

# OBSOLETE PESTICIDES (POPs) IN THE REPUBLIC OF BELARUS: INVENTORY, MONITORING AND ENVIRONMENTAL IMPACT ASSESSMENT

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## Abstract

The Republic of Belarus has significant stockpiles of obsolete pesticides created during 1970<sup>th</sup> and 1980<sup>th</sup>. Pesticides are placed both in aboveground warehouses and underground storages. Underground storages do not prevent leakage of pesticides into environment, first of all groundwater. Investigations carried out by Belarusian Scientific & Research Center Ecology revealed presence of pesticides in groundwater near all existing underground storages and even up to 3-4 kilometers from them. Detected concentrations of pesticides in groundwater fluctuate from year to year and reach occasionally 4-6 times maximum permissible concentrations.

**Key words:** Belarus, obsolete pesticides, inventory, monitoring, pollution

Safe storing of obsolete pesticides emerged as a problem in the Republic of Belarus as early as 1970s when production of pesticides surpassed their consumption.

According to the 2010 inventory, there are 7,359.835 metric tonnes of obsolete pesticides in the Republic of Belarus. Among them, 2,832.003 metric tonnes (39%) are stored in 159 agricultural enterprises and 2,824.706 metric tonnes (38%) are buried in 6 underground storages. The rest 1,703.126 metric tonnes (23%) of obsolete pesticides were moved to the specially designed Chechersk storage facility (processing and storage complex for toxic industrial wastes in Gomel region) during 1999-2010.

The bulk of the pesticides – 1,410.297 metric tonnes (50%) – are stored in Grodno region. There are also 927.200 metric tonnes (33%) in Minsk region and 494.506 metric tonnes (17%) Vitebsk region. Chechersk storage facility is the

only place on the territory of three other regions of the Republic of Belarus where obsolete pesticides are stored.

It should be noted that almost a half (3,719.962 metric tonnes) of all obsolete pesticides have been repacked. Moreover, 95% from 2,832.003 metric tonnes of pesticides in the above-ground storehouses were repacked. There are only repacked pesticides at the Chechersk storage facility.

Obsolete pesticides had being buried during 1971 – 1988. Brest, Verkhnedvinsk, Gorodok, Dribin, Petrikov, Postavy and Slonim underground storages were built to place these pesticides. According to the available data, there are 3,933.300 metric tonnes of different pesticides in these underground storages. Pesticides are represented by organochlorines, organophosphates and triazine class compounds.

Construction of underground storages was controlled by the temporary directive issued to regulate disposal of pesticides and their package. It was revealed that the majority of documents on their construction were lost. Therefore, it is impossible to be sure that the process of construction complied with all the requirements.

According to the National plan of the Republic of Belarus for the implementation of its obligations under the Stockholm Convention on POPs, for 2007-2010 and for the period till 2028, confirmed by the Decree of the President from June, 12<sup>th</sup>, 2007 № 271 Brest underground storage was closed in 2007. Pesticides were retrieved from the storage, repacked and transported to the Chechersk storage facility. Altogether 380 metric tonnes of pesticides were retrieved instead of 122 metric tonnes mentioned in the available documents. Starting from the second half of 2008 obsolete pesticides has being retrieved from

Petrikov underground storage. As of September 2010, 600 metric tonnes of pesticides were transported to the Chechersk storage facility. Finally preliminary works have started at Slonim underground storage which will be the next target. This storage is distinguished by the big portion of DDT (447.2 metric tonnes).

According to the available data, there still should be 2,824.706 metric tonnes to be retrieved from all the underground storages. However, the exact amount is unknown and could be figured out only in the process of retrieving.

According to the NIP in 2011-2015 liquidation of two burial places is planned (Slonim and Gorodok).

Liquidation of the burial place in Slonim is planned in the framework of the project GEF TF 096993 "POPs Management" (Component C of Integrated Solid Waste Management Project).

Monitoring of pesticides in the environment is carried out within the bounds of National System of Environmental Monitoring in the Republic of Belarus (NSMOS) as well as of independent scientific projects. Annual observation for pesticides content in natural waters is organized at 35 transboundary reaches of rivers. Besides, bed silts and biological samples have been investigated during the last 5 years at individual reaches. Finally, monitoring of DDT and  $\gamma$ -HCH (Lindane) in agricultural soils is carried out once in 5 years.

The most detailed monitoring for pesticides in the environment was organized at underground storages of obsolete pesticides. Observations started in 1999. Even first results revealed that the way obsolete pesticides are being stored does not prevent leakage. Investigation conducted by Belarusian Scientific & Research Center Ecology during 2000-2010 showed that pesticides contaminated groundwater, and specifically shallowest aquifers. Concentration of pesticides in groundwater evidently fluctuate with the weather and other factors. For example, concentration of pesticides did not exceed maximum permissible concentration (MPC) until 2007. Typically, concentration varied from  $1 \times 10^{-6}$  mg/L to  $1 \times 10^{-5}$  mg/L. Starting from 2007,

concentration increased to  $1 \times 10^{-3}$  mg/L while still being below MPC. However, in 2008, concentration of 4,4-DDD in groundwater at Slonim underground storage reached 0.349 mg/L and exceeded MPC of 0.1 mg/L, i.e. was 3.49 times MPC. In 2009 total concentrations of  $\alpha$ ,  $\beta$ ,  $\gamma$ - and  $\delta$ -HCH at Gorodok underground storage reached 6.41 times MPC. Concentration at Gorodok storage remained above the MPC in 2010.

Following features of pesticide migration were established on the basis of monitoring data. Pesticides were detected:

- in groundwater samples from observation wells at Dribin underground storage as well as from water well in Temnyi Les village (3.5 kilometers from the storage). Detected pesticides were represented by  $\beta$ -,  $\gamma$ - and  $\delta$ -HCH, Endrin, 4,4-DDD;
- in groundwater samples from observation wells at Slonim underground storage. Detected pesticides were represented by  $\alpha$ - and  $\beta$ -HCH, 4,4-DDT, 4,4-DDE and 4,4-DDD;
- in groundwater samples from observation wells at Petricov underground storage as well as from soil-reclamation canal (1.5 kilometers from the storage) and water well in Zatisch'e village (5 kilometers from the storage). Detected pesticides were represented by  $\alpha$ -,  $\beta$ -,  $\gamma$ - and  $\delta$ -HCH, Heptachlor;
- in groundwater samples from observation wells at Gorodok underground storage as well as from water well in Ozerki village (2.7 kilometers from the storage) and Ovsyanka River (3.7 kilometers from the storage). Detected pesticides were represented by  $\alpha$ -,  $\beta$ -,  $\gamma$ - and  $\delta$ -HCH;
- in groundwater samples from observation wells at Verkhnedvinsk underground storage as well as at a stream (100 meters from the storage). Detected pesticides were represented by  $\beta$ - and  $\delta$ -HCH;
- in groundwater samples from observation wells at Postavy underground storage. Detected pesticides were represented by  $\alpha$ -,  $\beta$ -,  $\gamma$ - and  $\delta$ -HCH, Heptachlor, DDT.

Underground storages of obsolete pesticides in the Republic of Belarus could be ranked in order of groundwater pollution intensity in the following way (from high to low): Gorodok, Slonim, Petrikov, Postavy, Dribin and Verkhnedvinsk. It should be taken into account

that shallow aquifers are the primary source of drinking water for people in rural areas. Water is being taken from water wells. Therefore in the case the package of pesticides is deteriorated, groundwater pollution will intensify significantly which will cause public health threat.