Ministry of Ecology
and Natural Resources
of the Republic of Azerbaijan

IHPA
International HCH & Pesticides Association

11th International HCH & Pesticides Forum
Gabala, Azerbaijan
PROCEEDINGS

11-ci Beynəlxalq Pestisidlər Forumu
Qəbələ, Azərbaycan
MƏQALƏLƏR




7-9 Sentyabr September 2011

University of Applied Sciences Northwestern Switzerland
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11th INTERNATIONAL HCH AND PESTICIDES FORUM

STATUS OF OBSOLETE PESTICIDE STOCKPILES IN EASTERN EUROPE, CAUCASUS AND CENTRAL ASIA (EECCA) COUNTRIES: SHARING EXPERIENCE OF THE EUROPEAN UNION (EU)

7 -9 September 2011
Gabala, Republic of Azerbaijan

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- State Committee of Land and Cartography of the Republic of Azerbaijan
- National Academy of Sciences of the Republic of Azerbaijan
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INTRODUCTION

John Vijgen
Director, International HCH and Pesticides Association

Dear readers and participants of the 11th International HCH and Pesticides Forum,

The forum has been organized in the light of progress of ongoing activities and increasing commitment of the concerned countries to solve the common issue of Obsolete and POPs pesticides. We are happy with the clear statements of Minister Bagirov of Azerbaijan that in 8 to 10 years time Azerbaijan will be free of obsolete pesticides. What is even more, just a couple of months after the Forum, when the EECCA Pilot inventory project was implemented in Azerbaijan, and the Phytosanitary Service reported in a letter to the Cabinet of Ministers of Azerbaijan explaining the situation in the Republic on obsolete pesticides, the Cabinet of Ministers of the Azerbaijan Republic, in its order 31/5-46 dating 14 December 2011, has given the order to the Ministry of Agriculture, the Ministry of Ecology and Natural Resources, the Ministry of Health, the Ministry of Emergency Situations, the Ministry of Finance, the Ministry of Economic Development and to the State Committee of the Earth and Cartography to create an Inventory Commission. Thereafter, the Ministry of Agriculture has written the letter to all partner ministries about its nominees for the Inventory Commission. The lnventory Commission was officially established on 17 January 2012.

The commission will specify for each site the exact quantity of OP, and the volume of contaminated soil. A plan has been made to carry out inventories for the period from February to March 2012. Now while this book is in print, the inventory works are going on in the regions. Every week, trips are undertaken for inventory works. Upon completion of the national inventory, based on the received data, the budget will be prepared and transferred to the country leaders for further consideration.

We congratulate the Government of Azerbaijan on these concrete steps undertaken towards the solution of the existent problem.

Even more, Mr. Dan Jørgensen, Member of the European Parliament, and Vice Chair of the Committee on the Environment, Public Health and Food Safety, will be visiting Azerbaijan from 8 to 11 March, and meeting the Members of the Milli Majlis (Parliament), the Minister of Ecology and Natural Resources, Mr. Huseyn Bagirov and the Minister of Agriculture, Mr. Ismat Abasov. It is also planned to visit the Jangi refurbished obsolete pesticide burial site.

We are clearly on the right track, but it is also obvious that we have to do more.

Therefore, I would like to take this opportunity to address the most important issue for the next decade(s) specifically, "How to finance the definitive elimination of obsolete and POPs pesticides from the EECCA region."

Based on the achievements of the first regional GEF-FAO project with financial support of GEF, Green Cross and the US AID "Capacity Building on Obsolete and POPs Pesticides in Eastern European, Caucasus and Central Asian (EECCA) countries, IHPA, Green Cross and Milieukontakt International have established the first platform of capacities in 9 countries (including Macedonia, Romania and Mongolia) of the region with experiences on Public Awareness, inventories and repackaging of Obsolete and POPs pesticides. Due to the strong signals, the Mini-Hearing on Obsolete Pesticides in Eastern European Countries, the Caucasus and Central Asian Countries in the European Parliament on 29 June 2010, the EU Commission took the signals of the hearing very serious and in February 2012, initiated a new EU project on "Improving capacities to eliminate and prevent recurrence of obsolete pesticides as a model for tackling unused hazardous chemicals in the former Soviet Union". The project will be implemented by FAO with partners IHPA, Green

Cross and Milieukontakt Int. with UNEP as cooperating partner. Further capacity will be established in all 12 countries of the Former Soviet Union, The opportunities for the countries to deal with the problems independently will be created.

It may be crystal clear that with a budget of 7 million Euros, a start can be made, but with the present estimate of a total need of at least 1 Billion Euros needed to clean-up the region, more has to be done. That is why over a period of 4 years, stakeholder and donor platforms will be established in order to secure stronger political and financial commitment of the countries. A key-role will play the governments of those countries that are known to have the strongest economies like Azerbaijan, Kazakhstan, Russia and the Ukraine. If the programme is aimed to be successful, then these countries have to take the lead! This decision could be made based on the willingness to finance the problems in their own countries and eventually support some other countries. Such commitment will be needed to create an additional financial support from international and bi-national donors, supplemented with GEF funding for POPs pesticides and not to neglect funding to be obtained from bigger private companies.

Therefore we call upon:

1. The 12 governments of Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Moldova, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, the Ukraine and Uzbekistan to nominate Obsolete and POPs pesticides problem as a national priority in their national environmental and waste management programmes and make national funds available accordlingly,
2. The 12 governments of Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Moldova, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, the Ukraine and Uzbekistan additionally to list Obsolete and POPs pesticides as their national priorities in all negotiations with all donors to show their willingness to solve these issues the soonest possible,
3. The 6 ENPI countries (Armenia, Azerbaijan, Belarus, Georgia, Moldova and theUkraine to include these priorities in the coming negotiations for the bilateral agreement with the European Union,
4. The European Parliament to increase the pressure on EU Commission to extend the started commitment towards co-financing of clean-up as well as to support necessary investments to establish the necessary destruction capacity in the countries in cooperation with other international and bi-national donors,
5. The international waste management companies to join the investments for the necessary destruction capacity in the countries and to supply technical staff that can operate the plants and build up sufficient technical capacity in the countries;
6. Appeal to international, bilateral and private donors to join Funding initiatives to secure full eradication of Obsolete Pesticides, promote better and sustainable agriculture (as promoted by FAO on the Save and Growth Strategy), in the next decade(s) and use such initiatives to show the efficient Corporate Governance of partner donors.

Gabala, 9 September 2011

THE GABALA DECLARATION OF 11th International HCH and Pesticides Forum

Gabala, Republic of Azerbaijan

7 -9 September 2011

PREAMBLE

The International HCH and Pesticides Forum is a bi-annual platform for discussion between stakeholders of all kind, working on awareness raising and implementation of projects related to POPs, obsolete pesticides and hazardous chemical waste. It acts as a catalyst in the exchange and sharing of information for the implementation of the Stockholm Convention and other chemicals-related multilateral environmental agreements, and the environmentally sound management of pesticides, pesticide waste and other chemicals, and has today developed into an important event for national as well as international decision-makers and stakeholders. On September 7-9th the 11th Forum on HCH and Obsolete Pesticides was held in Gabala, Republic of Azerbaijan. More than 120 experts from more than 40 countries of Europe, Asia and America participated.

The 11th Forum brought together governments, donors, UN agencies, IGOs, NGOs, academia and the private sector for further exchange of information and possible collaboration among countries, experts, institutions and donors. The Forum is initiated and enabled by the International HCH and Pesticides Association (IHPA) in order to follow up on the progress made since the 10th Forum in Brno, Czech Republic (2009).

The Forum was hosted by The International HCH & Pesticides Association (IHPA), the Ministry of Ecology & Natural Resources of the Republic of Azerbaijan and the Ministry of Agriculture of the Republic of Azerbaijan.

HOSTING COUNTRY: REPUBLIC OF AZERBAIJAN

The Republic of Azerbaijan has ratified the Stockholm Convention on "Persistent Organic Pollutant's (POP's)" by Decree of the Republic of Azerbaijan N554-PQ dated 9th of December 2003.

The Ministry of Ecology and Natural Resources of the Republic of Azerbaijan has established the National Coordination Centre in order to exchange information following Article 9 of the Stockholm Convention on "Persistent Organic Pollutant's" as according to Presidential Decree N329 dated 29th of July 2004.

By Presidential Decree N816 date 13th of May 2005 the authority was given to Mr. Huseyn Baghirov, Minister of Ecology and Natural Resources to sign the Contract on *"Services with regard to accelerated practicability measures to ease the initial activity on implementation of the Stockholm Convention on POP's between the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan and United Nations Industry Development Organization (UNIDO)"* and the aforementioned Contract was signed on the 19th of May 2005. The Contract provided assistance to the preparation of a National Implementation Plan.

The preparation of the National Implementation Plan took place in 5 phases. The 5 phases have been implemented under management of a dedicated Implementation Committee. The Committee consists of high level representatives of relevant organizations. The office was located in the main building of the Ministry of Ecology and Natural Resources. The Committee and its working groups were supported by the financial resources from the project.

The participants in the Committee included

representatives from the Ministries of Ecology and Natural Resources, Agriculture, Health, Economic Development, Industry and Energy, "Azerkimya", "Azernergy", State Oil Company of the Republic of Azerbaijan (SOCAR), Committees of State Customs and Statistics, National Academy of Sciences of Azerbaijan (NASA) and NGO's.

The legislation on Persistence Obsolete Pesticides (POPs) was assigned by competent representative of the Azerbaijani Parliament (Milli Mejlis).

As a result of discussions in the Committee, 4 working groups (Inventory of POP's pesticides, Inventory of hexachlorobenzene and PCB's, Inventory of involuntary formed POP's and Monitoring) were established in order to implement the inventory of POP's particular to various classes, to assess the National infrastructure and management potential. One of the results of the inventory process shows that only three (DDT PCB and Dioxin/Furans) out of the twelve substances listed in the Stockholm Convention exist in Azerbaijan. DDT was the only substance ever produced in the country and was removed from the production in 1982. The inventory process was finalized and the reports were submitted to UNIDO in February 2006. The potential of chemical analyses laboratories that exist in Azerbaijan were reflected in tables composed in accordance with the form in order to organize the monitoring work. The laboratories were selected for POP's analyses and the report was prepared and submitted to UNIDO.

Information leaflets about the *"Stockholm Convention on POP's, environment and human health"* were published according to Article 10 in order to inform the public and stakeholders. The leaflets include detailed information on the Stockholm Convention, impact of POP's to the environment and human health as well as information about the POP's problems in Azerbaijan. At the same time, several articles on POP's were published in different mass media.

The National Implementation Plan has been registered at the Secretariat of the Stockholm Convention on the 15th of January 2010. The implementation of the plan will be carried out in 3 phases. The first phase started in 2010 and concerns environmental elimination of DDT and PCB in accordance to the inventory results outlined above as well as the treatment/ elimination of medical wastes.

Since the 10th Forum, the following work concerning the elimination of POPs was carried out:

The project on environmental elimination of inventoried PCBs is being implemented with support of GEF and UNIDO. The proposal of the project was given to relevant organizations and their references were considered and submitted to the Cabinet of Ministers for approval.

With national funds and support from the Government of Azerbaijan the cells in Jangi obsolete pesticides landfill were rehabilitated. The territory was furthermore fenced and supplied with a security system and the landfill is now under the responsibility of the Ministry of Agriculture.

The project on environmental elimination of POP's pesticides was prepared with support of the World Bank and the United Nations Food and Agriculture Organization (UN FAO).

Azerbaijan has without any exceptions included the 9 new POP's substances adopted in the Annexes of Stockholm Convention, as well as other relevant work is conducted in connection with Stockholm, Basel and Rotterdam Conventions. In particular for the Rotterdam Convention, internal procedures are presently been carried out in preparation for ratification.

The preparations for the International HCH and Pesticide Forum held in September 2011 in Azerbaijan concerning pesticides management in Eastern Europe, Caucasus and Central Asia have been carried out.

All the above mentioned activities are being carried out in accordance to the National Implementation Plan on management of POP's. The work concerning environmental elimination of DDT and PCBs is considered to be finalized 5 year earlier than indicated in Stockholm Convention which means till 2025.

Azerbaijan aspires to be in the front line among

Implementation Activities in the field of POPs management in the Republic of Azerbaijan

Southern Caucasus and Central Asia in the field of environmental clean management of POPs in the coming 10-12 years.

In order to ensure the long term security in relation to POPs, the strategy of Azerbaijan will be environmental elimination of DDT and PCB, exchange of PCB equipments, inventory of Dioxin/Furans and 9 new POPs substances, preparation for registration of chemical substances and involve stakeholders as well as public, NGO, private sector and scientists.

Azerbaijan will increase the activity level in 2012-2015 in order to completely free itself from Obsolete POPs within the next 8-10 years.

Of high priority is the preparation of Annexes to NIP in order to improve the planned activities in the field of environmental safe management of the new POPs substances included in the Stockholm Convention.

THE GABALA DECLARATION

The participants of the 11th International HCH and Pesticides Forum representing governments, donors, IGOs, NGOs, the private sector, civil society and academia, meeting in Gabala on 7-9 September 2011, expressed their gratitude to the Ministry of Ecology & Natural Resources of the Republic of Azerbaijan and the Ministry of Agriculture of the Republic of Azerbaijan..

The participants….

Recognise that the elimination of obsolete pesticides is an issue of national interest threatening the environment, people and sustainability of agricultural export goods; and stress that the complexity of the associated problems require a multi-disciplinary approach supervised under the highest possible level of Government authority, involving and coordinating all institutions such as Ministries, universities and NGO's across the different sectors e.g. environment, agriculture, health, industry, defence and finance, and customs.

