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## **International POPs Elimination Project**

*Fostering Active and Efficient Civil Society Participation in  
Preparation for Implementation of the Stockholm Convention*

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# **Lindane in Hungary**

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**Hungary  
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## **About the International POPs Elimination Project**

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.

For more information, please see <http://www.ipen.org>

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The views expressed in this report are those of the authors and not necessarily the views of the institutions providing management and/or financial support.

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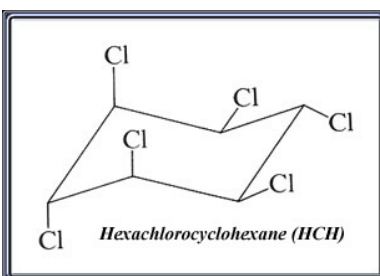
# Lindane in Hungary

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## 1. About Lindane

Lindane (Picture 1) is the common name of gamma-hexachlorocyclohexane, which is a persistent organic pollutant (POPs) with a half-life between 7 days and 3 years (depends on the conditions). This chemical was invented in 1825 by Faraday, but its pesticide effect has been known only since 1942. After this finding, Lindane production, and using started up in the United Kingdom. The first producer was the Imperial Chemical Industries Ltd (ICI), which now a part of Astra Zeneca.



Picture 1: The chemical structure of Lindane  
(Source: [www.the-piedpiper.co.uk](http://www.the-piedpiper.co.uk))

## 2. Sources of Lindane (gamma-HCH) in Hungary

The popularity of Lindane has grown mainly because of the phase out of DDT. A typical property of the usage of Lindane is the usage of active ingredients combination. It was quite popular in combination with DDT in the first period of its use (1966-1969). The highest usage of Lindane was in 1970 in Hungary. The use of a fertiliser (phosphate) and Lindane combination plant protection product (PPP) grew prominently in the period of 1965-75. Its usage in 1971 was higher than 17 thousands tonnes, but this agrochemical Lindane content was only 1,5%. The usage of Lindane containing powders was the highest in the early years of 1970s. This product usage decreased only after a decade in 1982. The last Lindane-containing product was Lindafor which used until 1989. The last Lindane containing PPP, Lindafor was banned in 1999 (PETHŐ – OCSKÓ, 2003), but it was legally used until 2001 as grain seed disinfectant (DARVAS, 2003). Most of the Lindane used in Hungary, was produced in a few Hungarian agrochemical factories (see: Map 1.), such as Nitrokémia Ipartelepek (Balatonfüzfő), and Budapesti Vegyiművek (Budapest) (PETHŐ – OCSKÓ, 2003).



Map 1: The position of the factories that produced Lindane

The amount of the sold Lindane in each decade in Hungary is shown in the Table 1.

**Table 1: The amount of Lindane sold in Hungary (1950 – 2000) (tonnes)**  
(Source: Central Service for Plant Protection and Soil Conservation)

Selling data in active ingredient (t)	1950-1960	1961-1970	1971-1980	1981-1990	1991-2000	Σ
100%	2	3073,4	1743,8	72,9		4892,1
75%				39,0		39,0
16%	0,1					0,1
10%		6,1	50,9	5,2		62,2
7%		851,1	1737,9	58,5		2647,5
2%		574,9	249,7			824,6
1,5%		777,8	493,8			1271,6
<b>Combined products (only a part of it Lindane)</b>						
<b>DDT-Lindane</b>		3512,8				3512,8
<b>TMDT-Lindane</b>		9,7	36,0			45,7
<b>Methoxychlor-Lindane</b>		3,7	0,01			3,7
<b>Methoxychlor-DDT-Lindane</b>		37,5				37,5
<b>Lindane-endosulfan</b>			3,0		3,9	6,9
<b>Total</b>	2,1	8 787,8	4 315,0	175,7	3,9	13 284

It is important to know that now the main possible sources of Lindane are the old agrochemical storage places and warehouses, and the packages of Lindane products. The major possibility of its existence is in the farms where the grains were produced (DARVAS, 2003).

The Plant Protection & Soil Conservation Service (PPSCS) carried out an investigation countrywide in 2003. They found approximately 314 tonnes of obsolete pesticide residues of PPP (Plant Protection Product, and only a smaller part of it had Lindane content) and 586 tonnes of its packaging material. It may be presumed that there are still unexplored places where some quantities might be found. This is because the total use of PPPs in Hungary from 1950-2000 was 2 376 000 tonnes, and the Lindane usage was approximately 180 tonnes (not in active ingredients, but in sold PPP), which is 7,5%. Therefore we assume that the fraction representing Lindane in obsolete stockpiles could be as much as 7.5% (SIMON, 2005).

