The International POPs Elimination Project

Fostering Active and Effective Civil Society Participation in Preparations for Implementation of the Stockholm Convention

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POPs Pesticides in the Czech Republic

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On May 1, 2004, the International POPs Elimination Network (IPEN http://www.ipen.org) began a global NGO project called the International POPs Elimination Project (IPEP) in partnership with the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Program (UNEP). The Global Environment Facility (GEF) provided core funding for the project.

IPEP has three principal objectives:

- Encourage and enable NGOs in 40 developing and transitional countries to engage in activities that provide concrete and immediate contributions to country efforts in preparing for the implementation of the Stockholm Convention;
- Enhance the skills and knowledge of NGOs to help build their capacity as effective stakeholders in the Convention implementation process;
- Help establish regional and national NGO coordination and capacity in all regions of the world in support of longer term efforts to achieve chemical safety.

IPEP will support preparation of reports on country situation, hotspots, policy briefs, and regional activities. Three principal types of activities will be supported by IPEP: participation in the National Implementation Plan, training and awareness workshops, and public information and awareness campaigns.

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Summary

Though there is no continuing production of persistent organic pollutants (POPs) pesticides listed in the Stockholm Convention and/or on the list under the POPs Protocol to the Convention on Long-Range Transboundary Air Pollution (LRTAP). However, the Czech Republic has many hot spots contaminated by POPs pesticides residues; especially DDT[a] and its metabolites and hexachlorobenzene (HCB)[b]. Levels of both chemicals in the environment are alarming.

We focused our report on one example of a site contaminated by pesticides. This is a former storage and manufacturing facility of organochlorine pesticides and other types of pesticides in Klatovy - Luby, which served for Klatovy district in south western part of Bohemia. We have measured levels of sum of p,p'-DDT and its metabolites (as sum of DDTs), residues of some other pesticides, and dioxins and furans (PCDD/Fs) in samples from buildings as well as in eggs from chickens living in the area of this obsolete pesticide storage facility. The levels of DDT and PCDD/Fs are alarming as they exceed EU limits for these chemicals in chicken eggs. The gross level of contamination calls for a clean up of the buildings, soil and underground water in the surrounding area.

Unfortunately Klatovy – Luby is not the only contaminated site in the Czech Republic. There are several other such places even more seriously contaminated by POPs pesticides residues. Examples from the Czech Ministry of the Environment database and from other published data include: Bedrc, Vaclavice, Sebanovice u Vrchotovych Janovic, Hodonin u Nasavrk, Zajezdec, Horsovsky Tyn, Desna, Hajek u Ostrova nad Ohri, Neratovice - chemical plant Spolana, Myslin u Mnichovic, Dubno, Vranova Lhota - underground storage of hazardous waste, Chabarovice - former hazardous waste landfill of the chemical plant Spolchemie, Vseborice - current storage of hazardous waste for Spolchemie, Usti nad Labem - Spolchemie - chemical plant.

Some of the above-mentioned places are related to the former production of POPs pesticides like DDT, hexachlorobenzene or Lindane in chemical plants such as Spolana Neratovice and Spolchemie Usti nad Labem.

In this report we make two key recommendations:

The Czech Ministry of Agriculture (MOA) should publicly identify and state a list of former organochlorine pesticide storage areas and their locations. These places are potentially highly contaminated by POPs. The extensive list mentioned above is only a small proportion of the full list of such sites.

[a] Dichloro diphenyl trichloroethane (or 1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane), CAS numbers: 50-29-3 for p,p'-DDT. Levels in environment are mostly given as sum of p,p'-DDT and its metabolites.
[b] CAS number: 118-74-1.

POPs-contaminated sites should be cleaned up in such a way as to prevent the formation of additional POPs or the contamination of other sites. Klatovy – Luby is an excellent place to begin cleanup.

Based on the Czech experience documented in Klatovy - Luby and other hot spots there are more pesticides that should be considered for addition to the Stockholm Convention Annex A compounds including Lindane. In addition, pesticides that represent a potential source of dioxins should be monitored by BAT/BEP guidelines and documents (such as the Dioxin Toolkit) prepared under Stockholm Convention.

1. Production and use - history

The history of production of POPs pesticides in the former Czechoslovakia starts in 1950, when Juraj Dimitrov Chemical Enterprises (CHZJD) completed research on DDT synthesis in the city of Bratislava. Hexachlorocyclohexane (HCH)[c] production started one year later. Only pure Lindane (> 99 % γ-isomer HCH) has been used in agriculture since 1959 (since1956 according to other information sources). Use of technical HCH continued in forestry. DDT use declined during the 1960s after resistance to this pesticide first appeared in insects. DDT was replaced by kelevan (also a chlorinated compound) at the beginning and later by chlorfenvinphos[d] and carbamates. Obsolete pesticides (including DDT) were stored in ZZNZ (Agricultural Supply and Purchasing Centers) and JZD (Agricultural Cooperatives) in many places of the Czech Republic.

Hexachlorocyclohexane

Production of HCH by light catalyzed addition on the benzene ring started in Spolana located in Neratovice in 1961. The product of this process was a mixture of isomers α, β, γ, δ, ε-1,2,3,4,5,6,-hexachlorocyclohexane, hepta- and octachlorocyclohexane and other substances. The mixture contained 13 % Lindane.

Hexachlorocyclohexane was used as source for production of trichlorobenzene and different pesticides. It was also used as additive into some paints.

Hexachlorobenzene

HCB was used for production of a combined fungicide for seed dressing, Agronal H. Agronal H contained 2 % organic mercury and 10 % of hexachlorobenzene in a mixture with mineral paste fillings. Part of the HCB was used with sodium alkali for sodium pentachlorophenolate and for pentachlorophenol (PCP) production. This production process was located in Spolana Neratovice as well. At the end of the 1960s this production process was stopped because of the health effects observed in workers at Spolana. The company also produced source compounds for the Agent Orange used in Vietnam by the US Army. The three buildings representing the former pesticides production unit in Spolana are highly contaminated by dioxins. One building is buried in concrete. The other two buildings are slated for clean up by the BCD CZ company using their base-catalyzed destruction (BCD) process, which is a better option than incineration which was also proposed. However the selection of BCD was not a fully transparent process by Czech National Property Fund.

