

# Obsolete Pesticides in Arctic Russia

Obsolete pesticides pose a risk to human health and the environment locally and globally. Many pesticides are found in the Arctic as a result of long-range transport in the atmosphere and water. The Arctic environment and indigenous peoples are often at greater risk of exposure to environmental contaminants because of changing climate conditions and local dietary habits.

The Arctic Council's Arctic Contaminant Action Program (ACAP), in collaboration with the Ministry of Natural Resources and Environment and Northern federal subjects of the Russian Federation, performed inventories of obsolete pesticides and improved their packaging and storage conditions. To date, nearly 7000 tonnes of obsolete pesticides have been removed from old, dilapidated storages and placed in safer interim storage facilities in thirteen regions of the Russian Federation.

## WHAT ARE OBSOLETE PESTICIDES?

Pesticides are chemicals which are meant to control fungi, weeds, insects or other pests. They are used in agriculture and forestry to increase yields and in animal husbandry as a protection against insects and parasites. Many pesticides do not have specific target pests and therefore they might also affect other organisms which in turn might lead to unforeseen effects in the environment.

Pesticides become obsolete when they are unfit for use due to:

- Poor storage conditions that have led to damage/alteration of the chemical composition or loss of identity of the product
- Exceeded shelf-life
- Prohibition and other changes in product registration and approval

Many countries have stockpiles of obsolete pesticides that may have accumulated over a period of as long as forty years. In the Russian Federation, stocks often dating back to Soviet times are most commonly found in connection to former collective farms but are also often found close to remote villages and forestry nurseries.

## SOURCES OF OBSOLETE PESTICIDES

Poorly stored obsolete pesticides may enter the environment from rain, wind, flooding, landslides and fires and are susceptible to theft and illegal use. In some special cases banned pesticides from stockpiles have also been used legally as well (Zhulidov et al. 2000<sup>1</sup>). Arctic regions often constitute the final destination of major atmospheric and riverine pathways and therefore act as a sink for many persistent pesticides and other pollutants. In the Arctic region, degradation of pesticides is slow due to low temperatures and therefore, residues of pesticides may be found in the environment long after their intended uses.



Examples of poor storage conditions

<sup>1</sup> Zhulidov AV, Headley JV, Pavlov DF, Robarts RD, Korotova LG, Vinnikov YY, Zhulidova OV. Riverine fluxes of the persistent organochlorine pesticides hexachlorocyclohexane and DDT in the Russian Federation. Chemosphere 41(2000): 829-841.

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## EFFECTS OF OBSOLETE PESTICIDES

Humans can be exposed to obsolete pesticides directly at storage sites but also indirectly at locations further away from these sites via long range environmental transport or consumption of contaminated food. The exposure via food is often of greater importance for humans than the direct exposure from ambient air and drinking water. Close to poor storage sites, however, direct exposure could be the dominating route of exposure.

The negative effects of improperly stored or used pesticides include:

- Acute health effects at high exposure as well as more long-term effects on workers and other persons that come in direct contact with the pesticides. These effects could include i.a. vomiting, chemical burns on skin and uncontrollable muscular twitching.
- Contamination of food and feed, directly and/or via the ecological food chain.
- Pollution of water, sediments and soil that could lead to effects at the sites but could also appear further “downstream” from these sites as the pollutants migrate.
- Effects on plants and animals in the environment that could threaten the biodiversity.
- Negative effects on livestock that could include food source contamination, toxic effects and even death.
- Disturbances of natural pest control processes as well as development of resistance to certain chemicals among different biota.

## OBSOLETE PESTICIDES IN THE ARCTIC ENVIRONMENT

Studies have shown that pesticides are present in the Arctic region (AMAP 2004<sup>1</sup>, 2010<sup>2</sup>), and that substantial amounts of pesticides (e.g. HCHs, DDT, chlorobenzenes) are transported to the Arctic region via rivers (Zhulidov et al. 2000<sup>3</sup>). In 1997 AMAP presented evidence of high concentrations of a number of pesticides in Arctic animals. In 2002, more specific information from Russian areas was published, including observations of DDT and toxaphene in the Kara Sea and adjacent areas, suggesting continued use of DDT and toxaphene and/or leakage from old stocks. In addition, climate change may increase the concentrations in the Arctic, as previously stored contaminants are released from ice cover and open water (AMAP 2010)<sup>2</sup>.

In Russia, the rivers Ob, Yenisey and Pechora discharge more organochlorine pesticides to the Arctic Ocean than other Russian rivers and the amounts are comparable to ocean current delivery via the Bering Strait and via the atmosphere (AMAP 2004<sup>1</sup>). Research also shows that the concentrations of HCH and DDT in the rivers have dropped from the 1980's to the 1990's (Zhulidov et al. 2000<sup>3</sup>); they are still substantial long after the ban of these insecticides. These releases were reported to originate from use of insecticides, leakage from pesticide storages, catchment run-off and also long-range transport. Production of pesticides has not been estimated to contribute to Arctic releases to any large extent, as the production sites were predominantly located in river Volga catchment area. (Zhulidov et al. 2000)<sup>3</sup>

## ARCTIC CONTAMINANTS ACTION PROGRAMME (ACAP) ACTIONS

The ACAP project “*Environmentally sound management of stocks of obsolete pesticides in the Russian Federation*” was initiated in 2001 to collect information and promote environmentally sound management of obsolete pesticides stockpiles in Russian territories affecting the Arctic. In addition to securing the obsolete stockpiles, the project was designed to contribute to Russia's readiness to ratify and implement Stockholm Convention on Persistent Organic Pollutants (POPs).