Recognise that the EECCA region makes important progresses in its actions, supported by international programmes, which have encouraging positive effects on (new) national initiatives and recognise the ongoing need for close cooperation between the EECCA countries in order to exchange information, coordinate project activities and explore possibilities for regional facilities and infrastructure, such as laboratories, treatment facilities etc.

Recognise the activities embedded in the GEF/FAO Capacity building project on Obsolete and POPs Pesticides in Eastern European, Caucasus and Central Asian (EECCA) countries (2009-2012) as important for the further development of capacities and strengthening of the institutions dealing with obsolete pesticides in the countries involved.

Recognise the importance of the Global UNEP/WHO Programme "Demonstrating and Scaling-up of Sustainable Alternatives to DDT in Vector Management" (2009-2015) aiming at protecting human health and the environment through demonstrating and scaling-up of sustainable alternatives to DDT in disease vector management, and to reduce the emission of DDT into the global environment. Regional programmes cover, or will cover, 13 countries in Africa, eight countries in Asia, eight countries in the Middle East and North Africa, five countries in Southern Caucasus and Central Asia; and eight countries in Mexico and Central America and recognise the importance of the planned Global UNEP/UNIDO Programme "Demonstrating and Scaling Up of Lindane and HCH Waste ESM" (2012-2017) aiming atprotecting human health and the environment through demonstrating and scaling up ESM of Lindane and HCH waste disposal to avoid the emission of HCH into the global environment. The programme aims at introducing and promoting sustainable alternative approaches to ESM of HCH waste disposal by innovative approaches in various regional projects.

Recognise the commitment of the European Parliamentarian Dan Jørgensen to urge the EU on the assistance to the obsolete pesticides

problems in the EECCA-region and to push the European Commission to raise the level of financial support and recommend that the EECCA-countries show their commitment to solve the national pesticides problems, taking into account the conditions of the Basel Convention by advocating for the set up of regional treatment facilities.

Recognise the commitment of the European Parliamentarians to make efforts that obsolete pesticides elimination becomes a priority issue and should remain on the EU agenda until a final solution has been obtained.

Recognise the project preparation facility as part of the EC funded Programme for the 'Prevention, Preparedness and Response to Man-Made and Natural Disasters in the ENPI East Region (PPRD-East)', by which countries can seek assistance to manage mitigation of environmental disasters, such as the Kalush case presented at the 11th Forum.

Recognise the importance of the planned EU-funded FAO implemented project "Improving capacities to eliminate and prevent recurrence of obsolete pesticides as a model for tackling unused hazardous chemicals in the former Soviet Union", to help strengthening capacities to tackle obsolete pesticides in the 12 partner countries in the EECCA region, promoting exchange of experience and expertise as well as opportunities for synergies and cross-regional co-operations.

Recognise the importance that sustainable agricultural practices play in the prevention of recurrence of obsolete pesticide stocks and in food security and recognise the importance of the guidance for policy-makers on Sustainable Crop Production Intensification provided by the FAO in their book "Save and Grow".

Recognise that the pesticides restriction policy in the EU legislation is one of the main drivers in developing sustainable agriculture.

Recognise the cooperation between the OSCE and the national governments and NGOs in coordinating multidisciplinary projects and recommend that this cooperation is strengthened and further developed to include more countries.

Recognise that there is important evidence that integrating public participation from the very start of a project strongly contributes to successful programmes for elimination and prevention of obsolete pesticides with minimal risks and builds cooperation between the public, the regulators (the Government) and the NGOs. They therefore recommend building public participation into the design of policies, programmes and projects in order to achieve more effective and sustainable results.

The participants in the 11th Forum, recognising the above achievements call upon further support and assistance for achieving the final goal.

The participants specifically, in recognition of the important contributions to the elimination of POPs, obsolete pesticides and other hazardous chemical wastes,

Call upon the European Commission, the European Parliament and the Member States, the United Nation institutions, World Bank and other bilateral and multilateral donors to

1. **note** the important progress (see attached IHPA report) on national level and the increasing momentum and desire among governments and civil societies to eliminate and prevent POPs, obsolete pesticides and hazardous chemical stockpiles,
2. continue dialogue on the scale and urgency of the problem and on developing possible solutions,
3. financially support and co-finance national and regional initiatives.

Specifically, the participants…

Call upon for enhanced

4. donor coordination and collaborations to support project activities in the EECCA countries in order to maximise the programme and project outputs.

Call upon the Global Environmental Facility (GEF) to

5. accelerate the processing of project proposals in order to ensure that countries and regions can advance in their work without losing momentum and their built up capacities for the elimination of POPs,

obsolete pesticides and hazardous chemical wastes.

The participants furthermore…

Call upon all EECCA Governments to

6. ensure political focus and raise the awareness of obsolete pesticides, make removal of stocks a priority in their national environmental plans, and add destruction to the agenda of negotiations with donors, while making national funds available for co-funding,
7. build in public participation as early as possible, and into the design of policies, programmes and projects in order to reach more effective and sustainable results,
8. consider applying a multi-disciplinary approach supervised under highest possible level of Government, involving and coordinating all institutions such as Ministries, scientific institutions and NGO's across the different sectors e.g. environment, agriculture, health, industry, defence and finance for solving the threat of obsolete pesticides in order to protect the environment and secure the quality of life of people,
9. take action on the urgent problems related to the so-called polygons and uncontrolled dump sites of POPs and other dangerous chemicals which are particularly prominent in the EECCA region,
10. improve the assessment of existing industrial capacities and expertise in the countries to be considered as an option for obsolete pesticides and contaminated soil elimination,
11. harmonise national legislation to international conventions, develop an adequate regulatory framework and implement international monitoring programmes according to the Stockholm Convention, human and ecological risk assessment systems and encourage FAO guidelines (EMTK's) for POPs in the environment,
12. work with FAO and other international organisations to promote national and regional policies that support Sustainable Crop Production Intensification approaches in order to prevent further accumulation of obsolete pesticides and to improve food security.

Call upon the European Commission to

13. implement the planned EU-funded project "Improving capacities to eliminate and prevent recurrence of obsolete pesticides as a model for tackling unused hazardous chemicals in the former Soviet Union", defined to help strengthening capacities to tackle obsolete pesticides in the 12 partner countries in the EECCA region, promoting exchange of experience and expertise as well as opportunities for synergies and cross-regional cooperations,
14. include in this project an assessment of issues that might cause delay or even block the progress and share these issues with the national governments and the donors and coordinate between parties the solution and financing of these issues,
15. prepare the possibilities of additional funding in order to provide short term interventions to facilitate the best possible progress in the 12 countries concerned.

Call upon the European Parliament to

16. re-activate the working group on obsolete pesticides. This group should provide support for the EECCA countries, and increase the awareness of the problem in the EU-system,
17. arrange for an active follow-up by this working group of the progress in the project "Improving capacities to eliminate and prevent recurrence of obsolete pesticides as a model for tackling unused hazardous chemicals in the former Soviet Union" including the recommendations as presented under 13 till 15 above,
18. request an amendment of the pesticides strategy within the Framework Directive (2009/128/EC) establishing a framework for Community action to achieve the sustainable use of pesticides with binding requirements to report obsolete pesticides stocks, and highlight obsolete pesticides in

the coming new Neighborhood Strategy.

Call upon NGOs and the civil society to

19. follow-up on Government policies and assist in their implementation.

Call upon plant protection associations and the industry in line with their capabilities to

20. offer to advise and assist the countries in elimination of dangerous chemicals by providing technologies and facilities for securing a low risk final disposition for empty and properly rinsed containers at a regional level when feasible.

RECOGNITION

The participants recognised the efforts of the Director of IHPA for his dedications and continued support in keeping the issue of obsolete pesticides on the international agenda. The participants furthermore expressed appreciation of IHPA for the cooperation and assistance to the development of capacities and to the elimination of POPs, obsolete pesticides and hazardous chemical wastes and to the prevention of future accumulation, and urged the continuation of this work.

The participants welcome and appreciate the invitation from the Republic of Slovenia to host the 12th International HCH and Pesticides Forum in 2013.

ABOUT IHPA

IHPA, the International HCH and Pesticides Association is a Foundation with a clear mission: To free the planet earth from obsolete pesticides.

IHPA therefore has committed itself to:

- ensure that the elimination of obsolete pesticides is on the global agenda
- assist in the inventory, elimination and prevention of obsolete pesticides
- establish donor platforms in order to ensure the elimination of obsolete pesticides
- monitor the progress in and report on the elimination of obsolete pesticides.
- initiate bi-annual meetings for exchange of information and review of results

The issue of obsolete pesticides is not only an environmental problem, it also infringes the right to live in a safe environment. Obsolete pesticides and the damages and impacts they cause have a direct influence on the quality of life of people, especially the poor, the old, women and children living in rural areas. But the scale of the problem is wider: obsolete pesticides have long term effects on environmental quality, food production, human health and the ecosystem. High economic risks are created when food, contaminated by obsolete pesticides is exported (ref. Nitrofen scandal 2002). Scientific (medical) research shows more and more the threats of low concentrations of dangerous chemicals, including pesticides, on human health

The funding of the work of IHPA depends on third party financing: involvement in projects, donor contributions and donations. Important multipliers are created over the voluntary work of our Ambassadors, who are taking their missions in their countries, our cooperation with partners and other supporters.

More information can be found on the website **www.ihpa.info**

As a new contribution, IHPA has prepared a status rapport of the national achievements of the EECCA-countries, based on the inputs obtained at the Forum. The aim of the country status report is to make a transparent overview of the national efforts and achievements and to monitor the progress in projects related to POPs, obsolete pesticides and hazardous chemical waste.

FORUM SPONSORS

The International HCH and Pesticides Forum in Gabala was sponsored by:

- Ministry of Ecology & Natural Resources of the Republic of Azerbaijan
- FAO -GEF funded project "Capacity building on Obsolete and POPs Pesticides in Easter European, Caucasus and Central Asia Countries (EECCA) countries
- GIZ Convention Project Chemical Safety
- Secretariat of the Stockholm Convention University of Applied Sciences
- Northwestern Switzerland, School of Life Sciences

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- Ministry of Ecology & Natural Resources of the Republic of Azerbaijan
- Ministry of Agriculture of the Republic of Azerbaijan
- Ministry of Health of the Republic of Azerbaijan
- Ministry of Emergency Situations of the Republic of Azerbaijan
- Ministry of Economical Development of the Republic of Azerbaijan
- State Committee of Land and Cartography of the Republic of Azerbaijan
- National Academy of Sciences of the Republic of Azerbaijan
- Baku State University, Republic of Azerbaijan
- UNEP-ECORES NatCom (ECORES Information-Analytic Environment Agency)

LIST OF ACRONYMS

DDT	Dichlorodiphenyltrichloroethane
EC	European Commission
EECCA	Eastern Europe, Caucasus and Central Asia
EMTK	Environmental Management Tool Kit
ENPI	European Neighbourhood and Partnership Instrument
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GEF	Global Environmental Facility
GIZ	German Society for International Cooperation
HCH	Hexachlorocyclohexane
IGO	Intergovernmental Organisation
IHPA	International HCH and Pesticides Association
NGO	Non-Governmental Organisation
NIP	National Implementation Plan
PCB	Polychlorinated biphenyl
POP	Persistent Organic Pollutant
PPRD-East	Prevention, Preparedness and Response to man-made and natural disasters in the ENPI East Region. EU funded project
UN	United Nations
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization

WELCOME NOTE. LOOKING BACK TO THE 10TH FORUM AND PAVING THE WAY FOR A STRATEGY TO CLEAN-UP FOR THE EECCA REGION

John Vijgen
Director, IHPA

Dear participants,

On behalf of the organisers of the 11th International HCH and Pesticides Forum, I welcome and I am very grateful for this opportunity to exchange knowledge and experiences with you

I am grateful to you for making the 11th Forum happen in Azerbaijan

I would like to mention a number of people, but I also know that there have been so many people assisting here, that I cannot mention them all.

Let me thank, his Excellency Mr. Huseyngulu Bagirov, the Minister of Ecology and Natural Resources and let me thank his staff: Emin Garabaghli, Rashad Allehverdiyev and Arastun Hasanov. On behalf of IHPA/ECORES I like to thank Gulchohra Aliyeva for her tireless work to fulfill the mission of this forum, together with all volunteers and Shahin Panahov.

I also would like to thank the Dutch Filmmaker Jan van den Berg for his willingness to come to Gabala to show us his phantastic Movie Silent Snow during the Forum.

My words of gratitude are also addressed to the EECCA colleagues: FAO with Richard Thompson Mr. Mark Davis, Green Cross with Stephan Robinson, Vladimir Shevtsov, Katya Leonchikova and Andrea Walter and Milieukontakt International with Sandra Molenkamp.

I would like to thank the Partners/Donors. Without their support, we would never have been able to organize this forum in the beautiful town of Gabala in Azerbaijan!