[c] CAS number: 608-73-1. Hexachlorocyclohexane has several isomers among which γ-isomer (Lindane) was found as most effective pesticide.

[d] 2,4-Dichloro-a-(chloromethylene)benzyl diethyl phosphate, CAS number: 470-90-6

DDT
DDT mixtures and HCB were produced in Spolchemie Usti nad Labem as well. HCB is still formed during production processes in Spolchemie as a by-product. These are not pesticides production processes, but production of technical chemicals. HCB produced by Spolchemie in the 1970s and was exported for agricultural purposes to the former Soviet Union (mainly to Uzbekistan).

POPs production and use in the Czech Republic
The following table (Table 1) shows a comprehensive history of the use and production of POPs pesticides and technical POPs in the Czech Republic.

Table 1: Overview of POPs production and application in the Czech Republic (according to the Draft of National Implementation Plan for Stockholm Convention prepared by I. Holoubek et. al. 2004)

Chemical name / CAS	Shorter name	Stockholm Conv. List	UNECE POPs List	Production / application / by-product in the Czech Republic
Organochlorine pesticides				
Aldrin / 309-00-20	ALD	Yes	Yes	Not produced, not used, banned in 1980
DDT and its metabolites / 50-29-3	DDTs	Yes	Yes	It was banned in former Czechoslovakia in 1974, but its application continued further in some specific applications eg. in insecticides against lice. Production of Neratidin, Nerakain and Pentalidol (all included DDT as well) in Spolana Neratovice was closed between 1978 – 1983. Another production facility in the former Czechoslovakia was located in Bratislava - Chemicke zavody Juraja Dimitrova (Juraj Dimitrov Chemical Enterprises)
Dieldrin / 60-57-1	DLD	Yes	Yes	Never registered.
Endrin / 72-20-8	END	Yes	Yes	Not produced *, not used *, banned in 1984.
Heptachlor / 76-44-8	HPC	Yes	Yes	Not produced, use for agricultural purposes banned in 1989.

Table 1 continued

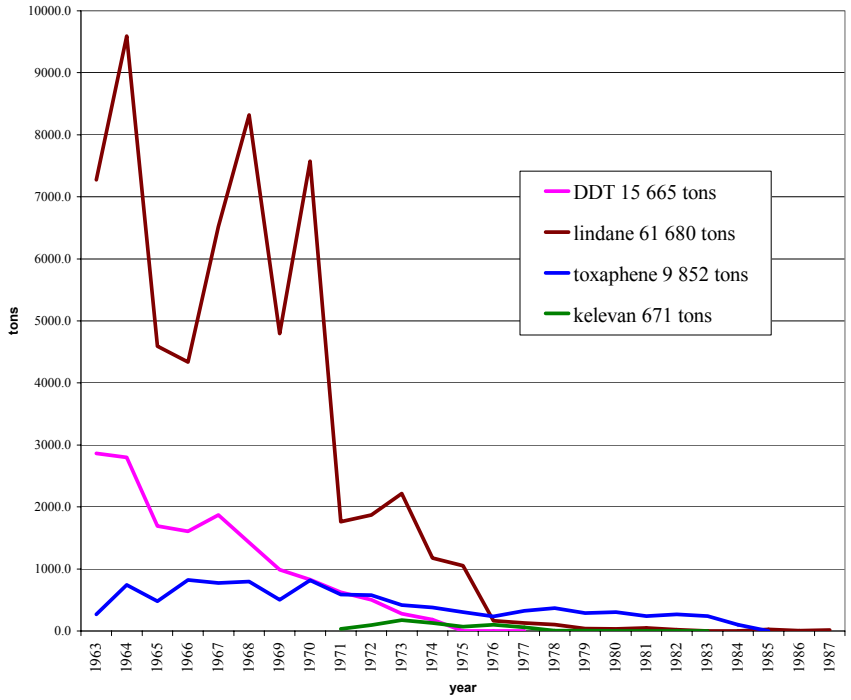
Hexachlorobenzene / 118-74-1	HCB	Yes	Yes	It is not currently produced; production in Spolana Neratovice was stopped in 1968. Its use as a pesticide was banned in 1977.
Chlordane	CHL	Yes	Yes	Never produced, never used and never registered.
Lindane / Hexachlorocyclohexanes	LIN (HCHs)	No	Yes	γ-HCH was produced in combination with DDT as Lydikol and Gamadyn in the former Czechoslovakia. It was still used after the DDT ban for seed disinfection. It is not currently allowed for agricultural purposes.
Mirex / 2385-5	MIR	Yes	Yes	Never produced, never used and never registered.
Toxaphene	TOX	Yes	Yes	Not produced and banned in 1986. It was imported during 1963 – 1987 to the former Czechoslovakia in large scale as Melipax.
Produced chemicals or their mixtures				
Polychlorinated biphenyls	PCBs	Yes	Yes	Produced in former Czechoslovakia between 1959 - 1984
Hexachlorobenzene	HCB	Yes	Yes	Currently not produced, but it occurs as a by-product in chemical production in Spolchemie. It was deliberately produced by Spolana Neratovice. Its production was stopped in 1968.

*Endrin was used in large scale amounts in the southern part of the Czech Republic in 1977 - 79 according to P. Pecina (1987) and was mixed in Spolana Neratovice according to the testimony of former pesticide production workers.

There were larger application quantities of pesticides per one hectare (ha) in the 1960s and 1970s compared to the current situation - up to 4 - 5 kg/ha. This demonstrates the scale of organochlorine pesticide use on fields in the Czech Republic in that period.

Graph 1 shows already stated information about the use of different organochlorine pesticides in the former Czechoslovakia in Table 1. While DDT was banned in 1974, but still partly used till the end of 1970s, toxaphene was largely used until the mid-1980s. Lindane use decreased in mid-1970s, but in very small quantities is still used presently in yacutin for pet protection from flies for example.

