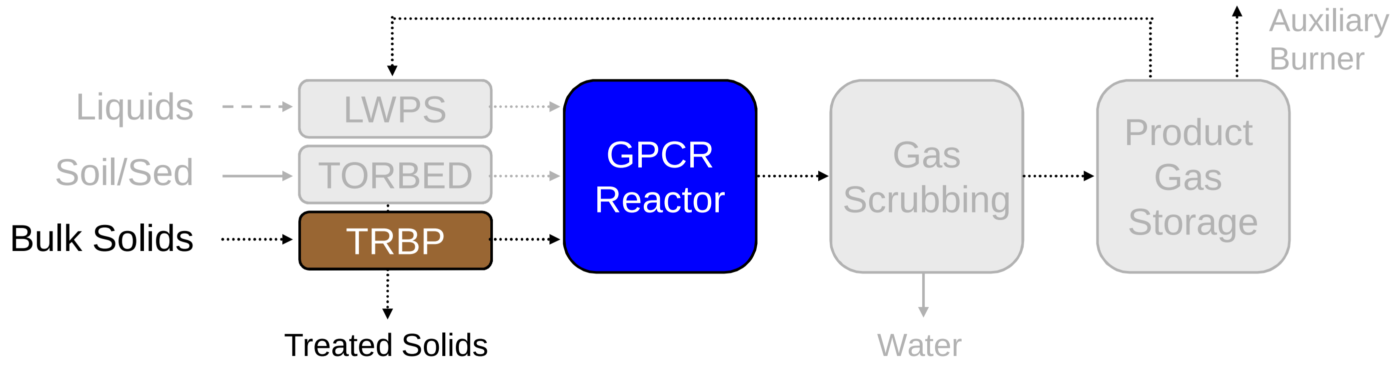
Technology for Environmental Stewardship

ECO LOGIC



Technology Overview

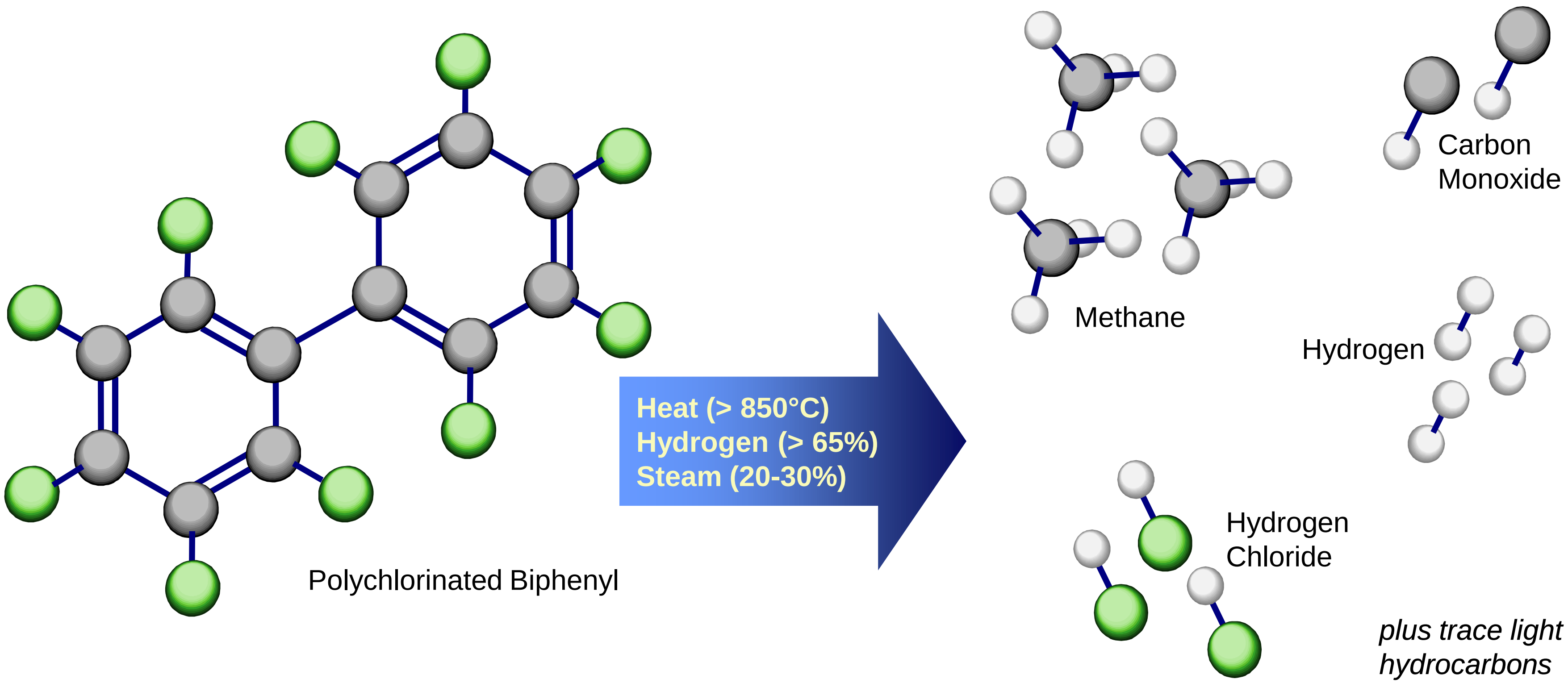
Example of Front-end/Reactor Combination at Stationary scale



Liquid and solid wastes are placed into the TRBP, which is then heated to approximately 600°C in a hydrogen-rich (oxygen deficient) atmosphere. Contaminants that volatilize from the solids and liquids are then swept into the GPCR reactor for destruction.

Volatilized contaminants from the TRBP are swept into the reactor, where GPCR occurs in a hydrogen-rich (oxygen deficient) atmosphere at approximately 875°C. Gases exiting the reactor (primarily methane, hydrogen and hydrogen chloride, are scrubbed to remove heat, particulate and acid, and then stored for reuse as a fuel.

Principal Products from
Gas-Phase Chemical Reduction of PCBs



GPCR Experience:
Commercial Work Established our Foundation for Excellence

- **PCBs**
  - Treatability-scale to full-scale commercial projects
  - Liquid and solid matrices

- **Pesticides and other Persistent Organic Pollutants (POPs)**
  - Treatability-scale to full-scale commercial projects
  - Liquid and solid matrices

Over 3,000 tons of hazardous waste treated during 30,000 hours of operation

Full-Scale PCB Treatment
PCB Destruction and Removal Efficiencies:

Test 1	99.9999996 %
Test 2	99.9999985 %
Test 3	99.9999997 %

Full-Scale PCB and DDT Treatment
Destruction and Removal Efficiencies:

PCBs	99.999998 %
DDT	99.999984 %

Pilot-Scale POP Treatment

Waste Type	*Input*	*Output*
Malathion/Xylene	1.7 g	< 7.0 ng
Hexachlorobenzene	66 %	150.0 ppb
Hexachlorobutadiene	17 %	< 0.2 ppb
Hexachloroethane	2 %	< 0.2 ppb
Hexachlorobenzene	100 %	< 5.2 ppb
OCDD	52 ppb	< 0.0057 ppb

Full-Scale POP Treatment Destruction Efficiency

	Hexachlorobenzene	*Chlorobenzene*
Test 1	99.999999%	99.9999%
Test 2	99.999999%	99.9999%
Test 3	99.99999%	99.9999%

GPCR Development / Experience

Examples of Performance Data

Pilot-Scale Data

Waste Type	***Input***	***Output***	***Destruction Efficiency (%)***
Malathion/Xylene	1.7 g	< 7.0 ng	N/Q
Hexachlorobenzene	66 %	150 ppb	N/Q
Hexachlorobutadiene	17 %	< 0.2 ppb	N/Q
Hexachloroethane	2 %	< 0.2 ppb	N/Q
Hexachlorobenzene	100 %	< 5.2 ppb	N/Q
OCDD	52 ppb	< 0.0057 ppb	N/Q
PCBs (soil)	200 – 260 ppm	< 0.0006 ppm	N/Q
VX	1440 g	ND in stack gas and scrubber water	99.999999
HD	2450 g	ND in stack gas and scrubber water	99.999999
PCBs (fiberglass)	120 ppm	< 0.05 ppm	N/Q

Full-Scale Data (Regulatory Testing and Full-Scale Trials)

Waste Type	***Input***	***Output***	***Destruction Efficiency (%)***
PCB Oil (3 tests)	48 – 54 %	< 0.02 – 0.83 µg/L (scrubber water) 0.041 – 0.41 µg/m3 (stack gas)	99.99998 – 99.999999
PCB Oil	90 %	< 0.72 µg/m3 (stack gas) ND in scrubber water	99.999998
DDT	30 %	< 1.7 µg/m3 (stack gas) ND in scrubber water	99.999984
Hexachlorobenzene	6,708 kg	119 kg (TRBP residual) ND in stack gas and scrubber water	99.99999

GPCR, A Mature Technology

DOD/National Research Council Conclusions

Summary of Evaluation of the Maturity of ACWA Demo II Unit Operations and Processes

Technology Provider/Unit Operation or Process	Hydrolysates			Agent Munitions			Other
	VX/GB	HD	Energetics	VX/GB	HD	Energetics	
AEA							
Silver II™[a]				C	C	C	
Solid/liquid waste treatment				C	C	C	
Gaseous waste treatment				D	D	D	
Foster Wheeler/Eco Logic/Kvaerner							
TW-SCWO	B	B	C				
GPCR™				*B*	*B*	*B*	*B*[b,c]
Teledyne-Commodore							
Ammonia fluid jet cutting/washout				D	D	E	
SET™				D	D	D	C[b]
Persulfate oxidation (agent)				D	D	D	
Peroxide oxidation (energetics)				D	D	D	
Metals parts/dunnage shredding							A[b,c]

Letter designations as follows: A, demonstration provides sufficient information to justify moving forward to full-scale design with reasonable probability of success; B, demonstration provides sufficient information to justify moving forward to the pilot stage with reasonable probability of success; C, demonstration indicates that unit operation or process requires additional refinement and additional demonstration before moving forward to pilot stage; D, not demonstrated and more R&D is required; and E, demonstrated unit operation or process is inappropriate for treatment. [a] Includes integrated gas polishing system to support demonstration [b] Dunnage [c] Metal Parts

Source: http://www.nap.edu/books/030907634X/html/3.html

GPCR Development / Experience

Significant Stages

General Motors of Canada Limited

- February 1996 to September 1997, under Ontario Ministry of Environment permits
- Processed more than 1000 tons of PCB-contaminated material
- Waste matrices included electrical equipment, high-strength oil, soil/sediment, concrete, PPE and miscellaneous other solids
- Compliance with all permit requirements, and PCB destruction efficiencies of at least 99.999999% (“8-nines”)

Kwinana, Western Australia

- May 1995 to December 2000
- PCB and pesticide wastes (including DDT) for government and industry clients throughout Australia
- 2,000 tonnes PCBs and pesticides
- Routine regulatory testing and performance validation showed better than 99.9999% (“6-nines”) destruction of PCBs and OCPs
- Treated solids to levels well below Australian “PCB-Free” criteria of 2 ppm

US Army, Chemical Weapon Destruction Commands, Aberdeen MD.

- 1995 to present
- Multiple tests and trials -- all agents/all matrices, always compliant with standards
- Integrated design for multi-reactor system

Technology Applications

Legacy Issues and Solutions

Legacy problems characterized by:

- Contaminated sites with multiple matrices requiring treatment (i.e. soil, concrete, drummed material, rubble, storage tanks, etc.)
- Contained stockpiles of hazardous waste awaiting treatment (i.e. PCB oil, obsolete pesticides, fly ash, ODS, other waste in liquid and solid form)

Requirement: One technology with the flexibility to deal with the varying waste matrices and the varying contaminant types

Eco Logic's Solution:

- Optimized GPCR front-end systems (i.e. TRBP, LWP, TORBED,) provide efficient flexibility for different matrices
- Simplicity of GPCR reactions provide robust response for different organic contaminants

Technology Applications
Full-Scale Plants

- Full-scale plants in operation since 1995 (Kwinana: 1995 to 2000; GMCL: 1996 to 1997)
- For use at sites with large waste stockpiles, or where waste can be brought in from surrounding area
- Footprint: 4,000 m^2 (approximately 8 to 10 trailers)
- Throughput: 150 tonnes per month bulk solids and liquids (2 TRBPs)
- Soil and Sediment Treatment Capability: 1000 to 3000 per month (1 TORBED) è *throughput highly dependent on characteristics of waste*

Commercial GPCR Plant, Kwinana, Western Australia

3rd Generation TRBP, 15 tons per Batch Cycle Kwinana, W.A.

Technology Applications
Mobile Plants

- Mobile plant currently constructed in Japan
- For use at sites or in regions with smaller waste stockpiles, or where mobility is important
- Footprint: 1,000 m^2 (approximately 4 trailers)
- Throughput: 30-70 tonnes per month bulk solid or liquid material
- Soil and Sediment Treatment Capability: 300 to 600 tonnes per month soil or sediment (1 TORBED reactor) **è** *throughput highly dependent on characteristics of waste*

Mobile Thermal Reduction Batch Processor

Mobile Liquid Waste Pre-heater for GPCR Plant

Photos courtesy of Tokyo Boeki and Nippon Sharyo, Japan 2002

Technology Applications

Pollution Prevention/Waste Minimization Issues and Solutions

Small quantities of "in-process" hazardous organic waste

- Avoidance of media (i.e. air, water, soil) contamination
- Re-cycling

Req1uirement: Robust technology that is easily integrated into existing plant operations and systems

Eco Logic's Solution:

- Portable GPCR unit for the treatment of wastes as they are produced
- Industry-standard operating systems and effective technology transfer
- For carbon filter material, treatment to remove the organics re-generation
- For CFCs, re-cycle by distillation and destruction of R_{12} with GPCR

Technology Applications
Portable Plants

- Small size (fits into single sea container or gooseneck trailer; 800 ft^2 footprint)
- Highly mobile
- First developed as a unit for conducting treatability tests
- Commercial applications are on-site, in-process treatment of manufacturing wastes and carbon filter material
- Throughput: 5 to 50 tonnes/year, depending on reactor configuration, chemical concentration and waste matrix

GPCR Technology Development - Milestones

1985	GPCR concept for hazardous waste treatment
1988	Bench-scale GPCR equipment fabricated
1990	First patent received for GPCR
1990	Field demonstration plant designed and fabricated
1994/95	Full-scale plant design and construction
1995	First full-scale plant began treatment of PCBs and pesticides
1996	Second full-scale plant began treatment of PCB waste
1996	First chemical warfare agent test
1997/98	Redesign of TRBP for increased throughput
1999	Redesign of Demonstration Plant for US Army testing
1999	Full-Scale successful Hexachlorbenzene Trials
1999	Identification of TORBED for front-end soil treatment
2000	ACWA Testing (US Army non-incineration program)
2000	Submission of Concept Design for a chemical weapons treatment plant
2001	Validation of technology by NRC
2001	Submission of Engineering Design Package for US Army EIS
2002	Selected by GEF/UNIDO and US Army as preferred technology

GPCR Advantages

- **Certainty**
  - Design
  - Performance
  - Cost
- **Flexibility**
  - Legacy and non-legacy applications
  - All waste matrices
  - All organic wastes and all halogens
- **Maturity**
- **Acceptability**

BCD Technology

International Workshop
Prague, January 16, 2003

Presented on behalf of the BCD Group, Inc.

BCD Group, Inc.
www. bcdinternational.com

BCD – Base Catalysed Decomposition

- Proven technology for the chemical destruction of POPs (persistent organic pollutants)

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BCD Process - Credibility

- Developed and patented by the USEPA
- Commercially proven
- Alternative to incineration

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BCD Process - Flexibility

- Applicable to a wide range of halogenated pollutants
- Applicable to liquids, sludge and soils

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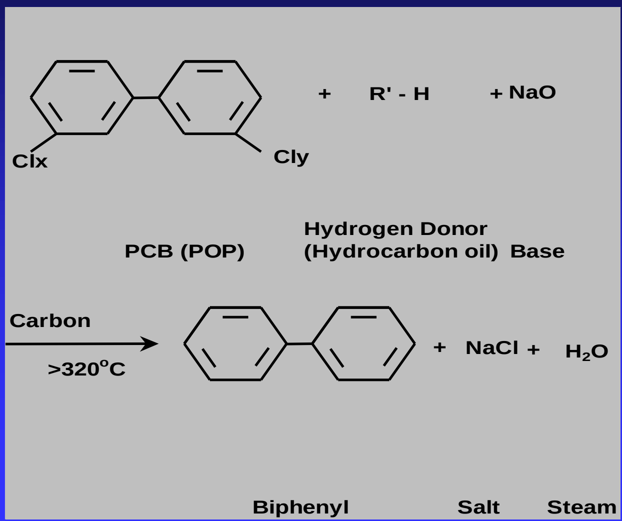
The BCD Reaction



BCD Pilot Plant, NZ Trials

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BCD Treatment Enhancements

Improvements in the following areas allowed waste treatment to be accelerated:

- Selection of appropriate catalysts for particular waste types
- Process design improvements
- Processing time reduced from >12 hours to < 1 hour

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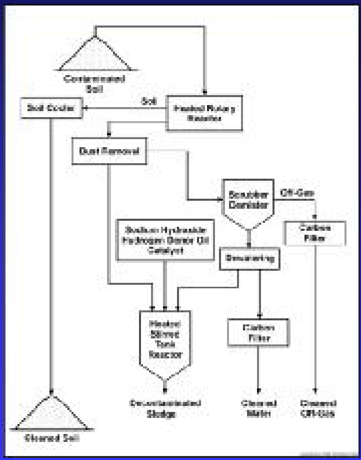
Simplified BCD Process Flow



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ITD Facility, Herne, Germany

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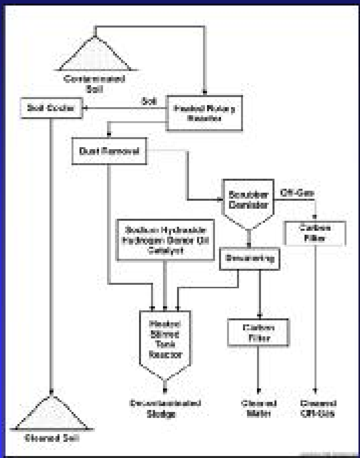
Simplified BCD Process Flow



NZ Pilot Plant Demonstrations

<u>ITD and BCD technologies 1997-1998</u>

- ITD treatment of PCP, DDT, HCH, Dioxins and Chlorothalonil contaminated solid wastes
- BCD treatment of various organochlorine pesticides

NZ Pilot Plant Demonstrations

<u>ITD treatment program</u>

Typical inlet concentrations

- PCP level 3,000 ppm
- Dioxin level 245 ppb
- DDT level 500 ppm
- HCH level 250 ppm
- Chlorothalonil 600 ppm

NZ Pilot Plant Demonstrations

<u>Indirect Thermal Treatment Program</u>

- Targeted PCP level < 0.05 ppm
- PCP level achieved < 0.02 ppm (below detection)
- Targeted Dioxin level < 1 ppb
- Dioxin level achieved < 1 ppb

NZ Pilot Plant Demonstrations

BCD Treatment Program

- BCD treatment of PCP, DDT, HCH, Dieldrin, Aldrin,

NZ Pilot Plant Demonstrations

BCD Treatment Program

- Targeted DDT level in soil < 0.05 ppm
- DDT level achieved < 0.001 ppm
- Targeted HCH level in soil < 0.05 ppm
- HCH level achieved < 0.001 ppm
- Chlorothalonil achieved in soil <0.1 ppm

Moe Project, Victoria Australia

- Approximately 250 tonnes of PCB contaminated soil
- Contaminant levels varied between 500 ppm and 1,300 mg/kg
- ITD treatment of contaminated soil followed by BCD treatment of ITD residue

Olympic Site, Sydney

- 10 tonnes of “pure” organochlorine waste
- 10 tonnes of mixed organochlorine waste
- 450 tons of organochlorine contaminated soil.

