Obsolete pesticides and soil overview of Bulgaria

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Introduction

The impact of obsolete pesticides on the environment is one of the world's major environmental problems. There is no country that is more or less currently free of this problem. In order to define priorities and identify urgent threats, two kinds of activities can be distinguished in Bulgaria:

- Inventory of available persistent plant protection stocks and the definition of their environmental risk
- Monitoring and protection of soil against persistent organic pollution (pesticides)

Activities in these two directions will be overviewed in parallel in this paper.

Methodology of the inventory of the pesticides stocks and the soil monitoring

Legal framework for the inventory of pesticides stocks

The Ministry of Agriculture and Forest has carried out the inventory of pesticides storage in Bulgaria in co-operation with the Ministry of Environment and Water (MoEW) according to the existing normative base in Bulgaria. The most important normative documents are "Reduction of the harmful impact of waste upon the environment act" and the "National waste management programme". These documents are prepared in line with the requirements of the Directive 75/442/EEC, Directive 91/689/EEC and the Community Strategy for Waste Management COM (96) final.

Reduction of the harmful impact of waste upon the environment act

This act shall define the environmentally sound management of waste as a combination of rights, obligations, decisions, acts and activities related to their generation and treatment, based on certain information and various forms of control. The management shall be realised for the purpose of preventing, reducing or limiting the harmful impact of waste on human health and on the environment. This act shall apply to domestic, production, construction and hazardous waste.

- *Order No RD - 323*. Pursuant to Article 23, item 2 of the Limitation of the Harmful Impact of the Waste on the Environment Act is determined the classification of waste.
- *Regulation No 10*. On the filling out of the report and the waste management information documents.
- *Regulation No 12*. On the requirements which must be met by the waste treatment facility sites.
- *Regulation No 13*. On the conditions and requirements towards the construction and operation of waste landfills. This regulation aims to establish the measures, procedures and requirements towards the prevention or abatement to the highest possible degree of the adverse impact of landfills on the environment, on ground- and surface water in particular, and on the human health-related risks.

National waste management programme

The programme sets the concrete measures related to the transportation and enforcement of the directives, regulations and decisions of the EU in the area of waste management, specified the obligations of complement authorities for speeding up the process of the EU legislation implementation.

Soil monitoring

Assessment of the soil on the base of the systematic control on contaminated soils in Bulgaria began in 1997. The responsible body is the Executive Environmental Agency at the Ministry of Environment and Water. The main principles and the sequence of the investigations made are as follows:

- During 1997, analysis was made regarding the different types of used pesticides in the different regions within the country. Data of the Central office for Vegetable Protection, Quarantine and Agro-chemistry to the Ministry of Agriculture have been used. That is why the investigation examines agricultural regions, which are possibly polluted. The aim was to determine if there is pollution by registered plant protection products.
- Within the next years 1998 - 1999, a new sampling system has been implemented, where the position of the sampling points was determined at the cross - points of the parallels (30' latitude) and meridians (20' longitude). The main goal was to determine whether pollution occurred as a result of using the forbidden plant protection compounds.
- Soil samples have been analysed for organochlorine pesticides (DDT, heptachlor, endrin, aldrin, dieldrin, metoxychlor, cis-heptachlorepoxid, isomers of hexachloro-cyclohexane), organophosphorus pesticides (zolon, fenitrothion) and triazine pesticides (atrazine, simazine, propazine). The analyses were performed by GC/MS or GC/ECP in compliance with ISO/CD 10382. For evaluation of the results, the established 3 levels of reference values - precaution, MPC and clean-up in Bulgaria have been used.

