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# NATIONAL IMPLEMENTATION PLAN FOR THE MANAGEMENT OF PERSISTENT ORGANIC POLLUTANTS

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## 1. INTRODUCTION

**The Republic of Slovenia (20,273 km$^2$, 1,996,433 inhabitants, 781,354 employees) is a Central European country. Its chief characteristic is its forestation (over 50%); a bit less than 40% of the area is intended for agricultural production, which has been decreasing in the last few years. In the lowlands, less than 25% is agricultural land. Agriculture represents approximately 5% of GDP and less than 10% of employees of the Slovenian economy. An average estate comprises approximately 4 hectares and has a low productivity rate. More than 90% of all agricultural facilities are private. Most of the farmers (10% of the employees) are not engaged in agriculture exclusively, but are also involved in other complementary activities. Agriculture is often only intended for production for the landowners' own needs. Slovenia is a net importer of food and agricultural products. The most important agricultural branch is stockfarming, which represents more than a half of the gross value of total agricultural production.**

**Slovenia has been a member of the European Union since 1 May 2004, which obliged it to harmonize its legislation with European Union directives.**

**In the field of handling and managing persistent organic pollutants (POPs), Slovenia is a signatory to the following international conventions:**

- **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal;**
- **Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade;**
- **Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters;**
- **Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean;**
- **Stockholm Convention on Persistent Organic Pollutants (POPs);**

**and the following international protocols:**

- **Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources (LBS Protocol);**
- **Protocol to the 1979 Convention on Long-range Transboundary Air Pollution on Persistent Organic Pollutants;**
- **Protocol on Pollutant Release and Transfer Registers.**

**Due to the aforementioned conventions and protocols, signed and ratified by the Slovenian Parliament, it was necessary to prepare a range of executive regulations and plans for the implementation of these documents. The last one among these plans was the *National Implementation Plan for the Management of Persistent Organic Pollutants* for the Stockholm Convention, which was prepared in 2004.**

## 1. NATIONAL IMPLEMENTATION PLAN

**The Stockholm Convention of 2001 (*Official Gazette of the Republic of Slovenia* No. 31/04) indicates the following persistent organic pollutants (POPs): *aldrin* ($C_{12}H_8Cl_6$) – 1,2,3,4,10,10-hexachloro-1,4,4α,5,8,8α-hexahydro-1,4:5,8-dimethanonaphthalene, *chordane* ($C_{10}H_6Cl_8$) – 1,2,4,5,6,7-8,8-octachloro-4,7-methane-3α,4,7,7α-tetrahydroindane, *DDT* ($C_{14}H_9Cl_5$) – 1,1′-(2,2,2-trichloroethylidene)bis[4-chlorobenzene], *dieldrin* ($C_{12}H_8Cl_6O$) – 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4α,5,6,7,8,8α–octahydro-endo,exo-1,4:5,8-dimethanonaphtalene, *endrin* ($C_{12}H_8Cl_6O$) – 3,4,5,6,9,9-hexachloro-1α,2,2α,3,6,6α,7,7α-octahydro-2,7:3,6-dimethanonaphth[2,3-b]oxirene, *heptachlor* ($C_{10}H_5Cl_7$) – 1,4-1,4,5,6,7,8,8-heptachloro-3α,4-7,7α-tetrahydro-4,7-methanoindene, *mirex* ($C_{10}Cl_{12}$) – hexachloropentadiene dimer, *hexachlorobenzene* (HCH) ($C_6Cl_6$), *polychlorinated biphenyls* (PCBs) and *dioxines/furans* (PCDD/PCDF).**

**This Convention stimulated the Ministry of Agriculture, Forestry and Food, Ministry of the Environment, Spatial Planning and Energy, and Ministry of Health of the Republic of Slovenia to prepare a harmonized *National Implementation Plan* of Problem-solving Associated with POPs in the field of industry, connected to the exchange of PCB compounds and destruction of used and old stocks, as well as agriculture, where phytopharmaceutical agents that contain one or more of the compounds listed in the Convention as an active substance are still present.**