Graph 1: Development of use of some POPs pesticides in the former Czechoslovakia (source I. Holoubek et al. 2004)



The Czech State Institution, (SOR) presented evidence that 584 100 kg (l) of obsolete pesticides existed in the country in 1991. This included only officially declared obsolete pesticides by commercial legal entities and by communities in the Czech Republic. The actual amounts are much larger, because there were found in hidden obsolete pesticides storage and/or sites, where pesticides were buried during the last several years. All these pesticides were incinerated in Bavaria and in the Czech Republic in hazardous waste incinerators. This way of destruction leads to the generation of new POPs, such as dioxins and other by-product POPs.

2. Levels in environment

There are many measurements of organochlorine pesticide residues in the Czech environment and their levels in people, which are not only the results of long term monitoring programs, but also of ad hoc scientific studies. We will present only a few illustrative examples here.

2.1. Food contamination in the Czech Republic

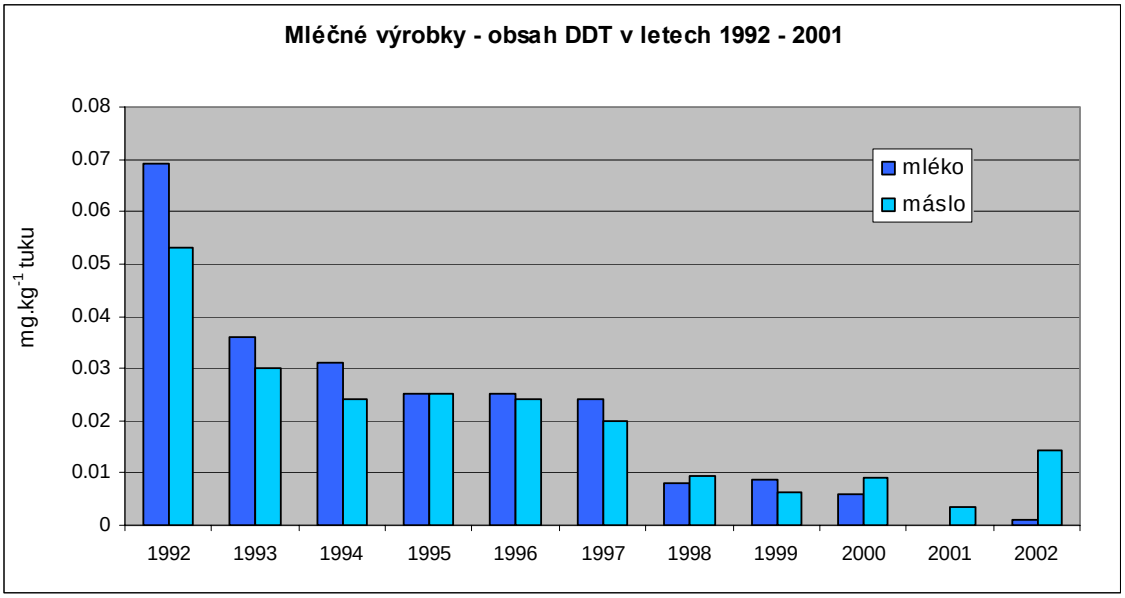
The official database of POPs measurements in food products was used to evaluate POPs contamination of the food chain in the national POPs inventory (in I. Holoubek et al. 2004). This database of the State Hygienic Service includes over 110 thousand analytical results related to POPs. These data have been collected since 1994 and are available for the period 1994 – 2001 in the Stockholm Convention National Implementation Plan (NIP) Draft (I. Holoubek et al. 2004).

The following POPs were measured in the period from 1994 - 2001: polychlorinated biphenyls (PCBs), aldrin, endrin, dieldrin, methoxychlor, endosulfan, heptachlor epoxide, hexachlorobenzene (HCB), alpha-, beta-, delta-, gamma- (Lindane) isomers of hexachlorocyclohexane, DDT and its metabolites and PAHs.

The highest levels of POPs contaminants measured by the Czech State Hygienic Service were PCBs. PCBs reached 8,5 % of the tolerable daily intake (TDI) in 2001 (measured in 7 congeners, not in TEQ levels).

HCB and p,p´-DDE were the most common pesticides residues found in food products during the period 1994-2001. Czech experts evaluated exposure to these residues as very low (<1 % of the acceptable daily intake (ADI) for "sum DDT" = p,p´-DDT+o,p-DDT+p,p´-DDD+p,p´-DDE and < 6 % of the tolerable daily intake (TDI) for HCB). However, the data still shows continuing contamination by these organochlorine pesticides residues. Other measured compounds were found with lower frequency and lower levels as well.

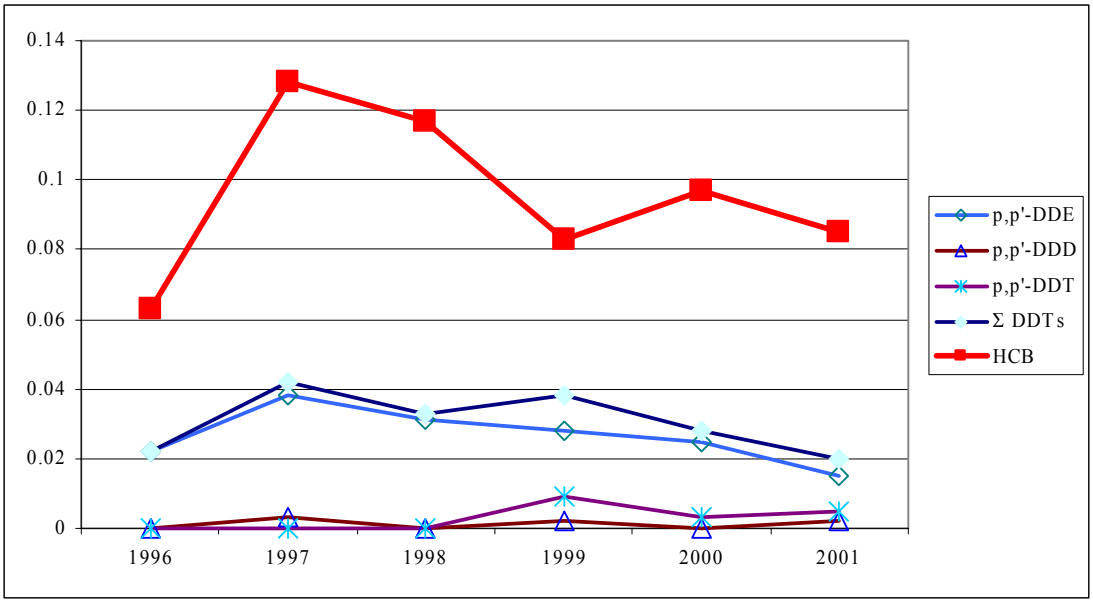
Graph 2: DDT in milk products 1992- 2002. Levels are in mg/kg of lipids. Blue = milk, turquoise = butter. Source: I. Holoubek et al. 2004.