Olympic Site, Australia

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18

Olympic Site, Sydney

<u>ITD treatment of contaminated soil</u>

- Predominantly chlorobezenes (CB) and chloropenols (CP)
- Approximately 20,000 ppm total OCCs
- <u>Treated soil</u>
- < 10 ppm total OCCs

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19

Olympic Site, Sydney

BCD Treatment

- Approximately 10 tonnes of CB/CP impacted ITD residue
- Concentration of CB/CP in ITD residue ranged from 12,000 mg/kg to 27,000 mg/kg.
- 10 tonnes of "Pure" waste
- 10 tonnes of miscellaneous waste

Olympic Site, Sydney

BCD Treatment

- Organochlorine concentration of waste ranged from 20,000 mg/kg to 500,000 mg/kg.
- Treated product < 1.0 total CB and CP

Full Scale BCD Plant, Australia

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Chronology of BCD Applications and Activities

Date	Organisation	Description
1989	US EPA	Development of Chemistry by the US EPA
1991		1st patents granted
1991	Soil Tech, USA	Wide Beach Superfund Site (NY) 42 000 t soil, PCBs (5 000 ppm)
1992		Outboard Marine Superfund (Il) 13 000 t soil, PCBs

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Chronology of BCD Applications and Activities

Date	Organisation	Description
1992-ongoing	BCD Technology	BCD Technology opens commercial facility, Queensland, Australia
1993	US EPA	Koppers Superfund Site (NC) Clayey soil, PCB and dioxins
1995		Smith Farm (KY) 30 000 t soil, PCP, pesticides
1996	ETG (USA)	Binghampton Superfund Site (NY) 3 000 t soil, PCP, dioxins
1997		Dow Chemical, wood preservatives (MI) 500 t soil, PCP, DDT, dioxins

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Chronology of BCD Applications and Activities

Date	Organisation	Description
1997	US Navy/IT Corp	US Naval Base, Guam 10 000 t soil, PCBs
1998	ADI Limited	Wood Preservatives Site (NZ) Soil, pesticides, dioxins, pure chemicals
2000-2002	IHOBE	Lindane reduction (Bilbao, Spain) 3 500 t lindane converted to TCB
2000	Enterra (Australia)	Moe Power Station Site VIC, AUS PCB contaminated soil
2001-2002	Enterra (Australia)	Olympic Site, NSW, AUS
Current	Shaw Group (USA)	Warren County Landfill (NC) 40 000 t soil, PCBs and dioxins
Current	S.D. Meyers (MEX)	BCD treatment facility (Mexico) PCB contaminated oil

25

BCD Project, US Navy, Guam

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26

Chronology of BCD Applications and Activities

Date	Organisation	Description
1997	US Navy/IT Corp	US Naval Base, Guam 10 000 t soil, PCBs
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Current	S.D. Meyers (MEX)	BCD treatment facility (Mexico) PCB contaminated oil

27

TCB Column, IHOBE, Spain

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Reactor, IHOBE, Spain

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Chronology of BCD Applications and Activities

Date	Organisation	Description
1997	US Navy/IT Corp	US Naval Base, Guam 10 000 t soil, PCBs
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30

10 m^3 Reactor, Mexico

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BCD Processing Facility, Mexico

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Summary of Benefits

- Non-incineration alternative
- Simple and Safe
- Proven track record

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TECHNOLOGY OF CATALYTIC DEHALOGENATION OF POPs COMPOUNDS

Institute of Chemical Process Fundamentals
Academy of Sciences of the Czech Republic
Rozvojová 135, 165 02 Prague, CR

Dr. Vladimir Pekarek

Scientific co-operation from 1994:
District Public Health Institute Ostrava
Department of Hygienic Laboratories Frýdek-Místek
National reference laboratory for analysis of POPs MZ ČR

15.1.2003

Scientific programme

- Basic research on the de novo synthetic reactions focused on PCDD, PCDF, PCBz on laboratory scale
- dehalogenation research in laboratory and semi pilot scale
- emission problems in metallurgical plants (proposed EU grant of 4 countries: Germany, Norway, Sweden, Czech Republic)
- PCDD, PCDF, PCB and PCBz measurement in the emissions of important combustion units

19.8.2017

Dechlorination method developed in our laboratory

- Reaction principle
  - polychlorinated matter
    - → Wheland intermediates formation
    - → inorganic chlorides (HCl, alkali chloride)

19.8.2017

Dechlorination method developed in our laboratory

- Reaction conditions
  - inert or oxygen free atmosphere
  - temperature 300°C
  - loading of destructed matter 4% (owing to the type of the dehalogenated compound could be optimized)
  - time 2-4 hrs (optimization under study)
  - reaction pressure (0.1-3 atm)
- Systems
  - laboratory
    - Discontinuous, stationary
  - semi pilot
    - Semi-continuous, mixed

19.8.2017

Limitation of the method

- Species with high alkalinity are not convenient for dehalogenation
- Dehalogenations on matrices which sinter under given conditions

19.8.2017

Advantage

- Well known mechanism
- Probability of coupling or polymerization reactions is negligible
- The dehalogenation does not significantly depend on the stage of chlorination

Comparable technologies under similar reaction conditions

- **Technologies based on reactions with glycolates (PEG, APEG, KPEG etc)**
  - limitation: highly chlorinated systems cannot be totally detoxifiied
- **BCD method - base catalysed**
  - limitations: the reaction mechanism is not reliably known
  - the process must be monitored for the case of high chlorinated systems (OCDD - 2,3,7,8 TCDD formation)
  - the waste may require an optimized pre-dilution to achieve required destruction efficiencies

(Andrea Lodolo et al. An Overview: Remediation Technologies for POPs (ICS-UNIDO). Training Workshop for Initial National POP Inventory, EU Project GEF/UNIDO, 16-17.5.2002, Brno)

Laboratory results I.

- **Hexachlorobenzene** → 100% conversion to benzene (optimized conditions)
  - total dehalogenation, determined dechlorination pathways
  - dechloration is thermodynamically controlled
- Publications
  - Chemosphere 39(14), 2391-2399 (1999).
  - Environ Sci Pollut Res. 10(2), 2003-will be published

Laboratory results II.

- Pentachlorophenol → 100% conversion to phenol (optimized conditions)
  - dechlorination pathways, thermodynamical studies
- Decachlorobiphenyls including
  - Delor 103, Delor 105 (optimized conditions)
  - dechlorination to biphenyl
- Presentation
  - Conference on persistent organic pollutants, Lancaster University, 28.-29,4.1998
  - All will be published

Laboratory results III.

- **Octachloronaphthalene**
  - → 97% dechlorination to naphthalene
- **Different sources of fly ash**
  - → 97% dechlorination
    (optimized conditions with respect to the fly ash composition and effect of matrix)
- Publications
  - Basic studies: Chemosphere 41, 12, 1881-1887, 2000.
  - Organohalogen Compounds 56, 205-208,
  - 2002 Karasek Meeting, US EPA and Vrije Universiteit Brussel, 2001, Durbuy/Brussels, Belgium

Laboratory results IV. – from Spolana

- Detoxification of samples
  - floor dust
  - wall coat
- All from from contaminated "sarcophagus"
- The dehalogenation process has not been optimized so far

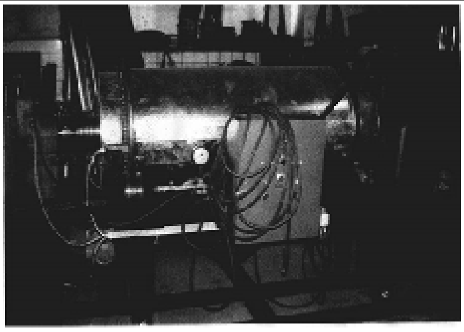
Floor dust

- **PCB** - polychlorinated biphenyls (predominant toxicity of PCBs 156,118, 167)
  - detoxification from 99.98%
- **PCDD+PCDF** (predominant toxicity of OCDD; TCDD; HxCDF)
  - detoxification from 99.97%
- **PCBz** - polychlorinated benzenes (predominant toxicity of HCB)
  - detoxification from 99.9987%
- **DDT** and its metabolites (predominant ppDDT)
  - after detoxification below detection limit)
- **HCH** -hexachlorohexanes (predominant compound alfa HCH)
  - detoxification from 99.9984%
- Polychlorinated chlorophenols were not analyzed

Wall coat

- The contamination of wall surfaces by PCDD/F was about more than order of magnitude lower compared with data for the samples from the floor,
- The wall scratch samples were detoxified worse, from ~ 85%
  (the effect of alkalinity of these samples).
- Absolute values after dechlorination of these samples are nevertheless under the limits for free landfilling

Apparatus



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Semi pilot detoxification experiments

- Trial and testing operation - one and half year up to now
- Expected to the end of 2003
  - offer all technical parameters for industrial prototype manufacturing
  - optimization of dechlorination processes

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Some experimental results I.

- **Detoxification of Delor 103,**
  - matrix active charcoal, 300°C, 4 hrs, 0.3 atm, loading 5.33%, without optimization
  - dehalogenation from 99.84%
- **Detoxification of fly ash** from baghouse of MWI
  - original toxicity 82 ng I-TEQ PCDD/F
  - no matrix, 300°C, 4 hrs, 0.1 atm, loading 5.33%, optimized regime
  - dehalogenation 99.9998%
  - detoxification 99.992%

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Some experimental results II.

- **Detoxification of Delor 103**
  - Amount: 1.2 kg,
  - Matrix: dehalogenated fly ash,
  - temperature/time/pressure: 300°C, 4 hrs, 0.3 atm,
  - loading 5.5%, without optimization
  - dehalogenation from 99.97%
  - detoxification 99.90%
- **All dehalogenated matters fully satisfy the limits for PCDD, PCDF and PCB for free landfilling**

19.8.2017

Acknowledgements

- We acknowledge the financial support of the Grant Agency of the Academy of Sciences of the Czech Republic:
  - № A4072508 (1995-1997)
  - № A4072901 (199-2001)
  - № S4072108 (2001-2003)
  - № IAA4072206 (2002-2004)
- We would like to express our thanks to the directors of both institutions for their support and encouragement in realization of these projects
  - Doc. Ing. Jiří Drahoš, DrSc.
  - RNDr. Petr Hapala

19.8.2017

Thank you for your attention!

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- +420-2203 90 317

19.8.2017

The monitoring of POPs surrounding of Spolana Neratovice after summer flood episode

Michael Vít
Ministry of Health CR

Roman Grabic, Šárka Crhová,
Tomáš Ocelka, Tomáš Tomšej
District Public Health Institute Ostrava,
National Reference Laboratory for POPs Frýdek-Místek

Vladimír Kočí
Institute of Chemical Technology

Mark Rieder, Drahomira Leontovycova
Czech hydrometeorological institute Prague

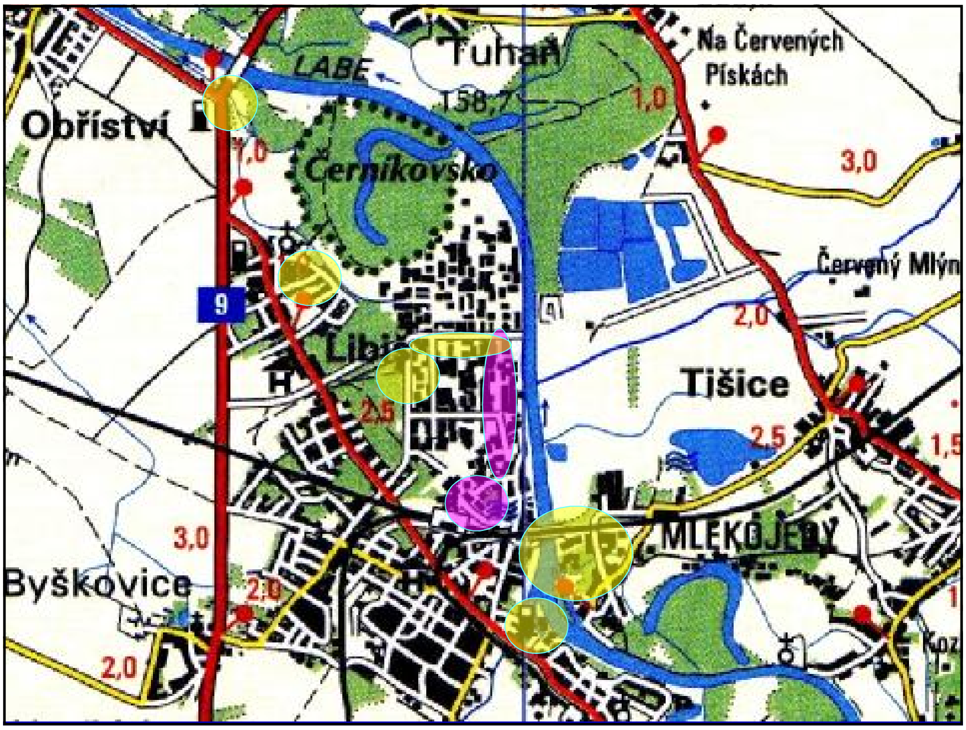
Content

- Sampling sites and situation
- The results of passive sampling (SPMD)
  The results of fast analysis of soil, sediments and water
  - Water
  - Air
- The results of analysis fish and foodstuff
- Conclusions and future activities of Ministry of Health

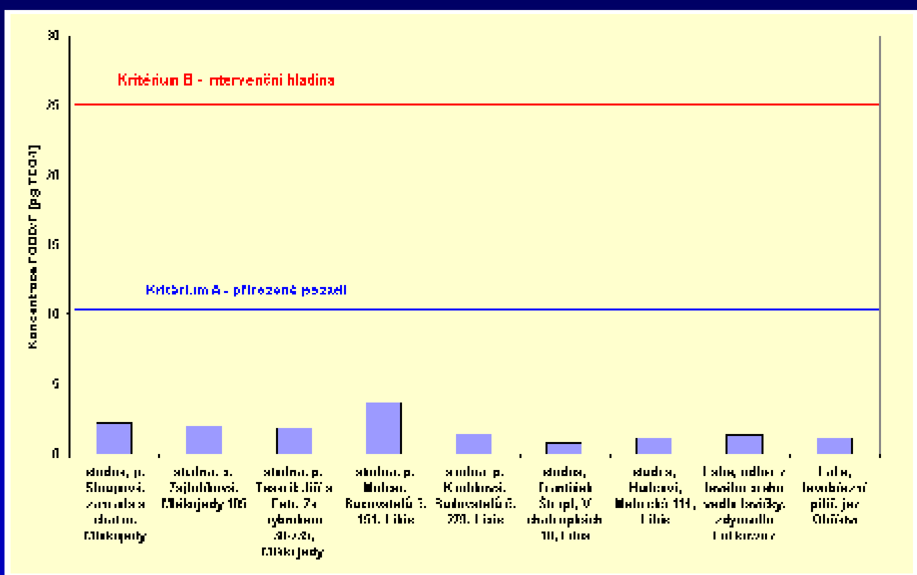
Legend for sampling map

- Sampling point in general
- Sampling area in general

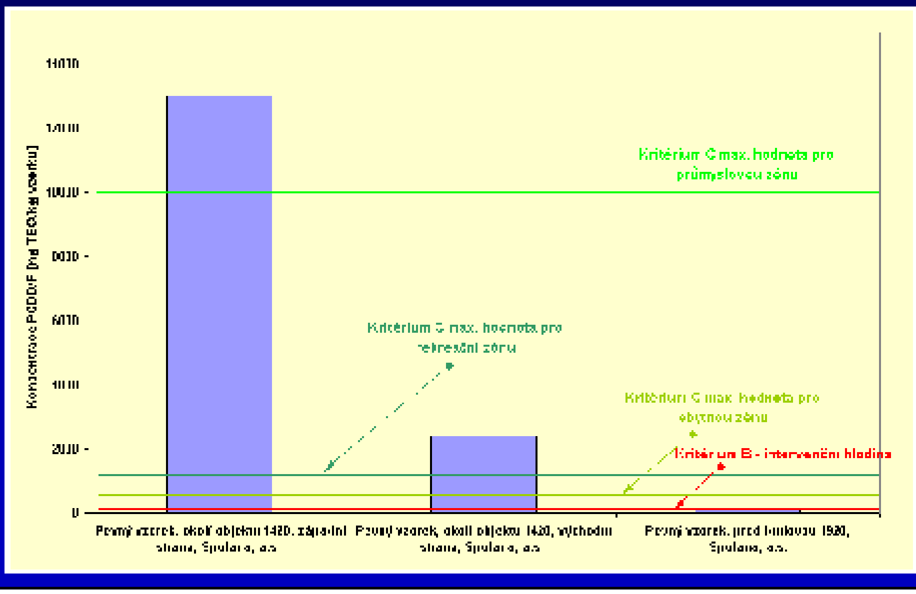
- Ministry of Health (30.8.2002), NRL for POP
- CIZP (11.9.2002), NRL for POP, Frýdek-Místek