***The National Implementation Plan* anticipates the following activities:**

- **Operative programme for removing PCBs and polichlorinated terphenils for the period from 2004 until the end of 2006;**
- **Operative programme for preventing the pollution of the aquatic environment with dangerous chlorinated hydrocarbons from dispersed pollution sources;**
- **Operative programme with waste oils from the electro-industry from 2004 to the end of 2006;**

- **Agricultural and environmental programme.**

**For the implementation of our programmes, certain Acts and executive Regulations have already been in force, such as:**

- **Environmental Protection Act (*Official Gazette of the RS*, No. 41/04);**
- **Waters Act (*Official Gazette of the RS*, No. 67/02);**
- **Chemicals Act (*Official Gazette of the RS*, No. 110/03);**
- **Veterinary Service Act (*Official Gazette of the RS*, No. 33/01);**
- **Health and Hygiene Safety of Foods, and of Materials and Articles Intended to Come into Contact with Foods Act (*Official Gazette of the RS*, Nos. 52/00 and 42/02);**
- **Plant Protection Products Act (*Official Gazette of the RS*, No. 98/04);**
- **Agriculture Act (*Official Gazette of the RS*, No. 54/00);**
- **Plant Health Act (*Official Gazette of the RS*, Nos. 45/01 and 23/05);**
- **Occupational Safety Act (*Official Gazette of the RS*, Nos. 11/03 and 11/01).**

### *2.1. Strategy of handling POPs in Slovenia*

**By its adopted legislation in the field of phytopharmaceutical agents, chemicals and health protection of people, animals and environment as well as other fields, the Republic of Slovenia has adopted the legal order of European Union; therefore, according to the Stockholm Convention, pesticides containing POPs substances shall not be marketed or used. Despite the fact that their use has been prohibited for a longer period of time, they will still be, due to their persistence, subject to routine monitoring of residues in foodstuffs, as well as agricultural and other products.**

## *2.2.* Some application results of *National Implementation Plan*

**Due to the great environmental disaster that happened years ago in southeastern Slovenia when, uncontrolled, a high quantity of the residues of PCBs was dumped and about ten people fell ill due to intoxication, the producer of a plan for handling and managing POPs prepared the appropriate legislation, plan for the monitoring, record keeping and disposal of PBCs and PCTs – *the Rules on the Disposal of Polychlorinated Biphenyls and Polychlorinated Terphenyls* (*Official Gazette of the RS*, Nos. 15/00, 15/02 and 18/03) which is compliant with the EU Directives (Directive 96/59/EEC – Disposal of PCB/PCT). For Slovenia, this represents an obligation to attend to the final maintenance of all PCB devices containing oils with more than 500 mg PCB/kg by the end of 2010 and, with regard to devices contaminated with PCB containing oils with a concentration of 50–500 mg PCB/kg, take care of the decontamination unless the useful life of these devices has expired.**

**List of records connected to PCBs**

- **list of devices containing more than 5 $dm^3$;**
- **list of PCB devices marked according to the regulation governing safety measures for handling substances containing PCBs;**
- **list of PCB devices that were decontaminated;**
- **list of PCB devices that do not operate and have not been removed or decontaminated;**
- **list of collectors of waste PCBs and their capacities for temporary storing;**
- **list of persons who have permission for the decontamination of PCB devices;**
- **export permissions for single or multiple export of waste PCBs;**
- **quantity of waste PCB fluid and list of PCB devices exported due to the disposal;**
- **methods and sites for the disposal of waste PCBs abroad;**
- **the performed measures of the content of PCB in fluids in PCB devices.**
- **Establishment of a system for controlling plans for the disposal of waste PCBs.**
- **Production of a detailed plan for the disposal of waste PCBs for the entire Slovenian territory, including the plan for exchanging filling and decontamination of PCB devices.**

– **Production of instructions for the owners of PCB devices regarding the fulfilment of the requirements of the regulation governing the disposal of waste PCBs.**

**The program is intensively implemented; PCBs are measured in all environments, foods and disposal sites.**

**In 1962, the Iskra Kondenzatorji company from Semič in southeastern Slovenia began manufacturing condensers by using the impregnator, PCB, as a dielectric. Up to 1970, the company used a commercial technical PCB mixture, Clophen A-30 and A-50 (Bayer, Federal Republic of Germany), containing 30% and 50% chlorine and, from 1970 until 1985, a PCB with the brand name Pyralen 1500 (Prodelec, France) containing a similar percentage of chlorine as Aroclor 1242 (42% $Cl_2$). Between 1962 and 1984 (after that, the consumption of PCBs in manufacturing was abandoned), the total consumption of PCB impregnator amounted to 3,700 tons, whereby the quantity of the total residue was approximately 7%, i.e., technical output, waste condensers and waste impregnator.**