Thank you to the Partners/Donors

Stockholm Convention Regional centre for capacity building and transfer of technology in Central and Eastern European countries

giz CHS Convention Project Chemical Safety

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GLOBAL ENVIRONMENT FACILITY 20 YEARS INVESTING IN OUR PLANET

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University of Applied Sciences Northwestern Switzerland School of Life Sciences

Tauw

I would like to make all participants aware of the fact that this forum is used by FAO to launch the ”SAVE AND GROW” campaign. A Policymaker’s guide to the sustainable intensification of smallholder crop production can be obtained by signing up for the book in the

exhibition room and attending the session this afternoon.
Film producer Jan van den Berg and IHPA Chairman Bram de Borst discussing questions on the silent Snow with participants in Gabala

Achievements

What has been accomplished since the 10th Forum in 2009, Brno, Czech Republic?
Let me just mention a small number of Achievements

1. **Awareness and Participation:**
   a. EECCA awareness pilot projects (grant scheme) - all results are presented in a special session during the Forum
   b. The IHPA publication 'Time Bomb' is translated to Azerbaijani and Russian language. The Mongolian translation in progress
   c. The Exhibition financed by the German GIZ, has been opened at the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety in Bonn, and remained there for the whole January 2011 and was exhibited at COP-5, in Geneva, in May 2011 and is also exhibited here in Gabala during the 11th Forum.
2. **Progress in the concerned EECCA project member countries**
   a. Moldova: OSCE along with the representatives of the Republic of Moldova and the Transniestrian authorities has made priority plan for elimination of 100 tonnes POPs in the Transniestrian region
   b. The Ukraine: National Centre of Strategic Studies and the EU-funded project PPRD-East on the Kalush emergency-area. Round table 30-31. August 2011
   c. Armenia: OSCE is in corporation with the emergency service and with the help from the national budget initiating a feasibility study concerning the emergency pesticide landfill
3. **International Cooperation**
   a. EECCA project – see results at session on Friday
   b. New EU funded project is planned for all 12 EECCA countries to be launched 2012 through FAO

Save and Grow book distributed during the Forum

Azerbaijani version of the Time Bomb Book

c. Turkish funded FAO/IPM project started in Central Asia (Kazakhstan, Kirgizstan, Tajikistan, Turkmenistan, Uzbekistan)

The Forum Resolution

In order to formulate the resolution, we need your input.

We have done the following preparation work so far

1. Reviewed progress since 10th HCH and Pesticides Forum 2009 in Brno, Czech Republic
2. Sent you all the questionnaires and evaluated the responses
3. We scheduled the Interviews to be conducted with you during this Forum
4. Reviewed progress made since 10th HCH and Pesticides Forum 2009 in Brno, Czech Republic
5. Collected questionnaire responses
6. Had interviews during this Forum
7. Established the Pesticides Forum Declaration Team led by Bram de Borst, Chair of the IHPA Board, Neel Strøbæk, Grith Strøbæk, Rashad Allahverdiyev

What Is the Outlook ?

We know we only have touched the top of the iceberg on Obsolete Pesticides, but we are working on it.

We only know that time is running and that every minute, hour and day counts in order to move forward for the solution of obsolete and POPs pesticides in the EECCA region.

Let us show our kids that we can make a difference, today.

I welcome you with great pleasure at the 11th Pesticides Forum held in Azerbaijan.

Playing on obsolete pesticides, these children are exposed to enormous dangers. Photograph: Courtesy of Berto Collet, Tauw, The Netherlands (2007).

OPENING SPEECH OF MR. H.BAGHIROV, MINISTER OF ECOLOGY AND NATURAL RESOURCES OF AZERBAIJAN REPUBLIC AT THE 11th INTERNATIONAL PESTICIDES FORUM, 7-9 SEPTEMBER 2011, GABALA, AZERBAIJAN

Honorable Ladies and Gentlemen,
Honorable Forum participants,

At present, the process of globalization, the rapid development of economy,increasing demand for natural resources due to population increase, the changes in climate, the use of hazardous chemicals and environmental problems arisen as a result of other factors concerns humanity.

At present consistent measures are being carried out for solution of actual environmental problems in Azerbaijan based on sustainable principles. The issues such as environmental protection, people live in a healthy environment and rational use of natural resources play an important role in the socio-economic reforms carried out in the country and this is an example of H.E. Mr. Ilham Aliyev's, President of the Republic of Azerbaijan, special attention and care to environmental problems.

This special attention of state leadership maintains a strong impetus to the works carried out to improve the environment and currently large-scaled projects are being implemented successfully.

In recent years, as a result of rapid development of economy of our country increasing revenues directed to non-oil sector has expanded considerably. In order to improve the ecological situation in Azerbaijan Republic purposeful actions are being implemented in the direction of prevention of pollution of the Caspian sea, conservation of biodiversity, increasing greenness, rehabilitation of contaminated lands to oil and other wastes, solid industrial and household wastes including hazardous waste management in the required level.

In recent years, large-scaled projects are being implemented such as the reconstruction of the centralized sewerage systems, the modernization of the existing waste water treatment plants and construction of new ones. At the same time, modular type waste water treatment installations are being installed to prevent even small local sources of pollution of the water basins. Large-scaled projects are being implemented for the construction of pipelines and treatment facilities to supply the population with safe drinking water (Oguz-Gabala-Baku 5 m^3sec).

At the same time, modular type waste water treatment installations are being installed for provision of safe water to the most remote settlements for a short time which don't have access to clean drinking water.

The works are being continued in the direction of implementation of pilot project on establishment of plant based on high technology for sea water desalination. In recent years, the areas covered with forests have been reached from 989 thousand hectares up to 1 million 21 thousand hectares which means increase of forest cover of the Republic from 11.4% up to 11.8%. Large landscaping works are being carried out in Baku and Absheron peninsula as well as along the sides of highways.

The area of specially protected natural areas, have been increased from 478 thousand hectares to 881 thousand hectares since 2003 and currently network consisting of 8 national parks, 11 nature reserves and 24 sanctuaries consist of 10.2% of the country.

One of the most serious environmental problems inherited from the Soviet Union at that time are the pesticides pollution of agricultural land planted to cotton. Medicine were sowed to the fields more than norm without taking into account the environmental aspects in order to achieve high productivity in cotton-growing regions. And as a result, although more than 20

years passed the pesticides residues used against the pests are still observed in those areas. The biggest threat here is that, the aforementioned lands are currently used for agricultural production.

At the same time taking into account the collection features of persistent organic pollutants in the human body and therefore the creation of a number of diseases we consider that, public awareness of the population about pesticides, and chemicals stored bases and warehouses of the soil is of particular importance to the continuation of the measures.

Azerbaijani strategy on provisions of long-term security in connection with POP's consist of – improvement of the legislation in this field, environmental disposal of pesticides residues, replacement of PCB's equipments, inventory of dioxin/furan and 9 new POP's substances, preparation of registration of chemical substances and involvement of all interested parties as well as public, NGO's, private sector and scientists to these works.

In cooperation with UNIDO National Action Plan was prepared within the framework of implementation of obligations on Stockholm Convention on POP's in 2005-2007 in Azerbaijan and registered at the Secretariat of the Convention.

In accordance with National Action Plan at the expense of the budget the Jangi obsolete pesticides landfill was restored at the same time the well was repaired and the territory was fenced and provided with security system in Azerbaijan.

Some works were carried out in the field of land cleaning of chemicals stored warehouses and bases. Thus, the cleaning works were carried out in the chemical substances bases in the southern region and pesticides contaminated soils transported to the hazardous waste landfill of the Ministry of Ecology and Natural Resources located in Sumgayit.

At the same time, inventory work has been carried out within the framework "Environmental sound disposal of obsolete PCB's" project with the support of GEF and UNIDO.

In addition, "Environmentally sound disposal of POP's pesticides" project has been developed with support of the UN Food and Agriculture Organization (FAO) and from GEF.

I think that we are about to complete the research work in this area and then the main attention in the drafted and implemented projects should be given to focusing on the problems directed to concrete and practical measures.

The Forum is a platform for discussion between the state agencies, NGOs, scientists and experts, the private sector come together to discuss solutions platform for pesticides and their related problems.

Forum held for more than 11 times and each time the increase in the number of participants shows the interest to it. In general, I think that such a co-ordinating meetings, sharing of gained experience will give its positive impact in the elimination of the problem.

I wish for the more serious efforts to the Forum held in Gabala, one of the most picturesque corners Azerbaijan, to solve the problem of POP's for the sake of protection of this beautiful nature you observe around you.

Thank you for your attention!

STATEMENT AT THE CLOSING SESSION

Mr. Gheorghe Salaru
Minister of Environment Republic of Moldova

Dear Colleagues,

The negative impact on the environment and human health, caused by poor management and use of chemicals in various sectors of the economy in recent years, causes a globally growing concern.

The Central and Eastern Europe, Caucasus and Central Asia Countries make no exception in this regard. Although they are different from economic and social development, some are large and small, rich and poor, the chemicals are threatening all of us equally. Currently, is increasing the perception that the safe handling of chemicals is one of the most important environmental and social problems. Therefore, the environmental issues are placed more and more seriously on the agenda at various international forums, and serious steps are being taken to solve them.

In this regard, I want to note the great importance of such international meetings as HCH and Pesticides Forum, which periodically gathers specialists of our countries, and is an excellent tool for setting and discussing the existing problems, sharing experiences and connecting efforts to solve the problems, and determine further joint action.

On this occasion, I want to welcome the efforts of members of the International HCH and Pesticides Association, and its leader and mastermind John Vijgen, which already during the 11 such forums insistently seek solutions to problems of obsolete pesticides and other hazardous chemicals at various levels, from non-governmental organizations to European Parliament, and international funding organizations.

The position of the Republic of Moldova on environmental issues is reflected in the commitments undertaken by our country's accession and ratification of 18 international conventions and other bilateral and multilateral environmental agreements. These include those relating to management of hazardous chemicals and, in particular, of persistent organic pollutants.

Moldova has made over the last 10 years some progress in the sustainable management and elimination of POPs and other hazardous chemicals. In the period 2003-2008 on the basis of funds allocated from the state budget and the National Environmental Fund, and supported by NATO, over 3,350 tonnes of obsolete pesticides from 350 stores and 40 illegal burials were collected, packaged and stored in 35 central district warehouses. Of them, in 2006-2008 about 1,300 tonnes of OP were evacuated and destroyed abroad, with support of the Global Environment Facility and the World Bank, and co-financing from the Moldovan government. Also, were dismantled, transported and disposed of 18,860 capacitors (934 tonnes), containing polychlorinated biphenyls (PCBs). Thus, more than 2,200 tonnes of POPs wastes have been removed.

Two other major events held nationwide in the recent years have been related to the inventory of POPs-contaminated areas, and the inventory of PCB contaminated dielectric oils in the energy sector. As a result around 1,600 sites contaminated with POP pesticides have been identified and about 30,000 units of power equipment have been registered. Database containing this information will serve the managing bodies of different levels as a starting point for developing and implementing measures of remediation of these objects.

The national legal and regulatory framework for the management of POPs and other hazardous chemicals and wastes has been revised and improved, based on EU legislation and international agreements. After coordination and approval of draft laws and regulations Moldova will have a modern legal framework in this area.

In recent years a large-scale national information and awareness campaign in the field of POPs at various levels was performed. Now the POPs issues are known and raised not only by specialists, but also by the authorities at various levels and the population.

The amount of funds used to address these issues to date, is about US$15 million.

We consider, however, that this success is not only of our country but also of our development partners, without whose support the results achieved would have been impossible. In this connection I wish to express, on behalf of the Moldovan government and the Ministry of Environment, our sincere appreciation for the attention shown by the international community in addressing the environmental challenges our country is facing, as well as for support of the reform and capacity building in environmental protection. We thank the foreign and local companies and experts (some of them are present at this important event), who with their work and experience have made a significant contribution to these results.

Of course, during 10 years it is impossible solve all the POPs problems accumulated over decades. Among the most pressing issues that remain on the agenda, and are to be solved in the coming years is the elimination of 2,000 tonnes of pesticides that are still stored in warehouses, and 4,000 tonnes buried in a special landfill, the remediation of about 250 most dangerous sites contaminated with POP pesticides, development and implementation of plans on management and safe disposal of PCB contaminated equipment, implementation of new legal and regulatory framework in the field of POPs. The needs of the country to continue implementation of the Stockholm Convention for the next five years, according to the National Program for Sustainable Chemicals Management, approved in October 2010, is approximately US$ 28 million.

The Government of the Republic of Moldova, in particular the Ministry of Environment will continue to make significant efforts in achieving the goals in this area, and look forward to continued support from the international community. In addition, we consider the continuation and extension of cooperation with our partners in the country and our neighbors in the region as an important factor in achieving these common goals.

In this connection I want to note the efforts and hard work of organizers of the 11th Forum, which brought the most active and interested in solving the discussed here problems experts from different continents and to thank all the participants for very interesting and informative reports. On behalf of the Moldovan delegation I would like to express sincere gratitude to the Ministry of Environment and Natural Resources of Azerbaijan, to Mr. Minister Huseyn Bagirov and his team for invitation to participate in the Forum and for the wonderful welcome to the participants.

I am confident that in the future, we will also continue insistently to set and solve the problems still exist in this area, in order to eliminate definitively the impact of hazardous chemicals and wastes, and thus provide a clean and healthy environment, and experience of our countries will serve as a successful model of approaching and solving such problems.

STATEMENT FROM MEP DAN JORGENSEN FOR THE 11TM HCH AND PESTICIDE FORUM

Dan Jorgensen
Member of the European Parliament

The Centre for European Policy Studies estimate that over 200,000 tonnes of OP's reside in unattended warehouses and derelict buildings in the EECCA countries. In reality the amount might exceed this number. This implies an unacceptable threat to public health, environmental quality and agricultural production and trade. I stand ready to help shoulder that burden.

It is clear that the EECCA countries recognize the severity of the issue. The size and complexity of these problems, however, combined with a lack of in-country expertise and adequate funding, render assistance imperative. The key to success is enabling the EECCA countries to solve the problems themselves, rather than forcing solutions upon them from the European level. Furthermore, solutions should respect the Basel Convention, which dictates that hazardous waste should be handled at the source. However, the EU could play an important role by assisting the EECCA countries in their handling of the problems, using financial and technical means. I will do my utmost to ensure that the EU will do so.

Firstly, I will work to increase the awareness of the problem in the EU-system, and to provide support for the EECCA countries in matters concerning obsolete pesticides.