The REFLEX KE (NGO) and the Bakonyalja KTE deal with surveying pesticide wastes in Hungary including POPs-contaminated wastes. They surveyed 85 pesticide storage facilities, which represented nearly 1 million hectares. They did not find any Lindane, but there were several tonnes of unidentified PPP. The surveying concerned only the western region of the country, where the pesticide storage discipline is higher than in the eastern regions. However, note that the Lindane usage was greater in the eastern regions of the country.

There is a national program to dispose of POPs (and other) pesticide wastes, its organised by CSEBER Kht.<sup>1</sup>

<sup>1</sup> The CSEBER Kht. (Csomagoló Eszköz Begyűjtési Rendszer, in English: Package Collecting System) is a non-profit organisation established by the main participants of the Hungarian pesticide market (e.g.

### 3. Levels of Lindane

#### 3.1. Lindane pollution of the surface- and ground waters

There were several international, national and institutional (HAS-PPI) monitoring surveys of the pesticide or POPs pollution of the surface waters. Some of these surveys deal with Lindane too. Several surveys among others focused on the Lindane concentration in surface water are (LÁSZLÓ et al., 2003):

- National Surface Monitoring System (1.),
- A survey in 2001 connected to the The Water Framework Directive (2.),
- Trans-National Monitoring Network, it is the common monitoring system of the countries of the Danube from 1996 (3.),
- A survey of the sediment pollution of the surface waters in 1995 (it is a part of the Phare W-905 project) (4.),
- The common Hungarian – Slovak monitoring program of the water quality of the Danube (5.),

In surface and ground water:

- The annual pesticide residue monitoring of the Central Service for Plant Protection and Soil Conservation (CSPPS) (6.),
- and the HAS-PPI survey in 2001 (7.).

Most of the samples did not contain Lindane below the detection limit. In the first survey, the amount of Lindane measured in 402 samples in the monitoring system in the 1990s was between <0,01-0,1 µg/l. These concentrations were quite low compared to regulatory standards (the limit of the 1<sup>st</sup> class water quality is 0,1 µg/l, 2<sup>nd</sup> class: 0,2 µg/l, 3<sup>rd</sup> class: 0,5 µg/l, 4<sup>th</sup> class: 2 µg/l (Hungarian standard 12749)). Approximately 86 of the 402 samples came from the Danube River near the Croat border, Hercegszántó. The other samples were collected in different places (mainly from the polluted rivers, and from the Balaton lake). The maximum concentration was detected in the Pécsi-víz Brook in 1999.

In the second survey there were 45 measurements in Hungarian rivers and 26 from the waste water of the main Hungarian polluters (chemical factories and waste water companies). Approximately 37% of the samples of the surface water contained Lindane under the detection limit (1 ng/l). Another 36% contained Lindane at levels between 1-10 ng/l. The maximum detected level of Lindane was 48 ng/l in the Berettyó River (South East Hungary). Approximately 38% of the waste waters contained Lindane under the detection limit (1ng/l). Another 19% contained Lindane at 1-10ng/l. The other samples contained a maximum level of 25 ng/l except the sample from the waste water company of South Pest (it is the eastern part of Budapest) with a Lindane concentration of 56 ng/l.

Lindane pollution data are available for the period of 1997-2001 from the Trans-National Monitoring Network. They have nine monitoring points in the main rivers of Hungary

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BASF, Bayer, BVM, Monsanto). It co-ordinated the recollecting and disposal of the 96% of the Hungarian pesticide packaging (CSEBER Kht.).

(Duna (5), Dráva, Tisza, Sajó, Sió Canal – see Map 2). See the measured concentration in the Table 2, the detection limit was 0,1 ng/l.