Table 1. Levels of organochlorine pesticides in soil (mg/kg dry soil)

	Substance	1**	2***	3****	4*****
The prohibited organochlorine pesticides					
25	HCB	-	0.025	0.25	10
26	alpha-beta-gamma-HCH	-	0.001	0.01	2
27	Diphenenyhalogenoethane - DDT (sum)	-	0.3	1.5	4
28	2,4′, 4,4″ – Dichlorodiphenildichloroethylene/ - o,p′ p,p′-DDE	-	0.1	0.5	-
29	2,4′, 4,4″ -Dichlorodiphenil-2, 2-dichloroethane/ -o,p′, p,p′-DDD	-	0.1	0.5	-
30	2,4′, 4,4′ -Dichlorodiphenil-2,2,2-trichloroethane/ -o,p′, p,p′-DDT	-	0.1	0.5	-

Amendment to Regulation N-3 Part: "Persistent organic pollutants in the soi l- mg/kg dry soil*.
** Reference background values
*** Precautionary levels
**** Maximum permissible concentrations
***** Clean-up levels

Results from the pesticides stocks inventory

It was established that as a result of overstocking, forbidding and restricting the usage of certain compounds about 4,391 tonnes pesticides are overhead. The general report specified three groups, according to the priorities for elimination. These included 149 tonnes forbidden by the UN/ECE, 276 tonnes forbidden for other reasons, and 3,966 tonnes unwanted pesticides. These pesticides are disposed in 1,268 stocks all over the country. The buildings (stocks), as well as the stored compounds, in most cases, do not meet the national and international prevention requirements and criteria. As could be seen at Figure 1 (Obsolete plant protection compounds in tonnes-1999), the biggest quantities of obsolete pesticides are stored on the territory of Razgrad (309 tonnes), followed by V.Tarnovo (240 tonnes), Kardjali (216 tonnes), Montana (211 tonnes), Vratza (199 tonnes), and then Dobrich (192 tonnes).

Some disposal actions were undertaken under the project "Pesticides disposal operations" according to the contract between the Ministry of Housing, Spatial Planning and Environment of the Netherlands and MoEW of the Republic of Bulgaria. On the base of this project, about 30 tonnes of most hazardous unwanted pesticides were gathered and exported from 6 regions, within the area of Sofia, Plovdiv, Shoumen and Bourgas, to the harbour of Bourgas.

It is about 1.5 percent of the total amount of the unwanted pesticides in Bulgaria. This 1.5 percent was stored in different stocks for nearly 30 years without the necessary protection, and in extremely bad conditions. So, they represented a serious danger for the environment.

According to the Basel Convention these pesticides are classified as hazardous wastes and their transportation to the Bourgas harbour had been made under special conditions. MoEW's obligations under this contract were to gather, transport and load these 30 tonnes on a ship in the harbour of Bourgas. The rest of the activities under the project constituted obligations assumed by the Netherlands. The Dutch government has financed the transport of the above pesticides from Bourgas to Rotterdam. The transportation was agreed upon with the governments of Bulgaria, Greece, Spain, Belgium, UK and the Netherlands. The pesticides were destroyed, in the biggest plant for pesticides destruction in Rotterdam. This plant has 12 incinerators. Three of them are for the incineration of the hazardous wastes from all over the world. The incineration process was very expensive and was entirely financed by the Dutch government.

At present, if good possibilities and financing support are available, MoEW is ready to export more than 200 tonnes from Bulgaria.

Figure 1. Obsolete plant protection compounds in tonnes - 1999

Results from the soil investigation

HCB

Registered values of HCB are between 0.025 mg/kg (precautionary levels) and 0.25 mg/kg (MPC).

alpha-, beta-, gamma-HCH

In most of investigated points of the country the measured quantities of HCH are not detected. Only in the Sofia and Haskovo regions the measured, levels of lindane increased from 0.14 to 2 mg/kg and more. Only once, a level of more than 2 mg/kg for the sum of HCH, above the maximum permissible concentrations, was detected.