2.2 Air emission levels of organochlorine pesticides

Measurements of organochlorine pesticides in air are less common compared to other media in the Czech Republic. However, development of these levels is displayed on the following graph based on measurements of the TOCOEN consultancy company and the Czech Hydro Meteorological Institute at the place of their common observatory in Košetice and published as many other data in the Draft National Implementation Plan (I. Holoubek et al. 2004). Levels measured in Košetice are marked as background levels for the Czech Republic.

Graph 3: Trends in medians of regional background levels of DDTs (DDT, DDE, DDD) and HCB measured in Košetice observatory, 1996-2001 [ng.m^{-3}]

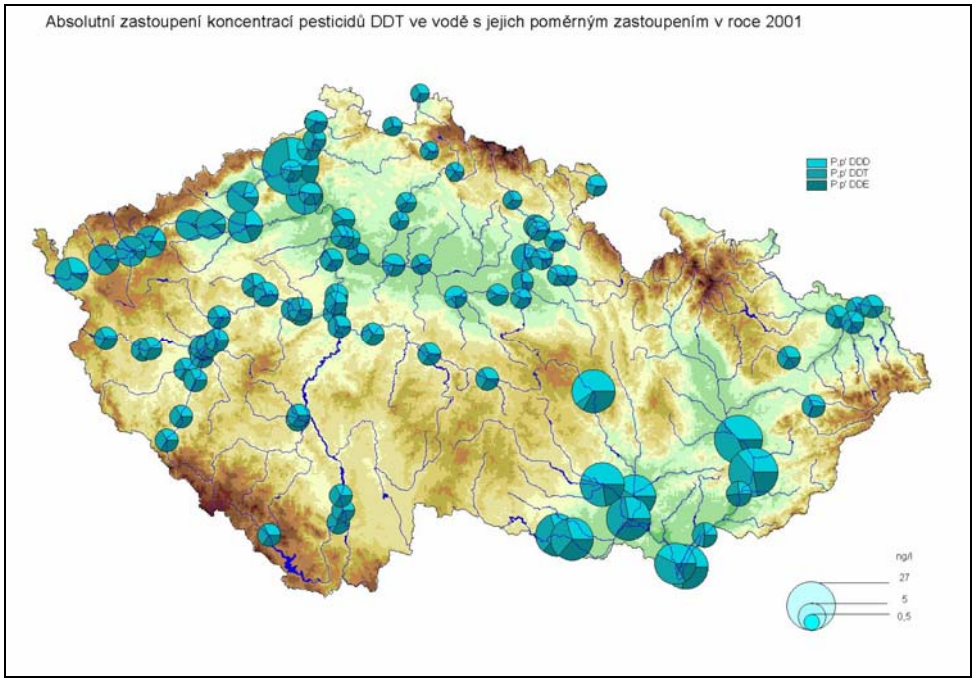


2.3 Hydrosphere levels of POPs pesticides

Organochlorine pesticides residues (DDTs, HCB, and HCHs) plus PCBs and PAHs have been measured mainly in water and water sediments in the Czech Republic. Other pesticides have not been measured as often and PCDDs/Fs have only been measured in the past 3 years.

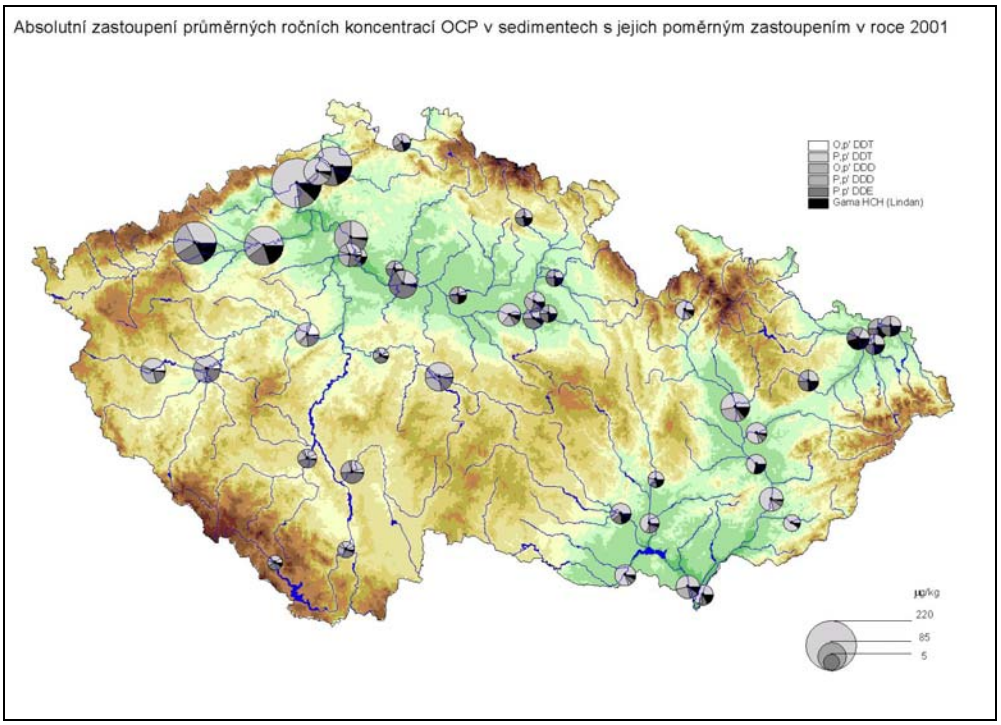
Levels of DDT and its metabolites in surface waters in the Czech Republic were measured between 10^{1} and 10^{-1} ng.l^{-1}. Higher levels (up to tens ng.l^{-1}) were found in several parts of the Morava river basin (southeastern part of the Czech Republic) and also in the Bílina River under Spolchemie Ústí. Detailed results are shown in Picture 1 according to the Czech Hydro Meteorological Institute surface waters monitoring published in I. Holoubek et al. 2004. Results from the same monitoring for surface water sediments are shown at Picture 2.