**Table 2: The concentration of Lindane in the main rivers of Hungary (ng/l, 1997-2001)**  
(Source: VITUKI)

River	Place	No. of samples	Lindane detection (% of the samples)	Max. conc.	Mean conc. of the positive samples
<b>Duna</b>	Dunaföldvár	54	77,8%	16	4,1
<b>Duna</b>	Hercegszántó	92	68,5%	28	2,9
<b>Duna</b>	Komárom	47	93,6%	500	27,5
<b>Duna</b>	Medve	47	80,1%	20,5	4,4
<b>Duna</b>	Szob	48	85,4%	600	18,7
<b>Dráva</b>	Drávaszabolcs	47	76,6%	32	3,2
<b>Tisza</b>	Tiszasziget	48	95,8%	112	9,3
<b>Sajó</b>	Sajópüspöki	65	86,2%	100	12,8
<b>Sió canal</b>	Szekszárd	37	97,3%	32	4,8

**Map 2: The position of the monitoring points of the Trans-National Monitoring Network**



The sediment of the rivers also contained Lindane as revealed by sediment pollution measurements in 1995 (4.). Only 36%, 32 samples of the 89 samples, contained Lindane in detectable concentrations (over 0,2 µg/kg). The average concentration of the contaminated samples was 0,41 µg/kg. The highest detected concentrations were 2,8 µg/kg (in the Rába near Győr) and 1,1 µg/kg (in the Tisza under Szeged). According to the Canadian Sediment Quality Guidelines (1999) the Probable Effect Level of the Lindane in the sediment is 1,38 µg/kg.

The Lindane concentrations were mostly under the detection limit in the Hungarian-Slovak common monitoring system. It is important to know that the detection limit was relatively high (2,5 µg/kg) in the sediment and floating particles, but there were a few

higher concentrations in data from 1996 where the maximum detected Lindane concentration was 3 µg/kg in the sediment of the Danube River near Komrom and Szob.

In the ground water the concentration of the Lindane mostly was under the detection limit. It was very rare for a sample to contain more than 0,01 µg/l Lindane. The maximum concentrations were detected in Nagykapornak (0,056 µg/l) and Szekszárd (0,05 µg/l).

There are only 3 samples of 69 which contained detectable concentrations of Lindane in 2005 by the measurement of Central Service for Plant Protection and Soil Conservation (CSPPS).

A surveying of the ground waters showed the same contamination level in 2002. Only 1 (0,034 µg/l in Molnári) of the 60 samples contained Lindane above the detection limit (0,01 µg/l). (National Directorate for Environment, Nature and Water, 2003)

### **3.2. Soil contamination with Lindane**

The Ministry of Agriculture made a Soil Information and Monitoring System (TIM) in 1992 with 1236 monitoring points throughout of the country. There was a pesticide monitoring project in 1993, 1997 and 2000 involving three levels of the chosen 100 soil monitoring points. The measurements were made by the CSPPS. The Lindane concentrations in the soil in most of the measurements (95%) were under the detection limit (1-2 µg/kg).

The maximum found pollution limit value of soils in 1997 was 4,4 µg/kg, and in 2000 was 13 µg/kg. According to a study made by the Research Institute for Soil Science and Agricultural Chemistry of the Hungarian Academy of Sciences in Hungary (RISSAC, 2003) the total HCH average concentration of the soil is 0,1-1 ng/m<sup>3</sup> and the yearly sedimentation is approximately 30-40 g/km<sup>2</sup>.

### **3.3. Food contamination with Lindane**

The human exposition to Lindane is mainly caused by food (at least 90%). The concentration of POPs grows in the food chain, so the most problematic group of food comes from animals (e.g. milk, butter, meat or fat) (FJNCPH, 2003).

The regulatory limit value of the Lindane content in foods is 1 mg/kg in Hungary (OÉTI, 2003).

Some of the measurement results of POPs residues in the period 1985-2001 which are characteristic of the plants produced in Hungary are presented below (Table 3).



**Table 3: POP residues in food (µg/kg)**  
**(Source: Central Service for Plant Protection and Soil Conservation)**

Active substance	Food, fruits							
	Pumpkin seed oil		Pumpkin seed		Potato		Wild strawberry	
	No. of samples	Measurement	No. of samples	Measurement	No. of samples	Measurement	No. of samples	Measurement
<b>Lindane</b>	32	1-12	6	1-5	3	2-9	5	4
<b>HCH isomers</b>	38	1-8	6	3-7				

The monitoring of the limit values of POPs content of plants and fruits are being carried out by the Plant Protection & Soil Conservation Service of each district – in Hungary there are 19 districts (Map 3). As it was to be expected, the residues of active substances of some chlorinated hydrocarbons having high fat-solubility were able to be absorbed from the soil. It concerns mainly foodstuffs, fruits, and berries of plants with high oil content (SIMON, 2005).