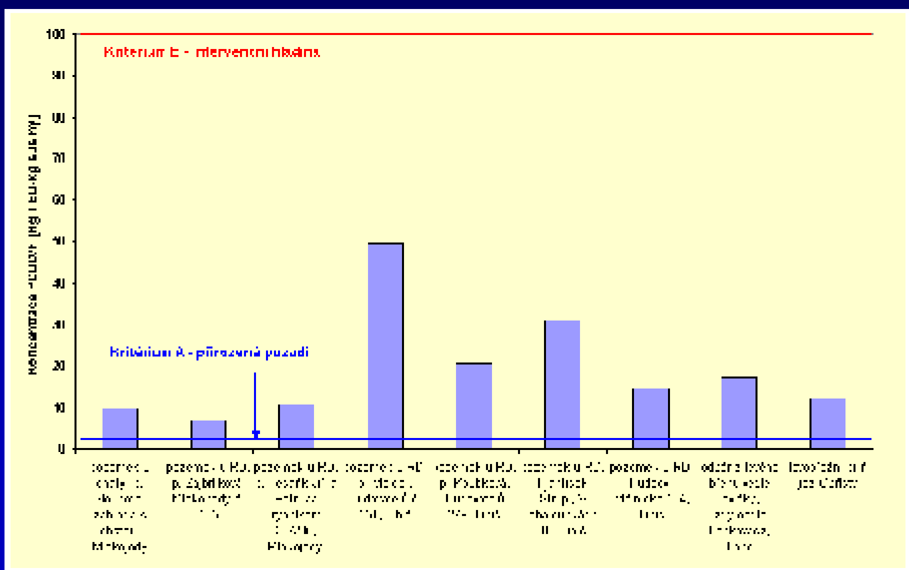
PCDD/F in water samples



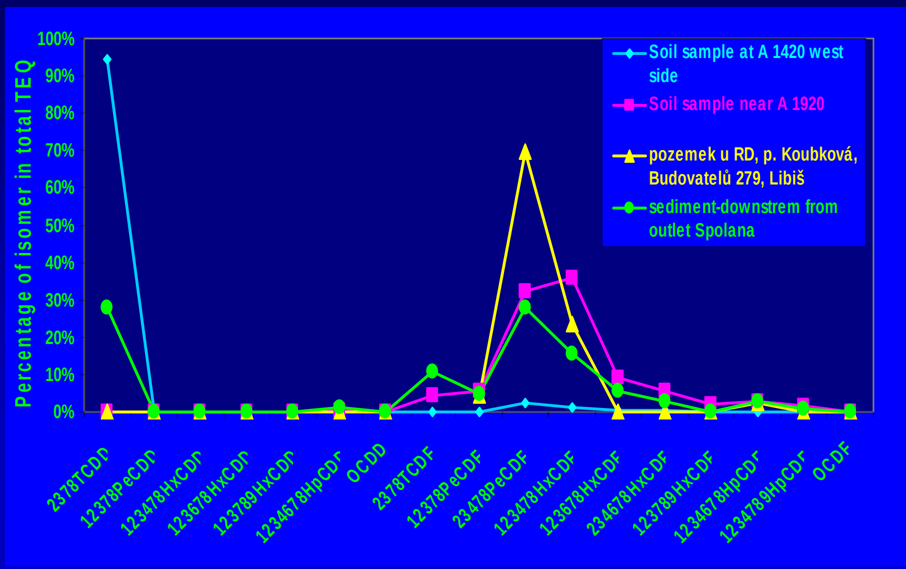
PCDD/F in soils and sediments



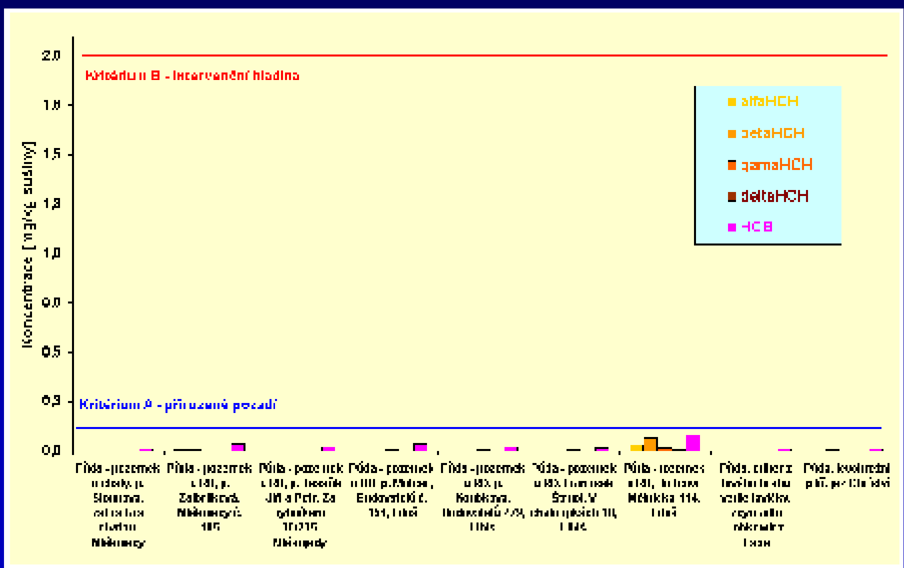
PCDD/F in soils and sediments



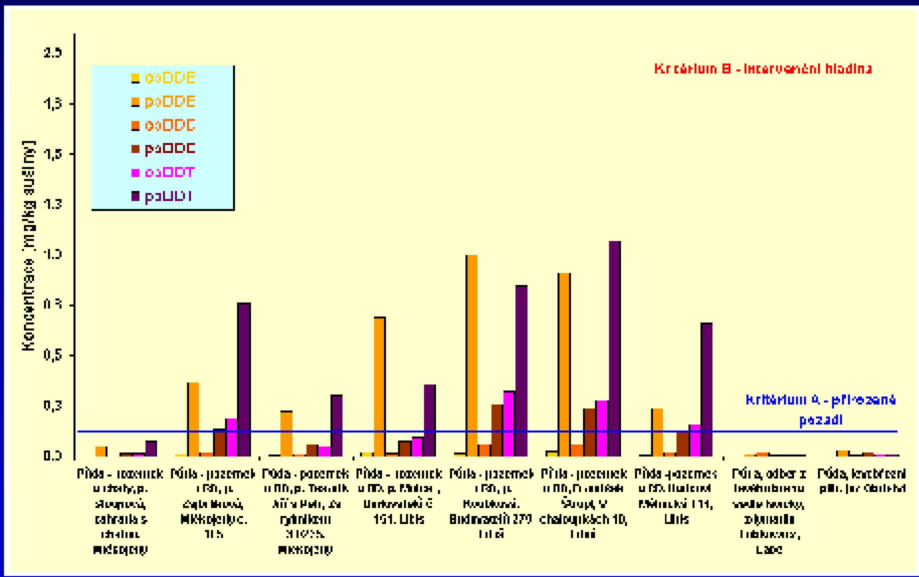
PCDD/F in soils and sediments



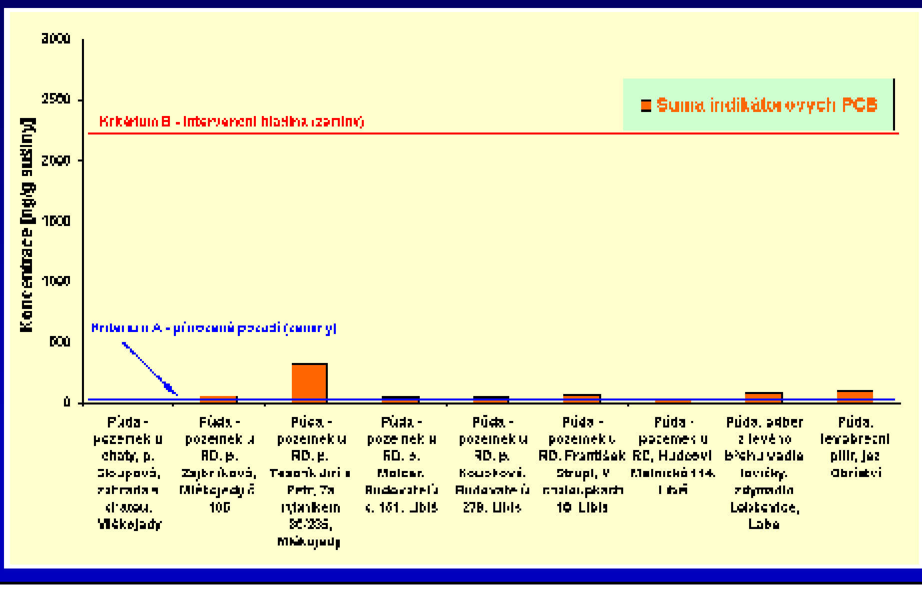
OCP in soils and sediments



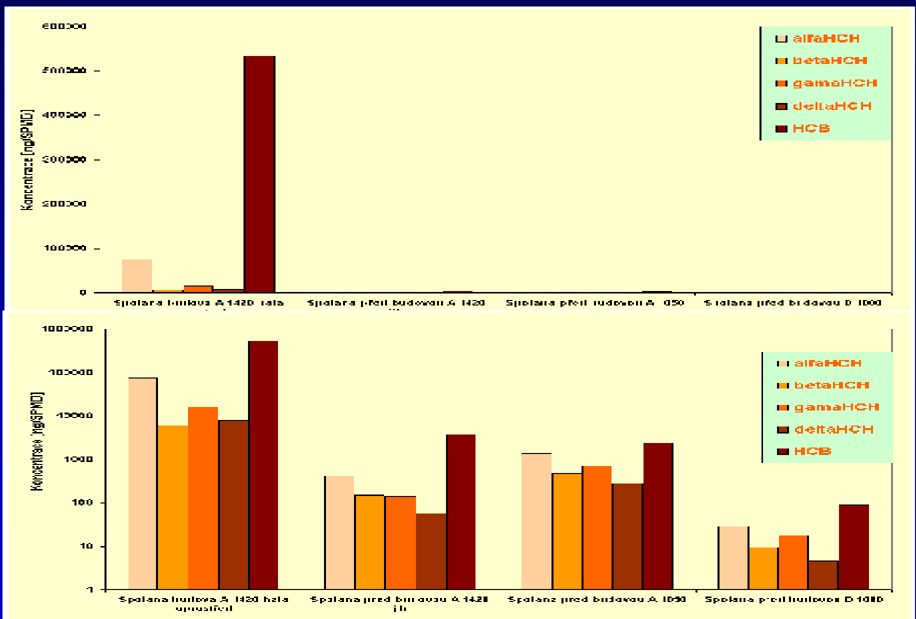
OCP in soils and sediments



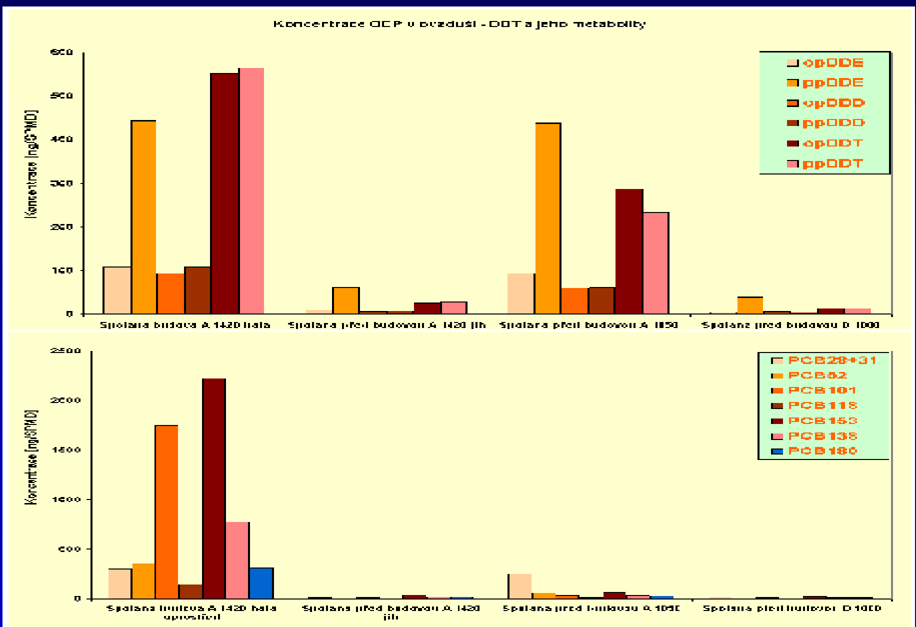
PCB in soils and sediments



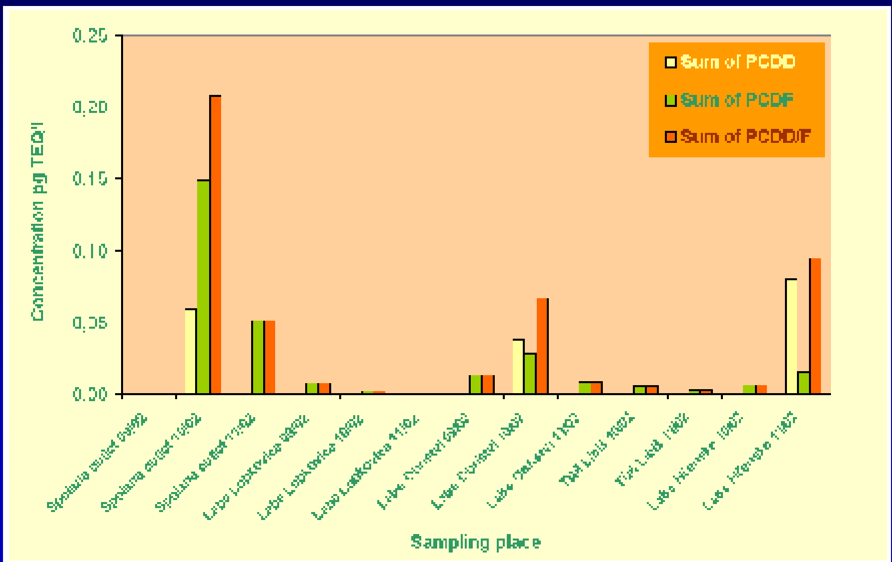
OCP in air (SPMD)



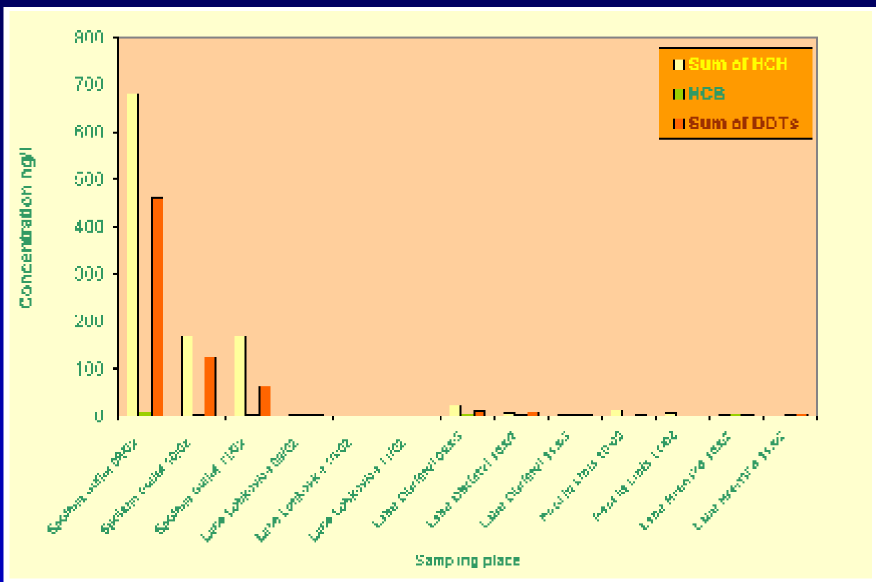
OCP and PCB in air (SPMD)



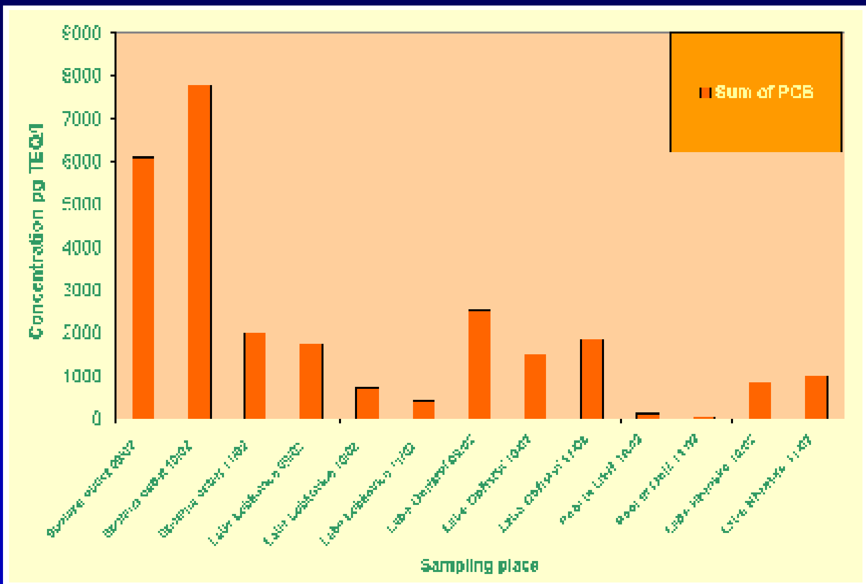
SPMD sampling of water



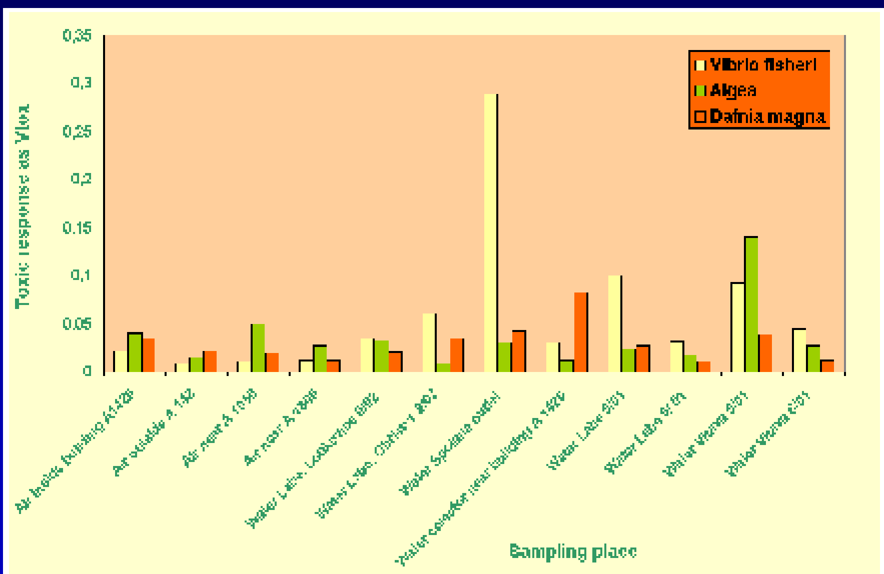
SPMD sampling of water



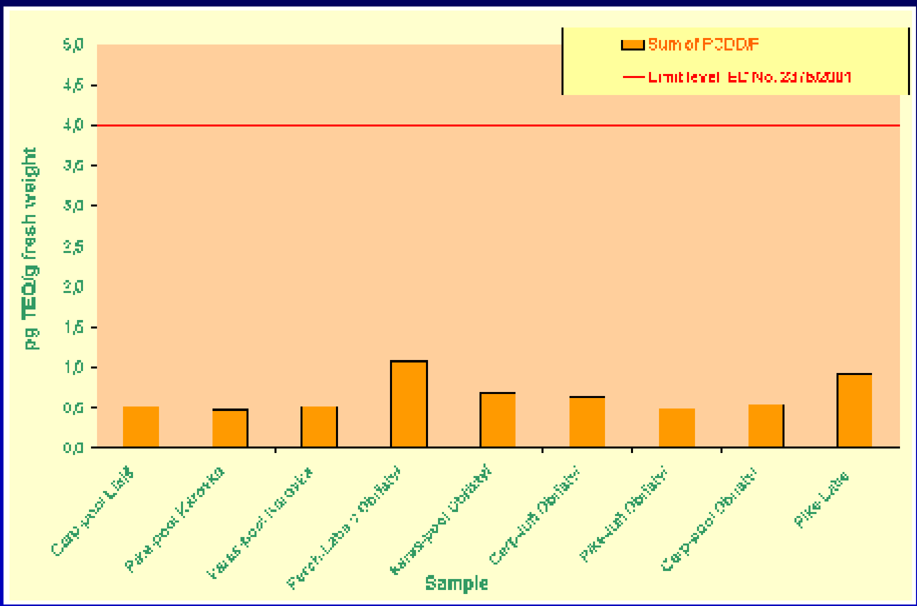
SPMD sampling of water



SPMD sampling of water



Analysis of fish



Conclusions

- There are two sources of contamination in Spolana Neratovice
- High levels OCP in air, soil and water
- The results of passive sampling show increased levels POPs but not out of range common in CR
- Slightly increased levels in fish

Future activities of MH CR

- Determination of reference level OCP, PCB and PCDD/F in blood
- Monitoring of workers exposure in Spolana
- Continuing of SPMD monitoring

GREENPEACE

Fact sheet

January 2003

Dioxins in Spolana Neratovice, Czech Republic

The chemical factory Spolana Neratovice is situated approximately 25 kilometres north of Prague on the river Elbe. It produced in the period of 1965-68 the chlorine herbicide 2,4,5–T. The former communist regime delivered it through various trade corporations to Vietnam where the American Army used it as a component for "Agent Orange". During production, a huge amount of dioxins were created and the former factory buildings are one of the most contaminated places on the Earth until today. These buildings were abandoned and closed more than 30 years ago. They contain rests of contaminated facilities, raw materials and intermediates from the cancelled production. Due to the immense dioxin contamination the reconstruction of the buildings is impossible and because of the fact that even maintenance is impossible, the buildings deteriorate quickly.

One of the buildings was put into a concrete sarcophagus halfway in 1998. The two other contaminated buildings are situated in an area near the Elbe that floods in average once every 50 years.

Greenpeace gained important risk analysis from Spolana in 2001. They prove an urgent risk endangering the surrounding environment with dioxins. This risk grows in time. Corrosion made part of the roof steel construction in one building collapse. The reinforced concrete construction of the contaminated buildings is so damaged by corrosion that cracks already appeared in one wall of one building. Extremely high dioxin concentrations were indicated in the surroundings of the contaminated buildings. The ground water under Spolana is contaminated not only with dioxins but with many other toxic chemical substances like: DDT, DDE, endrin, diendrin, lindane, benzene, 2,4,5-T, heptachlor, chloroform, HCB, HCH etc.

Degree of building contamination

Chemical analysis proved an extremely high degree of contamination of building, air, soil and ground water. The highest concentration of dioxins (over 24 000 ng TEQ of dioxins/g) was measured in the rests of chemical substances. We assume that there are tons of these rests stored in the buildings.

The immediate toxic impact of dioxins in the air of the contaminated buildings was proven by a rabbit experiment conducted by the Toxicology Department of the Military Medical Academy of J. E. Purkyne in Hradec Kralove. Rabbits in cages were located in the buildings in a way that they were exposed only to breathing the dioxin-contaminated air. The first rabbits already died on the 7th day of the experiment. Autopsy showed a significant damage of livers, lungs and kidneys.

Disposal of the dioxin contamination

In June 1992 the ICF Inc. (USA), Aquatest, Chemoprojekt and Ekohydrogeo carried out a study dealing with old environmental burdens in Spolana including also the dioxin contaminated buildings. As a result, Agreement 33/94 with the Czech National Property Fund was signed. This Agreement binds the National Property Fund to cover the disposal of old environmental burdens financially up to 4,329 billion of Czech crowns. In 1998 the first contaminated building (A114) was partially taken apart and partially set in a sarcophagus of approximately 1000 cubic metres of concrete. According to a declaration of Spolana, the costs of this "decontamination" were 66 million Czech crowns.

In January 2001 the company Aquatest finished a risk analysis on the dioxin-contaminated buildings A 1420 and A 1030. Both, Spolana management and relevant public authorities, refuse to disclose the report. The report suggests 12 methods of handling the dioxin contamination using a projected investment of 300 to 400 million Czech crowns. According to Greenpeace, however, some of the suggested methods may post a huge danger for human health and the environment. Amongst these are methods as demolition by using explosives, followed by incineration (burning).

Catastrophe and its victims

In the years 1964 to 1968 about 80 people from Spolana suffered from dioxin contamination. 55 of them were hospitalised at the average age of 36,3 years when first admitted. Intoxication manifested itself mostly by skin changes (chloracne). Often suppurating cysts were forming on the skin; many of the symptoms were so severe and widespread that they changed the patient's appearance completely.

Dioxins lead also to disorders of the porphyry metabolism, manifesting itself in dark skin colour and other symptoms linked with liver porphyria. A frequent finding was also diabetes (disorder of sugar and fat metabolism), tiredness and weakness of lower limbs - also proven by electromyographic examination.

According to a statement of one of the involved physicians, dioxins are highly probably responsible for brain function disorders found during psychiatric examination of the affected workers. However, the psychological changes were also caused by the desperate situation of the patients: indeterminate future, disfigurement and death fear.

In 1981 Dr. Vejlupkova published an essay on the progress of dioxin intoxication of the Spolana workers in an American professional magazine, Archives of Environmental Health. This was met with a large response. Although Dr. Vejlupkova had fully respected the communist regime's general information ban and had not mentioned the location of the dioxin disaster, she was scapegoated by the political power and said to cause "harm to the good name of socialist Czechoslovakia".