**From 1962 until February 1985, when the use of PCBs in manufacturing was abandoned, the material PCB balance in the Iskra Kondenzatorji company in Semič was the following:**

- **consumption of PCB (installed in condensers) 3,443.2 tons**
- **technological residue of PCB (waste PCB) 246.1 tons**

**Until 1985, the 246.1 tons of PCB residue included the following: 6.2 tons of unused and sold PCB, 169.9 tons incinerated PCB (France) and 70 tons of PCB in the form of emissions and waste disposed of in the area of Semič in southeastern Slovenia.**
**Of the total PCB quantity in the manufactured condensers of 3,443.2 tons, 20% of the PCB (approximately 700 tons) was consumed or "left over" as waste in Slovenia, and the remaining quantity was exported.**

**Table 1: The quantity of PCB waste collected and exported for the final maintenance in Slovenia as of 1991 until 2001:**

| YEAR OF EXPORT | Exported quantities (kg) |
|---|---|
| 1991 | 134,370 |
| 1992 | 76,173 |
| 1993 | 89,372 |
| 1994 | 103,932 |
| 1995 | 53,310 |
| 1996 | 61,407 |
| 1997 | 37,579 |
| 1998 | 54,608 |
| 1999 | 45,470 |
| 2000 | 38,515 |
| 2001 | 77,464 |
| 2002 | 75,804 |
| Total | 848,004 |

**After completing the combined records on the registered owners of PCB devices and waste, it was established that the actual export and destruction of PBCs amounted to:**

- **706,146 kg by the end of 2000;**
- **802,546 kg by the end of 2002;**
- **920,434 kg by the end of 2003.**

**At the end of 2004, the database included 159 registered owners of PCB devices, whereby the quantity of PCBs still to be removed amounted to 118,503 kg. It was estimated that the records include all important owners of PCB substances.**

**The largest quantity of PBCs and PBC-contaminated material was exported in 1994. The quantities exported after 1994 were a bit smaller and relatively constant. It has been estimated that the majority of the elimination of PCB devices and fillings will take place between 2006 and 2010 and will be in accordance with a detailed programme for removing PBCs for the entire Slovenian territory, including the plan for the exchange of filling and decontamination of PCB devices and detailed chemical analyses of fillings and lifespan of the devices in the following years.**

**According to a rough estimate of the preceding analysis on PCB quantities, performed by means of a questionnaire in 1998 and 1999, it has been established that there are approximately 500 tons of PBC waste (transformers and large condensers) and approximately 100 tons of PBC-contaminated oil of over 50 ppm (transformers) remaining in Slovenia. The main quantity of PBCs is allegedly in the operating devices.**
**In addition to devices containing PBCs subject to the *Rules on the Disposal of Polychlorinated Biphenyls and Polychlorinated Terphenyls* (*Official Gazette of the RS*, Nos. 15/00, 54/02 and 18/03), according to information in the project thesis, "The Concept of Handling the Dispersed PCB/PCT Sources in Slovenia", Slovenia also has approximately 650,000 kg of small condensers (volume smaller than 5dm$^3$) in the form of dispersed PCB sources containing approximately 215 tons of PCB.**
**The planned measures are in accordance with the operative programme for the disposal of PCBs.**

## 3. INSPECTION OF THE OLD STOCKS OF PHYTOPHARMACEUTICAL AGENTS CONTAINING POPs

**With regard to the agricultural regime and intensity of the agricultural economy as well as the purpose of using preparations containing POP substances, it may be concluded that their use in Slovenia was relatively small. The results of the analyses of pesticides residues in the soil also suggest the small consumption of POP substances in Slovenia.**