### 3.4. Assessment of health hazard due to POPs exposure

Lindane is thought to be moderately toxic. The LD<sub>50</sub> of Lindane is 90-270 mg/body mass kg (on rats), which is similar to DDT toxicity. The organochlorine chemicals cause some neural diseases. There are some data which shows that Lindane is possibly a carcinogen, mutagen, bioaccumulative, modifies the immune system and is estrogenic. The acceptable daily intake (ADI) of Lindane is 0,005 mg/bmkg.

The draft risk profile for Lindane written by Mexico as part of the Stockholm Convention POPs Review Committee also mentions several toxic effects.<sup>1</sup> These include toxic effects on the liver, immune system, reproductive system, and developmental damage. Acute exposures in humans can induce dizziness, headaches, diarrhea, nausea, vomiting, and even convulsions and death. Alterations in blood cells occur in workers after chronic exposure in production facilities. Lindane has been found in the serum, fat, and semen of people exposed environmentally or occupationally. The report notes that Lindane is also very toxic to aquatic organisms and moderately toxic to birds and mammals after acute exposure. Reproductive impacts in animals include reduced egg production in birds; altered sex ratios in frogs; testicular atrophy and disrupted sperm formation in male rats; and reduced ovulation in female rats.

Lindane still detectable in breast milk samples in Hungary. The maximum HCH content in breast milk was 0,841 mg/kg in data collected from 1996-2002. There are some samples without detectable HCH (>0,001 mg/kg) in 3 years of the 7 years.

A national measurement with 219 samples (2001-2002) showed that the total HCH content of breast milk is largest in Budapest and the lowest in Zala (Western Hungary). The average total HCH content of breast milk in Hungary is 0,055 mg/kg fat (Map 3) (OÉTI, 2003).



**Map 3: The total HCH concentration in several Hungarian districts (OÉTI, 2003)**

#### **4. Damage caused by Lindane**

There have not been any major known damages caused by Lindane. The pollution of the water and the soil is often different in different places, possibly because of the different earlier usage habits. Probably the highest concentrations of Lindane have been found in places of production (Balatonfüzfő, Budapest) or the old or unused pesticide storages.

#### **5. Laws currently regulating on POPs (including Lindane)**

Hungary signed the Stockholm Convention (in 2001), and the Aarhus Protocol (in 1998). Hungary has not yet ratified the Stockholm Convention. The decree 6/2001. (I. 16.) FVM prohibits the use of more POPs pesticides (for e.g. Lindane). There is no production of Lindane in Hungary, but it is not legally banned.

The external trade of most of the substances regulated in the Aarhus Protocol is strictly restricted in the government decree 112/1990. (XII. 23.). External trade has to comply with the Prior Informed Consent (PIC) rule, which is regulated in the decree 46/2000. (XII. 29.) EüM-FVM-KöM-GM.

The law 2000. XXV. (EüM), and the law 2000. XLIII. (KöM) regulate the labeling, waste disposal and register of the products contain dangerous substances.

The MRL of Lindane is 1 mg/kg (regulated the decree 5/2002. (II. 22.) EüM-FVM).

We direct special attention to the POPs residues of vegetables, crops, fruits, etc. The MRL (Minimal Risk Level) limit values and examination results of the most “POP sensible” plants and fruits with oil content according to the former and current regulation in Hungary:

	<b>Decree 5/1977 MÉM-EüM (mg/kg) MRL</b>	<b>Decree 59/2003 and the 5/2002 EüM-FVM (mg/kg) MRL</b>
<b>Lindane</b>	0,5-1 depending on plants	0,01 still tolerable in case of import
<b>HCH isomers</b>	0,2 banned, only import	0,02 banned, still tolerable conc.

The HCH emission is under the Pollutant Release and Transfer Register (PRTR) in Hungary however at present there is not any registered HCH polluter.

## **6. Hungarian NGOs and Lindane**

According to a list on a non-governmental website in Hungary there are at least 10-15,000 foundations and NGOs. There are about 4-5,000 more or less active NGOs in Hungary by our estimation. Most of the environmental NGOs in Hungary started their work in the area of political change (1989).

These NGOs organised quite well in a national network, which makes it easier to communicate with each other and with the government and partition the issues and work. The Hungarian Environmental Movement has about 300 organisations and they have a great meeting annually. Only some of these NGOs deal with chemicals (about 10-20), pesticides or POPs (about 5-10) constantly, but much more can work on a part of this issue (for e.g. giving information for the people, monitoring the sources of POPs pesticides, or dealing with the impact of the POPs pesticides). The importance of this NGO network is growing in the issue of raising public awareness, because people want to know more and more on the environmental topics. In Hungary no NGO or non-governmental workgroup only deals with POPs pesticides.