Spolana Neratovice, Agent Orange and Vietnam War

Agent Orange is the name for a compound existing of butyl ester 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and butyl ester 2,4-dichlorophenoxyacetic acid (2,4-D). The first substance was produced in the years 1965 - 1968 in the nowadays-contaminated buildings. The American Army used Agent Orange on a massive scale as defoliant in its confrontation with the communist troops hidden in the jungle of Vietnam. For the preparation of Agent Orange, the Americans used also 2,4,5-T from Spolana. At that time Spolana delivered its products through the Foreign Trade Corporation to Vietnam where Agent Orange was prepared directly at the U. S. air bases. The substance 2,4,5-T that was produced in Spolana was according to available information one of the substances most contaminated with dioxins, causing serious health problems.

Besides the victims amongst Spolana workers, also thousands of American soldiers (nowadays veterans) and hundreds of thousands Vietnamese were contaminated with

dioxins in herbicides used for the Agent Orange production. Up till now there are still vast areas of Vietnam contaminated with dioxins.

Chronology of Greenpeace campaign:

Early 2001 - Greenpeace asked Spolana, National Property Fund and relevant public authority for risk analysis study, but all refused to disclose the report
May 2001 – symbolic blockade of entrance of Spolana with anti-flood dam made of bags of sand

Summer 2001 – Greenpeace gained risk analysis report from Spolana´s internal sources
November 2001 – GP CZ published conclusions of study on press conference and appealed International Commission for protection of Elbe river to help to eliminate risks of dioxin pollution
January 2002 - Greenpeace activists have surveyed the level of a 100-year flood with a circular laser operated by a professional surveyor in front of the Spolana chemical plant.
February 2002 – GP CZ filed a criminal complaint against the management of Spolana because they failed already several years to protect heavily contaminated areas and buildings with mercury and dioxins against possible flooding. In spite of clear evidence of the risks and many repeated warnings, the management of Spolana refused to take defensive measures against possible floods
February 2002 – GP CZ requested the local hygiene inspection and the Czech Environmental Inspection to demand to secure Spolana´s buildings from leakage of dioxins into the surrounding air, because a high concentration of dioxins in the direct surroundings of the contaminated buildings endangering human health
March 2002 – management of Spolana announced plan for secure 1 of contaminated building by concrete "anti-flood wall"
May 2002 - Greenpeace activists marked the 27-year obsolete buildings and surrounding area that Spolana contaminated by mercury during the production of chlorine. and took probes of contaminated soil and hung huge banner (SPOLANA - DIOXINS IN THE AIR - MERCURY TO THE ELBE) from the roof of one of the administrative buildings of Spolana
May 2002 - Arnika and GP CZ published dioxins concentrations in blood samples of former employees of chemical plant Spolana in comparation with general public is 11 times higher. Concentration of the most dangerous substance - 2,3,7,8 TeCDD - was even 35 times higher.
May 2002 – Spolana admited seriousness of problems with dioxins and mercury and announced measures
August 2002 – almost 100% Spolana facility flooded, 3 times chemical alarm, 2 big leakage of chlorine, more then 3 500 ton of chemicals were washed down into the Elbe River, Greenpeace took samples of water an soil, documented floods in Spolana from helicopter and informed about situation in Neratovice German and Saxony authorities, Greenpeace published the study "Corporate Crimes" including Spolana case at the Earth Summit in Johannesburg
September 2002 – Spolana hides toxic pollution surrounding of company but analysis of Czech Environmental Inspection, Arnika, Greenpeace and Czech television found dioxins, PCBs, EDC, VCM and an other chemical in the water, sediments and soil
September 2002 - GP CZ filed suit against National Property Fund to force it over court to publish the information about Spolana contamination it keeps confidential
November 2002 Greenpeace requested the Czech Office for the Protection of Economic Competition to investigate the commissioning of the dioxin decontamination at the Spolana. The National Property Fund commissioned the task without open tender to the waste firm SITA Bohemia, part of the French SITA group. With this, FNM did not only prevent access to this project for competing firms, but also prevented proper proof that the chosen solution

for the liquidation of the dioxin contamination is indeed the best from the point of view of health and environment.

November 2002 - GP CZ filed a criminal suit at the Czech High State Prosecutor in Prague concerning the choice of the BCD technology in commissioning dioxin decontamination work at the Spolana. According to Greenpeace, this might constitute a criminal break of paragraph 255 of the Czech criminal code on responsibilities in management of property.

November 2002 - Greenpeace published the results of chemical analyses that show high levels of toxic dioxins and PCBs in soil and food products taken from the vicinity of Spolana Neratovice . The concentrations of dioxins in food products exceed several times the limits valid in countries of the EU, as well as exceed the working limit of the Main Hygiene Office of the Czech Republic. The samples also showed high values of toxic PCBs with dioxin-similar effects.

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http://www.greenpeace.cz/agentorange/index_en.htm

UNIDO IPEN® ARNIKA

International Workshop on Non-Combustion Technologies for Destruction of POPs

IPEN European Working Group Meeting

Penzion Ráj, Litice u České Lípy
January 17-19, 2003

Financial support from the United Nations Industrial Development Organization (UNIDO), the International POPs Elimination Network (IPEN), Global Greengrants Fund, DOEN Foundation, Phare-Access EU and Ministry of the Environment of Czech Republic

Health Care
Without Harm

The Campaign
for Environmentally
Responsible Health Care

Non-incineration Medical Waste Treatment Technologies

Dr. Čestmír Hrdinka

Litice, 18th January 2003

Health Care Without Harm

The Campaign for Environmentally Responsible Health Care

Non-incineration Medical Waste Treatment Technologies

Dr. Čestmír Hrdinka

Litice, 18th January 2003

Discussed Topics

- **Introduction of HCWH**
- **Problems of medical waste incineration**
- **Non - incineration treatment technologies**

The Campaign for Environmentally Responsible Health Care

Health Care Without Harm is an International Coalition of Hospitals and Health Care Systems, Medical and Nursing Professionals, Community Groups, Health Affected Constituencies, Labour Unions, Environmental Health, Environmental and Religious Organisations.

www.noharm.org

The Mission of HCWH

To transform the health care industry world-wide, without compromising patient safety or care, so that it is ecologically sustainable and no longer a source of harm to public health and the environment.

HCWH Campaign Goals

- To promote policies, practices and laws that **eliminate incineration of medical waste**, minimise the amount and toxicity of all waste generated, and promote the use of safer materials and treatment practices;
- To **phase out use of polyvinyl chloride (PVC)** and persistent toxic chemicals **in health care**, and to build momentum for a broader PVC phaseout campaign;
- To **phase out the use of mercury** in all aspects of the health care industry;

HCWH Campaign Goals
(Continued)

- To develop health-based standards for medical waste management to recognise and implement the public's right to know about chemical usage in the health care industry;
- To develop just siting and transport guidelines that conform to the principles of environmental justice: "no communities should be poisoned by medical waste treatment and disposal."
- To develop an effective collaboration and communication structure among campaign allies;
- To work with a wide range of constituencies for an ecologically sustainable health care system.

HCWH Europe

31 members in Europe

3 working groups

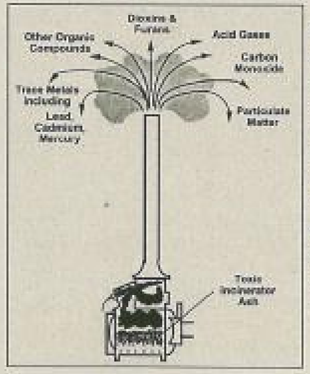
Incineration WG | PVC WG | Hospital WG

www.noharm.org

Problems Related to Medical Waste Incineration

- Environmental pollution
- Impact on public health & occupational safety
- High cost
- Potential impact of the Stockholm convention on POPs

Pollutants From Medical Waste Incinerators



trace metals: As, Cd, Cr, Hg, Ni, Pb

acid gases: HCl, SO_2, NOx

dioxins and furans, including 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)

other organic compounds: trichloroethylene, tetrachloroethylene, trichlorotrifluoroethane, etc.

carbon monoxide

particulate matter

pathogens (for incinerators with poor combustion)

Impact on Public Health & Occupational Safety

STUDY SUBJECTS	CONCLUSIONS REGARDING ADVERSE HEALTH EFFECTS	REFERENCE
Residents from 7 to 64 years old living within 5 km of an incinerator and the incinerator workers	Levels of mercury in hair increased with closer proximity to the incinerator during a 10 year period	P. Kurttio et al., *Arch. Environ. Health*, 48, 243-245 (1998)
122 workers at an industrial incinerator	Higher levels of lead, cadmium, and toluene in the blood, and higher levels of tetrachlorophenols and arsenic in urine among incinerator workers	R. Wrbitzky et al., *Int. Arch. Occup. Environ. Health*, 68, 13-21 (1995)
56 workers at three incinerators	Significantly higher levels of lead in the blood	R. Malkin et al., *Environ. Res.*, 59, 265-270 (1992)

Impact on Public Health & Occupational Safety

STUDY SUBJECTS	CONCLUSIONS REGARDING ADVERSE HEALTH EFFECTS	REFERENCE
Residents living within 10 km of an incinerator, refinery, and waste disposal site	Significant increase in laryngeal cancer in men living with closer proximity to the incinerator and other pollution sources	P. Michelozzi et al., *Occup. Environ. Med.*, 55, 611-615 (1998)
532 males working at two incinerators from 1962-1992	Significantly higher gastric cancer mortality	E. Rapiti et al., *Am. J. Ind. Medicine*, 31, 659-661 (1997)
Residents living around an incinerator and other pollution sources	Significant increase in lung cancer related specifically to the incinerator	A. Biggeri et al. *Environ. Health Perspect.*, 104, 750-754 (1996)
People living within 7.5 km of 72 incinerators	Risks of all cancers and specifically of stomach, colorectal, liver, and lung cancer increased with closer proximity to incinerators	P. Elliott et al., *Br. J. Cancer*, 73, 702-710 (1996)

Impact on Public Health & Occupational Safety

STUDY SUBJECTS	CONCLUSIONS REGARDING ADVERSE HEALTH EFFECTS	REFERENCE
10 workers at an old incinerator, 11 workers at a new incinerator	Significantly higher blood levels of dioxins and furans among workers at the old incinerator	A. Schecter et al., *Occup. Environ. Medicine*, 52, 385-387 (1995)
53 incinerator workers	Significantly higher blood and urine levels of hexachlorobenzene, 2,4/2,5-dichlorophenols, 2,4,5-trichlorophenols, and hydroxypyrene	J. Angerer et al., *Int. Arch. Occup. Environ. Health*, 64, 266-273 (1992)
37 workers at four incinerator facilities	Significantly higher prevalence of urinary mutagen/promutagen levels	X.F. Ma et al., *J. Toxicol. Environ. Health*, 37, 483-494 (1992)
104 workers at seven incinerator facilities	Significantly higher prevalence of urinary mutagen and promutagen levels	J.M. Scarlett et al., *J. Toxicol. Environ. Health*, 31, 11-27 (1990)

Impact on Public Health & Occupational Safety

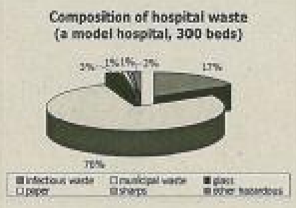
STUDY SUBJECTS	CONCLUSIONS REGARDING ADVERSE HEALTH EFFECTS	REFERENCE
86 incinerator workers	High prevalence of hypertension and related proteinuria	E.A. Bresnitz et al., *Am. J. Ind. Medicine*, 22, 363-378 (1992)
176 incinerator workers employed for more than a year from 1920-1985	Excessive deaths from ischemic heart disease and lung cancer among workers employed for at least 1 year; significant increase in deaths from ischemic heart disease among workers employed for more than 30 years or followed up for more than 40 years	P. Gustavsson, *Am. J. Ind. Medicine*, 15, 129-137 (1989)
Residents exposed to an incinerator	Reproductive effect: frequency of twinning increased in areas at most risk from incinerator emissions	O.L. Lloyd et al., *Br. J. Ind. Medicine*, 45, 556-560 (1988)

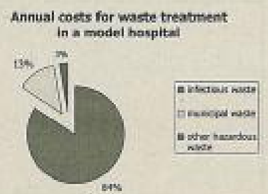
Impact on Public Health & Occupational Safety

Results of epidemiological studies:

Incinerator emissions associated with lung cancer, laryngeal cancer, ischemic heart disease, urinary mutagens and promutagens, and elevated blood levels of various toxic organic compounds and metals

Costs of Medical Waste Treatment





Infectious waste amounts to 17 % of all hospital waste but represents 84 % of all costs

Cost of Incinerator Vs Autoclave

(20-45 Kg/hr)

Cost item	Incinerator*	Autoclave**
Base equipment cost	158,000	70,000
Installation cost	22,500	6,500
Cost of pollution control to meet EPA limits for a 50 lb/hr incinerator	184,500	0
Cost of electric steam generator	0	16,000
Cost for monitoring and testing	18,600	2,400
TOTAL	$383,600	$93,100

* US EPA estimate of annual operating cost for the air pollution control Device = [illegible] per year

** Autoclave cost based on san-i-pak

Savings in Given Hospital

Czech Republic

Infectious waste in 2001 - 270 156 kg

Costs

Autoclave	incinerator
0,18 EUR/kg	0,26 EUR/kg (0,36)
48,5 ths. EUR	71,5 ths. EUR

Savings

23 000 EUR

Potential Impact of the Stockholm Convention on POPs

- Stockholm convention on persistent organic pollutants (POPs)
- Adopted in may 2001
- Article 5: countries will have to take measures to further reduce releases of POPs from unintended production with the goal of ultimate elimination
- Annex C
  - Present a list of POPs from unintended production
  - First in the list: dioxins and furans
  - Major source with the potential for comparatively high formation and release of dioxins and furans: medical waste incinerators

Non-incineration Treatment Technologies - Resource:

Non-incineration medical waste treatment technologies: A resource for hospital administrators, facility managers, health care professionals, environmental advocates, and community members

HCWH, august 2001

http://www.noharm.org/library/docs/non-incineration_medical_waste_treatment_te_2.Pdf

Update on Pyrolysis

http://www.noharm.org/library/docs/Update_on_Pyrolysis.pdf

Note: HCWH does not endorse any technology, company, or brand name.

Framework

- Waste Minimization
- Waste Segregation
- Occupational Safety and Health
- Environmental Protection

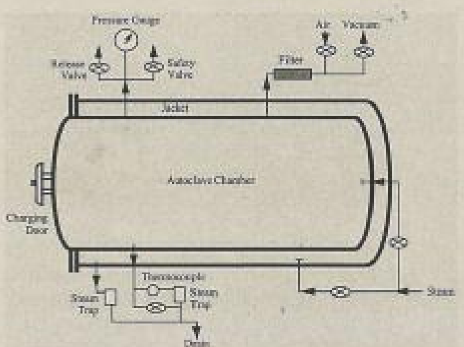
Non-incineration Technologies General Categories and Processes

- Thermal - low heat
  - medium heat
- Chemical - chlorine based
  - non-chlorine based
- Irradiative
- Biological

Recommended Alternatives

- Low-Heat Thermal Technologies
  - Autoclaves or Retorts
  - Advanced Autoclaves
  - Microwave Units
  - Dry Heat Systems
- Chemical
  - Non-Chlorine Technologies

Autoclave



Waste treated:

cultures and stocks,

sharps,

material contaminated with blood and limited amounts of fluids,

isolation and surgery wastes,

laboratory waste (excluding chemical waste),

soft waste (gauze, bandages, drapes, gowns)

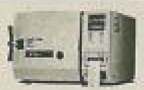
Note: Volatile and semi-volatile organic compounds, bulk chemotherapeutic waste, mercury, other hazardous chemical wastes and radiological waste **should not be treated in an autoclave or retort.**

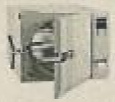
Steam Disinfection Temperature-Minimum Exposure Time Requirements

T °F	T °C	Spore Kill Time (min)	Min. Exposure Time (min)
240	116	30	60
245	118	18	36
250	121	12	24
257	125	8	16
270	132	2	4
280	138	1	2

From E. Hanel, Jr., "Chemical Disinfection," in *Control of Biohazards in the Research Laboratory*, School of Hygiene and Public Health, Johns Hopkins University, Baltimore, MD, 1981.

Pre-vacuum/steam treatment/ post-vacuum





EHS series (Electronic High Speed pre-and post-vacuum autoclave)

E/EK series

Automatic Autoclave (E), Kwiklave (EK) - a quick cycle model

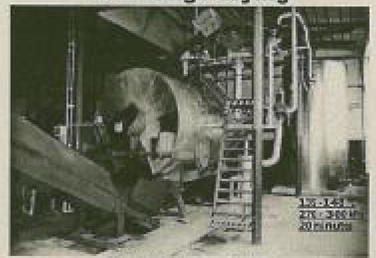
T-Max steriliser

Source: Tuttnauer, USA

Advanced Autoclaves: Examples

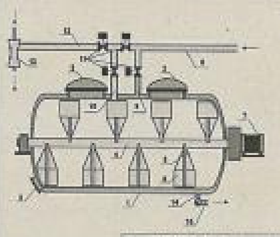
- Vacuum / steam treatment / shredding / compaction
- Pulse vacuum-steam treatment / drying
- Steam treatment-mixing-fragmenting / drying / shredding
- Steam treatment, fragmenting & mixing / drying
- Internal shredding / steam treatment / cooling / vacuum
- Internal shredding / steam treatment & mixing / drying

Steam treatment, fragmenting & mixing / drying



Source: IDOS Praha, Czech republic

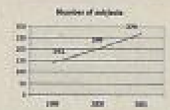
Steam treatment, fragmenting & mixing / drying

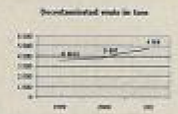


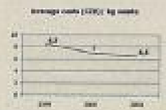
1 pressure tank
2 openings
3 discharge opening
4 shaft
5 arms
6 blades
7 electro-motor
8, 12 pipes
9 heating jacket
10 autoclave vessel
11 valves
13 condenser

Source: IDOS Praha, Czech republic

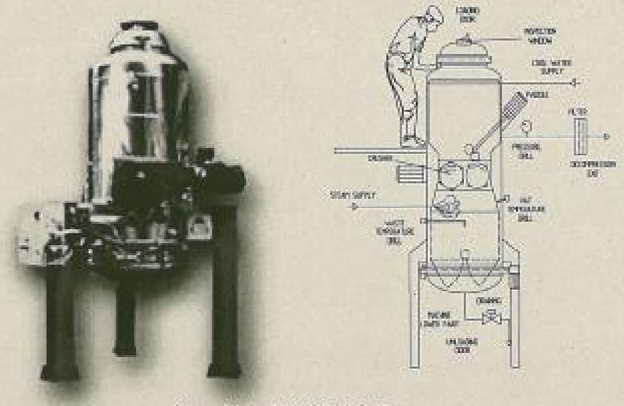
Infectious waste treatment by the autoclave in the Czech republic







Internal shredding / steam treatment / cooling / vacuum



Source: Ecodas T.1000, Roubaix, France

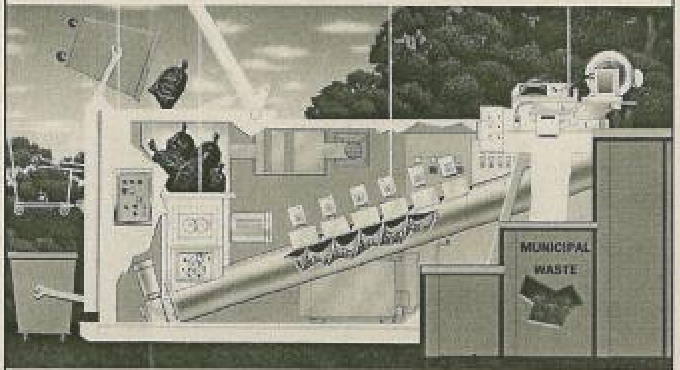
Internal shredding / steam treatment / cooling / vacuum

Process:
- Waste loaded at the top and sealed
- Internal shredding
- Steam at 138 C, 3.8 bar for 10 min
- Cooled down to 80°C
- Drained and vacuumed

Range of capacities: 45 to 180 kg/hr

Source: Ecodas T.1000, Roubaix, France

Microwave Disinfection



Source: Sanitec, West Caldwell, New Jersey

Microwave Disinfection

Process:
- Waste automatically fed into hopper and sealed
- Internal shredder
- Steam added
- Waste heated by six microwave generators up to 100°C while mixed in rotating screw
- Holding tank for longer exposure time
- Second shredder for sharps

- Range of capacities: 100 kg/cycle to 250 kg/hr
- 75 units in 7 countries

Note: Microwave units could generally treat the same wastes as autoclaves

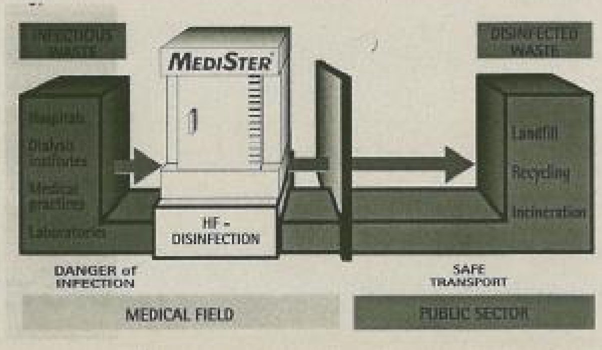
Source: Sanitec, West Caldwell, New Jersey, USA

Small Microwave Disinfection

- Waste heated to 121 – 134° C using microwave generators for 30 minutes
- Optional post-treatment shredder
- Range: 60 – 70 liters/cycle

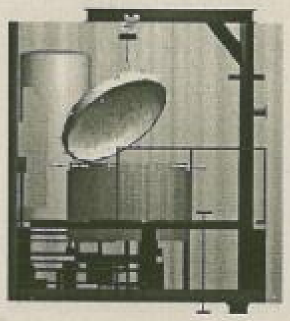
Source: Sintion, Graz, Austria

Microwave Disinfection Concept by Meteka



Source: Meteka, Austria

Chemical: Alkaline Hydrolysis



Source: Waste Reduction by Waste Reduction, Inc. (WR2), Indianapolis, Indiana

Chemical: Alkaline Hydrolysis

Process:
- Waste placed in stainless steel baskets and lowered into alkali bath
- Alkali heated to 110-150° C for 4-8 hours

- Designed for tissue waste, placentas, animal waste, organs
- Also destroys cytotoxic waste
- Range: 19 – 570 liters

Source: Waste Reduction by Waste Reduction, Inc. (WR2), Indianapolis, Indiana, USA

Other Technologies

- Chlorine-Based Chemical Systems
  - Issues: wastewater discharges (especially chlorine-based systems)
- Irradiative Technologies
  - Issues: ionizing radiation (worker safety), high capital costs
- Biological Systems
  - Issues: no track record

Other Technologies

- Medium and High Heat Thermal Systems
- E.g., Plasma Pyrolysis
  - **Issues:**
    - **Emissions (including dioxins & furans)**
    - **Engineering performance**
    - **No track record**
    - **High costs**

What to Consider in Selecting Alternative Technologies?