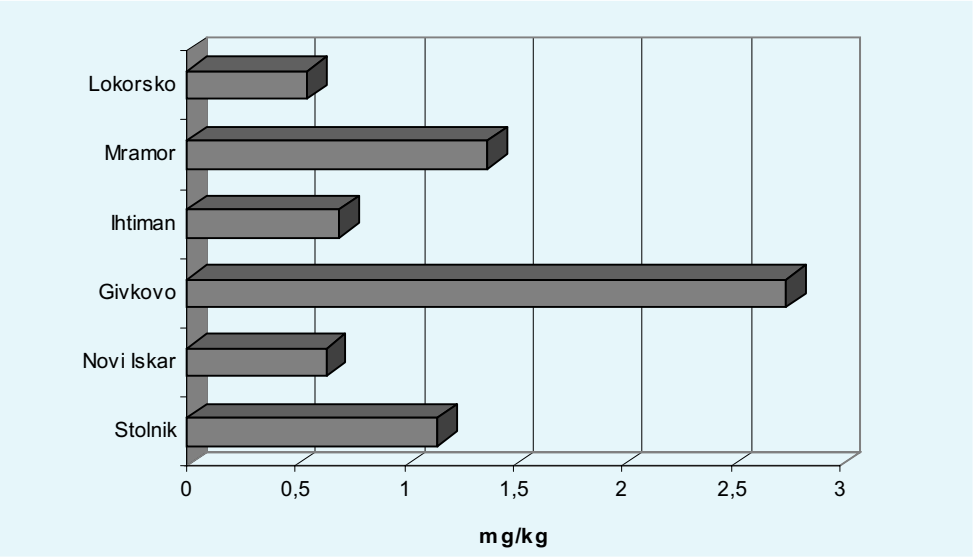

Figure 2. Gamma-HCH - maximum detected levels in the soils in the Sofia region

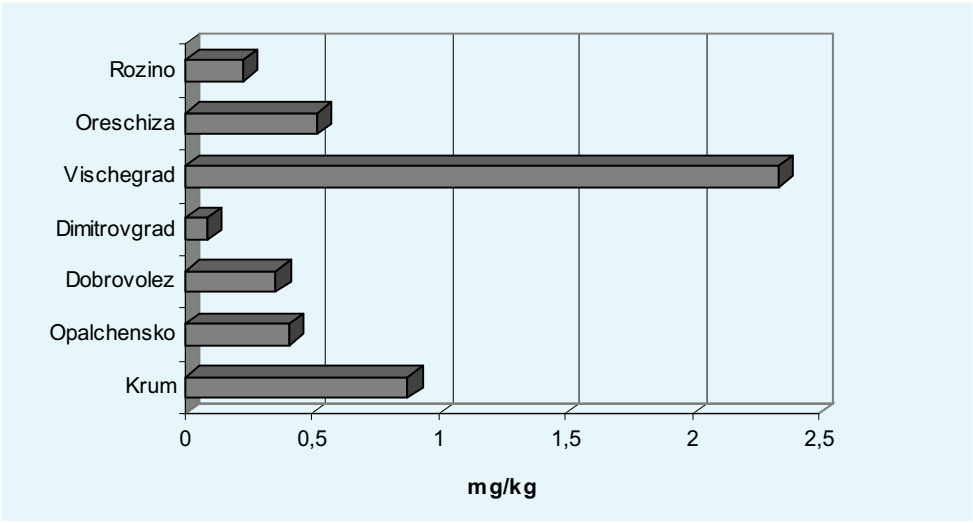

Figure 3. Gamma-HCH - maximum detected levels in the soils in the Haskovo region

Plovdiv, Vratza, Montana, Shoumen, Pazardjik and Varna regions could be determined as regions where the levels are above the maximum permissible concentrations (0.01 mg/kg, but under 2 mg/kg).