People do not know much about the effects of chemicals (including POPs pesticides). Most of them have heard only about DDT and know something about its harmfulness. Now society is beginning to wake up to the importance of clean nature, and the potential harmful effects of chemicals on health, but there are only a few people who have more or less particular knowledge about the POPs.

Two Hungarian environmental NGOs were involved in NIP process. A group of the REFLEX KE from Győr led by Tibor Kovács surveyed the obsolete pesticide stockpiles in the Western districts. Their findings have been built to the POP inventory.

The Hajdúsági Civil Központ és Adattár Alapítvány led by Zoltán Köszörüs took part in the translation and spreading of some IPEN leaflets on rules of the Stockholm Convention.

## **7. Efforts to deal with POPs pesticides**

The Government, mainly the Environmental Ministry deals with POPs because of the signed international conventions e.g. Stockholm Convention, Basel Convention, and Aarhus protocol. It is in charge of the preparation, implementation and monitoring of the obligations of the Stockholm Convention.

These offices deal with POPs pesticides:

- National Inspectorate for Environment, Nature and Water (co-operate with the authorities and NGOs; make provision plans; it is the primary responsible authority)
- Ministry of Health (co-ordinates the role of health preservation),
  - National Public Health and Medical Officer Service
    - National Institute of Chemical Safety (analyse the effects of POPs on health, and collect and analyse data; attend the PIC Convention)
    - National Food Safety and Dietetics Institute (collect and analyse the data of the POPs contamination of foods, and the examination of the people)
- Ministry of Agriculture and Rural Development (plant protection, and protection of the soil quality),
  - Central Service of Plant and Soil Protection (authorise the PPPs, register the data on pesticide residues),
  - Plant and Soil Protection Stations (sampling, analyse the level of the contamination),
- Ministry of Economy and Transport (regulate the transport and external trade of the dangerous substances such as POPs pesticide wastes),
- Hungarian Central Statistical Office (collect data).

The Hungarian Government has been working on the POPs pesticide issue. One of the aims of the National Waste Management Plan (2003-2008) is the discovery and disposal of obsolete pesticides. The survey of the pesticide storage facilities of the western regions resulted from work performed by an environmental NGO and also by the Plant Protection Services. The current legislation orders the recollection of the pesticide packages and there were several programs for recollection of the obsolete pesticides from the farmers and the citizens too (e.g. the in last program 90 tonnes of pesticide were recollected and disposed).

## **8. State of Stockholm Convention Ratification and the National Implementation Plan**

Hungary signed the Stockholm Convention in May of 2001, and signed the Aarhus Protocol in 1998. Its need for the ratification of these international conventions makes the National Implementation Plan (NIP) very important. This plan is necessary to complete the Hungarian POPs Inventory. Probably the most work-demanding phase of the NIP has been the preparation of the POPs inventory. The POPs inventory has been made with the co-ordination of the Department for Air and Noise Pollution Control of the Ministry of Water and Environment. The detailed inventory includes studies and reports used in the project and is available in Hungarian language on the homepage of the Ministry of Environment and Water.

## **9. Public awareness activities**

In Hungary there are no governmental public awareness activities on the POPs pesticide issue. The only action is that the Hungarian POPs Inventory is available on the website of the Ministry of Environment and Water, but this detailed report is inaccessible for those who do not know the exact URL.

There are few public awareness activities among NGOs too, because of the low number of concerned organisations. All of these NGOs deal with other issues besides POPs too, leaving fewer resources for concentrating on POPs. However, sometimes this issue (POPs pesticides) appears in a small part of the brochure, press releases or other activities. The media are only interested in acute environmental problems and accidents and these often do not correspond directly to the issues of POPs pesticides in Hungary.

## 10. Alternatives to Lindane

Lindane has been banned in Hungary for five years and the usage volume was quite low in the last few decades. The phase-out of this chemical do not cause any major problem in agriculture. Lindane has been replaced with newer less dangerous PPPs, such as pyrethroids.