- Throughput Capacity
- Types of Waste Treated
- Emissions and Residues
- Volume or Mass Reduction
- Safety
- Space Requirements/Siting Requirements
- Process Monitoring and Documentation
- Equipment Safety and Worker Safety During Repairs
- Ease of Use/Training Requirements
- Reliability/Track Record
- Cost

US Trends

- Trend regarding medical waste incinerators (US):
  - Number in 1988 6,200
  - Number in 2002 764
  - New incinerators since 6/96 3

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Non-incineration waste treatment technologies

Biological of Biowaste Treatment Technologies

Antonín Slejška

IPEN European Working Group Meeting
Penzion Ráj, Litice u České Lípy
January 17 - 19, 2003

Association Arnika
www.arnika.org

CZ Biom
www.biom.cz

Biological waste sorts

- agricultural wastes
  - from plant production,
  - from animal husbandry,
- food production wastes (and from other processing industry),
- municipal wastes
  - green wastes,
  - waste-water treatment sludge (they are usually contaminated by heavy metals),
  - separately collected municipal biowaste
    - from households and gardens,
    - from restaurants and dining halls,
- waste wood
  - from forests,
  - from woodprocessing industry and
  - from constructions and demolitions.

Possibilities of biological waste utilisation

- Thermo- or pyro- lysis processes, mainly combustion

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- Biological processes (composting, anaerobic digestion, alcohol fermentation)

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Possibilities of biological waste utilisation

- Thermo- or pyro- lysis processes, mainly combustion
- Biological processes (composting, anaerobic digestion, alcohol fermentation)
- Chemical processes (oil or grease esterification)
- Feeding to animals (feeding paste, fibrous addition to food, alpha amylase, etc.)

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Collection bin types

- Common waste bins
- Optimised waste bins (110 or 220 l)
- Containers (approx. 1m^3)
- Large-volumes containers (5-10 m^3)
- Bag systems

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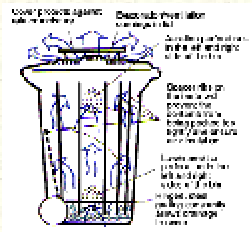
Collection bin functions

- Separation of biowaste from rest waste
- Improving the hygiene of waste collection
- Prolongation of the interval among collections
- Start of aerobic fermentation
- Simplification of manipulation

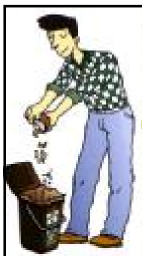


SSI Schäffer Kompostainer

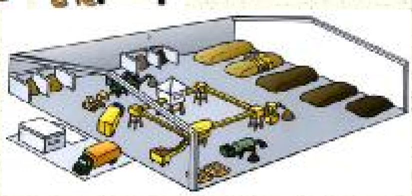
Household collection bins

Bag for collection of biowaste made from recycled paper

Good bins have odour filter



Composting plant of municipal biowaste in Baix Camp (Botarell, Spain – cap. 30.000 t / year)



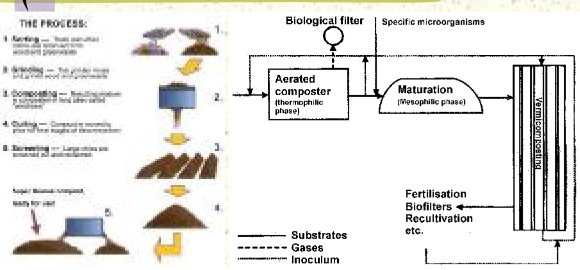
Collection of biowaste

Composting plant Nová Paka; biowaste collector is unloaded and the biowaste is then manualy final-sorted.

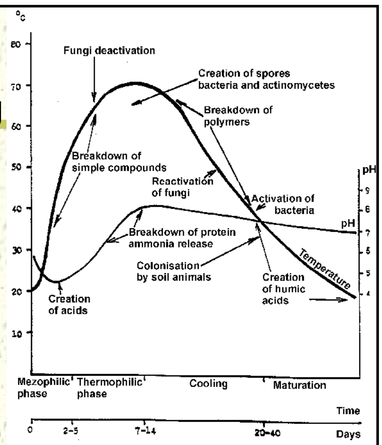
How to improve the quality of separation?

- Education and communication with citizens
- Control of the collected biowaste
- Finacial motivation
- Optimization of bins arrangement
  - GIS
  - Loan the bins to interested persons
  - Collection yards

Composting process



Composting process

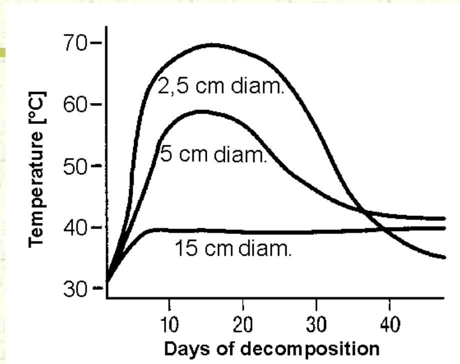


(Hejátková 2001)

Grinding of materials

- Increase of particle surface
- Improvement of homogenisation
- Creation of structure easing control of moisture, aeration and manipulation with material
- Increase of drying resistance
- Improvement of heat isolation
- Reduction of rain penetration to compost pile

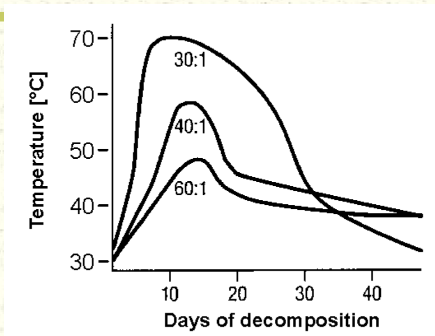
Particle size effects on composting



Grinding



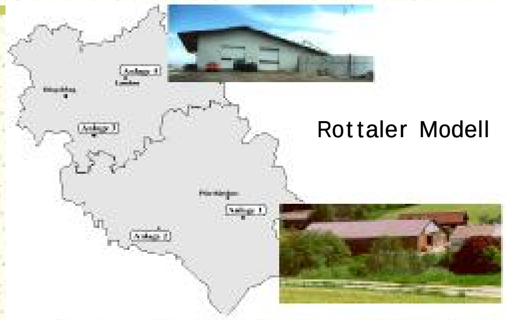

Carbon:nitrogen ratio effects on composting



Manipulation with materials

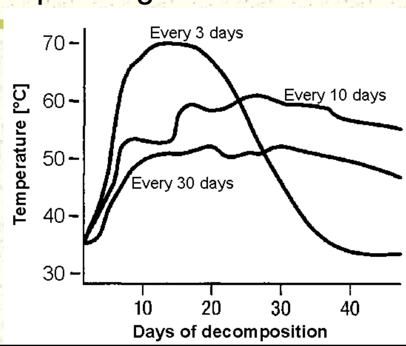


How to shorten biowaste collectors routes?



Rottaler Modell

Turning frequency effects on composting



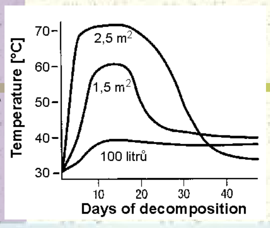
Turners

A tractor pulled compost turner

A self propelled windrow turner

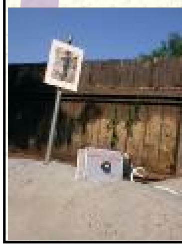
An auger-style turner

Pile volume effects on composting



Composting temperature

>55°C	Max. of sanitation
45-55°C	Opt. for biodegradation
35-45°C	Increasing of microbial diversity



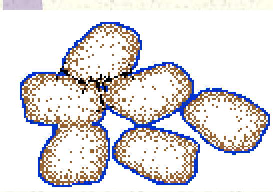
Sanitation requirements

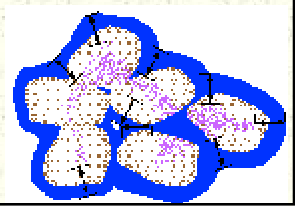
Country	Temperature [°C]	Duration [days]
Austria	65	6 or 2*3
Belgium	60	4
Denmark	55	14
France	60	4
Italy	55	3
Netherlands	55	2
CR (suspection to patogenic microorganisms)	55	21
CZ (other composts)	45	5

(ORCA 1992,ČSN 66 5735)

Moistening

- Sprinkling of piles
- Moistening of air during pressure aeration
- Injection of water to piles
- Turning with simultaneous water addition





Sieving

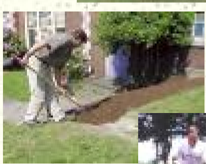
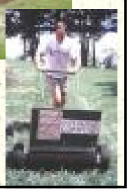



Compost: brown, dun or almost black homogeneous matter with crumb structure



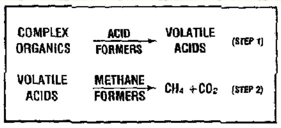

Compost application



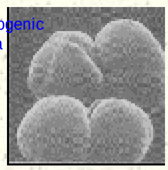



Anaerobic digestion process

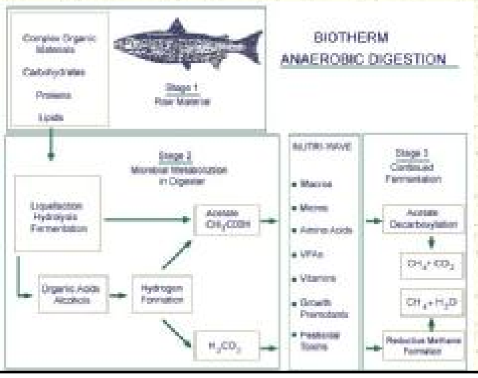
(Fox and Pohland, 1994)



Methanogenic bacteria



Anaerobic digestion process



www.envirem.com

Materials suitable for AD

- agricultural wastes
  - from plant production,
  - from animal husbandry,
- food production wastes (and from other processing industry),
- municipal wastes
  - green wastes,
  - waste-water treatment sludge (they are usually contaminated by heavy metals),
  - separately collected municipal biowaste
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- waste wood
  - from forests,
  - from woodprocessing industry and
  - from constructions and demolitions.

Anaerobic digestion - conditions

- Materials
  - Moisture > 45%
  - C/N of material composition < 20-30/1 (Meynell 1976)
  - C/P of material composition approx. 200/1 (Bardiya, Gaur 1997)
- Process
  - Mesophilic 35°C, thermophilic 55°C
  - Hydrolysis and acidogenesis: pH 6-6.5 (Massey, Pohland 1978)
  - Acetogenesis and methanogenesis: pH 7-7.5 (Massey, Pohland 1978); strictly anaerobic conditions, slow growth and multiplication of microorganisms, lower resistance to stress
- Final product
  - Biogas (55-70% CH_4, 27-44% CO_2, 1-3% H_2, 0.1-1% H_2S, etc (Jonáš et al. 1988)
  - Compost

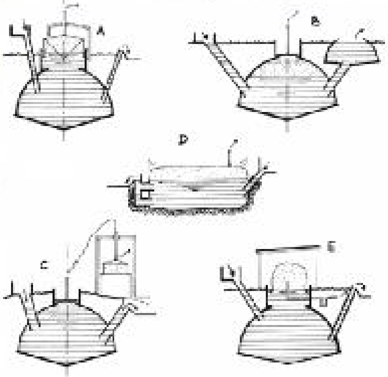
Material potencials for biogas production

Material	Biogas production [l/kg of dry matter]
Cattle slurry	250
Cereal straw	250
Dung	300
Grass	410
Corn straw	410
Distiller's draff	420
Pig slurry	420
Beet tops	450
Poultry slurry	470
Waste water treatment sludge (unstabilised)	540
Biowaste	700
Grass chippings	710
Grease industry waste	1200
Grease from grease separators	1330

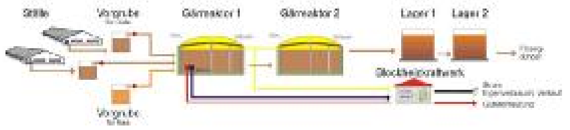
Schattner et al.

Simple digesters – wet processes

- "A" with internal floating gasholder
- "B" with internal gasholder in digester's vault
- "C" with external floating gasholder
- "D" channel digester with internal baloon gasholder
- "E" with internal balloon gas holder

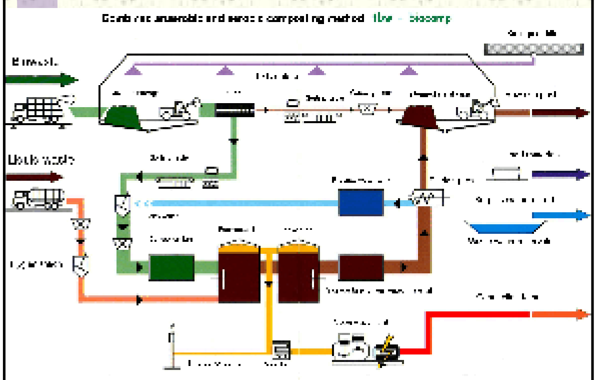


Farm digesters – wet processes



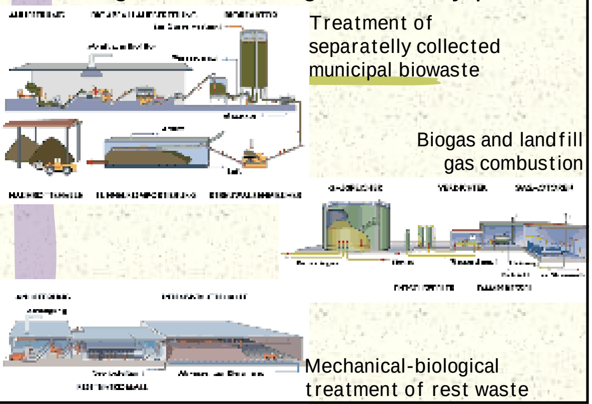
Karlshof
by München

Biowaste digestion - Teugn

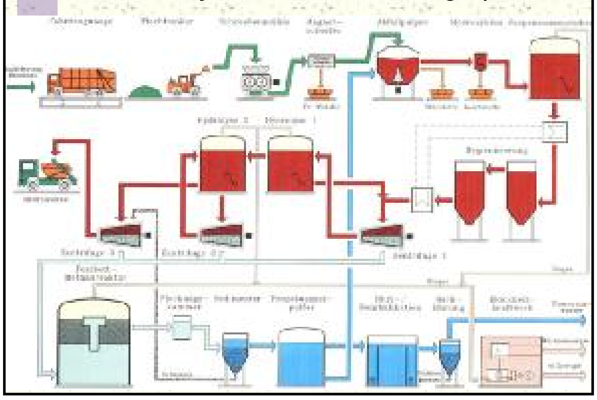


Teugn - photos

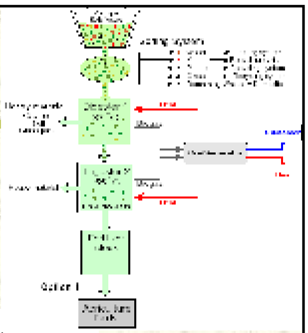
Salzburg, DRANCO digester – dry process

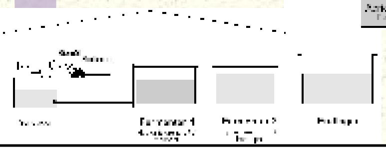


Kirstockach by München – 2-stage process



Kleegarten by Landau – economical design





What we can gain by biowaste recycling

- Decrease of landfilling
- Emmision reductions
  - landfill gas
  - dioxins
  - greenhouse gases
- Nutrients reuse
- Stable organic matter
- Energy production (biogas)
- New workplaces
- Lower prices of waste treatment (compared to combustion

Price of treatment of 1 tun of biodegradable municipal waste [EUR]

	Collection and composting	Combustion
Gironde	24	49
Niort	30.5	60
Bapaume	30-35	72

European Commision, Directorate for the Environment:
Success stories on composting and separate collection. Luxembourg, 2000

Drawbacks of biowaste recycling compared to disposal

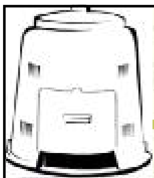
- more work
- more complications
- more manipulation
- more space enclosured

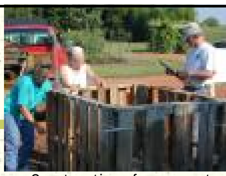
But some problems can be easily solved. How?

Home composting and community composting




Active support


City Toronto offers composters for 15$


Construction of a composter is easy.

Construction of composters from an old fence


In the town Sutton by London municipality offers composters for free (1 per family at max.)

UNEP Dioxin Toolkit The Good, the Bad & the Ugly

IPEN Europe Meeting

Czech Republic – 19 January 2003

Darryl Luscombe (PhD)

GREENPEACE

UNEP Dioxin Toolkit
The Good, the Bad
& the Ugly

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GREENPEACE

UNEP Toolkit

- Intended to provide a uniform and consistent method of estimating dioxin sources for the preparation of national inventories of releases of dioxins/furans
- Consists of a report and an Excel spreadsheet
- Available on Stockholm Convention website http://www.pops.int

Methods of developing an POPs inventory

- Measure releases from each and every facility that generates dioxins, then sum all facilities to give total releases (air, water, residues/wastes)
- Measure releases from a few *similar* facilities, calculate an emission factor based on these measurements (e.g. emission factor = amount released per amount processed). Use emission factor to calculate release for all facilities
- Use emission factors developed elsewhere to estimate a countries total releases

UNEP Toolkit (cont.)

- UNEP dioxin toolkit provides emission factors for a range of industries, so does not require any testing to conduct a national inventory!
- Apparently developed from data for modern facilities in EU and North America
- Only provides single emission factor for each type of release
- Divides releases into air, water, land, residues, products

Limitations of UNEP Toolkit

- Does not provide references/citations for sources of data
- Does not provide information for all identified sources
- Does not include PCBs/HCB
- Does not include data for older industries
- Does not include a strategy for identifying sources
- Contains a number of undocumented assertions and opinions

Examples of sources not listed

- Tire combustion
- Petroleum refining catalyst regenerators
- Tetrachlorobisphenol-A manufacture
- Primary aluminium production
- Primary copper production
- Drum and barrel reclamation
- Iron chloride manufacture
- Aluminium chloride manufacture
- Copper chloride manufacture
- Phthalocyanine dyes and pigments manufacture
- Printing inks manufacture and/or formulation
- Carbon reactivation furnaces (industrial spent carbon and spent carbon from municipal water treatment)

Emission Factor$_{Air}$, µg I-TEQ/ton

	UNEP Toolkit	Other
Cement kilns, all	0.15 - 5	0.15 OSPAR Guidance
Cement kilns, hazardous waste	No factor given	20.91 U.S.
Cement kilns, no hazardous waste	No factor given	0.27 U.S. 202231 Russia
Municipal waste incinerator, high quality pollution control	0.5	1.5 OSPAR Guidance
Aluminium Production, Primary	None or insignificant No factor given	11169 Russia
EDC/VCM/PVC *"Modern plants"*	0.015	0.1 – 33 Germany
Thermal metal reclamation	3.3	17 OSPAR Guidance

UNEP Toolkit

Should:

- address all by-product POPs
- include coherent strategy for identifying sources, including development of PRTR legislation
- incorporate emission factors as a range (low, high)
- include emission factors appropriate for sources in developing countries and for countries with EIT
- provide references for all data used

Health Impacts of Persistent Organic Pollutants (POPs)

Chapaevsk, Cheliabinsk - February/March 2003

Campaigning for Stockholm Convention and for dioxins elimination

Arnika Association experience

Jindřich Petrlík

Toxics and Waste Program of Arnika Association

Established in October 2001. Our Toxics and Waste Program continues in the work started in For Clean Soil, Air and Water section of the Children of the Earth.