**To explain the consumption of pesticides containing POP substances, the following facts are important:**

- **Slovenia has approximately 50% area of forested land;**
- **In the past, the production of food was mainly of the extensive type but was not sufficient for the needs of the population; therefore, Slovenia also imported the majority of its food;**
- **The fragmentation of agricultural areas and use of crop rotation led to a relatively small consumption of pesticides by producers.**
- **The consumption of pesticides containing POP substances in Slovenia began with the appearance of new harmful pests, including the following two: the Colorado beetle, which endangered the production of potatoes, and San Jose scale, which caused the deterioration of fruit trees;**
- **Forest pests in Slovenia have not caused significant damage; therefore, POP pesticides have not been used in forestry.**

**Among the pesticides containing POP substances from the list of the Stockholm Convention, DDT was mainly used for controlling the Colorado**

**beetle (*Leptinotarsa decemlineata*), pests in orchards (*Quadraspidiotus perniciosus*) and other pests in storage facilities in Slovenia. The consumption of DDT was the most extensive between 1957 and 1962, when the resistance of the Colorado beetle to DDT was established in the territory of southeastern Slovenia. After 1962, the consumption of DDT was in decline. For controlling the vole (*Arvicola terestris*) in fenced orchards, approximately 1,000 litres of endrin were used annually until 1989 in Slovenia. *Toxaphene* ($C_{10}H_{10}Cl_8$) – chlorinated camphene was mainly used for controlling mice. Dieldrin and aldrin were mainly used against pests in soil and storage facilities, but less extensively compared to DDT. Products based on chlordane, heptachlor, mirex and hexachlorobutadiene were not used in agriculture in Slovenia. In Yugoslavia, mirex and chlordane were not registered.**

**Due to their negative characteristics, possible old stocks of phytopharmaceutical preparations containing persistent organic pollutants (POPs) represent a potential danger to the environment and people's health. With regard to the fact that Slovenia did not have accurate, but only approximate, records and estimates of old phytopharmaceutical preparations, since they were also used in the time when Slovenia was still a part of Yugoslavia, it was necessary to prepare an inquiry on the remaining quantities of these substances. This was done by means of a questionnaire intended for traders who market these substances and a questionnaire intended for agricultural producers.**

**The list of POP substances in the questionnaire included all preparations registered in the territory of the former Yugoslavia. The list did not include preparations and individual concentration variations of the preparations, since such list would be too long and unpractical.**

### *3.1. The results of the questionnaire on record keeping of old phytopharmaceutical agents – pesticides containing POP substances owned by traders of phytopharmaceutical agents*

**The process of using the questionnaire intended for traders of phytopharmaceutical agents was carried out in March 2004. It was delivered to 239 addresses from the list of the registered traders of phytopharmaceutical agents (current data of the Office for Plant Protection of the Republic of Slovenia). 50.8% (121) questionnaires were returned, of which 109 were correctly filled-in and included in the results.**

**The result of the questionnaire showed that the existing traders do not have preparations containing substances included in the list of POPs of the Stockholm convention on stock.**

**The Pinus company seems to be the largest seller. In its report, it also indicated selling preparations of aerosol, aldrin, dieldrin, doripin, gesarol, lindane, linditin, neocide and pinodrin; however, they do not keep records on the sale to individual traders, since the last quantities were sold in 1989. We also considered the possibility that the acquired data were not complete, since the number of traders changed from the time of the permitted sale of these preparations and, in addition to this, record keeping has only been compulsory since 2003. Regardless of this, we have estimated that most of the traders were included: the results showed that the traders included in the questionnaire do not have phytopharmaceutical substances containing POPs on stocks.**

### *3.2. The results of the questionnaire on record keeping of old phytopharmaceutical agents – pesticides containing POPs in agricultural holdings*

**The questionnaire in the survey addressed to farm owners in Slovenia included a list of all phytopharmaceutical agents containing POPs registered in the territory of the former Yugoslavia. In addition to these, the list also included agents containing *thiodan* or *endouslfan* ($C_9H_6Cl_6O_3S$) and *dicofol* ($C_{14}H_9Cl_5O$), which have characteristics of persistent organic pollutants but are not included in the list of POPs of the Stockholm Convention. Due to the transparency and effectiveness of the questionnaire, the list of phytopharmaceutical agents did not include individual concentration variations of the preparations.**