A better solution to the insect problem than pesticides is the use of *Bacillus thuringiensis* products against the juveniles. The biggest step for farmers is the prevention of agricultural damages caused by the insects. It is quite important to observe good agricultural practices, which includes the use of the suitable plant varieties, adequate nutrient supply and cultivation, and crop rotation etc.

Finally, organic agriculture offers a non-POPs (and non-pesticide) alternative that eliminates toxic chemical use in cultivation.

## 11. Recommendations

Public awareness:

- education of farmers (leaflets about old pesticides, Lindane, etc.), workshops
- www pages with available information about the Lindane and POPs pesticides, alternatives to Lindane and POPs pesticide, examples of good environmental practices in agriculture in the Hungarian language
- public awareness to the broader public

The Lindane hot-spots:

- identification of Lindane hot-spots in Hungary (agricultural, industrial – production places, storage, etc.)
- sampling the previous production places
- cleaning up of the Lindane hot-spots

Regular monitoring:

- environment
- humans
- food residues
- industry, agriculture (Pollutant Release and Transfer Register)

Disposal of the POPs waste and Lindane waste

- use of non-combustion technologies for the POPs pesticides disposal
- use of the environmentally friendly technologies for the Lindane disposal

## 12. Resources on Lindane

### 12.1. Resources - Hungary

There are detailed reports and databases on the homepage of Ministry of Water and Environment ([http://www.kvvm.hu/dokumentum.php?content\\_id=758&section\\_id=1](http://www.kvvm.hu/dokumentum.php?content_id=758&section_id=1)).

#### Competent Authority:

##### **Department for Air and Noise Pollution Control of the Ministry of Water and Environment**

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##### **Department for Air and Noise Pollution Control Directorate of Environment National Directorate for Environment, Nature and Water**

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#### Restriction of use of POP pesticides:

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Website: [www.ontsz.hu](http://www.ontsz.hu)

**Restriction of industrial use of POP chemical substances and preparations:  
National Institute of Chemical Safety 'Fodor József' National Center for Public  
Health**

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Website: [www.antsz.hu/okk/okbi](http://www.antsz.hu/okk/okbi)

**Management and disposal of hazardous waste containing POPs:  
Department for Waste Management and Technology Ministry of Water and  
Environment**

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Website: [www.kvvm.hu](http://www.kvvm.hu)

**Decrease of POPs emissions into the air:  
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National Directorate for Environment, Nature and Water**

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Institute for Water Quality Protection  
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## **Environmental NGO's:**

### **REFLEX Környezetvédő Egyesület**

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### **Bakonyalja Környezetvédelmi és Turisztikai Egyesület**

Address: 2888 Csatka, Szabadság tér 86.

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Website: [gportal.hu/gindex.php?prt=65005](http://gportal.hu/gindex.php?prt=65005)

### **Hajdúsági Civil Központ és Adattár Alapítvány**

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Website: [www.hajduboszormeny.koznet.hu](http://www.hajduboszormeny.koznet.hu)

## **12.2 International resources of information**

1. ATSDR (Agency for Toxic Substances and Disease Registry) - <http://www.atsdr.cdc.gov/>
2. INCHEM (Chemical Safety Information from Intergovernmental Organizations) - <http://www.inchem.org/>
3. Haz-Map Occupational Exposure to Hazardous Agents - <http://hazmap.nlm.nih.gov/index.html>
4. Environmental Health Perspectives - <http://ehp.niehs.nih.gov/>

## **13. Abbreviations**

CSPPS: Central Service for Plant Protection and Soil Conservation

DDT: dichloro-diphenyl-trichloroethane

FJNCPH: Fodor József National Center for Public Health

HAS-PPI: Hungarian Academy of Science, Plant Protection Institute

HCH: hexachlorocyclohexane

NGO: non-governmental organization

NIP: national implementation plan

OÉTI: National Institute for Food Safety and Nutrition

PIC: prior informed consent

POP: persistent organic pollutant

PPP: plant protection product

VITUKI: Research Institute for Environment and Water



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\* Available in Hungarian language in this website of the Ministry of Water and Environment: [www.kvvm.hu/dokumentum.php?content\\_id=758&section\\_id=1](http://www.kvvm.hu/dokumentum.php?content_id=758&section_id=1)

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<sup>i</sup> Stockholm Convention POPs Review Committee – Mexico, Draft risk profile for Lindane, April 2006 available here: [http://www.pops.int/documents/meetings/poprc/tech\\_comments/default.htm](http://www.pops.int/documents/meetings/poprc/tech_comments/default.htm)