Picture 1: DDT metabolites levels measured in waters in 2001 and their comparative levels (I. Holoubek et al. 2004) in ng/liter.



The highest levels of DDT and its metabolites were found in sediments in Labe river in Ústí nad Labem and also downstream from this city up to the Czech - German border. The reason is obvious: DDT production was located in Ústí in the Spolchemie facility. Compared to levels observed in water, lower levels were observed in sediments in the Morava river. The reason might be due to large floods in Moravia (Eastern part of the Czech Republic) in 1998, which most likely washed out contaminated sediments.

Picture 2: Levels of organochlorine pesticides and their metabolites measured in sediments in 2001 and their comparative levels (I. Holoubek et al. 2004) in ng/g of dry weight.



2.4 Soils

There were two monitoring periods for soils of arable land in the Czech Republic. ÚKZÚZ (Ústředního kontrolní a zkušební ústav zemědělský = Central Controlling and Probation Agricultural Institute) monitored organochlorine pesticide levels in soils from every year at different locations from 1994 – 1997. Thirty-five stable monitoring places on arable land and five in protected natural areas were set up for another monitoring period from 2000 - 2002. Results of the monitoring were included in the Draft National Implementation Plan (I. Holoubek et al. 2004).

Average levels of HCB in mold (soil on arable land) more than tripled between 2000 and 2002. HCB levels increased from 2,26 $ng.g^{-1}$ in 2000 to 7,34 $ng.g^{-1}$ in 2002 . Average levels of DDT metabolite, p,p'-DDE, nearly doubled in subsoil from 2000 to 2002. Levels of p,p'-DDE increased from 15,4 $ng.g^{-1}$ in 2000 to 26,14 $ng.g^{-1}$ in 2002 with median levels increasing from 2,7 $ng.g^{-1}$ to 7,50 $ng.g^{-1}$. Levels of p,p' and o,p'-DDT metabolites rapidly decreased during this time period. Levels of metabolites o,p'-DDE, p,p' and o,p'-DDD remained steady in this three year period in mold as well as in subsoil.

Levels of organochlorine pesticides in soils of arable land areas continue to be high. HCB levels found in mold (soil samples from arable land) exceeded the acceptable limit according to Czech Republic decree No. 13/1994 Sb. (10 $ng.g^{-1}$) in about 13% of

the cases. DDT and its metabolites exceeded federal limits for arable land in 73% of the cases.

Scientists cooperating on the preparation of the Draft National Implementation Plan (in I. Holoubek et al. 2004) summarize also that the limit from Czech Republic decree No. 13/1994 Sb. was exceeded in 36,7% samples in 2002. During the whole monitoring period (1994 - 2002) considerable fluctuation of organochlorine pesticide levels in soil did not permit unambiguous trends from the monitoring data to be derived.

2.4.1 DDT and its metabolites – a more detailed overview

DDT levels in soil samples from arable land range from 1,00 $ng.g^{-1}$ – 5,62 $ng.g^{-1}$ (using the geometric average of levels calculated for each district in the Czech Republic). Districts with higher levels of DDT (exceeding 3 $ng.g^{-1}$) include: Kladno, Praha-West, Jičín, Benešov, Karlovy Vary. Localities with the highest levels of DDT include: Teplice (1207 $ng.g^{-1}$), Ústí nad Labem (1133 $ng.g^{-1}$), Praha-City (1044 $ng.g^{-1}$), Karlovy Vary (398 $ng.g^{-1}$) and Jablonec nad Nisou (344 $ng.g^{-1}$).

Average levels of the DDT metabolite, DDE, in soils are even higher than DDT and range from 1,00 $ng.g^{-1}$ – 9,62 $ng.g^{-1}$. The highest measured level was found in district Praha-West. Districts with levels exceeding 5 $ng.g^{-1}$ include Kladno, Beroun, Příbram and Cheb. The highest local maximum levels were found in districts Praha-City (1054 $ng.g^{-1}$), Cheb (167 $ng.g^{-1}$), Jablonec nad Nisou and Jičín (159 $ng.g^{-1}$) and Teplice (146 $ng.g^{-1}$).

Levels of DDT metabolite, DDD, ranged slightly lower at 1,00 $ng.g^{-1}$ – 3,67 $ng.g^{-1}$. The highest average level was calculated for Benešov district and the second highest concentration, 2,48 $ng.g^{-1}$, was calculated for the neighboring district, Kutná Hora. In other districts the levels of DDD were calculated about 1 $ng.g^{-1}$. Local maximum levels include the following districts: Teplice (256 $ng.g^{-1}$), Karviná (49 $ng.g^{-1}$), Karlovy Vary (36 $ng.g^{-1}$) and Příbram (32,2 $ng.g^{-1}$).

3. Hot spots

3.1 Klatovy-Luby - obsolete pesticides storage

An example of a place where organochlorine pesticides were used and stored is a complex of agricultural buildings in Klatovy - Luby, identification number 167. The facility is located in the center of an inhabited area of the community and the nearest residential house is several meters from the backyard of the complex.

The agricultural buildings in Klatovy - Luby were used for storage and preparation of pesticides from the 1960s to the beginning of the 1990s. The facility began as STS - technical-machinery center and later became Agrochemický podnik - Agro-chemical company. An analysis of the plaster in the building along with the soil and groundwater demonstrates that this activity has had disastrous impact. Both the buildings and their surroundings are strongly contaminated by toxic pesticides such as DDT, Lindane, fensone and atrazine as well as by oil products. Both the soil and the well water is polluted. In addition, eggs of hens grown in the backyard are contaminated by pesticides.