SUCCESSES

- helped put a stop to 19 unnecessary waste incinerators (1994 - 2000) and two new landfill sites,
- limit on emissions of dangerous dioxins from waste incinerators in the Czech Republic (1999 - 2000),
- preventing building of one new waste incinerator proposal (2002)
- PRTR legislation and Stockholm Convention ratification (2002)

Situation on the beginning of 90-s, public knowledge

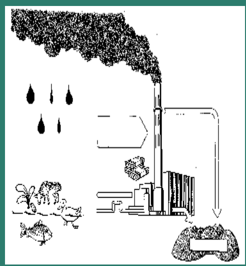
- people didn't know what the dioxins are for
- very few people cared about dioxins coming out of the stacks of waste incinerators and other factories
- at least no one except workers in Spolana Neratovice knew about terrible contamination by dioxins in former pesticides production unit in Spolana (chemical component of Agent Orange was produced there)

List of campaigns

- START in 1993
- Resistance against waste incinerator in Liberec 1993 - now (Children of the Earth /Arnika)
- Opposing waste incinerator in Prague-Malešice 1996 - 1999 (Children of the Earth)
- Stop dioxins in the Czech Republic - a campaign for introduction of the air emissions limit 1998 - 2000 (Children of the Earth)
- Clean up Milovice stockpile 1998 - 2000 (Greenpeace)
- Toxics Free Future 2001- now (Children of the Earth /Arnika)
- Clean up Spolana Neratovice from POPs 2001 - now (Greenpeace/since 2002 Arnika as well)
- Stop Lysa nad Labem incinerator 2000 - now (Arnika)

Incineration Impacts on Environment

- **Inside goes:**
  - waste
  - money
- **Outcomes:**
  - air emissions
  - (toxic) waste
  - waste water



Liberec Waste Incinerator - Fly Ash on Long Travel

- there were terribly high dioxin emissions by the incinerator
- Liberec incinerator produce about 3.000 t of fly ash per year
- it is washed, but still includes dioxins on level 362 ngTEQ/kg
- it means 1.086 mgTEQ/year
- fly ash goes to landfill in mixture with bottom ash 30 km far
- waste water from landfill, which can include dioxins goes to treatment plant again 30 km far
- we did not find out, what does happen with sewage sludge after treatment
- State institutions gave up to control this long trip of dioxins

Liberec Waste Incinerator - what we learned

1) to follow all pollution flows
2) to follow not only pollution flows but economic as well
3) when you get rid of dioxins from air you will receive them somewhere else

No incinerator is safe enough - it always produces some POPs

Incineration is mostly economic disaster for the community or for the state budget

List of campaigns

- START in 1993
- Resistance against waste incinerator in Liberec 1993 - now (Children of the Earth /Arnika)
- Opposing waste incinerator in Prague-Malešice 1996 - 1999 (Children of the Earth)
- Stop dioxins in the Czech Republic - a campaign for introduction of the air emissions limit 1998 - 2000 (Children of the Earth)
- Clean up Milovice stockpile 1998 - 2000 (Greenpeace)
- Toxics Free Future 2001-now (Children of the Earth /Arnika)
- Clean up Spolana Neratovice from POPs 2001 - now (Greenpeace/since 2002 Arnika as well)
- Stop Lysa nad Labem incinerator 2000 - now (Arnika)

"Toxics free Future"

an Arnika's Waste and Toxics Program

- This project brings together **three important steps** towards a clean environment
- **Integrated register of pollution** (= Pollutant Release and Transfer Register - PRTR)
- **signing, ratification and implementation of the Stockholm Convention on POPs**
- **reduction in the quantity of harmful materials released** into the environment from particular industrial plants

Toxics Free Future - results

- 9 320 signatures under petition
- more than 70 members of local and regional authorities supported campaign as well
- Stockholm Convention was adopted by the Parliament in May - 9, 2002
- PRTR adopted in 2002 as well

List of campaigns

- START in 1993
- Resistance against waste incinerator in Liberec 1993 - now (Children of the Earth /Arnika)
- Opposing waste incinerator in Prague-Malešice 1996 - 1999 (Children of the Earth)
- Stop dioxins in the Czech Republic - a campaign for introduction of the air emissions limit 1998 - 2000 (Children of the Earth)
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- Stop Lysa nad Labem incinerator 2000 - now (Arnika)

Spolana Neratovice

- 1961 – production of HCHs (13% g) – pesticide - mixtures and production of TrCBz – TeCBz and HCB
- HCB – pentachlorophenolate Na – PeCP
- TeCBz – trichlorophenolate a – 2,4,5-T
- PCDDs/Fs contamination
- some products used for Agent Orange in 60-s

Spolana campaign - history

- 1996 - Children of the Earth published article "Czech Agent Orange" and warned about dioxin other possible sources of contamination
- 2001 Greenpeace started campaign on cleaning up old pesticide production buildings and warned before possible floods
- at the beginning of 2002 Arnika started campaign on safety measures and cleaning up old chlorine electrolysis production from mercury
- August 2002 Spolana was flooded

Spolana Neratovice

After floods company declared: dioxins and PCBs found in sediments, soil and / or have not origin in its area. In January 2003 scientists found that in Spolana are at least two sources of dioxins - pesticides production unit and old chlorine production unit

How to solve Spolana's problems with dioxins?

Czech officials and industry representatives got answer on this question on conference organized by NGOs (IPEN and Arnika) together with UNIDO in January 2003 in Prague. By dioxins and other POPs contaminated sites can be cleaned up by non-combustion technologies such as GPCR (above) or BCD (below) processes are.

Summary: Some results of NGOs campaigning in Czechia

- Dioxins air emissions limit (0,1 ngTEQ/m^3) for waste incineration introduced into Czech legislation since May 2000
- Between 20 - 30 new proposals for waste incinerators were stopped
- Stockholm Convention and PRTR adopted by Czech Parliament during Spring 2002
- Fly ash from incinerators has to be separated and specially treated according to Czech law
- Chemical plant Spolana Neratovice (chlorine production) is better monitored as POPs hot spot and will be cleaned up by non-combustion technology

Some websites with more information

- Arnika's English website with information about Spolana, waste incineration and other toxic issues http://english.arnika.org
- International POPs Elimination Network website http://www.ipen.org
- International Conference on Non-Combustion Technologies http://pops2003.arnika.org

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10 January 2003

To: United Nations Environment Programme
Heidelore Fiedler, Scientific Affairs Officer
UNEP Chemicals
International Environment House
11-13, chemin des Anémones
CH-1219 Châtelaine (GE)
Switzerland

Re: Greenpeace Comments on UNEP Chemical's "Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases"

We appreciate the opportunity to offer our comments on the UNEP Chemicals draft report, "Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases."

The draft Toolkit provides an introduction to the process of preparing inventories of sources and releases of polychlorinated dioxins and furans (PCDD/Fs). However, the Toolkit requires major revisions and additions if it is to provide the fundamental informational and procedural tools required by the Parties to the Stockholm Convention in meeting their obligations with regard to the identification of sources of the by-product POPs and estimation of the releases of these POPs from those sources. With these needs in mind, we offer the following summary recommendations and include, as an attachment, our general comments and detailed comments and suggestions on selected excerpts from the draft Toolkit.

Greenpeace recommends strongly that the Toolkit is revised to …

- **Address all currently listed by-product POPs – polychlorinated dioxins and furans (PCDD/Fs), polychlorinated biphenyls (PCBs) and hexachlorobenzene (HCB).** Many if not all activities and processes that have been identified as sources of PCDD/Fs are also sources of the other two by-product POPs -- PCBs and HCB. [See, for example, the global HCB inventory by Bailey (2001)[1], the European HCB inventory[2], Canada's inventory of PCDD/Fs and HCB[3], the UK PCB inventory[4], and the U.S. inventory of dioxins and dioxin-like compounds[5].] Given this circumstance, the preparation of one inventory of sources of all four by-product POPs and their estimated releases is a far more efficient use of limited resources than the more costly and repetitious process of preparing one inventory for PCDD/Fs, another for PCBs and yet another for HCB.

- **Include a coherent strategy for identifying sources of by-product POPs.** The Toolkit's list of PCDD/F sources is, and will remain, incomplete: it does not include all those sources that have thus far been identified and, further, new sources are still being discovered. Consequently, the Toolkit must be revised so that it includes a coherent strategy for identifying sources that will, when followed, enable Parties to identify their sources of PCDD/Fs and other by-product POPs.

- **Include emission factors that are appropriate for sources of by-product POPs not only in industrialized countries but also in developing countries and countries with economies in transition.** While the origins of the PCDD/F emission factors currently presented in the draft Toolkit are not given in many cases, they appear to be drawn almost entirely from studies of facilities and activities in the industrialized countries. Moreover, in many cases the Toolkit's emission factors are markedly smaller than those used in the existing inventories of the industrialized countries. As a consequence, many of the emission factors currently in the Toolkit cannot be assumed to reflect the PCDD/F-generating processes and activities even in the industrialized countries and particularly in developing countries and countries with economies in transition. In addition, they do not have the robustness needed to yield estimates of PCDD/F releases that are sufficiently accurate to be relied upon by the Parties, particularly developing countries and countries with economies in transition, in prioritizing PCDD/F sources and developing National Action Plans. Greenpeace strongly urges revision of the draft Toolkit to include well-documented emission factors that are appropriately comprehensive and conservative and that include emission factors that have been reported or derived for studies of facilities and activities in developing countries and countries with economies in transition.

- **Include and/or refer Parties to guidance in crafting and implementing legislation to establish Pollutant Release and Transfer Registers (PRTRs)** and related mechanisms whereby point sources of by-product POPs, such as manufacturing facilities, waste disposal facilities, etc., are required to monitor and report their releases of by-product POPs as well as intentionally produced POPs. With PRTRs in place, Parties have a mechanism for gathering the information needed not only to craft and implement their National Action Plans but also to verify the effectiveness of such Plans.

- **Include and/or refer Parties to guidance, capabilities, availability of and financial support for the less costly analytical methods for by-product POPs, such as bioassays.** Several bioassay methods have been validated, accepted, recommended and/or relied on by scientists in academia, industry, national and international agencies for determining concentrations of PCDD/Fs and related chemicals in all media, even incinerator stack gases. Costs of such methods are a fraction of the costs of conventional analysis by high-resolution gas chromatography/mass spectrometry. Information on these bioassay methods, including the costs and availability of commercial analytical services as well as the costs and availability of requisite laboratory equipment and training, may expedite the inventorying process and conserve limited resources.

- **Include source citations for all values and statements of fact that are not currently documented, expunge superfluous statements of opinion and correct all inaccuracies.** The draft Toolkit contains many undocumented emission factors, statements of fact, assertions, and assumptions that can have enormous impacts on the results of the inventorying process. It also contains many statements that are extraneous to the subject at hand in addition to alleged facts that contradict the findings of other highly credible reports and papers. This is particularly true with regard to those processes and activities that are, according to the Toolkit's authors, most well characterized, such as waste incinerators. Greenpeace recommends that the draft Toolkit be revised so that its content is concise, accurate and well documented.

Following our review, we ask UNEP Chemicals to recognize the shortcomings of the current draft Toolkit and the revisions that need to be made and, pursuant thereto, to advise those Parties who have completed inventories based on the Toolkit that they will need to revise their inventories commensurate with the revised Toolkit.

We respectfully submit, as an attachment, our general comments as well as more detailed comments and suggestions on selected excerpts of the draft Toolkit. The latter does not represent an exhaustive evaluation of the entire contents of the Toolkit since, due to time constraints, a complete assessment was not possible. Rather it is intended to illustrate the breadth and depth of the needed revisions to the draft Toolkit.

Respectfully yours,

Kevin Stairs
Political Advisor and
Head of Greenpeace Delegation,
Stockholm and Basel Conventions
Greenpeace International

Attachment (1)

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[1] Bailey, R., 2001. Global hexachlorobenzene emissions. Chemosphere 43: 167-182.

[2] Berdowski, J., Bloos, J., 1997. European hexachlorobenzene inventory prepared at TNO, Netherlands. [Cited in Bailey, R., 2001. Global hexachlorobenzene emissions. Chemosphere 43: 167-182.

[3] Environment Canada, 1999. Dioxins and furans and hexachlorobenzene inventory of releases. Available from the Environment Canada homepage http://www.ec.gc.ca.

[4] Dyke, P., Stratford, J. 1998. Updated inventory of PCB releases in the UK. Organohalogen Cpds. 36: 365-368.

[5] U.S. Environmental Protection Agency. 2000. Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Part I: Estimating Exposure to Dioxin-Like Compounds, Volume 2: Sources of Dioxin-Like Compounds in the United States. EPA/600/P-00/001Bb, Washington, DC, September 2000.

UNIDO IPEN ARNIKA

International Workshop on Non-Combustion Technologies for Destruction of POPs

Prague, January 15 and 17, 2003
Hotel Prokopka

Asociación Argentina de Médicos por el Medio Ambiente AAMMA

Dra. Maria C.Della Rodolfa Vicepresident, Dra. Lilian Corra President

How far is Argentina with ratification of the Stockholm Convention?

The project is at the congress at this time after being approved by the senators. Due to the actual socioeconomic situation there are other priorities delaying this treatment. Another aspect to underline is the evident inefficiency and/or lack of control, especially because the deficient economy and lack of infrastructure (laboratories to control dioxins emissions).

This situation prevents the achievement of effective control measures.

Was there initiated a project Enabling Activities for Stockholm Convention in your country and is your or other NGOs involved in the project?

Argentina is working with the adoption of the Toolkit/UNEP to calculate the emissions and build inventory of sources on industry that generate non-intentional POPs (chlorine, chlorate solvent, incineration of municipal waste, disposable medical supplies and hazardous waste). This started 10.02 and finishes 12.03. There are working national, but expect to work regionally as soon as possible. The major problem is to evaluate all the open waste burns witch are a large source of POPs due that the waste is not classified.

There are working on a GEF/UNEP project to evaluate the priority in the country on PCBs.

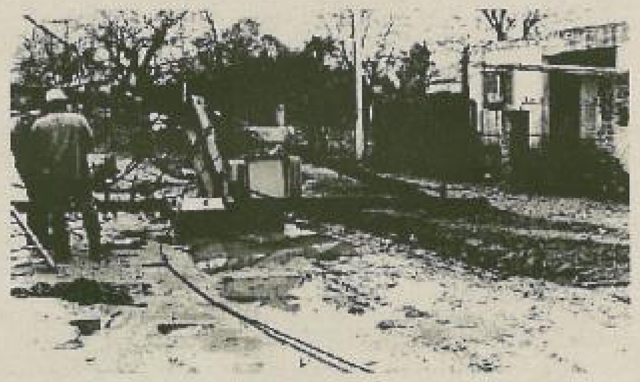
AAMMA as an NGO is included in a project of HCWH /WHO with Argentina as the only country in Latin America that has already the "PDF A" approved to reduce the emission of dioxin produced by medical waste because of the large amounts of

PVC products that are use in medical treatment. Incineration is still the main technology adopted for dangerous (medical waste) waste treatment but NOT used for domestic waste (land field is mainly used). A reunion is settled this February in India to continue working this project. The objective is also to reduce the sources of emission of mercury to the environment.

Does some obsolete PCBs, HCBs and pesticides stockpiles exist in your country?

Misfortunes we still have PCBs in large amount in electric transformer many of them situated in front of schools were children are highly exposed. This gets even worse when they have a leakage or they fell and PCB is spilled as seen in the pictures.

When this transformer are replaced the PCBs is stored in stockpiles in different regions of our country, with dangerous to the surrounding population unknown of this situation.



What is the most serious problem connected with POPs in your country?

There exists a general regulatory framework but no specific requirements to approach the Pops issues, especially to define the limits of emission and acceptable concentrations for PCBs, dioxins and furans and their monitoring. Another aspect to underline is the evident inefficiency and/or lack of control, especially because the deficient economy and lack of infrastructure (laboratories to control dioxins emissions).
This situation prevents the achievement of effective control measures. Public access to the information about the reports,
inventories of sources and emissions; diagnosis on the level of execution of the current legislation.
Analytic capacity of the laboratories (human resources and materials) should be installed and/or reinforced in order to complete a regional list, and to establish analytical calibration programs.

DECLARATION
TO SUPPORT NON-COMBUSTION DESTRUCTION TECHNOLOGIES OF POPs

19 January 2003, Litice u Ceska Lipa, Czech Republic

We, the participants of IPEN European Working Group Meeting and of International Workshop on Non-Combustion Destruction Technologies of POPs would like to

- give our strong support to the groups that are working on elimination and minimization of POPs and other toxic substances worldwide,
- give our strong support to the efforts of NGOs and their Governments involved in preparation of National Implementation Plans/Enabling Activities,
- call upon Governments around the world to ratify the Stockholm Convention as soon as possible,
- express our strong support for NGOs and communities working to identify and eliminate stockpiles of obsolete POPs, including stockpiles of obsolete pesticides and industrial chemicals, and encourage governments to facilitate and assist with data gathering and identification of stockpiles.

We recognize that proven Non-Combustion Technologies for the destruction of obsolete POPs stockpiles already exist and are commercially available. We demand that such technologies must be used in preference to those which form or release POPs, such as incineration.

We emphasise waste minimization at source and demand appropriate non-combustion technologies must replace existing technologies that are creating and releasing POPs.

We stress that we are not satisfied with the UNEP Toolkit and would like to express our strong concern at the lack of scientific references as to the facilities chosen in obtaining the emission figures used.

UNEP should
- address all by-product POPs
- include coherent strategy for identifying sources, including development of Pollutant Release and Transfer Register (PRTR) legislation
- incorporate emission factors as a range (low, high)
- include emission factors appropriate for sources in developing countries and for countries with economies in transition.

List of signatories (as of February 14^{th}, 2003):

1) ACPO - Associaçao de Combate aos POPs (Brasil) - Jeffer Castelo Branco
2) Agrolink Association (Bulgaria) - Ivan Ginev
3) Arnika Association (Czech Republik) - Jindrich Petrlik
4) AWHHE - Armenian Women for Health and Healthy Environment Armenia) - Elizabeth Danielyan
5) Baikal Environmental Wave (Russia) - Jennie Sutton

6) BALKANI Wildlife Society (Bulgaria) - Andrey Kovatchev
7) Belgian Platform Environment and Health (Belgium) - Fred De Baere
8) Centre of development of the human rights and genderic equality of Bashkortostan (Russian) - Shamil Galimov
9) Chemical Weapons Working Group (USA) - Elizabeth Crowe
10) Communities Against Toxics (UK) - Raplh Ryder
11) DEA Klub (Slovenia) - Maja Bavdaz Solce
12) Department of the Planet Earth (USA) - Erik Jansson
13) ECAT Tirana (Albania) - Marieta Mima
14) Elm Tree (Bulgaria) - Boryana Hrissimova
15) Environmental Experts Association (Romania) - Simona Condurateanu
16) For Civil Society (Kyrgyzstan) - Igor Hadjamberdiev
17) Foundation for Agriculture and Environment (Bulgaria) - Marya Mudrova
18) Foundation for Realization of Ideas (Belarus) - Eugenyi Lobanow
19) Georgian Environmental and Biological Monitoring Association (Georgia) - Manana Juruli
20) Green Justice Association (Bulgaria) - Elena Mihayllova
21) Greenpeace International (Netherlands) - Darryl Luscombe
22) groundWork (South Africa) - Llewellyn Leonard
23) Health Care Without Harm Europe - Cestmir Hrdinka
24) Human Write Groupe "Step Towards" (Russia) - Tatiana Schoor
25) InfoECOclub (Bulgaria) - Maria Moleshka
26) Institute for Work, Environment and Health - CC.OO. (Spain) -Estefania Blount
27) Mama-86-Kharkov (Ukraine) - Nadia Yefimova
28) Medical Students for Social Responsibility (Egypt) - Ahmed Geneid
29) People's Task force for Bases Cleanup (Philippines) - O'lola Ann Olib
30) Polish Ecological Club (Poland) - Daniel Nowakowski
31) Public Fund "Ecology" (Russia) - Nikolai Schoor
32) RAPAM-Red de Acción sobre Plaguicidas y Alternativas en México (Mexico) - Fernando Bejarano
33) REACT! Canterbury Alliance for Incinerator Alternatives (UK) - Naomi Browton
34) Russian Regional Environmental Centre (Russia) - Olga Razbash
35) Save Bombay Committee (India) - Priya Salvi
36) Tools for Transition (Netherlands/Poland) - Ewa Charkiewitz
37) Uganda Environmental Education Foundation UEEF (Uganda) - Nicholas Ssenyonjo
38) Union for Chemical Safety Izhevsk (Russia) - Vadim Petrov
39) Union for Chemical Safety Votkinsk (Russia) - Natalia Pavlukova
40) Union of Parks & Landscape Specialists (Bulgaria) - Maria Samardjieva
41) University of St. Tomas (Philippines) - Carmelito Tatlonghari
42) Waste Prevention Association (Poland) - Pawel Gluszynski
43) Wildlife Clubs of Uganda (Uganda) - Rebecca Nalunkuuma
44) Women In Europe for A Common Future (Netherlands) - Sylvia Altamira
45) Zero Waste Ireland (Ireland) - Aine Suttle

INTERNATIONAL POPS ELIMINATION NETWORK FACT SHEET

WHAT ARE POPS?