**At the end of April 2004, the survey with a questionnaire and letter was sent to approximately 68,000 agricultural holdings in Slovenia – i.e., to all addressees in the register of beneficiaries of subsidies of agricultural products. With regard to the extent of the people included in the questionnaire, we have estimated that we included 95% of the agricultural holdings, i.e., the most active agricultural holdings.**

**The collection of questionnaires took place in cooperation with the Agricultural Advisory Service and was coordinated by the Chamber of Agriculture and Forestry of Slovenia. Agricultural advisers were informed of the objective of the survey and they offered help in filling in the questionnaire. The time limit for completing and returning the questionnaire was 15 May 2004.**

**Of all the questionnaires sent, 26.4%, or 17,926, were returned. Of the returned questionnaires, 3.9% of the respondents reported consumption or stocks of phytopharmaceutical agents from the list of the questionnaire – Table 2. The surveys were not filled in by those who did not use phytopharmaceutical agents from the list of the questionnaire.**

**Table 2: The successfulness of the survey, "Records of Old Pesticides in Agricultural Holdings", (National Chemicals Bureau, 2004):**

| Number of the returned surveys (of 68,000 sent) | | |
|---|---|---|
| Surveys with no consumption reported | 15,277 | 22.5% |
| - of this, not filled in | 1,153 | 1.7% |
| - no. of surveys with filled-in data on the consumption/stocks | 1,496 | 2.2% |
| TOTAL returned surveys: | 17,926 | 26.4% |

**1,136.75 litres of fluid and 6,019.6 kilograms of powdered phytopharmaceutical agents containing POPs were recorded. Regardless of the actual quantity of substance reported in this survey, the ratio between individual preparations is realistic. The survey has shown that, of the available preparations, mostly those containing the active substance, DDT, (Pantakan, Pepein and Zlatacid) were used, with endrin and lindane following it. The analysis of data reported in the survey has shown that mostly phytopharmaceutical agents based on DDT (86%) were used in Slovenia, with HCH (10%) and endrin (4%) following them. The consumption of other preparations containing other POPs was lower than 0.1%. Mirex was not used in Slovenia. The distribution of POPs on stock is similar, as shown by the inspection of the phytopharmaceutical agents used containing POPs (DDT – 81%, HCH – 9%, Endrin – 10%), whereby the stocks have a slightly higher percentage of preparations based on endrin, which is reasonable, since this substance was the last to be taken out of circulation. Since the survey was not anonymous, the producer of the survey, the National Chemicals Bureau of the Republic of Slovenia, has complete data on the owners of the stocks that need to be removed. Due to the possible misunderstanding of the names and, consequently, incorrectly indicated data, these data need to be checked, especially in cases of Pantakan and Pepein.**

**The total stock of phytopharmaceutical agents containing POPs reported in this survey in Slovenia is 19.0 litres and 75.5 kg. Since the survey was not anonymous, the producer of the survey (National Chemicals Bureau) also has complete data on the owners of the stocks that need to be removed. Certainly, these are not actual quantities of phytopharmaceutical agents containing POPs that are in stock in agricultural holdings. The real number is much higher. It only represents a relation between individual preparations, and, with regard to the number of the filled-in questionnaires, we concluded that the number is at least 200-times higher.**

**Our estimation, that in Slovenia laying between 400 to 800 tons of obsolete pesticides is real, but this are not only those agents containing POPs.**

## 4. CONCLUSION

**On the basis of the documents presented, such as the international obligations of Slovenia (EU membership), signed and ratified international conventions and protocols, adopted legislation, and on the basis of the prepared "National Implementation Plan for the Management of Persistent Organic Pollutants (POPs) for the Stockholm Convention" ratified by Parliament and the survey with the inventory of pesticides containing POPs of traders and agricultural producers, Slovenia may be able to remove, i.e., destroy, the existing stocks of POPs by 2010.**

**The legislator is aware that the cost, regardless of the fact that we have relatively small quantities of old and useless phytopharmaceutical agents containing POPs, will still be very high and that this problem will probably not be solved without international financial aid and loans. Despite this, these activities lead towards decreasing the stocks and towards increased inspection activities that prescribe appropriate measures and advise the owners of these agents how to act to eliminate them.**

## 5. REFERENCE


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