Secondly, I will work to increase the available funding. Currently, the European Commission is preparing a project entitled "Improving capacities to tackle obsolete pesticides and other unused hazardous chemicals in the former Sovjet Union". The funding - 67 million - hardly measures up to the size of the problem. The Commission itself estimates that an amount in the order of €600 million would be required to safely store or dispose of OP's in the EECCA countries. The Centre for European Policy Studies estimates the amount of required funding to be closer to €800 million. In any case, the picture is clear. Current funding levels are inadequate, and I pledge to work in the European Parliament to increase these levels.

Thirdly, it is clear, that the respective Governments need assistance in setting up proper programs for the elimination of OP's, and that they need to benefit from the sharing of expertise and concepts. The 11th HCH & Pesticides Forum is an important step in the right direction. The EU should assist by providing technical expertise for respective governments, in setting up waste management programs.

In order for the EU to help the EECCA-countries in relation to the obsolete pesticides it is imperative that the EECCA countries also put up a serious effort themselves and show the will to solve this problem themselves. Exporting the problem is neither a viable nor sustainable solution. The EECCA countries will have to build up the necessary expertise and equipment so they can handle the problem as close to the source as possible in line with the principles of the Basel Convention. Then I will work in order to establish support from the EU in cooperation with the World Bank, FAO and OSCE.

Obsolete Pesticides is a major environmental problem. Several million of people are put in risk because of the harmful effects of these pesticides. I am dedicated in my efforts to assist the EECCA countries in struggle to diminish the problem.

Dan Jorgensen
Member of the European Parliament
Brussels, September 2011

SPEECH BY THE MINISTER OF HEALTH OF THE REPUBLIC OF SLOVENIA, MR. DORIJAN MARUSIC, DELIVERED BY DR. BRANKO DRUZINA, PERMANENT MEMBER OF THE BOARD OF INTERNATIONAL HCH & PESTICIDES ASSOCIATION (IHPA), ON THE OCCASION OF 11th INTERNATIONAL HCH AND PESTICIDE FORUM, SEPTEMBER 7-9, 2011, GABALA, REPUBLIC OF AZERBAIJAN

Dear participants of the 11th International HCH and Pesticides Forum,

As Minister of Health of the Republic of Slovenia and as co-chairperson of the European Environment and Health Ministerial Board (EHMB), I would like to offer my support for your persistent and devoted endeavours for the thorough elimination of stocks of obsolete pesticides and other obsolete chemicals.

I can assure you that Slovenia will also participate actively in the future in the process for the minimization of old burdens which can endanger people's health and for their prevention in the future.

I am glad to highlight that Slovenia has actively paticipated in several processes where some important documents have been adopted, calling for and providing a legal basis for action in this area. I would like to point to the WHO Resolution on improvement of health through proper management of obsolete pesticides and other obsolete chemicals, adopted at the 63rd World Health Assembly (WHA) on 21 May 2010, the European Strategy for the Danube Region, adopted by the Council of the European Union in Brussels on 13 April 2011 (the Danube Strategy) and on the Parma Declaration on Environment and Health, which was adopted by the 5th Ministerial Conference on Environment and Health in Parma, in May 2010. In addition I would like to mention the Strategic Approach to International Chemicals Management, SAICM, the process in which the goal is to ensure by 2020 that chemicals will be produced and used in ways that minimize significant adverse impacts on the environment and human health. Slovenia is presiding over this process during the period of 2010 - 2012.

All these documents and political commitments provide a basis for further action. Since there are some international funding sources available, such as the Quick Start Programme in the SAICM process, European Neighbourhood Policy/Central Asia Strategy and the ENPI Program, allow me to encourage all governments that have the problem of obsolete pesticides and other obsolete chemicals to set this issue as a priority in their national strategies and political agendas. I also call for bilateral and multilateral cooperation in solving this problem.

Explicitly I would like to mention the Danube Strategy, which is relevant for eight EU and six non-EU countries, where implementation in the area of obsolete pesticides and other obsolete chemicals should make use of the financial instruments of the EU for the neighbourhood[1] in the implementation of the Danube Strategy on this issue. Moreover, eligible countries should set the obsolete pesticide issue as a priority for their respective national programmes/action plans, and in contracts with the EU for using financial instruments. In addition, elimination of obsolete pesticides should be listed as one of the priorities in the financial perspective for 2014+, which can only be achieved if the proposal is set out there by the countries concerned. I would like to encourage those countries that are able to exert some influence on the priorities of the financial perspective 2014+ to propose the addressing of this issue, which poses such a threat to health and the environment.

I wish you a very successful meeting and good outcome of the 11th International HCH and Pesticides Forum.

Mister Chairman, Minister Bagirov, Ladies and Gentlemen!

[1] European Neighbourhood Policy/Central Asia Strategy, ENPI Programme

Best regards

Dorijan Marušič
MINISTER

cc
H.E. Hussein Bagirov
Minister of Ecology and Natural Resources of Republic of Azerbaijan

OPENING SPEECH BY MR ANDREAS BIEBER

Federal Ministry for the Environment,
Nature Conservation and Nuclear Safety, Germany

This year is the International Year of Chemistry under the head of

- the United Nations Educational, Scientific and Cultural Organization and
- the International Union of Pure and Applied Chemistry.

Chemistry is an important economic branch in the European Union and in Germany. The European Union is the second largest chemical producing region in the world and the world's largest exporter of chemicals.

Once Germany was called the "Pharmacy of the World".

Within the European Union, Germany is the largest producer of chemicals with a market share of 25 %. More than 400,000 people are employed in the chemical industry in Germany. This renders the chemical industry an important economic factor.

It seems quite logical therefore that Germany has a great interest and, moreover, a particular responsibility in relation to the safety of chemicals.

Chemistry contributes to a very high extent to human welfare. Without chemistry, it would be, as an example, impossible, to feed the growing population in the world.

But – as we all know – every coin has two sides. Chemicals could be a threat to human health or to the environment, if used improperly. Chemicals may, if released to the environment, contaminate soil, water, air, food.

The result of an improper use are amounts of hazardous wastes and a large number of contaminated sites, which sometimes seem to be an unavoidable result of industrialisation.

Contaminated sites can be found in all countries, in industrialised countries as well as in emerging countries and in countries of transitions. The types of contamination are various, representing the whole history of chemistry.

Germany is tackling the problems of contaminated sites since the eighties of the last century. Since the nineties, we have national regulations to remediate contaminated sites and to protect the soil from new contamination.

Germany is ready and willing to share its experience concerning these kinds of problems with other countries, who also have to cope with these problems.

One of the harmful groups of contaminants being a threat for human health and the environment are pesticides, especially if no one takes care of safe storage.

Also in this field Germany offers support, for example,

- Germany supports the Secretariat of the POP Convention by providing more than 10 % of the overall budget of the Secretariat, and
- Germany gives directly financially support to a number of selected developing countries to participate in international conferences.
- Germany carries out scientific projects, as for example the further development of POP criteria.
- Germany supports continuously special country projects of the POP secretariat, so for Nigeria in 2010.
- On behalf of the German Government, the Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ) in Germany, supported and executed many projects on the management and disposal of obsolete pesticides in developing and emerging countries.

- The GIZ project "Chemical Safety", responsible for the disposal of obsolete pesticides since many years sends its impressive poster exhibition on obsolete pesticides in Eastern Europe, the Caucasus and Central Asia as contribution to this event. This poster exhibition is a joint project with the IHPA Forum and the pesticide Action Network (PAN) Germany. This exhibition will be opened soon afterwards.

I think that the problems arising from the contamination of the environment, soil, groundwater and air, will keep us busy for still a long time – to solve all these problems of the past und to avoid further contamination of our ambient to get a better world for us and for future generations.

I wish that the conference here in Gabala will help to come nearer to this aim.

INTRODUCTORY REMARKS BY MR. JAN OLSSON

Head of the Economic and Environmental Unit at the Office in Baku

Excellencies,

Ladies and Gentlemen,

First of all, let me thank the organizers for inviting the OSCE Office in Baku to participate and provide active support to the organization of this important event.

The fact that Azerbaijan took the initiative to host this meeting, following last year´s "Year of Ecology" is particularly encouraging. In a few weeks time, the Ministerial Summit on Environment for Europe will be organized in Astana. This is a good opportunity to highlight some of the conclusions that we will draw from this workshop.

The inventory, management, removal and ultimate destruction of obsolete pesticides, largely inherited from the Soviet Union, is a huge and demanding, but also very essential task due to their potentially very damaging effects on ecosystems and the health of future generations.

The Stockholm Convention, which is celebrating its 10th anniversary this year, was a major breakthrough as a global convention to eliminate the world´s most dangerous substances, persistent organic pollutants, or POPs. The prevention, phasing-out and elimination of further use of these substances is now a prioritized global action programme of co-operation between Governments, under the auspices of UNEP.

As you may know, the OSCE – the world´s largest regional security organization - has a comprehensive approach to security across its three dimensions – politico-military, economic-environmental and human rights.

In its second, economic-environmental dimension, the OSCE supports and assists its host Governments in preventing environment and security risks, by providing a platform for co-operation, dialogue, increased access to environmental information, risk assessments and an active exchange of ideas and potential solutions between Government, the civil society, scientific institutions and the general public.

Whereas some of these environmental challenges are limited to the national or local level, other challenges are more transboundary in nature and require cross-border co-operation to be properly addressed. The challenge posed by POPs is one area which has very serious environmental implications far beyond national borders.

The OSCE activities - in all its three dimensions - are based on ministerial decisions taken jointly by all its 56 participating states. These 56 countries cover a geographical area from North America to the Russian Far East. A key document was adopted at the ministerial meeting in Madrid in 2007 under the Spanish Chairmanship to the OSCE – the Madrid declaration on Environment and Security.

The decision refers to the challenge of environmental risks – especially risks related to land degradation, soil contamination, water management and the environmental impact of natural and man-made disasters. The OSCE ministerial council reaffirmed that co-operation on environmental issues can serve as a tool to prevent tensions, to build confidence and promote cross-border relations.

Thus, environmental degradation could be an additional contributing factor to conflicts. However, environmental co-operation and early warning could also be a tool for diminishing tensions, prevent conflicts and build confidence between nations. This is the spirit of the Environment and Security Initiative – a joint programme of co-operation between six international organizations. The first regional programme within ENVSEC – the programme for South Caucasus was launched in 2003.

Within this initiative, the OSCE collaborates extensively with its main counterparts. In Azerbaijan it is Ministry of Ecology and Natural Resources and the Ministry of Foreign Affairs as well as with other, specialized international organizations such as UNEP, the United Nations Economic Commission for Europe, Regional Environmental Centre for South Caucasus and UNDP.

Currently, the programme for South Caucasus is addressing four main priorities:

- Environmental degradation and access to natural resources in areas of conflict
- Management of transboundary natural resources and industrial legacies, particularly water resources
- Population growth and rapid development in capital cities
- Public Awareness and Participation in environmental decision-making

For example, through a programme called CASE-Azerbaijan (or Civic Action for Security and Environment) we provide small grants and training to non-governmental organizations across Azerbaijan for local initiatives on environment and security, for example on assessing environmental risks, management of hazardous waste, land degradation, environmental awareness-raising among youth, sustainable energy and many other areas. These non-governmental organizations then interact with local and national authorities in public discussions and assessments on environmental challenges to identify joint solutions.

As a contribution to this event, the OSCE Office has translated FAO and US EPA guidelines and information material on pesticides and POPs management into Azerbaijani, which will be distributed during this workshop.

The forum is an excellent opportunity for exchanging best practices between countries across the region and build networks between experts, which will last long beyond this meeting. Again, I would like to reiterate my thanks to the organizers for inviting us to be a part of this event.

Our Office would be pleased to further support to the current efforts of Azerbaijan in addressing the issue of hazardous pesticides management and the Stockholm Convention in future projects

Thank you for your attention and I wish you all success and an interactive discussion during the workshop!

LETTER OF MR. T.N. BEKOV

Minister of Agriculture of the Kirgiz Republic to the organizers of the 11 IHPA Forum

КЫРГЫЗ
РЕСПУБЛИКАСЫНЫН
АЙЫЛ ЧАРБА МИНИСТРЛИГИ

МИНИСТЕРСТВО
СЕЛЬСКОГО ХОЗЯЙСТВА
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Организаторам 11 Форума IHPA.

Правительство Кыргызской Республики в лице Министерства сельского хозяйства К.Р. и его подразделения (департамент химизации и защиты растений) проводят определенную работу по управлению запасами устаревших пестицидов.

За последние годы были проведены полномасштабные инвентаризационные работы по определению запасов запрещенных и устаревших пестицидов на местах хранения во всех хозяйствующих субъектах.

Результаты обследования показали, что ситуация с непригодными пестицидами не совсем благополучна, тем более они являются потенциальными источниками стойких органических загрязнителей (СОЗ).

В двух южных районах республики разбросанные по разным местам, запасы устаревших пестицидов свезены в одно закрытое помещение, что позволило исключить доступ к ним во избежания растаскивания этих химикатов.

На Сузакском участке захоронения пестицидов, где заказчиком является Всемирный Банк, Консорциум ТАУФ провели инвентаризацию и на этой основе предложили комплекс мероприятий по управлению и снижению риска загрязнения окружающей среды этими веществами.

Участие директора департамента г-на Дербишалиева Ж.С.
на данном Форуме и полученная там информация от других
специалистов разных стран позволит определить направление и действие республики по решению существующей проблемы.

Министр **Беков Т. Н.**

TRANSLATION OF THE LETTER OF MR. T.N. BEKOV, MINISTER OF AGRICULTURE OF THE KIRGIZ REPUBLIC TO THE ORGANIZERS OF THE 11th IHPA FORUM

The government of the Kirgiz Republic, represented by the Ministry of Agriculture and its department (Department of Chemicalization and Plant Protection) have implemented xtensive works related to management of obsolete pesticides in the country.