Table 2: Concentrations of pesticides and metabolites measured in April of 1995 in samples of plaster from the agricultural buildings in Klatovy-Luby (J. Hrabal et al. 1997). Values for Limit C are taken from Methodological Instructions of Ministry of Environment, Czech Republic.

Pesticides	**Values in mg/kg (April 1995)**					**Limit C**
	P	**S**	**G**	**H**	**M**	
α HCH	<10	<10	<10	141	<10	
γ HCH (Lindane)	773	780	< 10	4390	548	**2.5**
o,p – DDE	<10	69	<10	147	65	
p,p – DDE	1080	334	<10	953	339	
o,p – DDT	1 590	540	<10	6060	925	
p,p – DDT	4570	242	<10	1680	822	
o,p – DDD	235	103	<10	<10	175	
p,p – DDD	2090	291	<10	1 880	386	
atrazine	4790	<10	9620	<10	199525	**6**
OCPs individually	max.	max.	<10	max.606	max.	**2.5**

Explanatory notes:: P - preparation hall, S - store of rodenticides, G - garage, H - main store of pesticides M - room next to store of rodenticides, OCPs - organochlorine pesticides. Explanation of Limits A to C of Methodological Instructions of Ministry of Environment, Czech Republic(MŽP ČR 1996): Exceeding of limits of category A in soils (and ground waters) according to the Methodological Instructions from 3rd July is considered as pollution of an appropriate component of environment, with the exception of areas with naturally higher content of monitored substances. Exceeding of Limit B is considered as pollution which can adversely impact human health and individual components of environment, and which needs further measures. Exceeding of Limit C is considered as pollution which can represent a significant risk for human health and components of environments, and requires preventive action.

In 2000, the District Sanitary Station in Klatovy monitored groundwater pollution by DDT and its metabolites. The District Sanitary Officer stated that pollution of waters by pesticides had decreased, but DDT levels still exceeded Limit B of the Methodological Instructions of the Ministry of Environment (MŽP ČR 1996). In his report (S. Krýsl 2000), the District Sanitary Officer wrote, “Comparison to the existing standard for drinking water is not completely appropriate, because it does not include the wider spectrum of pesticide-like substances. The new standard for drinking water proposal assumes that the maximum concentration of 1 μg/l is for each individual pesticide. Thus, only sample No. 1371 (well 2) could fulfill this criterion, other samples of water would not comply with the new decree for drinking water." As a consequence, the water from the contaminated well next to the entrance was used as drinking water until the beginning of the 1990s.

According to the calculations of experts from 1997, decontamination of the facility and surrounding area would cost over 3.5 million CZK. But in these calculations, "only" embedding of contaminated plaster to landfill was assumed, not the actual toxic chemical cleanup. Safe decontamination of the buildings will probably be even more expensive. The last estimate of experts from the Czech Ministry of Environment was approximately 30 million CZK.

New owners of the facility discovered the contamination of the whole complex by pesticides and other toxic chemicals when they tried to rent it to a company for commercial use. This is when the first chemical analyses of plasters were performed. Since then, a lot of chemical analyses have been made. The summarized results are shown in Tables 2 – 5.

Table 3: Results of analyses of razed and swept samples from the floor at Klatovy-Luby, ordered in June 2003 by Arnika.

Compound	**Main store + preparation room of pesticides (μg/kg)**	**Oil store (μg/kg)**	**Limit C**	**Limit B**	**Limit A**
Alfa - BHC	344	NA	2500	2000	50
Beta - BHC	10	NA	2500	2000	50
Lindane	***3904***	NA	2500	2000	50
Hexachlorobenzene	16,0	NA	none	2000	50
Octachlorostyrene	3,1	NA	2500	2000	50
Oxychlordane	ND	NA	2500	2000	50
trans-Nonachlor	0,3	NA	2500	2000	50
o,p'-DDD	NA	NA	none	2000	50
p,p'-DDD	4431	NA	none	2000	50
o,p'-DDE	669	NA	none	2000	50
p,p'-DDE	950	NA	none	2000	50
o,p'-DDT	11298	NA	none	2000	50
p,p'-DDT	18265	NA	none	2000	50
DDT total	***35612***	NA	2500*	none	none
OCPs - total	39890	NA	none	none	none
simazine	<200	1800	4000	3000	50
atrazine	870	9700	6000*	3000	50
MCPA	1500	***1300000***	4000	3000	50
As	6500	45000	70000	65000	30000
Cd	2400	3900	20000	10000	500
Hg	70	400	10000	2500	400
sum of 7 congeners of PCB	NA	<250	5000 (1000*)	2500	20

Explanatory notes: * Limit C is determined for multi-purpose use of the area. Values in bold and italics indicated exceeding of Limit C; NA = not analyzed; ND = under level of detection by laboratory means Analyses were made by Axys Varilab (organochlorine pesticides) and Ecochem (other monitored substances). For comparison, limits laid down by Methodological Instructions of MoE CR (MŽP ČR 1996) for soils are shown. Analyses also included the content of heavy metals, because pesticides containing them (rodenticides) were also stored there.

J. Hrabal et al. (1997) stated, based on measurements from 1995 that, "The highest level of pollution was found in a sample of groundwater labeled "Basement", taken from the interior part of a flooded basement in the commercial building. Concentrations of pesticides found in that sample exceeded Limit C according to the Methodological Instructions of Czech Ministry of Environment in several categories including individual organochlorine pesticides and other pesticides (not including triazines). In the sample, well "S1 - entrance" Limit C values were exceeded for individual organochlorine pesticides. "It would mean practically the need to clean part of the groundwater under the building of the former storage and preparation room for pesticides."

Table 4: Concentrations found in groundwater under the former pesticide storage facility in Klatovy-Luby and its neighborhood in April of 1995. Source: J. Hrabal et al. 1997.