"POPs" is short for "Persistent Organic Pollutants," a class of toxic chemical pollutants that are widely present in the environment and that are harmful to human health and to wildlife. POPs appear as toxic contaminants in human food in all regions of the world; POPs harm workers who use or produce them; and POPs also cause harm in communities nearby where they are used, produced and/or stored.

POPs have three critical characteristics:

✓***Persistent.*** POPs last in the environment and do not disappear or lose force over time.

✓***Humans are strongly impacted.*** POPs collect in fatty tissue, and they concentrate as they move up the food chain.

✓***No safe levels.*** These chemicals are very dangerous and are toxic in very small amounts.

Some POPs are produced for use as pesticides and some POPs are produced for use as industrial chemicals. POPs are also produced as unwanted by-products during the combustion and incineration of wastes containing chlorine and in some other chemical and/or combustion processes where chlorine is present.

POPs enter the environment through:

✓*Pesticides*
✓*DDT*
✓*Incineration and waste burning*
✓*Releases of chemical and industrial wastes*

POPs easily enter the environment by evaporation into the air, and by other means.

Once POPs are in the environment, they do not just go away. They remain in the environment as very stable and persistent chemical substances that do not easily degrade or metabolize.

In the environment, POPs travel about on air currents and water currents. POPs also can be carried from place to place by migratory animal species. Eventually, POPs in the environment return to the ground or the water and find their way into the food eaten by fish, birds and other animals. POPs are also present in the food people eat.

POPs accumulate in small animals and other organisms. They then concentrate in the bodies of the larger fish and animals that eat the smaller ones. When POPs fall onto grass and vegetation, they accumulate in the bodies of grazing animals and contaminate food products like beef, fish, eggs or milk. When POPs are used as pesticides, they directly impact farmers and nearby dwellers. POPs can also contaminate the vegetables and fruits that go to market. Since POPs do not dissolve in water, they cannot be washed off or easily removed.

Most of the POPs that enter the environment remain near the places where they were originally produced, used and/or stored. They mainly cause harm to the local environment, the local food supply and the local communities. However, POPs in the air can also travel thousands of kilometers before returning to earth.

For example, POPs enter the Arctic region through the air in quantities that cause serious harm, though little POPs have ever been used or produced there. Examples of POPs pesticides include DDT, Aldrin, Dieldrin, Endrin, Chlordane, Heptachlor, Mirex and Toxaphene. Some industrial chemical oils, such as PCBs (polychlorinated biphenyls), are also POPs. PCBs have been widely used in electrical transformers and in some other equipment.

Finally, POPs also are produced unintentionally as by-products and wastes. The most notable of these are dioxins and furans, which are among the most highly toxic substances ever discovered. These poisons are commonly created and released to the environment when chlorine-containing materials such as PVC-plastics are burned or incinerated. Dioxins produced this way fall onto the grass, vegetation and waterways and cause contamination in fish, meat and milk products.

POPS AND HEALTH

POPs (persistent organic pollutants) accumulate in animal fat and fish fat and are present in human foods such as meat, fish and milk products. Where POPs pesticides are directly used on food crops, POPs are also be present in vegetable foods. Workers who use or produce POPs are also impacted, as are people living in nearby communities.

People in all parts of the world have POPs in their bodies in amounts that can cause disease and health deficits. POPs are especially harmful to infants and to the developing human fetus.

Wildlife

The first evidence pointing to widespread health injury from POPs came from scientists who were researching population declines in fish and wildlife. They observed a range of health injuries in fish, birds and mammals that were associated with the presence of POPs in the environment.

Documented health injuries and health deficits in wildlife species exposed to POPs in the environment include:

- ✓*Reproductive failure and population declines*
- ✓*Abnormally functioning thyroid glands and other hormone system dysfunctions*
- ✓*Feminization of males and masculinization of females*
- ✓*Compromised immune systems*
- ✓*Behavioral abnormalities*
- ✓*Tumors and cancers*
- ✓*Gross birth defects*

Human Health

Soon after scientists began to document the harmful impacts of POPs on wildlife, medical researchers began to also explore impacts of POPs on human health.

Researches analyzed human tissue samples, human blood samples, and human milk samples. They discovered that people in all countries and all regions have an alarming presence of POPs and other man-made toxic chemicals in their bodies.

Medical researchers then began to study the ways these widespread environmental toxic pollutants impact health. Such studies are often difficult since cause/effect relationships of this sort are hard to prove. Still, a good body of evidence has been collected that points clearly toward a number of different ways POPs in the environment injure or impair human health.

Studies have associated POPs with many different human health impairments. These include:

- ✓*Cancers and tumors in different parts of the body*
- ✓*Nervous system damage and impairments, including learning disorders, attention deficits, changes in temperament, and reduced performance on standard tests*
- ✓*Immune system changes that may weaken a person's ability to fight off disease*
- ✓*Reproductive failure and some sex-linked disorders, such as delayed sexual maturation in boys and girls and declines in male births*
- ✓*Shortened period of lactation in nursing mothers*
- ✓*Certain diseases such as endometriosis (a painful and debilitating, gynecological disorder), increased incidence of diabetes, and some others*

These diseases and deficits do not impact all people equally. Some groups of people may be especially contaminated such as farmers and workers who are exposed to POPs in their occupations, and also, in some cases, people living in nearby communities. Subsistence hunters and fishers are also often highly exposed. In addition, some

localities, and some countries or regions may be more contaminated than others.

Human exposure to POPs, however, is not limited to specific occupational groups or only to people living in certain regions. POPs are found in the blood and in the tissues of the general human population in all parts of the world. This makes POPs a legitimate and important cause for concern, everywhere.

Women, infants, and children are also especially vulnerable to POPs. Mothers transfer POPs from their own body, through the placenta into the fetus, which is especially vulnerable. POPs can cause irreversible to the fetus, although the harm is often not easily recognized and may not be evident until adulthood.

Good evidence also links POPs present in a mother's body to various health impacts in her children. Learning and behavior disorders in children and adolescents have been associated with perinatal exposure to POPs. There also is evidence that suggests linkage between a mother's exposure to POPs and other impairments in her child such as immune system disorders, reproductive and sex-linked disorders, and certain other diseases and deficits. Some of these may not be apparent until later in life.

POPs are also found in mother's milk. While this too can cause harm, the best evidence suggests that the good effects of breastfeeding outweigh the harm caused by POPs in mother's milk. Therefore, mothers are strongly encouraged to breastfeed.

There is more data to be collected on POPs, and more research needs to be done. Still, more than enough is known to justify urgent action now aimed at reducing and eliminating human exposure to POPs.

The Stockholm Convention provides a means to end the manufacture and use of POPs chemicals and pesticides and their by-products, and to cleanup and properly destroy POPs stockpiles. The treaty will also reform waste management practices to prevent POPs formation when wastes are burned or incinerated, and to promote the use of cleaner production processes and cleaner materials.

THE STOCKHOLM CONVENTION ON POPS

On May 23, 2001, governments of the world adopted a global, legally binding treaty called *the Stockholm Convention on POPs (Persistent Organic Pollutants).* In its first Article, the Convention calls attention to the Precautionary Approach. It declares that the Convention's objective is *"to protect human health and the environment from POPs."*

To achieve its objective, the Convention will assist, encourage and require countries to take measures that will reduce, minimize and ultimately eliminate releases of POPs to the world's environment.

Convention Provisions

Under the Convention, Governments will:

- ✓*Restrict, phase-out and ban the production and use of POPs pesticides and POPs industrial chemicals;*
- ✓*Minimize releases of POPs as unwanted by-products, and where feasible, prevent or avoid their generation; and*
- ✓*Cleanup and properly destroy obsolete stocks of POPs.*

Developing countries and countries in transition will receive financial and technical assistance to enable them to implement Convention measures.

The Stockholm Convention requires:

- ✓*A ban or phase-out of the pesticides: aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene,*[1] *mirex and toxaphene;*
- ✓*DDT elimination except for malaria and other disease control; and strategies to reduce and eliminate all DDT use;*
- ✓*Immediate prohibition of new uses of PCBs (polychlorinated biphenyls), and the phase-out and disposal of existing stocks;*
- ✓*Best available techniques to minimize releases of unintended by-products (dioxins and furans*[2]*) with the aim of their ultimate elimination; and*
- ✓*Disposal of POPs stocks and wastes in ways that destroy or irreversibly transform their POPs content to no longer exhibit POPs characteristics.*

The Convention establishes criteria and a procedure for expanding the list of POPs that will become subject to the provisions of the Stockholm Convention beyond the initial twelve. These criteria and the procedure reflect a precautionary approach.

Under the convention, countries will be required to:

- ✓***Develop plans for identifying stockpiles*** of POPs pesticides and industrial chemicals, and produce inventories of sources of unwanted by-product POPs.
- ✓***Develop implementation plans specifying the measures they will take to meet Convention obligations.*** This includes a plan to restrict and to ultimately ban the production, trade and use of POPs as pesticides or as industrial chemicals. (Where POPs are now used for disease control or for crop production, provisions will first be made to assure the availability of effective and affordable alternatives.)
- ✓***Develop a specific action plan on measures to reduce and eliminate sources of by-product POPs.*** The Treaty identifies waste incinerators and cement kilns firing hazardous waste as having the potential for relatively high formation and release of POPs to the environment. Governments should therefore give priority consideration to alternative processes, techniques or practices, including waste minimization and elimination.
- ✓***File their implementation plans with the Convention;*** update the plans on a periodic basis; and report to the Convention on the implementation measures they have taken.

[1] Hexachlorobenzene is also an industrial chemical and an unwanted by-product.

[2] Also PCBs and Hexachlorobenzene when these are produced as unwanted by-products.

Ratification

One hundred and twenty countries took part in negotiating the Stockholm Convention and more than 150 countries have signed it. A country, by signing, indicates an intention to ratify.

Treaty ratification is a formal and political country decision, taken at the highest level. When it ratifies, a country assumes a legal commitment to implement the Convention.

The country makes the Convention's provisions its national law, and, if necessary, it changes the country's existing legislation and regulations to bring its laws and practices into line with Convention obligations.

A country that ratifies is called a "Party" to the Convention. Ninety days after fifty countries ratify, the Convention enters into force and becomes legally binding on its Parties. It is likely that the Stockholm Convention will enter into force within only a few years, possibly as early as 2003 or 2004.[3]

NGO Role

Education. Because POPs harm human health and the environment, governments, industry and others are strongly urged to act now to reduce and eliminate sources of POPs, not to delay action until after the Convention enters force. NGOs can play a key role in helping all parties understand the dangers of POPS and steps they can take for their elimination.

Ratification. Ratification by 50 countries is required for the Convention to take effect. NGOs can play a role in educating the public and government officials about the Convention and the important role it will play in toxic pollution reduction.

Funding to Promote Action. Public health and environmental advocates in many countries have launched campaigns and projects to promote action on POPs. A special fund to encourage government action on POPs has been set aside by international donors through the Global Environment Facility (GEF). Developing countries who have signed and/or ratified the Convention can receive money from this fund to prepare Stockholm Convention National Implementation Plans (NIPs), and for other so- called *"Convention Enabling Activities."*

Some early funds from the GEF will likely also be available for targeted regional or global projects to perform assessments and/or to demonstrate techniques for the reduction and elimination of releases of POPs to the environment.

Stockholm Convention Enabling Activities are a government-led multi-stakeholder process. Under Enabling Activities, the government:

- ✓*Consults with and involves stakeholders including civil society, NGOs and industry*
- ✓*Assesses its institutional infrastructure and its capacity to meet future Convention obligation*
- ✓*Produces an initial inventory of POPs including: present POPs uses and by-products, stockpiles, sources, and also possibly human body burdens and environmental pollution*
- ✓*Establishes country objectives and priorities for action on POPs*

Prepares a National Implementation Plan detailing measures the country will take to satisfy its country objectives together with its Convention obligation.

[3] As of January 2003, 25 countries have ratified.

IPEN Stockholm Declaration

Sweden | May 22, 2001

Statement of the IPEN Participating Organizations agreed in conjunction with the Conference of Plenipotentiaries for the Stockholm Convention on Persistent Organic Pollutants. Any non-governmental organization can join the IPEN by signing the Stockholm Declaration.

Participating Organizations of the International POPs Elimination Network (IPEN), including (but not limited to) those gathered in Stockholm, Sweden to attend the Diplomatic Conference at which governments will sign the Stockholm Convention on Persistent Organic Pollutants:

Hereby declare, on this occasion, our renewed commitment to work jointly toward the elimination of persistent organic pollutants (POPs) and other persistent toxic substances from the world's environment.

Furthermore, on this occasion:

* **Recognizing** the serious and long lasting injury to ecosystems and human health that POPs and other persistent toxic substances can cause in communities that immediately surround their source locations, and also in far distant regions;

* **Cognizant of** growing scientific evidence and public awareness around the world concerning the harm that is caused by these toxic pollutants; and noting special concerns about their accumulation in food and in human body tissues;

* **Applauding** the Stockholm Convention as the first negotiated, global, legally binding instrument that will oblige governments to take actions aimed at eliminating these pollutants from the world's environment;

* **Calling attention** to the precautionary approach which is affirmed in the Convention's Preamble and Objective, is referenced in its indicated method for determining best available techniques, and is operationalized in its procedures for evaluating additional candidate POPs;

* **Noting** that, upon ratification and entry into force of the Convention, the world's governments will be committed to proceed toward bans on the production, generation and use of POPs, and to promote and require appropriate substitution with cleaner products, materials, processes and/or practices;

* **Noting** further that under the terms of the Convention, governments will also be committed to identifying obsolete stockpiles and wastes containing POPs, to requiring their proper and complete destruction (chemical transformation), and to

promoting proper cleanup and remediation of soils and other environmental reservoirs that are significantly contaminated by these substances;

* **Calling attention** to the initial list of twelve POPs whose releases the Stockholm Convention will aim to eliminate: Dioxins, Furans, DDT, PCBs, Chlordane, Heptachlor, Aldrin, Dieldrin, Endrin, Mirex, Toxaphene and Hexachlorobenzene;

* **Understanding** that this initial list of twelve POPs is only a starting point, and that expedited expansion of the list is needed in order to incorporate into the Convention other persistent, toxic substances of global concern that harm ecosystems and human health;

* **Reminding** donor governments, intergovernmental organizations, and international aid agencies of the commitments made to developing countries and countries with transitional economies to provide them with new and additional sources of financial and technical support in order to enable them to meet their obligations under the Stockholm Convention, and to make these resources available in an efficient and transparent manner;

* **Celebrating** the opportunity given to public interest nongovernmental organizations (NGOs) to participate in the global POPs Intergovernmental Negotiating Committee process, and noting that this enabled IPEN Participating Organizations from all corners of the world to make important contributions toward securing international agreement on numerous provisions of the Stockholm Convention;

* **Recognizing** that economic globalization encourages and promotes activities in many countries that result in toxic chemical pollution; and that organized efforts to oppose and stop polluting activities are often resisted by transnational corporate interests and others as a perceived threat to economic development and growth;

* **Recognizing** further that successful activity to implement this Convention and to eliminate POPs and other persistent toxic pollutants will require the participation of NGOs as effective stakeholders in joint activities involving governments, industry groups, international agencies, scientific centers, and others; and

* **Commending** the Government of Sweden, as host of this Diplomatic Conference, for its recent initiative to secure "bans on substances that accumulate in the body" and for advocating international chemicals policies based on the objective that: "the environment must be free from man-made substances and metals that represent a threat to health or biological diversity;" commending Sweden also for its international leadership in advocating chemicals policies based on the precautionary principle, the substitution principle, producer responsibility and the polluter pays principle; and commending Sweden finally for its important contributions toward securing agreement on a strong global POPs treaty.

IPEN Participating Organizations hereby declare and affirm our common:

* **Commitment** to work for a world in which POPs and other persistent toxic chemical substances no longer pollute our local and global environments, nor contaminate our food, our bodies, and the bodies of our children and future generations;

* **Agreement** that the mission of IPEN is to facilitate effective involvement by its Participating Organizations in local, national, and international activities to promote the elimination of POPs and other persistent toxic substances; and

* **Demand** that urgent action be taken to eliminate POPs and other persistent toxic substances, that this action move forward now, and that it not be delayed or deferred until after the Stockholm Convention has been ratified and enters into force.

To accomplish our shared vision, IPEN's Participating Organizations affirm our intention to work to:

* **Phase-out and ban** the production and use of POPs and other persistent toxic substances; and substitute cleaner products, materials, processes and practices, with priority, as appropriate, to non-chemical alternatives;

* **Phase-out** materials, products, and processes that generate and release dioxins and other unwanted byproduct POPs, and promote cleaner products, materials, processes and activities that avoid generation and release of toxic byproducts;

* **Identify, make secure, and properly destroy** obsolete stockpiles and wastes containing POPs and other persistent toxic substances by means that ensure complete destruction (i.e., chemical transformation), and that do not themselves generate or release toxic pollutants or otherwise cause injury to the health and the safety of workers and surrounding communities;

* **Support** the Polluter Pays Principle under which the producer, exporting company, and/or exporting country is responsible for the cleanup and destruction of obsolete POPs stockpiles, especially in developing countries;

* **Halt** combustion and other environmentally inappropriate methods of treating wastes and contaminated soils and sediments;

* **Cleanup and remediate** contaminated sites and environmental reservoirs containing POPs and other persistent toxic substances;

* **Reduce and aim to eliminate** the generation of wastes, including municipal solid waste, medical waste, and hazardous waste; and encourage waste prevention, resource recovery, re-use and recycling;

* **Reduce and eliminate** the use of toxic chemical pesticides, and substitute lower impact methods of pest and vector control to achieve effective agricultural and public health practices that are environmentally sound;

* **Eliminate** toxic chemical residues in food, animal feed, and drinking water;

* **Secure** opportunities for meaningful participation by public interest NGOs and other civil society organizations in programs at the local, country, regional and global level associated with the implementation of the Stockholm Convention, including enabling activities, demonstration projects, development of country implementation plans, monitoring activities, performance evaluation, and others;

* **Develop** timely and effective Stockholm Convention National Implementation Plans in all countries; and promote rapid execution of these plans to achieve the elimination of POPs and their sources;

* **Appropriately and expeditiously expand** the Stockholm Convention's current list of twelve global POPs to incorporate other POPs of global concern; support the immediate establishment of a POPs Review Committee that can begin screening candidate POPs even before the Convention enters into force; and establish appropriate commitments and obligations leading toward the elimination of all additional POPs that are listed subsequent to the initial twelve;

* **Encourage** donor countries and donor agencies to provide adequate technical and financial assistance to enable developing countries and countries with transitional economies to implement the Stockholm Convention, and undertake related activities to eliminate POPs and other persistent toxic substances;

* **Establish** a new focal area within the Global Environmental Facility (GEF) to support implementation of the Convention, and ensure that it is adequately funded in GEF replenishments; and

* **Secure** the ratification of the Stockholm Convention by all countries in advance of the Rio +10 World Summit on Sustainable Development (to be held in Johannesburg in 2002); and by the same deadline also secure ratification, by all countries, of other related conventions: the Rotterdam Convention on Prior Informed Consent; the Basel Convention, together with its Ban Amendment forbidding export of wastes from OECD to non-OECD countries; and the 1996 Protocol to the London Convention on ocean dumping.

Agreed this 22nd day of May 2001, in conjuction with the Conference of Plenipotentiaries for the Stockholm Convention on Persistent Organic Pollutants, by the undersigned IPEN Participating Organizations.

Arnika Association

Arnika was established at the end of September 2001 by part of activists working before with Children of the Earth. It is environmental NGO – an association according to Czech law.

„We want more effectively to protect our environment in larger European context," said founders of Arnika. They worked in Children of the Earth for longer time, so they are not greenhorns on this field. One of Arnika's founders Jindrich Petrlik helped to establish Czech environmental movement including Children of the Earth in 1989.