During the past years the full-scale inventory works on identification of banned and obsolete pesticides stocks have been conducted in all economic entities.

The results of the inventory revealed that the situation with obsolete pesticides is not exactly satisfactory, moreover, the inventorised objects can act as potential sources of persistent organic pollutants (POPs).

The obsolete pesticides revealed in two southern regions of the Republic have been re-collected and transported to a safegurareded warehouse for temporary storage to prevent access to these chemicals.

Within the World Bank project, the consortium TAUW has carried out an inventory of pesticides on Susak burial site, and proposed a complex of activities related to risk management and mitigation.

The Head of the Department of Chemicalization and Plant Protection, Mr. Derbishaliev is participating in the Forum on behalf of the Ministry of Agriculture of Kirgiz Republic. The exchange of information and expertise, as well as the outcome of the Forum will help to define jointly the further steps and activities directed towards addressing the POPs issue in the Kyrgyz Republic.

Minister **Bekov T.N.**

Dear Mr. Minister,

MR. SHAHIN PANAHOV
Chairman UNEP - ECORES National Committee
Azerbaijan (ECORES Information-Analytic Environment Agency)

Dear ladies and gentlemen,
Dear guests,
And dear press representatives!

Today we all are participants of the very important event in history of ecological meetings of Azerbaijan – 11th International HCH and Pesticide Forum, 7-9 September, 2011, Gabala, Azerbaijan.

I have the honour to make a speech at the opening of exhibition organized within this Forum.

Firstly, I want to say that there are two exceptional importance in helding this Forum in Azerbaijan.

The first is that scientific research of solution ways of Pesticide problem inherited from the past must be considered a very progressive case discussed by participation of local and international specialists.

The second one is permission and comprehensive support in organization of such event in Azerbaijan. This side of event may be assumes great importance for our young country. If there was no political will, this event would not be possible. Organization of this event in our country affirm once again that political leadership of modern Azerbaijan supports the events directed to the solution of past problems, as well as ecological problems and is ready for discussions on an international scale.

From this standpoint on behalf of all of us I express my gratitude to Mr. Ilham Aliyev, the President of the Republic of Azerbaijan, for permission to organize this event.

Meanwhile, I'd like to express my gratitude to the Government of Azerbaijan, as well as to personally participating Mr. Huseyngulu Bagirov, Minister of Ecology and Mr. Ismat Abbasov, Minister of Agriculture, for the high level arrangement of this event by mobilizing all energies and resources of related bodies of the Ministries that they are leading.

The exhibition of which you participated at the opening, is composed of printing materials and posters reflecting key topics of 3-days discussions. Thus, ECORES, ecological analitical information agency rendering assistance in the arrangement of the event and representaing he Secretaria of the Forum, upon assignement of IHPA and agreement of the Ministry of Ecology, translated into Azerbaijani language and publishd with financial support of OSCE Baku and Green Cross Switzerland, several awareness rasing material and documents related to issues of obsolete pesticide management:

- Booklet "Capacity Building on Obsolete and POPs Pesticides in Eastern European, Caucasus and Central Asian (EECCA) Countries" for public awareness and inventory activities on obsolete pesticides in Azerbaijan within UN FAO/GEF programme, a project which is under implmenetation in Azerbaijan by UNEP-Ecores NatCom.
- "UN FAO Guidelines for the Management of Small Quantities of Unwanted and Obsolete Pesticides"
- US EPA Reference Guide to Non-combustion Technologies for Remediation of Persistent Organic Pollutants in Soil, Second Edition – 2010
- "Obsolete (lethal) Pesticides, a ticking time bomb and why we have to act now" Authors: John Vijgen, Director of the International HCH & Pesticides Association (IHPA) Christian Egenhofer, Senior Fellow at the Centre for European Policy Studies in Brussels (CEPS).

I would like to thank particularly OSCE Baku office and Green Cross, Switzerland, for funding the translation of these material into Azerbaijani language, and their publication.

I would also like to thank the organisers and supporters of GIZ-IHPA-PAN Germany Exhibition which are opening in this Forum. The presented posters tell valuable story of the situation with obsolete pesticides in different parts of the world, and underlines the urgency to take actions.

Once again I welcome you in this Forum and Exhibition.

SESSION 1. STATE OF OBSOLETE AND POPS PESTICIDES IN CENTRAL/ EASTERN EUROPE, CAUCASUS AND CENTRAL ASIA

TECHNICAL AND ORGANIZATIONAL CONDITIONS OF THE PROCESS OF DISPOSING OF OBSOLETE PESTICIDES. 16 YEARS OF POLISH EXPERIENCE

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Abstract

In the 70's, there were about 300 underground storage facilities for obsolete plant protection products (the so called "tombs") built in Poland. The estimated amount of expired or obsolete pesticides stored in the tombs and other warehouses was around 15 - 20 thousand tonnes.

At the beginning of 1990 we started to define the scale of the problem and look into possible solutions. The practical phase, i.e. first tomb closing took place in 1996. Since then, more and more tombs were gradually disposed of, with the last of them being closed down in 2011.

Cleanup work was performed by all-Polish crew, without the participation of any outside experts. Site remediation projects were funded almost wholly with Polish resources - mainly by the National Fund for Environmental Protection and Water Management. Along the way, tomb disposal in Poland faced a number of organizational and technical difficulties which slowed down and hampered the process.

The presentation will describe Polish accomplishments and problems encountered during the 16 years of tomb closing and provide same practical findings and possible solutions. It will also talk about the total number of tombs in Poland and the resources expended for their disposal.

Key words: pesticide waste, obsolete pesticides, tomb, waste problems

Introduction

From 1960 to 1980, Poland set up around 300 facilities for storing obsolete pesticides. Pursuant to a special Instruction issued in 1971, large amounts of expired products that were taken out of the market and no longer used since they lost their desired properties were effectively "disposed of" by storing them in the so called tombs. They were usually underground wells, 2-4 meters deep, consisting of concrete rings that were 1 - 1.5 meters in diameter. Obsolete pesticides were also stored in specially constructed rectangular tanks, underground chambers, old dugouts and military bunkers. Some waste was put directly into ground pits. A single tomb could contain from a few hundred kilograms to a few hundred tonnes of waste (usually from more than a dozen to a few dozen tonnes). The structures did not provide adequate barrier for the chemicals. They were usually poorly constructed and joints between the rings were leaking. Sometimes bottoms of the tombs were located in a layer of underground water and the geological structure at a location did not provide adequate insulation for the surrounding areas. Products were not sorted before being placed in a tomb; containers got frequently damaged or were intentionally crushed while being pushed down to maximize the use of space inside the tomb. In some cases, this would lead to products being mixed up with each other as well as with broken containers made of glass, metal, wood, etc. Poor construction and a lack of tightness allowed the rainfall and underground waters to flush out active ingredients, solvents, products of their decomposition and other compounds formed through various chemical interactions.

The tombs and storing hazardous waste inside them was intended to be a final and permanent way of their disposal. The idea, however, proved to be a failure. After years of storage, it turned out that the tombs were leaking and released contaminants into the environment, posing a risk for soil and underground water.

Moreover, records regarding their locations were inadequate which made it difficult to locate them. In mid 90s, efforts were undertaken to eliminate the risks posed by the leaking sites and first tombs started to be emptied.

A separate problem related to pesticide waste, which still remains unsolved, is the "Rudna Gora" landfill containing post-production waste, located by the "Organika Azot" Chemical Plant in Jaworzno, which is not subject of this presentation.

The presentation is designed to show the progress, difficulties and outcomes of tomb disposal in Poland and offer conclusions that may be helpful for other countries looking for solutions to similar problems.

The process of tomb disposal

Inventory

At the time the tombs were constructed, there was no central registry or any other system that would collect and store information about the sites. Farming cooperatives and other entities that owned or managed the facilities were reorganized or liquidated during the political and economic changes in Poland and in many cases any records regarding the tombs were lost. We were faced with a situation where there were no records listing the contents of individual tombs, or there was no record of their exact location. It was necessary to make inventory of all the sites, to establish their locations and to estimate the amounts of waste they contained. The first project of this kind was carried out in 1993 when funds received under the PHARE programme were used for a report on "Gathering input data on the disposal of obsolete pesticides and empty containers". The same year, the National Inspection for Environmental Protection performed inspections which indicated that there were 297 tombs and 73 of them were ground pits. Subsequent inventories undertaken jointly by the Institute of Plant Protection and National Geological Institute were performed in 12 out of 49 Polish provinces. The work mostly included finding source documentation, conducting interviews and collecting surveys from available sources (ministries, agencies and offices). The obtained information allowed to locate most of the sites, however it was not sufficient to determine the contents of the tombs and amounts of waste they stored. The situation created difficulties for organizers of formal tenders and contractors performing the work. It became necessary to come up with more accurate estimates of the amounts of waste in each tomb as well as quantities of contaminated concrete rubble and soil that had to be removed. In the second half of past decade, inventories were more detailed, involved substantial amount of earth work, uncovering underground chambers, performing tests and taking soil samples from areas adjacent to the sites in order to more accurately determine the scope of the necessary remediation activities. This approach made it easier to assess the scope and cost of work, but it was not used in all cases.

In 2006, the Ministry of Environmental Protection published a list of sites, which was a result of the inventory done so far. After crossing out the sites whose location could not be confirmed, the list had 262 sites, including 133 that were already closed and contained around 11 thousand tonnes of waste and 129 sites that still needed to be disposed of. In June of this year, the Ministry of Environmental Protection reported on the tomb disposal progress again. [1] As of 30 June 2011, after another 27 sites were taken off the list because they could not be found, the list had 242 sites. This final figure included 231 tombs that were already disposed of and 11 that will be closed in the near future.

Interim storage facilities

In 1995, under the PHARE project, two interim storage facilities were constructed: one in Niedzwiady, Wielkopolskie Province and the other one in Sosnicowice, Slaskie Province at the premises of the Institute of Plant Protection (IPP). [2] Additionally, the project provided equipment and training for a team of chemical emergency response personnel working on site closing, allowed to remove the contents of the two tombs including the most contaminated concrete rubble and soil and transfer them to the new facilities and install a network of piezometers around the sites to monitor the level

of contamination. At that time, Poland had no domestic hazardous waste disposal facilities and Polish laws did not allow hazardous waste to be exported abroad. Hence a decision was taken to store the waste at a new and secure storage facility. The construction concluded in 1996. For Poland this was all pioneer work that gave rise to further actions. The experiences gained during the various stages of the project and in particular during the excavation and repacking of waste, setting up site monitoring and supervising the work, were used for closing many other sites throughout Poland. Temporary landfills were disposed of at a later time and the areas were remediated. In 1998, Poland passed a new Act regarding waste utilization which allowed for alternate ways of waste disposal. Interim storage facilities were no longer constructed.

Waste utilization abroad

Next set of pioneer activities involved exporting the waste abroad. The new Waste Utilization Act that was in force as of January 1998 and its accompanying regulations made it possible to export obsolete pesticides to be incinerated in foreign countries. After experimental burning of samples representing typical contents of a tomb as well as trials involving incineration of the most hazardous waste (including the explosive DNOK and waste containing large amounts of arsenic and mercury) we were able to obtain the necessary passes from transit countries and a permit from the main Inspector of Environmental Protection to export the waste. In December of 1999, Institute of Plant Protection in cooperation with LOBBE Company successfully transported to Bayern Leverkusen, an incineration plant in Germany, 130 tonnes of waste excavated from a Prussian bunker used as a tomb in the town of Zabice, Lubuskie Province. In the years that followed, incineration was the only method that Poland used for disposal of chemicals removed from the tombs. The waste was exported to Germany, Netherlands, Denmark and Belgium.

Waste disposal in Poland

In 2003, a domestic incinerator started to operate in Poland: LOBBE hazardous waste incineration plant, with the annual capacity of 20 000 tonnes and it was located in Dabrowa Gornicza. At that time, the Main Inspector of Environmental Protection stopped issuing permits for exporting waste to foreign countries. Two more incinerators were built and even though they were licensed to burn pesticides, they never accepted shipments of pesticide waste. The big incinerator monopolized the domestic market. In 2009, following modernization, another plant started to operate in Gdansk. In the recent years the plant did accept some waste removed from the tombs, but the quantities were not significant.

Funding

Tombs throughout Poland were disposed of using resources mostly provided by the National Fund for Environmental Protection as well as provincial, communal and county Environmental Protection Funds. The activities undertaken by Institute of Plant Protection were an exception: PPI used PHARE funds to construct two interim storage facilities, close the two first tombs, equip and train the emergency response team and close the interim storage facility in Sosnicowice. PPI also used EU funds for a pilot project involving incineration of liquid pesticides mixed with fuel fed into cement kiln.

Reports published by the Ministry of Environmental Protection indicate that tomb disposal in Poland cost close to PLN 200 million, i.e. close to €50 million (figures include VAT). The amount includes removal of tomb contents, excavation and storage of contaminated rubble and soil, as well as site remediation. The average price for disposing of 1 tonne of pesticide waste, including the above listed activities, could be estimated at PLN 10 000 (€ 2 500).

Current situation

Currently, we can say that the tomb problem has been resolved, however, with a few exceptions. Pursuant to the provisions of the Stockholm Convention, ratified by Poland, and the National Waste Management Plan, by the end of 2010 Poland closed 210 tombs and disposed of 18 thousand tonnes of obsolete pesticides. Six months later, (until 30.06.2011), the figures rose to 231 closed sites and over 19

thousand tonnes of waste. Mostly due to formal reasons (disputes regarding land ownership and funding), there are still 11 rather small tombs to be disposed of. One of them is a military bunker and its entrance is covered with a thick layer of concrete which is currently being removed to determine the bunker contents. The estimated amount of waste that needs to be disposed of is around 120 tonnes. As a result of tomb closure, about 100 thousand tonnes of contaminated rubble and soil were delivered to hazardous waste landfills around the country.