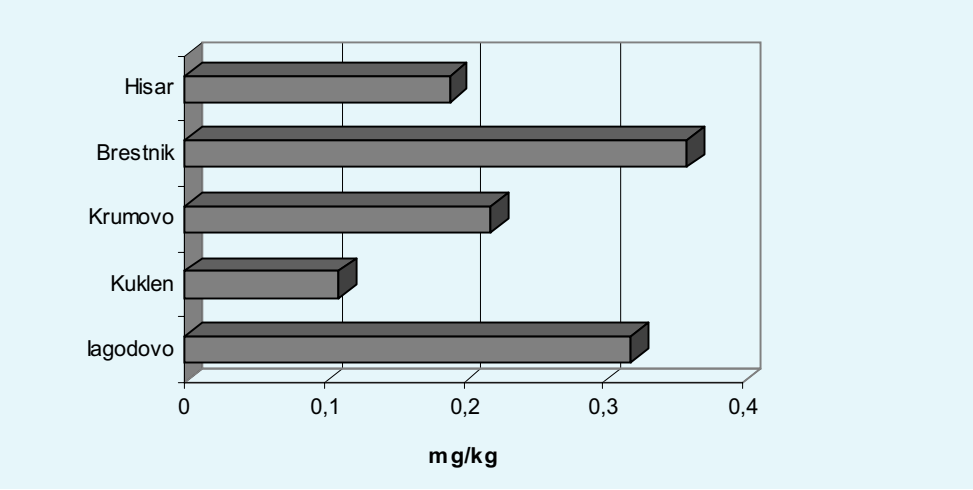

Figure 4. Gamma-HCH - maximum detected levels in the soils in the Plovdiv region

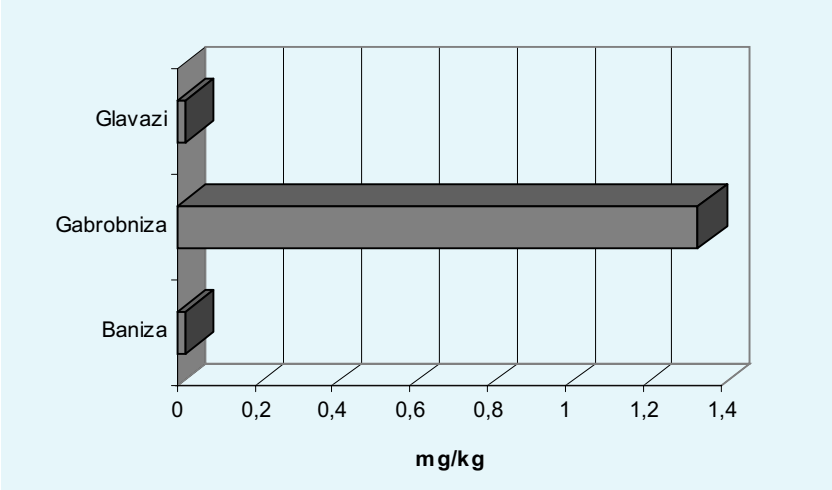

Figure 5. Gamma-HCH - maximum detected levels in the soils in the Vratza region

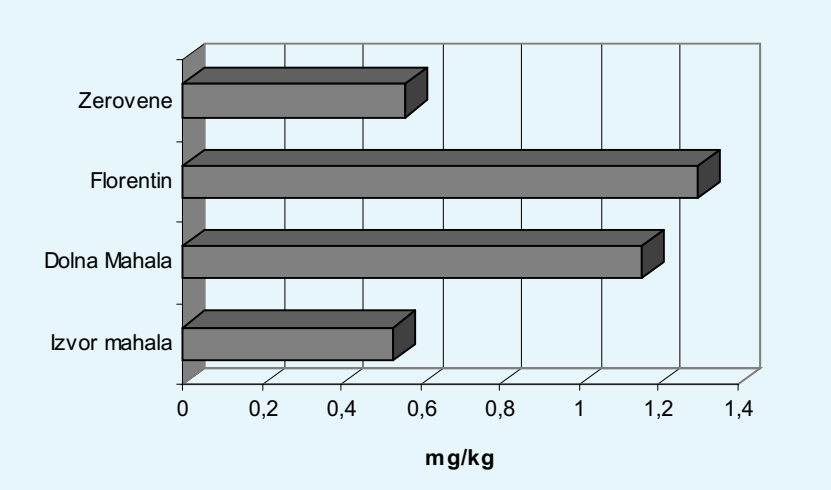