Arnika's mission and goals

Arnika's mission is improvement of environment, preventing its toxic pollution, and restoration of the landscape natural value in the Czech lands, as well as in European context. Arnika is nationalwide NGO with central office in Prague and local and on the topic oriented branches. Arnika is willing to have a wide membership base. We want to achieve our goals through projects and campaigns.

Three Programmes of Arnika are:

- Nature Conservation

- Public Participation

- Toxics and Waste

"Toxics Free Future"

Arnika's Toxics and Waste Programme project

This project brings together three important steps towards a clean environment

- the introduction of an integrated register of pollution which guarantees the public the right to information about what particular industrial plants are releasing into the environment and what dangerous materials are to be found in it

- the signing, ratification and implementation of the new international agreement about the twelve most toxic materials on the Earth (known as persistent organic pollutants), including dioxins, polychlorinated biphenyls and DDT.

- a reduction in the quantity of harmful materials released into the environment from particular industrial plants

What have Waste and Toxics Platform of Arnika (as former part of the Children of the Earth) done so far to reduce the emissions of dangerous materials?

- helped put a stop to 19 unnecessary waste incinerators (1994 - 2000) and two new landfill sites,

- with the help of the public, they pushed through a law placing a limit on emissions of dangerous dioxins from waste incinerators in the Czech Republic (1999 - 2000),

And what are they doing now?

- they operate a register of information about pollution from waste incinerators and generators (http://bez-jedu.detizeme.cz/registr.htm).

- they help with the recycling of waste in Dobrá

- they take part in international projects aimed at reducing the dangerous levels of persistent organic pollutants (dioxins, PCB's and DDT) in the environment, and to limit the use of PVC, which is a danger to the environment and to health

How much dioxins the Czechs eat? Toxic chemicals even after 12 years

5.4.2002

PRAGUE (Arnika - Toxics and Waste Programme Press Release) - Association Arnika ordered measurement of contamination of tissue of trout caught in the river Nisa in Liberec. The measurement was supposed to discover a level of dioxins (PCDD/F) and polychlorinated biphenyls (PCBs) (1). Now results of the measurement are known but not gratifying. Levels measured by accredited laboratory Axys-Varilab achieve 35,2 pgTEQ/g(2) lipid as for the dioxins (PCDD/F) and 165,9 pgTEQ/g lipid (3) in case of PCBs. "It means that when eating 200g portion of trout from Liberec one would fulfill 450-460% of the recommended maximum daily limit of dioxins intake recommended by the World Health Organization (WHO), or 200% of the limit for one weak dioxin consumption recommended by the European Commission," Jindrich Petrlík, leader of Arnika´s Toxic Free Future campaign, commented on the measured concentrations.

The results of this analysis just confirm a conclusions stated earlier by the State Health Institute concerning its analyses of selected kinds of food usually consumed by Czech people (4) . Though some politicians try to convince us that environment had been cleaned from the toxic substances within last 12 years, food contamination by dioxins in the Czech Republic exceeds the limit set by the WHO. According a risk analysis worked out by the State Health Institute´s experts, quantity of dioxins consumed by Czechs in 1998 can cause approximately 270 new cases of cancer (5).

The toxics certainly must have some kind of origin. They leak from insecurely placed wastes, from untight landfills, they also leak to atmosphere during waste incineration. "That is why we try, within the Toxic Free Future campaign, to push a ratification of the Stockholm Convention through the Parliament and to make its deputies adopting a right for information about the toxics to Czech legislation. We want to make state authorities to become involved in the serious problem of dioxins in environment. It concerns for instance high PCBs concentrations in Ostrava. We further demand closing of useless sources of pollution such us incinerator of hazardous waste in Lysá nad Labem. But we know this will not solve the problem completely," said Jindrich Petrlík from Arnika Association at a press conference today.

When we start seeking for causes of the pollution, the reply is: wrong political decisions and inconsistent work of state authorities in reduction of the toxic contamination by dioxins and polychlorinated biphenyls (6). "More strict measures are being adopted quickly in the Czech Republic, under pressure from the EU," Petrlík added.

Appendix:

(1) Polychlorinated biphenyls (PCBs) had been produced since 1930 as chemicals for industrial use. They were used for production of transformer and condenser oils, painting colors, plastificants (softeners of plastic products) and also added to tracing paper and ink. Their production was banned in former Czechoslovakia (in Slovak chemical plant Chemko Strážske) in 1984 after finding negative impact on human health. However, these substances are still present in transformers and condensers. They became the most problematic substance in waste.

Dioxins (exact title is polychlorinated dibenzo-p-dioxins and dibenzofurans) are highly stable chemical substances created as a side product for instance in plants of chlorinated

Notes for the editor:

(1) The mercury contamination at Spolana originates from former and present electrolysis units for the production of chlorine. The old production unit was closed in 1975, but Spolana still uses this inherent dangerous technology. According to expert studies made in commission of Spolana itself, there are at present around 250 tons of toxic mercury on the bank of the Elbe. This endangers the safety of the Elbe ecosystem and public health. Metallic mercury and even more dangerous organo-mercury substances not only contaminate some of the production buildings, but also thousands of cubic meters of soil on the Elbe bank.

(2) The largest concentration measured in the soil samples taken at Spolana was 37 grams of mercury per kilogram soil. Several times concentrations in the order of 1,5 to 3,6 g/kg were measured in the samples. Source: Ecochem a.s., Zkušební laborator akreditovaná CIA c. 1163, Protokol o zkoušce c. 6294/1/2002

(3) Methodological instructions from the department for ecological damages from the Ministry of the Environment of the Czech Republic for the implementation of the Czech Government Decree no. 393 from 13 July 1994 on the principles of the further procedures of privatisation: http://plumbum.ceu.cz/ERA/RA [in Czech] The limit for decontamination of soil is 20 mg/kg, but the samples taken from Spolana show concentrations up to 37 000 mg/kg: http://plumbum.ceu.cz/ERA/RA/Lim_zemina.htm [Czech]

(4) Source: Press release of Spolana from May 27, 2002

(5) Mercury is a toxic metal. People that are long term exposed to mercury suffer from weakness, headaches, lack of appetite, digestion problems and weight loss. Mercury can damage the nerve system to an extend that those afflicted get uncontrolled tremors starting in the eyelids, tongue, lips and fingers. They can suffer from a loss of memory and behavioural disturbances, incl. depression. Several studies indicated an enlarged chance on spontaneous abortion, premature birth and birth deformations like lower birth weight amongst women that work professionally with mercury.

(6) Spolana musí prepracovat dokumentaci o zamorení rtutí (Spolana has to rework its documentation on mercury pollution), Arnika Press Release, 11 April 2002, http://bezjedu.arnika.org/index.php?inc=tiskovka&aktualita=ne&id=95

(7) "Greenpeace took samples of mercury pollution in Spolana Neratovice, Czech Republic", Greenpeace Press Release 20/2002, 6 May 2002, http://www.greenpeace.cz/release/en/ 020506en.htm

Carcinogenic Chemicals Leak from Spolana

4.9.2002

PRAGUE (Arnika – Toxics and Waste Programme) - Carcinogenic chemicals such as vinylchlorid and dichlorethan leaked from chemical plant Spolana to the river Elbe. Beside these two chemicals, a number of other hazardous chlororganic substances (tri- and tetrachlorethylen, dichlorethen or trichlorethan) was found in the water, according to analyses of samples taken by the Czech Environmental Inspection in the area of Spolana and its surroundings during the floods in August.

"The analyses make apparent that it was not just a simple dezinfection getting to the river, as reported by management of Unipetrol in its public statement," Jindřich Petrlík, head of Arnika´s Toxics And Waste Programme commented on the situation. "Its is really sad that the Czech Environmental Inspection tried to calm down the public via media and did not provide its own evaluation of measurements which it had ordered," he added.

The measurements showed that in water from the river flowing under Spolana there were also higher levels of polychlorinated dibenzofurans (i.e. one of the two large groups of chemicals included under the title "dioxins"). It means the dioxins were also leaking from the plant. Bu it will take some time to get an evaluation of general impacts of toxic emissions to the environment around Spolana. Arnika says it will require wider monitoring which should be guaranteed by the Ministry of Environment. It will also take some time to find quantity of toxics accumulated in fish because, according to experience from floods in Moravia in 1997, fish tissues are the best indicator of water contamination by dioxins, pesticide called lindane, that used to be produced in Spolana, and other so called persistent organic pollutants.

Results of the water measurements are showed on Arnika´s website http://havarie.arnika.org. For instance, concentrations of 1,2-dichlorethan in Elbe above the plant could be hardly detected while in the water under the plant there was 5,5-8,1 micrograms per litre. "Most of the chemicals found in the water is bound to the PVC production. That is why Arnika recommended people to avoid using PVC materials when renovating their flats and houses." said Lenka Mašková who deals with PVC problematics in Arnika.

Dioxin concentrations in Liberec doubled after waste incinerator started work

25.10.2002

LIBEREC (Arnika – Toxics and Waste Programme) - Concentrations of toxic dioxins in atmosphere in Liberec increased more than twice when company Termizo started operating of local municipal waste incinerator (1). This can be documented by results of research, so far published only among scientists. „As for the discovered data, to be objective, it was not so bad with the dioxins in Liberec . But the situation became much worse in 1999 due to the incinerator which started its trial operation," said Jindřich Petrlík head of Arnika´s campaign „Toxic Free Future".

Sudden increase of dioxin concentrations in the air is apparent on a graph (Fig.1), worked out by RECETOX-TOCOEN by processing data from the Regional Public Health Station in Frýdek-Místek.

The increased concentrations of dioxins in atmosphere is usually followed by contamination of a foodchain by these substances. Arnika pointed on this concerning analysis of tissue of trout, caught in river Nisa in Liberec, and of soil in city part Liberec-Rochlice (see a press release from 18.4.2002). The same as PCBs and hexachlorbenzen, dioxins are dangerous already in trace concentrations. They harm immunity and hormonal systems and some of them are carcinogenic. Human organism accepts them mostly by consuming contaminated food, to which the chemicals get from atmosphere in 80% of cases. Dioxins emerge for instance as undesired byproduct in chemical processes which include usage of chlorine, or by incineration of chlorinated chemicals (during waste incineration or in metallurgy).

The situation in Liberec is not worst in winter season as it usually is in other Czech towns and cities, on contrary, the highest concentrations were measured in summer. This can be documented by graphs (fig.12 and 3), worked out with a use of data published in a study (2), ordered by the Czech Ministry of Environment.

Dioxins are also present as contaminants in ash and slag, mixture of which Termizo wants to sell as a construction material. „If the Czech Republic wants to act in accordance with ratification of Stockholm Convention on persistent organic pollutants (3), it should consider elimination of all sources of dioxins. And Liberec incinerator apparently belongs to the most significant pollutants. Instead of incinerators and stockpiles, it is better to prefer waste recycling. It also concerns currently prepared Plan of Waste Management of the Czech Republic, which is to be approved by government at the beginning of 2003," Petrlík summarized what the discovered information mean in terms of its environmental impacts.

Appendix:

NOTES:

1 - It is apparent that dioxin concentrations in Liberec were under the level of 40 fgTEY/m3 by June 1998, while according to measurements from 2000-2001 they achieve 80 - 110 fgTEQ/m3. Concentrations measured right in the city are several times higher, compared to the levels measured on the mountain Ještěd.

2 - Study of appearence of persistent organic pollutants in atmosphere and their deposition on the territory of the Czech Republic, VaV 520/6/99.

3 - The Stockholm Concention banns usage of POPs and orders their elimination (it concerns 8 pesticides including DDT and technical chemicals, i.e. PCBs and hexachlorbenzen and undesired byproducts such as for example dioxins). The Czech Republic ratified the convention and now is preparing implementation plan. New international convention will be valid after it is ratified by the fiftieth state. It was so far ratified by 22 countries.

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Arnika helps people affected by the escape of chemicals from Spolana

18.11.2002

PRAGUE/MELNIK (Arnika - Toxics and Waste Programme) - The environmental organisation, Arnika, has set up a help centre offering effective assistance to people who have suffered from the escape of toxic materials from the Splana works in Neratovice. There, they can find help in ascertaining whether their soil and their crops have been contaminated with chemicals from the works and learn what they can do about it. "There were many people in and around Neratovice who approached us for help after the floods, wanting to find out whether there were toxic materials present in the soil, whether they could continue to till it, and how to obtain compensation for the damage caused. The Arnika Help Centre is here to offer assistance in solving these problems", explained the director of Arnika's Toxics and Waste Programme, Dr. Jindřich Petrlík.

The Arnika Help Centre offers a range of services including advice on the right way to take a sample of soil or plant material, how to go about taking photographic evidence and where to apply for an analysis to be carried out. "Without proof, it's nearly impossible to obtain compensation for contaminated crops or loss of profits caused by soil pollution. Our objective is to help people to obtain proper evidence", said Petrlík.

The Help Centre is already receiving its first enquiries, such as the owner of a pine plantation near the village of Kostelec nad Labem who told us how his trees had been damaged by chlorine and who now wants to ascertain in what concentrations the pollutants are present.

The firm, Ecosy, and even infant schools in the town of Tišice are all finding ways to solve the problem of obtaining compensation. The schools suffered chlorine burns to their trees worth 2.6 million korun this year, and Ecosy estimates damages at 4,160,000 CZK.

Infant schools in Knížecí Dvůr Tišice are also resolving unsettled accounts with Spolana. In 2000, an escape of chlorine there damaged young trees worth more than 30 million CZK.

The damage caused to vegetation by the escape of chlorine from Spolana two years ago was assessed by specialists from the Research Institute for Hunting and Woodland Management (VÚLHM). They recorded extensive damage to vegetation and a clear connection with the escape of chlorine. As one of the members of the institute, Ing. Hana Uhlířová, CSc., told us, they found up to ten times more chlorine in plants than normal. "Two years ago we even found damage to trees at an infant school at Lhota, twelve kilometres away from Spolana as the crow flies", Mrs. Uhlířová said.

Dr. Petrlík reassured us that "those who are seeking compensation in connexion with the chlorine escape two years ago can, of course, also obtain assistance at the Help Centre".

The Help Centre was made possible by grants from two foundations; Stichting DOEN and Environmental Partnership Foundation.

Appendix:

More information about services offered by the Arnika Help Centre can be found at http://spolana.arnika.org (in Czech only).

Starting PVC production can be a grave for the region around Elbe

26.11.2002

PRAGUE/NERATOVICE (Arnika - Toxics and Waste Programme) - Hundreds of dead trees and many other plants which have not survived invasion of chlorine, water, soil and bodies of domestic animals contaminated by toxic chemicals – that is what is the area around Spolana after several accidents in 2002, and after many years if chlorine production. Animals and plants by Elbe and around Spolana are dying. Arnika organized a funeral march in order to point out on this fact and to show it to management of Spolana and to state representants. Activists symbolically paid their last tribute to the landscape around Elbe and to the trees, which had not survived toxic releases from the chemical plant. Spolana´s director, ing. Miroslav Kuliha, refused last week to postpone renewal of PVC production to the time when all revision reports and security reports are discussed with a public. As he said, the postponing would cause unbearable losses to Spolana.

„We wanted to point on the high risk Spolana represents for its surroundings. That is why we have made the happening at the day for which Spolana announced its plan to initiate work in the most dangerous sections – in PVC production and chlorine chemistry, because it was in these sections where the accidents happened and had the most serious impacts for environment and inhabitants of Neratovice region," said Jindřich Petrlík, head of Arnika´s Toxics And Waste Programme, about the action.

As he added, Spolana is going to start the PVC production five days before the promised finishing of ecological audit and without having discussed any complete revision report with the public. Arnika asks Spolana´s management for guarantees of safe work, but without results. „For us, sufficient guarantees are in a complete security revision, mainly revision of PVC section, and in public negotiation about securing the company against accidents and toxic releases to the environment. This requirement is also included in the petition „STOP DANGER FROM SPOLANA," Petrlík said.

On 15th October, Arnika addressed Minister of Environment Libor Ambrozek and Minister of Interior Stanislav Gross with a request not to start running of Spolana before discussing security measures with the public according to the law on serious accidents. Minister Ambrozek reacted by an appeal addressed to director of Spolana – Miroslav Kuliha, while the interior minister Gross promised discussing Arnika´s requirements with management of stock company Unipetrol Praha. Arnika has sent the same request to Spolana´s management, which refused it because of company´s economic reasons.

Appendix:

Main objectives concerning the PVC production:
- The section is backward which can be documented by frequented leakages of chlorine and by the latest accidents.
- Usage of mercury in the chlorine production leads to high releases of this chemical substance to environment (in waste, atmosphere, waste water).
- The PVC production is ecologically dangerous in its essence – it uses carcinogenic substances, which leak to environment, other hazardous chemicals appear as undesired byproducts (for instance dioxins, pentachlorphenol etc.), which then also leak, to the environment.
- Additives are included to the PVC during its production. They represent serious risk for the environment (concretely heavy metals and phthalates).

Spolana Neratovice: more contaminated than suspected

6.2.2003

MELNIK (Arnika - Toxics and Waste Programme) - Area belonging to chemical plant Spolana Neratovice is much more contaminated by toxic chemicals than it was suspected and than its management was admitting. According to latest findings, sources of highly poisonous dioxins are not only in buildings, which used to serve for a production of pesticides, but also in area of old amalgam electrolysis. Roman Grabic from the National Reference Laboratory on POPs (1) within the Regional Public Health Station in Ostrava presented these findings at the international conference, organised by Arnika.

Results of the measurement were published at the conference and confirmed Arnica's concerns that Spolana is a source of river Elbe's contamination by PCBs. The results were also confirmed by measurement ordered by the main public health authority of the Czech Republic and by the Czech Environmental Inspection.

Polychlorinated biphenyls (PCBs) emerged in high quantities in samples of sediments taken by Arnika from mud at the bottom of the river Elbe under Spolana after the floods in August 2002. Another speaker at the conference, ing. Vladimír Pekárek from the Institute of Chemical Processes said his institution has discovered presence of the PCBs also in samples taken inside the Spolana building, which has been contaminated by dioxins. „The PCBs could have emerge as undesired by-product of the pesticides´ production or they were a compound of colours used for painting of inside walls," Pekárek added.

„Discovery of another source of dioxins in the old chlorine production section is very serious fact. Spolana counts with a decontamination of the old, no more working section, but this plan concerns only a problem of mercury. So far it was refusing to verify a presence of the dioxins," said RNDr. Jindřich Petrlík from Arnika.

„Furthermore, not all of the area of the chemical plant has been properly inspected – for instance soil under old transformers and condensers. Spolana should tidy-up its area and, if not, a government should make its management to do so. Costs for the decontamination of the newly found dioxin burden should be taken into account within a sale to Unipetrol. Otherwise the state will be the one who will pay for further toxic releases. Another inspection should find out if present PVC production also does not belong to the sources of dioxins. Nobody has so far done that," said Arnika´s spokesman Marek Jehlička.

Spolana so far refuses that its production could cause releases of toxic chemicals ad PCBs into environment during the floods. In doing so, it has a support of some professionals such us professor Miroslav Suchánek from the University of Chemistry and Technology in Prague. Arnika is refusing his proclamation as he is not a specialist on dioxins and has a function of vicechairman of Unipetrol supervisory board.

Appendix:

(1) POPs – Persistent Organic Pollutants – are probably the most toxic chemical compounds that were ever created by people. They include for instance dioxins, DDT or polychlorinated biphenyls (PCBs). POPs cause dysfunctions of hormonal and immunity systems endanger reproductive abilities of humans and animals as the chemicals have ability to cumulate in their bodies. Their natural disintegration is very slow. Humans are most endangered as they are on the top of a food chain.

APPENDIX: List of participants

ALBANIA

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IPEN®

International POPs Elimination Network

Dioxin, PCB and Waste Working Group

The IPEN Dioxin, PCB and Waste Working Group was established in May 2001 in Sweden, after the text of the Stockholm Convention was agreed.

The Working Group, within its capacity and resourses, works to assure that measures addressing dioxins, PCBs and wastes are appropriately interpreted and fully incorporated into each country´s Stockholm Convention Enabling Activities and Implementation Plans. Furthermore, it works and campaigns to promote policies and practices in every region and country aimed at the elimination of dioxins and PCBs; and aimed at reduction and elimination of wastes, and appropriate waste management for the residues.

Pracovní skupina pro dioxiny, PCB a odpady

Pracovní skupina pro dioxiny, PCB a odpady sítě IPEN byla založena v květnu 2001 ve Švédsku poté, co byl na mezinárodní konferenci schválen text Stockholmské úmluvy.

Pracovní skupina usiluje o to, aby opatření vztahující se k dioxinům, PCB a odpadům byla náležitě vysvětlována a plně zahrnuta do implementačních plánů každé země. Kromě toho skupina pracuje na propagaci politik a praktik zaměřených na eliminaci dioxinů a PBC a na redukci a eliminaci odpadů včetně vhodného managementu pro rezidua.

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