Major Obstacles

Lack of pesticide disposal strategy and coordination of activities

The tomb disposal process has lasted for 16 years without a clear strategy or a set of technical and organizational guidelines. Troubles were already encountered at the time of inventorying the sites, which was done with several breaks and unsystematically from 1993 to 2006. Due to insufficient funding provided by the Ministry of Environmental Protection and local authorities and a lack of a uniform plan, any reports on the subject were sketchy and did not include all the necessary data. Similarly, the official report summing up the inventory activities that was published by the Ministry of Environmental Protection in 2006 had substantial shortages of information regarding site locations and the actual amounts of waste they contained.

The importance of tomb disposal was first included in the National Plans for Waste Management, which are developed and updated every four years since 2002. [4] The plans assumed the final deadline of tomb closing for 31.12.2010. Accordingly, the Ministry of Environmental Protection oblidged the National Fund for Environmental Protection and Water Management and its provincial offices to provide adequate funds to complete the any disposal projects undertaken locally, however it did not issue any timetable of necessary steps or clear guidelines on how to complete them. Due to a lack of experience with closing of this type of sites and the environmental damage they created, at the beginning the parties failed to come up with a coherent view on the scope of the necessary steps and how to go about their completion. It made it difficult to organize public procurement tenders and define the subject of the tenders. It was not until we gained some experience with closing the first tombs and resolved the formal and legal disputes related to the bidding process that we were able to come up with methodology guidelines for completing the necessary steps. They were defined in the document "Guidelines for activities related to tomb disposal and remediation of sites degraded by the storage of expired pesticides", whose final draft was not released by the Ministry of Environmental Protection until May 2009 [5].

Changeable legal and organizational considerations

In the face of a lack of strategy and guidelines on how to perform the work, the only unquestionable assumption was that tomb disposal must proceed in compliance with the law. The law, however, kept changing due to the political transformation and Poland's accession to the European Union, which took place in May 2004. The changes were related to the laws regulating environmental protection, liability for environmental damage and public procurement. In the thicket of constantly shifting regulations and unclear interpretations, some land owners who became liable for disposal of tombs located on their property delayed to take action and resolve the problem hoping that it would go away. The situation improved a little in 2004, when Poland started to implement the provisions of the Stockholm Convention on Persistent Organic Pollutants and issued the National Implementation Plan of Stockholm Convention [6]. The document obligated Poland to have all tombs closed by the end of 2010 and made the authorities responsible for providing funds to complete it. Under the circumstances, activities progressed sluggishly and without a plan. The situation improved after 2004, when it became clear that by the end of 2010 public funds will be guaranteed for tomb disposal projects. Additionally, Ministries issued specific guidelines, there was a group of specialized companies who were able to

professionally handle pesticide waste and soil contamination and there was an established way of organizing public procurement tenders for closing individual tombs or tomb clusters located within the same province. The drive behind the actions was the awareness of local authorities that successful completion of public tendering procedure by 2010 would guarantee financial support from the central government. On the other hand, those who miss the deadline would not only lose the chance of getting the necessary funding, but also open themselves to charges of mismanagement and violating provisions established by both national plans and international obligations.

It is worth noting that the majority of projects were funded using domestic resources, without the EU support, which is hard to understand, considering that EU aid was readily available for projects related to the environment. This trend could be explained by the lack of coherent strategy and access to information on available support. As the deadline to have the task completed was approaching, there was no time to carry out the complicated and laborious procedure necessary to obtain the EU funds. It seems that had the strategy, including funding, been developed at the right time, following Poland's accession to the EU, expending domestic resources could have been limited to the amount of the necessary contribution, required by the EU aid regulations.

Problems with technical infrastructure needed for pesticide waste disposal

On top of the legal and organizational difficulties described above, we also had to deal with a lack of technical infrastructure necessary for pesticide waste disposal. Until 2003, Poland had no incineration plants or other technologies that would allow for safe disposal of pesticides. This is why the very first tomb removals performed in the late 90s and the beginning of 2000 involved expensive transport of waste to incineration plants located in other countries. Under the circumstances, the National Fund for Environmental Protection and Water Management decided to purchase a semi-mobile incinerator which was specially equipped to burn pesticide waste removed from the tombs. After a public tender, the incinerator was purchased from the Austrian company SEILER and brought to Poland. Institute of Plant Protection was the beneficiary of the project and it was put in charge of making the installation operational. Here, we encountered yet another set of problems concerning the location of the incinerator, which had not been settled prior to purchasing the installation. More than a dozen locations were considered and each attempt met with fierce opposition from the local community who expressed their concerns, albeit unjustified, about the impact that the incinerator could have on the health of residents and possible deterioration of the local natural environment. Low level of technical awareness among the public combined with unclear regulations regarding the participation of the public in selecting the site for the incinerator lead to a situation where, despite changing the project beneficiary twice, the incinerator has not been made operational and any funds received for the project from the EU had to be reimbursed.

A breakthrough in using incineration as a domestically available technology came in 2003 when at an industrial site in Dabrowa Gornicza LOBBE Company (now SARPI) opened a modern incineration plant, capable of burning pesticides. The majority of pesticide waste was incinerated at this plant. Since 2009, following the necessary modernization, another plant, called PORT SERVICE started to operate in Gdansk. It has been accepting pesticide waste and become a competitor on a domestic market, which allowed to keep the waste incineration costs in check.

The situation was different for the disposal of pesticide contaminated soil, excavated from around the tombs. There was no soil cleansing method that was technologically or economically viable, therefore all contaminated soil was distributed among the local hazardous waste landfills. Access to the landfills operating under a permit to accept polluted soil was practically guaranteed throughout the duration of the tomb cleanup process.

Problems with commercialization of tomb disposal activities

Practically the entire project was performed in cooperation with commercial vendors, in compliance with the provisions set by the Public Procurement Act. This had some advantages in terms of lower costs and meeting the project deadlines, dictated by free competition, but it also had some disadvantages. These involved not only the difficulties with defining the scope of tender offer, as indicated earlier, but also the specialized character of the work and risks of exposure to hazardous conditions. The organizers of public tenders were not entirely aware of the conditions (lack of guidelines on site cleanup) and since the terms of a contract were not precisely defined there was always a risk that contracts would be awarded to an incompetent company who happened to be the lowest bidder. This in turn could result in poor quality of work, cutting expenses at cost of safety and not meeting the quality standards. We could also observe some tender organizers and contractors taking advantage of confusing regulations in order to force out competition and monopolize the market. All this resulted in tendering processes being lengthy as tender participants disputed the results and filed appeals. In some cases, public tenders had to be declared invalid.

It is also worth noting that contracting the work out to private, profit-oriented companies called for a stricter supervision of the amounts of materials being removed from the sites, since lack of detailed inventories gave the contractors an opportunity to overstate the excavated amounts and overcharge for the work performed under the contract.

Summary and Conclusion

As a result of the steps taken so far, the problem of tomb disposal is headed towards the end. It has now been 20 years since we first started to define the scale of the problem. With no models to look up to, Poland has come up with its own solution. We did run into some pitfalls, which, looking back, could have been avoided. Certainly the work could have proceeded faster and smoother and Poland's own money spent on the projects could have been minimized. The following are the most important lessons that other countries with similar problems could learn from Poland's experience:

- it is necessary to make detailed inventories of materials stored at a site in terms of location and the contents of the tomb, and set up a data base which would be constantly updated and include information on tombs that have already been closed
- create a legal basis and a set of technical and organizational guidelines defining how to proceed with excavation, waste disposal and site remediation as well as supervise all the activities;
- estimate the costs of completing the project;
- research opportunities to receive funding for the project from other countries, not only for its pilot stages but throughout the entire duration of the project;
- develop the initial strategy, including an analysis of whether it is better to contract the project out to private companies, or manage it centrally and use dedicated and trained governmental agencies (e.g. military chemical units, firefighters, etc.)
- analyze the country's technological capabilities for waste disposal, site remediation and cleansing.
- undertake comprehensive activities involving disposal of obsolete pesticides and site remediation.

For the past 16 years, Poland has spent almost €50 million to close 231 tombs and remediate the sites after their removal. In all, about 20 thousand tonnes of pesticide waste was delivered to incineration plants and about 100 thousand tonnes of contaminated rubble and soil ended up in hazardous waste landfills. Certainly, the work could have proceeded faster, smoother and cost less money, but the most important thing is that we did take the necessary steps and this year we will finally get rid of the tombs in our country.

References:

1. Ministry of The Environment. 2011. Report on tomb disposal process. http://www.mos.gov.pl/kategoria/2641_przeterminowane_srodki_ochrony_roslin/
2. Stobiecki S., Silowiecki A., Pruszynski S., Czaplicki E. 1998. Pilot project of remediation of two bunkers containing unwanted pesticides in Poland. HCH Forum Book Bilbao: 205-211.
3. Stobiecki S. Cieszkowski J., Silowiecki A., Stobiecki T. 2001. Disposal of pesticides as an alternative fuel in cement kiln: project outline. HCH Forum Book Poznań: 285-289.
4. Ministry of the Environment. National Plans for Waste Management. www.mos.gov.pl/kategoria/3851_plany/
5. Guidelines for activities related to tomb disposal and remediation of sites degraded by the storage of expired pesticides. 2009. http://www.mos.gov.pl/kategoria/2641_przeterminowane_srodki_ochrony_roslin/
6. National Implementation Plan of Poland to the Stockholm Convention. http://www.mos.gov.pl/kategoria/2113_konwencja_sztokholmska/

IDENTIFICATION OF POPs RESIDUALS AND MAPPING OF POLLUTED AREAS

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Abstract

An original methodology of POPs pollution study and hazards assessment was developed aiming at: (i) identification and assessment of sites potentially contaminated with POPs all over the country; (ii) creation and filling of the POPs data base, as well as mapping and visualization of acquired data; and (iii) setting the reporting formats and assuring the data base support.

All identified potentially contaminated sites were visited by field teams and were described based on an unified questionnaire; the coordinates of the POPs sites were determined using GPS; photo images and composite soil samples were taken at each site. The soil samples were further analyzed for POPs in a certified laboratory. In total, 1604 POPs contaminated sites were identified and described. In terms of territorial loading, their distribution across the country is relatively uniform, with a national average of one site per 20 square kilometers.

An integrated GIS system for POPs data mapping and analysis was developed allowing an effective storing, managing and presenting of POPs information such as geographic locations of the POPs sites, concentrations and other related parameters as well as distribution of health and environmental hazards. The system consists of an integrated spatial (GIS) POPs Database, a desktop GIS toolset using ArcGIS platform, and a Web Mapping Application acting as a POPs data analysis and visualization interface, giving advanced means for viewing locations of POPs areas and their various parameters on-line. The data base is accessible on the Ministry of Environment website: http://pops.mediu.gov.md. The information on POPs polluted sites is to be periodically updated by environmental authorities.

With the POPs database the Ministry of Environment got a new tool which could significantly improve the management of contaminated sites. It can effectively support the policy and decision making process in the field of contaminated sites management.

Key words: persistent organic pollutants (POPs), obsolete pesticides (OPs), polychlorinated biphenyls (PCBs), POPs management, Stockholm Convention on POPs.

Introduction

The decades of intensive use of pesticides in Moldovan agriculture left behind several thousand tonnes of obsolete pesticides and PCBs containing oils, and many hundreds of POPs polluted sites. In line with the requirements of the Stockholm Convention, which Moldova has ratified, in 2004, the Government adopted the National Implementation Plan (NIP) which paved the road to the elimination of POPs. In this regard, the removal of existing POPs stockpiles and further rehabilitation of contaminated sites is a necessity in order to prevent uncontrolled release of POPs in the environment and to allow the safe development of concerned areas.

In order to address the priority POPs issues identified in the NIP, Moldova benefited from the international support within several projects implemented in the last years, including the GEF/World Bank grant for ***Persistent Organic Pollutants Management and Destruction Project***, implemented by the Ministry of Environment in 2006-2010. Over 3,350 tonnes of obsolete pesticides (OPs) were collected, repacked and stored in a safe manner. About 1,300 tonnes from these stocks were removed and incinerated abroad. The entire stock of 18,660 electrical capacitors with PCBs (934 tonnes) was removed from the electrical transformer stations.

Another important project task addresses the identification, assessment and GIS mapping of areas potentially contaminated with POPs. It follows logically after the efforts that have led to the centralization and starting of destruction of the obsolete pesticides and PCBs stocks scattered all over the country, thus removing the most acute threats to human health and environment. This operation moved the problem of obsolete pesticides one step further and the priority question now is: what to do with the contaminated sites?

The *overall objective* of this study was to identify the POPs polluted areas posing the highest environmental and health hazards, as well as to map these areas using the GIS tool. Within this overall objective, the more specific objectives were as follows:

- the development of the methodology of the POPs pollution study and risk assessment;
- design of the POPs contaminated areas database;
- the development of the sampling program and field trial;
- analyses of POPs contents in the collected samples;
- creating the database and mapping POPs polluted areas using the GIS technology;
- the identification of environmental and health risk zones.

The results of this study will be used by relevant national authorities for making further decisions on POPs management and land use options, from a health and environmental management perspective.

Approaches

At the initial stage of the research, the information on potentially POPs contaminated sites was either unknown or incomplete. Many of such sites have been abandoned and forgotten, and only a minority has previously been described and assessed in terms of their potential health and environmental risks. Moreover, most existing data were inaccessible or unusable because they were scattered between different institutions and existed only on paper. Besides, there was a problem of data ownership since the responsibilities in this field were not always clear.

Starting from this, the study was structured around three main elements: (i) identification and assessment of sites potentially contaminated with POPs over the country; (ii) creation and filling of the POPs data base as well as mapping and visualization of acquired data; and (iii) setting the Reporting Formats and assuring the data base support and training, required for further renewal and operation of the POPs data base.