Figure 6. Gamma-HCH - maximum detected levels in the soils in the Montana region

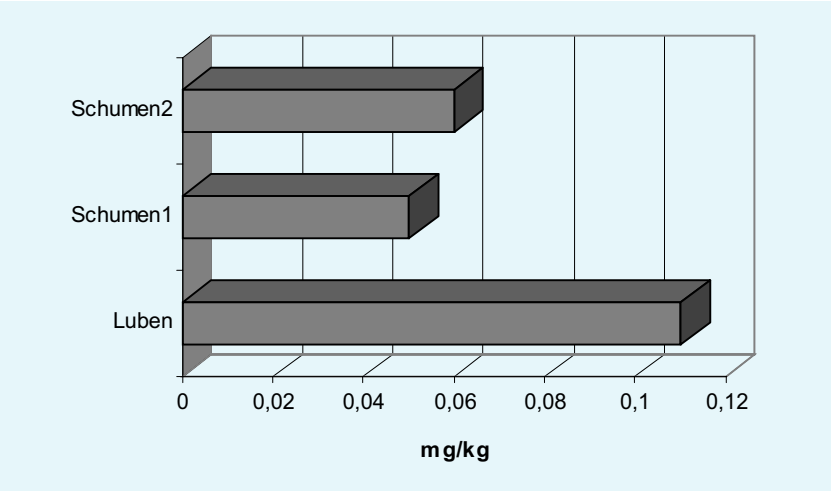

Figure 7. Gamma-HCH - maximum detected levels in the soils in the Schumen region

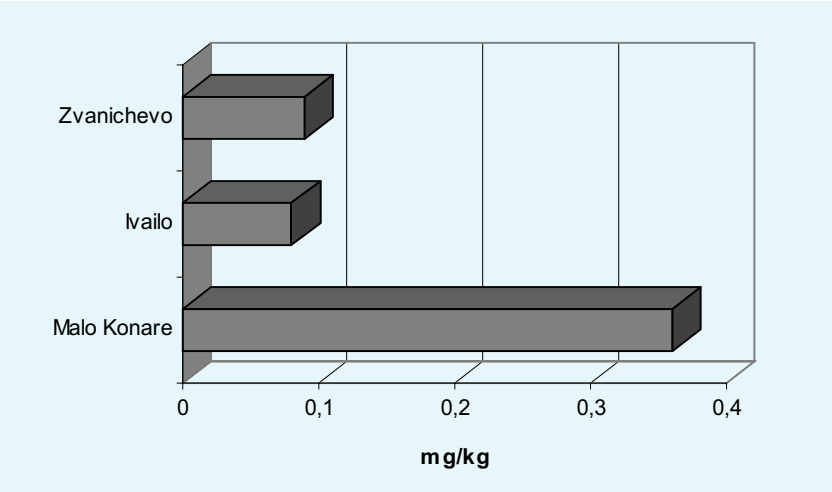

Figure 8. Gamma-HCH - maximum detected levels in the soils in the Pazardzik region