ACAP selected thirteen Russian priority regions that impact the Arctic for the project. Nine are located in the Arctic and four Sub-Arctic regions were also included based on their large riverine input to the Arctic Ocean. Inventories

<sup>1</sup> AMAP, 2004. AMAP Assessment 2002: Persistent Organic Pollutants (POPs) in the Arctic. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway. Zvi+310 pp.

<sup>2</sup> AMAP, 2010. AMAP Assessment 2009: Persistent Organic Pollutants (POPs) in the Arctic. Science of the Total Environment Special Issue. 408: 2851-3051. Elsevier, 2010.

<sup>3</sup> Zhulidov AV, Headley JV, Pavlov DF, Robarts RD, Korotova LG, Vinnikov YY, Zhulidova OV. Riverine fluxes of the persistent organochlorine pesticides hexachlorocyclohexane and DDT in the Russian Federation. Chemosphere 41(2000): 829-841.

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of stockpiles of banned and obsolete pesticides are the first step towards the reduction and elimination of their impact in the environment. Once identified, there is a need to ensure that these stocks of obsolete pesticides are safely stored. In many cases this calls for repackaging and transportation to safe storages. Eventually, the pesticides should be destroyed in an environmentally sound manner, preferably via high temperature incineration considering international standards for incineration of hazardous waste.

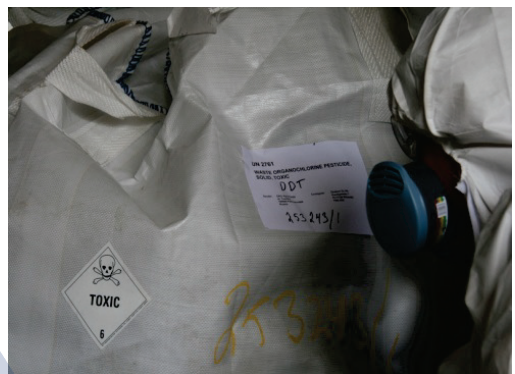
The project has facilitated the development of regional inventories, the sampling, analysis, transportation, packaging and storage of obsolete pesticides as well as the training of local officials and reporting of results. These activities were carried out in close cooperation with local administrations and consultants under supervision of Centre for International Projects (CIP). The ACAP Project Steering Group (PSG) consisting of representatives of the Arctic States has been responsible for overall coordination and donor co-funding for the activities. There have also been considerable contributions and co-funding from the beneficiary regions to the project activities.

In the first phase, the pesticide stocks were located using official documentation complemented with questionnaires to and interviews of stakeholders, including municipal and village level administrators and agro industry experts. Special attention was paid to forestry and veterinary applications.

The pesticides were identified, to the extent possible, based on documentation and labelling. When necessary, chemical analyses were performed. The project emphasized the importance of using personal protective equipment when in contact with obsolete pesticides.

Safe interim storage for the pesticides was prioritized in order to quickly reduce the risk of further contamination of the environment. When possible, UN-approved packaging material was used for the repackaging of pesticides. The pesticides were transported into temporary storages that met the minimum requirements for protection of the stocks until they can be disposed of in an environmentally sound manner. The aim was to create as few central storages as possible taking into account logistics, including transportation conditions and distances.

So far no certified environmentally sound destruction capacity for pesticide waste has been identified in the Russian Federation. Until destruction capacity becomes available, it will be important to ensure that the interim safe storages and packaging material remain secure and in good condition to make sure they do not pose a threat to human health and the environment.



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## ENVIRONMENTALLY SOUND DESTRUCTION OF PESTICIDES

To prevent environmental and health risks, it is recommended that the obsolete pesticides are destroyed in an environmentally sound manner in accordance with internationally approved guidelines, such as the Basel Convention Technical Guidelines on Environmentally Sound Management. In practice, this would either mean high temperature thermal destruction or destruction using physical and chemical methods that result in a complete breakdown of the pesticides.

ACAP is cooperating with Russian authorities and technology developers promoting the establishment of facilities for environmentally sound destruction of obsolete pesticides and other hazardous wastes. Until such facilities come into place in Russia, the pesticides have to be safely and securely stored or exported for destruction in facilities in other countries.

## RESULTS

The table below shows the estimated stocks of obsolete pesticides before the ACAP project (based on all available background information), the quantities found in the ACAP detailed inventories and the known stocks at the end of 2012. Some of the pesticides were removed from interim safe storages to hazardous waste landfills in Russia by the local authorities after the ACAP inventory activities were completed. One of such facilities is located in Tomsk.

	Estimated stocks (t)	After detailed inventories (t)	Stocks in end of 2012
Altai Krai	4000	4972	4972
Altai Rep.	23	250	250
Arkhangelsk	41	63	5
Kamchatka	9	52	0
Komi Republic	14	23	0
Krasnoyarsk Krai	300	282	282
Kurgan	646	Unknown	Unknown
Magadan	16	23	0
Murmansk	3	0	5
Omsk	464	540	540
Sakha(Yakutia)	30	192	77
Tomsk	181	121	Unknown
Tyumen	40	314	314
<b>Total</b>	<b>5755</b>	<b>6779</b>	<b>6439</b>

The final report for inventories and safe storage activities, including lessons learned, can be found at the project website under the **Arctic Council → ACAP → OP PSG**

Arctic Contaminants Action Program (ACAP) is a working group of the Arctic Council.

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