Identification and assessment of sites potentially contaminated with POPs

To ensure the most effective and complete way for identifying the potentially contaminated sites it was decided to gather information at the local level rather than to use data available at the central level. The information was basically collected from two sources: the mayoralties and local operators.

The information collected from the mayoralties was used as a starting point for further field investigation. The field teams visited and described all identified potentially contaminated sites, based on an unified questionnaire; determined the coordinates of the POPs sites using GPS devices; took photo images and composite soil samples at each site. The soil samples were further analyzed for POPs in a certified laboratory, in accordance with the Quality Management procedure (ISO 17025). The general approach to assessing the hazards associated with the sites potentially contaminated with POPs residuals included: (i) gaining the information on-site concerning the status of pollution sources, the nearest risk receptors and the potential for contamination spreading; (ii) establishing the degree of environmental pollution with POPs; (iii) integration of data gathered on-site with relevant digital map layers, information from topographical maps, aero-photo images; and (iv) calculation of "hazard indexes".

Calculation of a site hazard index integrated different elements of information, collected during site investigation namely the status of pollution sources, data on the degree of soil pollution on site, the potential for dispersion of the contamination spot, and the nearest risk receptors.

POPs environmental pollution database and visualization of data

The POPs environmental pollution database has been developed in order to ensure a structured management of POPs information to support effective decision making process at the Ministry of Environment. The proposed integrated GIS system for POPs data mapping and analysis allows an effective storing, managing and presenting of POPs information, such as geographic locations of the POPs sites, concentrations and other related parameters, as well as distribution of health and environmental hazards.

The system has client/server configuration with the following components:

- Integrated spatial (GIS) POPs Database based on SQL Server Express platform that supply data to below components;
- Desktop GIS toolset using ArcGIS platform, that delivers effective automation, management, editing and analytical functionality to the POPs data acquired in the field;
- POPs Web Mapping Application developed on ArcGIS Server, NET and FLEX platforms.

The POPs Database and its fields were designed in a way to allow database structure scalability i.e. the ability to make changes in the existing configuration and add more data sets later on. For example, the database administrator would have the ability to add new spatial and non-spatial tables, add and change fields and their basic characteristics, change values for the records in the database. Moreover, the database allows smooth compatibility with any standardized databases defined for integration into the Information Management and Reporting System (IM&RS).

All data acquired during contaminated sites investigation were entered into the POPs Database. Data incorporated in the database were fully based on the Reporting Format requirements (the field questionnaire completed by the operators on-site). At the same time, the data on POPs sites included in the database are linked with other types of information obtained in the field, including:

- Electronic form of questionnaire, ensuring the access to the original information obtained during the field investigations;
- Electronic form of sites general layout drawn by the field operators on-site;
- Photo-gallery providing a visual of the status of major infrastructure on POPs sites and surrounding neighborhood areas;
- Data on soil contamination on sites provided by the laboratory and presented under the Reporting Format requirements.

For all end-users of the Web interface there would be no opportunity to change data in the master database but rather to visualize and request data from the database and use predefined mapping models in easy mode. All data changes (including adding and changing new sites and parameters) will be executed by the database administrator from the Desktop GIS side.

The Reporting Format and data base system support

The need to have a Reporting Format stems from the idea that the information on POPs polluted sites collected during this assignment will be periodically updated, most probably by the rayon ecological inspectors. This information will be transferred, processed and stored at the Ministry of Environment in order to be used in the decision-making process. A precondition for efficient use of data at the central level is to have a homogenous and standardized dataset coming from the local sources. To secure such uniformity of data, a special Reporting Format is to be used by the rayon inspectors.

The Reporting Format was regarded as a uniform platform for sites assessment. In this sense, it consists of the following elements: (i) coordinates of the site; (ii) the field questionnaire, to be filled in during site investigation; (iii) technical instructions treating in detail the field operations; (iv) photo and sampling protocols; (v) laboratory standard form; and (vi) procedures for collecting, transferring, checking data and filling the database.

The Reporting Format is based on a specially developed Field Questionnaire. It also simplifies the procedures for data checking before putting into the data base and will help ease new data

incorporation. As a part of the Reporting Formats developing activity, a special data base module was developed for standardized presentation of laboratory results. The Reporting Format regarding sampling and analytical data was developed in a manner to have potential for including different environmental matrices (soil, water, air, biological samples) and for fitting various monitoring schemes, e.g. identification of POPs sites hazards or contamination dispersion.

Inventory findings

Distribution of POPs polluted sites and related infrastructure

Altogether, 1604 potentially POPs contaminated sites were identified and described. The national average figure is 0.05 sites/km^2 or one site per 20 square kilometers. During the inventory a variety of potentially contaminated sites were identified: different types, small and large, simple and complex. In many cases, the old pesticide sites were designed and used for more than one purpose: for example, storage facilities together with blending stations and evaporation grounds; or blending stations with helicopter platform nearby.

The 1604 investigated sites hosted 2326 major pesticide related infrastructure elements: storehouses, blending stations, helicopter platforms, evaporation reservoirs, as well as illegal pesticide dumps. On average, the number of installations per one investigated site was 1.5. Throughout the country, the main type of pesticide infrastructure was represented by storage facilities (45% of the total number of installations), followed by blending stations (34%), evaporation reservoirs (13%), helicopter platforms (5%), and illegal pesticide dumps (3%). Despite the fact that the pesticide dumps formed the lowest category of sites by number there were found not less than 73 such sites, which is quite an important figure given the illegal character of these practices.

The technical condition of the major pesticide related infrastructure found at the investigated sites was generally poor, what contributes significantly to increased environmental risk generated by the contaminated sites. 24% of the installations were evaluated as slightly damaged, while 31% were found destroyed. In about 25% of cases only the basements of installations were discovered while for the rest of 11% of cases just the places where pesticides have been handled in the past were established. Among identified illegal pesticide dumps, two thirds or 49 dumping places were covered by earth while 24 places were found uncovered.

Degree of POPs contamination of sites

The "diagnostic" sampling program consisted in taking one composite soil sample at every identified potentially polluted site, which allowed finding out if specific POPs are present at the site. Registered concentrations were used for prioritization of POPs pollution sites over the country and the calculation of the site hazard indexes.

Five POPs (groups of) compounds namely ∑DDT, ∑HCH, chlordane, heptachlor and toxaphene have been found in soil samples taken at investigated sites, in concentrations exceeding the national standard for organochlorinated substances in soil (0.1 mg/kg).

The pollution of POPs sites with DDT and – to lesser extent – with HCH can be defined as widespread. The share of sites contaminated with chlordane (31%) and heptachlor (22%) is also significant. Less number of sites are polluted with toxaphene (about 10%), but very often this is a severe level of pollution. Aldrin, dieldrin, endrin, HCB and mirex were not detected in the investigated samples.

The acquired data showed a severe level of soil contamination with POPs pesticides at some investigated sites, in the order of hundreds and even thousands of mg/kg. The concentrations of the five mentioned POPs pesticides varied in the interval from detection limit to 616 mg/kg for chlordane, 4838 mg/kg for toxaphene, 505 mg/kg for heptachlor, 3148 mg/kg for sum of DDT metabolites, and 4216 mg/kg for sum of HCH isomers.

Many of the sites have been polluted by several POPs compounds, which poses the problem of potential synergistic effects on the humans and the natural environment.

The pesticide construction waste samples were studied separately from soil samples on 42 sites. The waste samples showed a high level of contamination and have an irregular statistical distribution.

For 252 sites (about 16% of the total number) the data expressed as a sum of all POPs detected on-site in composite soil samples showed concentrations exceeding 50 mg/kg. At this level of pollution the soil can be classified as hazardous waste. For these sites, measures preventing the access of and contact with the population as well as remediation measures to minimize pollution spreading are to be envisaged.

To express the variability of POPs contamination of sites across the rayons in a more integrated way (rather than based on the prevalence of severely polluted sites) it was introduced an area-specific POPs pollution coefficient, which is calculated for every site as the sum of individual coefficients for five meaningful pollutants indicated above. In turn, the sum of site-specific coefficients has given the general coefficient for every rayon. The area-specific coefficient is then calculated by dividing the rayon coefficient by the rayon area: the higher its value the higher is the cumulative soil pollution by POPs pesticides at investigated sites.

The POPs sites hazard assessment

The assessment of contaminated sites is an important precondition for ranking them in view of developing site specific remediation strategies. At the moment, Moldova does not have formal requirements for contaminated sites assessment. Under this study a hazard assessment methodology for POPs contaminated sites was developed and tested. The methodology forms the basis for a developed POPs database computerized module calculating the respective risk indexes and Site Hazard Total Score (SHTS) and for respective ranking of sites by their hazards.

The proposed site hazard assessment is based on three pillars, similar to the classical risk assessment elements: (i) level of contamination, (ii) risk receptors, and (iii) pollutants distribution potential. The integration of these three conceptual elements into the total site score system is providing an integral approach for site classification, which is a well-approved international practice. Nevertheless, the major focus of the site hazard assessment tool formulated under the current study was to adapt the methodology to the local conditions and to the existing in-country capacity, thus allowing the rayon ecological inspectors and the database administrator at the Ministry of Environment to implement the assessment after project termination.

The ranking system based on SHTS itself does not and cannot serve as an ultimate management tool so that necessary measures are taken to ensure that environmental site management initiatives are implemented in timely and cost-effective manner. The SHTS is only one – probably the most important – but still one among some other parameters which should be considered before the decision to act (clean-up measures, reducing risks measures) is taken. The ranking system proposed is extremely important when assessing a large number of POPs polluted sites in order to set priorities for further decision making process regarding sites remediation.

Notes:

1. For further details on addressing the issue, the methodology and results of investigations the authors could be contacted on the following address:

   POPs Sustainable Management Office
   Ministry of Environment
   9 Cosmonautior str.
   Chisinau, MD2005
   Republic of Moldova
   Tel/fax: +373 22 226254
   e-mail: vplesca@moldovapops.md
2. Additional material on this subject can be found on the website: www.moldovapops.md.
3. The Database of POPs polluted sites in Moldova is available at: http://pops.mediu.gov.md.

DISPOSAL OF OBSOLETE PESTICIDES IN TRANSDNESTRIA/ MOLDOVA

Mihail Tcaciuc
OSCE Moldova

In April 2008, following a seminar on Confidence and Security Building Measures in Economic and Environmental Spheres held in Odessa, the Transdniestrian authorities requested the Environment and Security (ENVSEC) initiative to provide support for the safe disposal of approximately 100 Tonnenes of obsolete pesticides. The stockpile might include banned chemicals such as Persistent Organic Pollutants (POPs), unidentified material and chemicals made unserviceable as a result of age, contamination or chemical breakdown. The Moldovan side supported this initiative and offered its co-operation in developing a project for the disposal of the pesticides.

The presence of these chemicals in fact, constitutes a threat to the health of the communities in which they are sited and, because of the perception they engender, threaten the general economy. They also place a financial burden on the local authorities in charge of safeguarding, monitoring and maintaining the storage sites.

The ENVSEC initiative which aims at reducing risks and promoting co-operation through sound environmental governance has singled out the presence of pesticides in the ENVSCE Eastern Europe Assessment and included in its work plan the destruction of Pesticides in Moldova and particularly on the left bank of the River Dniester/Nistru.

OSCE Mission to Moldova developed a project in cooperation with the representatives of the Republic of Moldova and the Transdniestrian authorities on the Agriculture and Ecology Working Groups set up under an initiative to promote Confidence Building Measures (CBM). This project will make a direct contribution to the development of dialogue and co-operation between the parties and the building of confidence between them.

The goals of the project are to reduce the risks to health and life of the population living in Transdniestria by reducing the risk of contamination from dangerous pesticides and to promote co-operation between the sides to the Transdniestria conflict in support of Confidence Building Measures.

The project will provide a basis for any future projects to remediate the former storage sites.

Planned Activities

The project will be divided into the following two phases:

- Phase 1: Removal and destruction of pesticides centralised in the Rybniţa area of Transdniestria
- Phase 2: Removal and destruction of the remaining pesticides stored in Transdniestria

Sufficient funds have already been secured for the completion of Phase One and actions will be taken to find donors for Phase Two.

Each phase will comprise the following activities:

- Assessment and analysis of the types and quantities of pesticides
- Repacking of pesticides using internationally approved materials
- Removal of the pesticides from Transdniestria and their environmentally safe destruction at an approved site

The project will be managed through the framework of the ENVSEC Initiative for Eastern Europe with expert advice provided by the Office of the Co-ordinator of OSCE Economic and Environmental Activities and the United Nations Environment Programme. A member of the OSCE Mission to Moldova will act as Project Manager on behalf of ENVSEC. Other international partners may be invited to participate.

A suitably qualified and experienced commercial company (-ies) capable of carrying out all phases of the project will be selected as Implementing Partner in accordance with OSCE rules and procedures.

To ensure an over-arching framework for the project, agreement on its scope and implementation will be confirmed in an exchange of letters between the OSCE and the Transdniestrian authorities

Co-ordination of the project between the left and right banks of the River Dniester/Nistru, and also advice and assistance from the Moldovan authorities will be done through meetings of the Moldovan and Transdniestrian expert Working Groups on Agriculture and Ecology.