Chemical name	**Common name**	**Concentration (µg/l)**			
		Well 1 entrance	**Basement**	**Well 2 (Ší.)**	**Well 3 (Šil.)**
2-sec-Butyl-4,6-dinitrophenol	Dinoseb	<0,01	155	<0,01	<0,01
2-(tert-Butylamino)-4-chloro-6-(ethylamino)-s-triazine	Terbuthylazine	<0,01	2,46	<0,01	<0,01
2-tert-Butylamino-4-ethylamino-6-methylthio-s-triazine	Terbutryn	1,46	31,9	<0.01	<0.01
2-chloro-4-ethylamino-6-iso-propylamino-1,3,5-triazine	Atrazine	4,67	42	1,4	0,42
2-Methoxy-4-(ethylamino)-6-(sec-butylamino)-s-triazine	Secbumeton	1,09	<0.01	<0.01	<0.01
4-Amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)-one	Metribuzin	1,51	<0.01	<0.01	<0.01
2-(Methylamino)-4-(Isopropylamino)-6-(methythio)-s-triazine	Desmetryne	1,13	<0.01	<0.01	<0.01
2,4-Bis(isopropylamino)-6-(methylthio)-s-triazine	Prometryn	5,49	15,4	<0.01	<0.01
2-Chloro-6'-ethyl-N-(2-methoxy-1-methylethyl)-o-acetotoluidide	Metolachlor	0,9	5,82	<0.01	<0.01
2-(Isopropylamino)-4-((3-methoxypropyl)amino)-6-(methylthio)-s-triazine	Methoprotryne	1,54	<0.01	<0.01	<0.01
2-Chloro-N-(2,6-diethylphenyl)-N-(methoxymethyl)acetamide	Alachlor	<0.01	2,47	<0.01	<0.01

Table 5: Comparison of maximum values found in Klatovy-Luby in April of 1995 with limits for groundwater designated by Methodological Instructions of MoE CR - in μg/l.

Groups of pesticides	Well 1 entrance	Basement	Well 2 (Ší.)	Well 3 (Šil.)	Limit exceeded
other pesticides - individual (without triazines)	max. <0.01	max. 155	<0.01	<0.01	C (0.2)
other pesticides - herbicides (triazines)	5.49	42	1.4	0.42	B (25)
organochlorine pesticides	0.9	5.82	<0.01	<0.01	C (0.2)

Explanation of Limit A to C of Methodological Instructions of Ministry of Environment, Czech Republic(MŽP ČR 1996): Exceeding of limits of category A in soils (and ground waters) according. to the Methodological Instructions from 3rd July is considered as pollution of appropriate component of environment, with exception of areas with naturally higher content of monitored substances. Exceeding of Limit B is considered as pollution which can adversely impact human health and individual components of environment, and which needs further measures. Exceeding of Limit C is considered as pollution which can represent a significant risk for human health and components of environments, and requires preventive action.

Samples swept from the floor of the pesticide preparation room, taken in June 2003, exceeded Limit C for individual organochlorine pesticides (in case of Lindane) and for DDT and its metabolites. This indicates that it is still necessary to decontaminate the entire facility.

Another even more disturbing finding is the high concentrations of pesticide residues found in eggs of hens grown in neighboring areas summarized in Table 6. This was the result of an analysis, ordered by Arnika in June and August 2003. The first sample consisted of one egg and the second analysis contained a mixed sample of 12 eggs. The results demonstrated DDT levels that exceeded legal limits designated by Czech law by 34 – 60-fold. (Decree No. 465/2002 Sb. from 15th October 2002). This law defines the maximum allowed content of residues of different kinds of pesticides in food and food raw materials and adopts the limit for dioxin designated by a directive of European Commission.

Table 6: Results of analysis of eggs taken in June - July 2003 in the neighborhood of former pesticide storage facility in Klatovy-Luby, with regards to content of residues of pesticides, polychlorinated biphenyls (PCBs) and polychlorinated dibenzodioxins and polychlorinated dibenzofurans (PCDD/Fs).

Compound	**Sample 1 egg (sampling on 7th June 2003) ng/g**	**Mixed sample of 12 eggs (sampling July 2003) ng/g**	**Limit acc. to Decree No. 465/2002**
Alfa - BHC	0.097	not detected	
Beta - BHC	0.102	0.984	
total of HCH	0.199	0.984	30
Lindane	0.46	1.09	100
Hexachlorobenzene	1.0	2.4	20
Octachlorostyrene	0.007	not detected	none
Oxychlordane	0.010	not detected	none
trans-Nonachlor	0.010	not detected	none
o,p'-DDD	not analyzed	not analyzed	
p,p'-DDD	91.3	137.7	
o,p'-DDE	0.09	0.28	
p,p'-DDE	1.6	4.7	
o,p'-DDT	2.00	4.24	
p,p'-DDT	74.3	108.4	
total of DDT	**169**	**255.32**	5
OCPs - totally	171.211	259.79	
sum of di- to octa-chlorobifenyls (PCB)	11	NA	
sum of 7 congeners of PCB	4.777	NA	
sum of PCDD/F (in pg/g of fat I-TEQ)	not analyzed	**3,2 - 3,4** pg per g of fat	3*

Explanatory notes: If it is not stated otherwise, data are calculated using the weight of fresh eggs; * limit for content of dioxins in eggs according to directive name and number of European Commission; NA = not analyzed

3.2 Other hot spots

The case of the pesticide storage facility in Klatovy-Luby is certainly not the only one in Czech Republic. In the former Czechoslovakia, similar storage facilities and preparation areas for pesticides probably existed in each district. This suggests that there could be 80 and more in the Czech Republic.

In addition, the third Draft of the National Implementation Plan mentions obsolete pesticides storage in Václavice (no. 9) in Benešov region. Contamination of the area with HCH, DDT and HCB has been detected and now the facility is being demolished and the soil removed. The POPs Inventory for the Czech Republic, (I. Holoubek et al. 2003) reveals information about the storage of 5000 kgs of pesticide based on Lindane in Agroslužby Čáslav (Agro-services Čáslav).

Based on the information in Draft National Implementation Plan (I. Holoubek et al. 2004) a comprehensive list of sites contaminated by POPs and other pesticides was assembled and shown in Table 7.

Table 7: List of other sites contaminated by POPs and other pesticides according to districts (some were cleaned up, but it is not specified how), source: I. Holoubek et al. 2004.