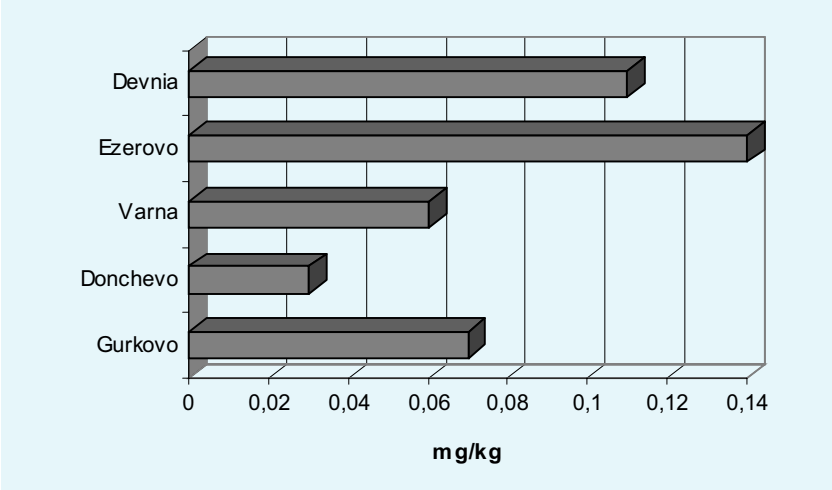

Figure 9. Gamma-HCH - maximum detected levels in the soils in the Varna region

DDT - isomers and metabolites

In spite of the prohibition for the DDT usage, its metabolites are still detected in the soils. Three groups of DDT and its metabolites could be detected in the collected samples with domination of pp' isomers. In the first group, 20% of the total samples showed predominant existence of DDT, followed by the second group with 40% - of the samples have equivalent existence of the three DDT metabolites DDT, DDD, DDE. And finally the third group constituted 40% of the total samples with predominant existence of DDE. 20% of the investigated samples contained DDT (sum) levels within the precautionary limits, i.e. between 0.3 - 1.5 mg/kg. These levels are measured in the regions of Haskovo, Montana, Smolian and Bourgas. 11% of the samples were above the maximum permissible concentrations (over 1.5 mg/kg) detected in the regions of Plovdiv, Pazardjik and Sofia. About 50% of them are concentrated in the territory of Botunec, Pirdop, Stolnik, Chelopechene, Anton, Zivkovo and are exceeding the values of 4 mg/kg and require immediate intervention. In the other regions over the country, the levels of DDT (sum) are within the limits of the background values.

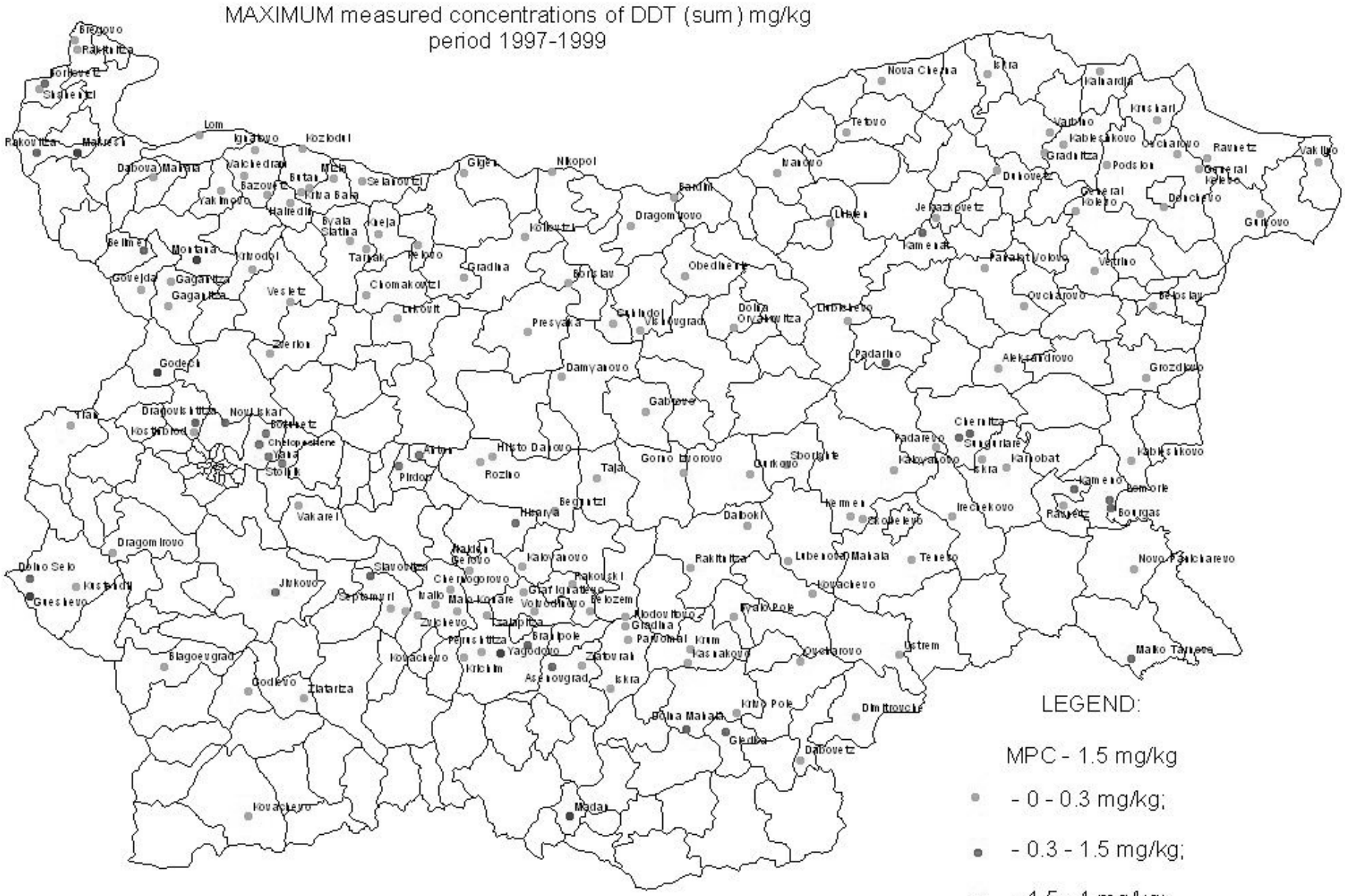

Figure 10. Maximum detected levels of DDT (sum) mg/kg

Triazine pesticides and phospho-organic pesticides

In most of the investigated points, the triazine pesticide group, compounds with active substance (atrazine, simazine and propazine) are not detected. Only 7.4% of investigated soil samples have shown levels between 0.22 and 0.67 mg/kg. Phospho-organic pesticides (phenitrotion and zolon) are also not detected. There were only two cases where 1.62 mg/kg of zolon and 0.48 mg/kg of phenitrotion were detected.

Conclusions

- As a result of overstocking, forbidding and restricting the usage of certain compounds about 4,391 tonnes pesticides are overhead. These pesticides are disposed in 1,268 stocks all over the country. The buildings (stocks), as well as the stored compounds, in most cases, do not correspond to the national and international prevention requirements.
- The diffuse soil pollution comes directly and mainly from intensive application of persistent pesticides in the past.
- There is less control of plant protection stocks, which leads to soil pollution. This is evidence of violating the prohibition for the DDT use.
- The soil investigation for the pollution by plant protection compounds started in 1997, but is limited nowadays because of financial restrictions. It is necessary that in the future the monitoring net should be extended, especially in the regions with estimated high concentrations.

MoEW's policy

MoEW's policy reflects the "National waste management programme". It was based on the requirements set by the Environment Protection Act and art. 27 of the Law of Limitation of Harmful Impact of Waste on the Environment. The programme takes into consideration that waste is dangerous for human health and environment and its aim is the environmentally friendly management. The programme sets the concrete measures related to transposition and enforcement of the directives, regulations and decisions of the EU in the area of waste management, and specifies the obligations of complement authorities for speeding up the process of the EU legislation implementation. An Action Plan is prepared in which the necessary institutional and investment measures for the near future are presented. The concrete measures involved in the programme are:

- Prevention and reduction of waste production
- Improving the organisation of waste collection and transportation
- Environmentally friendly waste disposal
- Minimisation the risk of former waste pollution
- Legal regulation of waste management
- Public awareness and participation on waste management issues
- Improving of the monitoring system, information collection and control the organisation of waste collection and transportation