Locality (district)	Character of contamination
Bedrč (Benešov) ***]**	DDT thrown in old well, new case
Václavice č.p. 9 (Benešov)	Contamination by HCH, DDE, DDT, DDD, HCB found – demolition and remediation started (this building owner is State Estate Jeneč)
Šebánovice u Vrchotových Janovic (Benešov) ***]**	Former pesticide storage of Agricultural Cooperative (JZD) Vrchotovy Janovice. There is a decision of the Czech Inspection for Environment to remediate that is not yet finished.
Hodonín u Nasavrk – hazardous waste landfill (Chrudim) ***]**	Hazardous waste landfill contains used packaging for pesticides (contaminated by petroleum compounds, organochlorine pesticides, DDT and PCBs. In CHKO (Landscape and Nature Protected Area) Železné hory - in Mniška larger underground water contamination at deep levels was found.
Zájezdec (Chrudim)	Obsolete pesticides (including DDT) from this village were brought to Aliachem a. s. OZ Synthesia Pardubice
Horšovský Týn (Domažlice) ***]**	Serious contamination by pesticides and petroleum compounds.
Dešná (Jindřichův Hradec) ***]**	Petroleum hydrocarbons in six sub-localities and pesticides in two sub-localities; remediation of nonsaturated zone finished, underground water remediation focused on petroleum compounds continues.
Hájek u Ostrova nad Ohří (Karlovy Vary)	Dump of the Hájek mine near Ostrov nad Ohří was contaminated by residues from pesticides production in Spolana Neratovice. HCH and chlorobenzenes were measured in surrounding of dump. Source: Hešnaur, L., Jech, J. 2001.
Luby u Klatov (Klatovy) ***]**	See chapter 3.1

Table 7 continued

Neratovice - chemical plant Spolana (Mělník) ***]**	High levels of 2,3,7,8 tetrachlorodibenzo-p-dioxin, by-product of pesticides production, mercury contamination approximately 265 tons; and organochlorine pesticide contamination. EIA on remediation process (based catalyzed destruction) started in 2003.
Myšlín u Mnichovic (Praha-West) ***]**	Storage - petroleum compounds, pesticides and chlorophenols exceed Limit C according to Ministry of Environment Methodological Instructions.
Dubno (Příbram) ***]**	Pesticides
Vranová Lhota - underground storage of hazardous waste (Svitavy)	Vranová Lhota was a well known hazardous waste landfill in the district Svitavy in a former underground mine. There were also obsolete pesticides based on DDT and mercury compounds dumped. Remediation finished by Spring 2002.
Chabařovice – former hazardous waste landfill for Spolchemie (Ústí nad Labem)	HCB produced in Spolchemie chemical plant as by-product during the production of epichlorohydrin was stored on Chabařovice hazardous waste landfill until the end of year 1992. Real amount of stored HCB is not known. Landfill is going to be covered and monitored.
Všebořice - current storage of hazardous waste for Spolchemie (Ústí nad Labem)	HCB from Spolchemie Ústí nad Labem was stored in its new hazardous waste landfill in Všebořice in the period 1992 -1999. Full amount of HCB produced as a by-product stored in Všebořice during this period was 300 tons. It was stored in plastic containers and covered by a sand layer between them and by a fly ash and cement mixture on the top.
Ústí nad Labem - Spolchemie - chemical plant (Ústí nad Labem)	Chemical plant area itself is probably contaminated by organochlorine pesticides and HCB. Mercury contamination remediation is planed to start soon and will continue for 12 years beginning in 2004. HCB was burned in hazardous waste incinerator MEGAWASTE – EKOTERM, spol. s r. o. Prostějov since year 2000.

*****Localities taken from priority list of contaminated sites prepared by Department for Contaminated Sites of the Czech Ministry of Environment (version updated to 2002). All data is current to the middle of 2003.

RNDr. Pavla Kačabová from the Department for Contaminated Sites of the Czech Ministry of Environment (Odbor ekologických škod MŽP ČR) provided a list of sites contaminated by other than Stockholm Convention-listed pesticides for the Draft National Implementation Plan (I. Holoubek et al. 2004):

- STS Jindřichův Hradec, locality Dačice – contaminated by oil residues, MCPA (2-Methyl-4-chlorophenoxyacetic acid), Dinoseb, Metolachlor, Prometryn, Atrazine
- STS Jindřichův Hradec, locality - landfill „Na Klaničném“ – contaminated by Dinoseb, Dicamba, Dichlorprop
- STS Jindřichův Hradec, inside area of enterprise – contaminated by oil residues, MCPA (2-Methyl-4-chlorophenoxyacetic acid), Dinoseb, Prometryn, Atrazine
- MEGA Třeboň s. r. o. – pesticide storage and “poison reservoir”

4. Needed actions

The following are requirements of the Czech NGOs and local authorities submitted as a part of Comments to National Implementation Plan of the Stockholm Convention:

- The Czech Ministry of Agriculture must publicly reveal a list of former organochlorine pesticide storage facilities.. As seen above, these facilities are potentially highly contaminated by POPs. The list mentioned above is only a fraction of the full list of such sites.

- The most highly contaminated sites should be cleaned up using technologies that prevent the creation of more POPs or new contaminated sites. The Klatovy - Luby storage facility should be prioritized for cleanup.

- When giving authorisation, according to the Czech law on chemical substances, there should be a compulsory measurement of content of POPs, mainly dioxins, in material streams in environment.

- Persistence should be considered when regulating new and current pesticides as a characteristic which should earmark substances for prohibition. Greater knowledge of pesticide levels in the environment should be pursued and more substances should be added to the list of substances under the PRTR government decree.

- Efforts should be focused on contaminated hotspots to prevent further contamination of the environment.

Based on the Czech experience documented by the Klatovy - Luby facility and other toxic hot spots there are more pesticides that should be added to the list of the Stockholm Convention Annex A compounds including Lindane. Pesticides that represent potential sources of dioxins should be monitored by BAT/BEP guidelines and documents (such as the Dioxin Toolkit) prepared under the Stockholm Convention.

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