SITUATION ON COMMERCE AND HANDLING WITH PESTICIDES (MOST WIDELY USED AND OBOSLETE) IN THE LAST DECADE IN THE REPUBLIC OF SLOVENIA

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Abstract

The purpose of the article is to represent the actual situation in the field of using different sorts and amounts of plant protection products in the Republic of Slovenia. The purpose is also to present the legislation acts of long-term handling of obsolete pesticides and rules for processing and packaging of these substances and materials. The method used to prepare the article was collecting all available data, calculating the average annual consumption of plant protection products on farms and locations and preparing figures and tables. The results are illustrated in the tables and figures using consumption amounts of plant protection products per hectare in private agriculture on small farms and in social agriculture on big farms. Data are given for the years 1990 to 2009. The results also indicate an overview of national monitoring of plant protection products in food agriculture. Although the Republic of Slovenia is a relatively small country (only 20.000 km^2 and around 2 million citizens) there are a lot of problems to change the stated situation of the last twenty years. The paper also reports on the efforts of official state institutions invested to solve the residues of obsolete pesticides the amounts of which are not so great and problematic in comparison to others countries in the region but still present a great environmental pressure in Slovenia.

Key words: plant protection products (PPP), national monitoring of PPP, monitoring samples, organization of monitoring, legislation in the field of PPP, packaging of PPP, handling of PPP, management of obsolete PPP

1.Introduction

In the Republic of Slovenia (20,273 km^2, 2,01050 of inhabitants) chief characteristics is its forestation (over 60 %); a bit less than 30 % 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 agriculture products. The most important agricultural branch is stockfarming, which represents more than a half of the gross value of total agricultural production.

2. Short description of agricultural activities in the Republic of Slovenia

Area: 20,273 km^2
Population: 2,001,000
GDP (USD per capita): 14,004
Statistical data – economy
GDP share (%)
- Agriculture 3,0

Employees share per sector (%):
- Agriculture 9.65
- Industry 38.5
- Service 51.3

Import (1000 EUR) 10,962,013
Export (1000 EUR) 11,574,072
Statistical data – agriculture
Agricultural lands in use (ha) 505,734
Number of agricultural households 77,145 (in 2003)
Export (agriculture 1000 EUR) 10,595 (in 2002)
Import (agriculture 1000 EUR) 63,521 (in 2002)
Import share of foods and agricultural products from EU in total import (%) 6.7
Export share of foods and agricultural products to EU in total import (%) 4.2

Compared to other countries of Middle and Eastern Europe, the macro economical importance of agriculture in Slovenia is

relatively low. GDP share of agriculture, fishing and forestry has been consistently decreasing in the past decade (5.5 % in 1990, 4.5 % in 1995, 3.4 % in 2000 and 3.0 % in 2002). Agriculture employs approximately 9.65 % of working population and the share is decreasing. Despite these facts, it is still of great social importance as a developmental, social and political factor, as reflected in GDP statistical data.

Natural conditions for agriculture in Slovenia are relatively unfavourable. Approximately 60 % of the country's area is covered with forests, and 75 % of agricultural land is in areas with limited factors for agricultural production. There is a large share of grasslands and small share of fields in the land structure of farm use. Less than 25 % of all agricultural lands are on the planes and in fertile basins. In Slovenia, 8 % of the territory has a protected area status (4.2 % as national parks). Based on natural conditions, approximately 30 % of the territory should be protected.

		2000				2003		
	Number of agriculture economy	% of all economies	Area (ha)		Number of agriculture economies	% of all economies	Area (ha	% of all area
[illegible]	8.043	9,2	4.467	0,92	5.403	7	3-049	0,63
[illegible]	27.255	31,52	52.169	10,74	22.219	28,8	43.092	8,96
3 – 5 ha	18.130	20,97	70.875	14,59	16.777	21,75	65.713	13,66
5 -10 ha	22.058	25,51	155.278	31,96	20.631	26,74	145.157	30,18
10 – 20 ha	9.165	10,6	121.063	24,92	9.695	12,57	130.261	27,08
20 – 50 ha	1.641	1,9	43.732	9	2.202	2,85	59.859	12,44
50 – 100 ha	101	0,12	6.361	1,31	148	0,19	9.586	1,99
⩾100 ha	74	0,09	31.933	6,57	71	0,09	24.317	5,06
Total	86.467	100	485.878	100	77.146	100	481.034	100
Average size of agriculture economies	5,6 ha				6,2 ha			

Table 1. Agriculture land in use and the number of agricultural economies by size standards between 2000 and 2003 (hectare (ha) - 10.000 m²)

Fragmentation of agricultural land and small parcels are typical for Slovene agriculture. Agriculture structure reflects political and economical circumstances of the socialism period. Two very distinct forms of agricultural production appeared: social agriculture on big farms and private agriculture on small farms. Average farm size is approximately 6.2 ha and only 15 % of farms are bigger than 10 ha. More than 77,000 small family households, to whom agriculture is mostly a supplementary activity with additional income, owns at least 94 % of agricultural land and produce 75 % of entire agricultural products. Agricultural companies are managing less than 6 % of agricultural lands.

Average farm size is increasing, thus, in 2000 it accounted for 5.6 ha and 6.2 ha in 2003. In 2000, the average land size of agricultural companies was 288 ha.

Almost 60 % of the territory is covered in forests and, in the past few years, its share has been increasing. Because of forestation and urbanization, agricultural land is reducing. In the past decades, about 140,000 ha of land have been overgrown with forests. This process is most intense in southern and western Slovenia.

	Group	of the land	categories		seed	seed	seed	seed	seed
	Applicable agriculture area	Permanent plantation	Permanent grass area	Fields and gardens	Grains	Potato	Garden vegetables	Industrial plants	Feeding stuff
Agriculture farms	29.621	4.456	4.581	20.583	16.012	152	/	1.854	2.205
% of all	5,82	15,08	1,49	12,03	15,72	1,7	/	15,16	5,1
Family farms	479.347	25.209	303.615	150.524	85.853	8.800	3.153	10.375	41.035
% of all	94,18	85,3	98,51	87,97	84,97	98,3	100	84,84	94,9
Total	508.958	29.555	308.196	171.107	101.85	8.952	3.153	12.229	43.240

Table 2. Groups of land categories and seeds in the year 2000 (in hectares)

The most important focus of Slovene agriculture is livestock breeding. Its share in final agricultural production in 2000 was 71.9 %. The main branch of Slovene livestock is cattle farming which encompasses more than one third of production, poultry farming represents 12 % and pig farming 11 %. Sheep farming has been rapidly increasing in the past few years. Other structural shares of agricultural production in 2000 are: farming 14.1 %, fruit growing 7.1 % and winegrowing 6.9 %. In the past years, an increase of olive groves has been noted.

3. Plant protection products and registered active substances in the Republic of Slovenia

Each year, a list of registered plant protection products is published in the Official Gazette of the Republic of Slovenia. On the list from January 2004, there are 212 active substances that are registered for use and 372 registered plant production products. Non-active substances, such as exscipients and growth regulators, are also on the aforementioned list. Figure 1 shows the 372 registered plant protection products in groups.

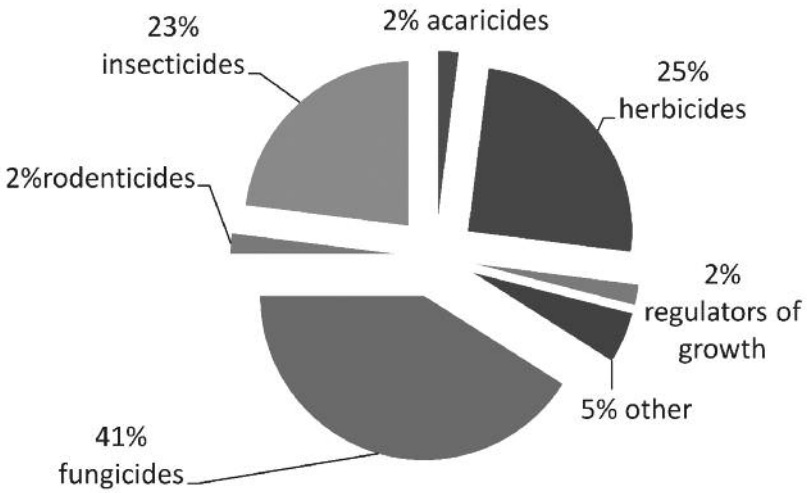


Figure 1. The 372 registered plant protection products in groups.

Plant protection products	Number of registered plant protection products
Acaricides	7
Fungicides	151
Herbicides	94
Insecticides	85
Regulators/activators of growth	7
Rodenticides	9
Other pesticides	19

Table 3. Number of registered plant protection products by categories

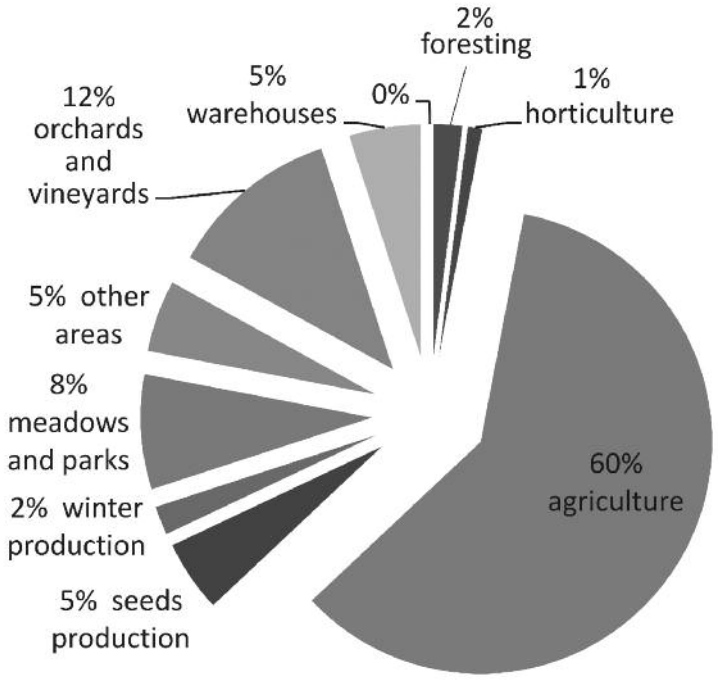


Figure 2. The manner of using of plant protection products

Groups of plant protection product	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Insecticides on the basis of pyrethroids	874	2.341	1.034	884	592	758	789	717	638	580
Insecticides on the basis of chlorinated hydrocarbons	1.612	2.029	0	1.870	0	1.837	1.577	620	188	231
Insecticides on the basis of carbamates	1.248	893	607	1.239	291	267	55	59	49	1.906
Insecticides on the basis of phosphoric compounds	33.656	30.081	28.272	28.474	24.566	22.834	24.288	22.943	11.142	7.925
Other sorts of insecticides	60.576	45.561	79.545	86.074	74.439	71.421	83.282	82.124	30.170	58.652
INSECTICIDES TOTAL	**97.966**	**80.905**	**109.457**	**118.540**	**99.888**	**97.116**	**109.990**	**106.463**	**42.187**	**69.294**
Inorganic fungicides on the basis of copper	147.873	124.448	136.907	112.656	106.183	112.036	88.193	21.394	53.050	55.568
Other inorganic fungicides	346.513	389.787	437.455	388.880	716.723	455.508	361.958	331.080	427.609	400.262
Fungicides on the basis of dithiocarbamates	228.283	240.484	250.292	222.941	178.449	238.184	203.261	182.364	176.602	171.643
Fungicides on the basis of benzimidazoles	2.720	3.393	923	1.510	1.091	1.426	934	819	780	447
Fungicides on the basis of diazoles and triazoles	11.311	10.347	7.553	7.637	6.964	7.971	8.750	9.237	11.533	9.991
Fungicides on the basis of diazines and morpholines	10.253	6.761	6.141	5.764	6.058	5.689	6.277	5.969	8.961	6.921
Other sorts of fungicides	95.641	157.498	97.416	103.656	99.020	146.918	147.908	137.834	168.798	149.691

FUNGICIDES TOTAL	**842.594**	**932.718**	**936.687**	**843.044**	**1.114.48**	**967.733**	**817.281**	**688.697**	**847.333**	**794.522**
Herbicides on the basis of phenoxyphytohormones	36.644	38.215	28.675	31.063	26.138	23.016	28.100	15.753	16.335	12.888
Herbicides on the basis of triazines	80.815	104.990	68.312	48.935	31.691	32.022	33.238	26.467	26.106	23.464
Herbicides on the basis of amides	109.452	55.983	98.606	82.133	78.084	97.889	84.541	81.570	83.369	74.204
Herbicides on the basis of carbamates	1.617	1.018	875	2.322	994	1.681	598	2.992	7.175	9.075
Herbicides as derivatives of dinitroaniline	24.462	23.642	30.930	25.955	23.129	25.743	20.526	14.098	11.425	7.260
Herbicides on the basis of urea derivatives	30.719	31.149	27.070	32.823	20.149	21.582	18.598	15.376	10.301	9.560
Other sorts of herbicides	121.412	106.554	123.184	101.802	107.202	117.061	136.132	176.887	140.441	138.367
Herbicides as regulators of plant growth	3.412	4.343	7.329	7.004	3.776	798	154	852	1.240	1.114
HERBICIDES TOTAL	**408.532**	**365.894**	**384.981**	**332.038**	**291.164**	**319.791**	**321.887**	**333.995**	**296.393**	**275.932**
Rodenticides	58.533	5	5	2	2	2	1	2	2	1
Others	60.484	18.746	40.797	67.016	25.194	29.325	31.821	26.064	32.237	23.125
OTHERS TOTAL	**119.017**	**18.751**	**40.802**	**67.019**	**25.196**	**29.327**	**31.822**	**26.066**	**32.239**	**23.125**
TOTAL OF TOTALS	**1.468**	**1.398**	**1.471**	**1.361**	**1.530**	**1.413**	**1.280**	**1.155**	**1.218**	**1.162**

Table 4. Selling survey of plant protection products on the market in the Republic of Slovenia between 1997 – 2009 (in kg of active substances)

Situation as regards the sale of plant protection products in the Republic of Slovenia between 1997 and 2007

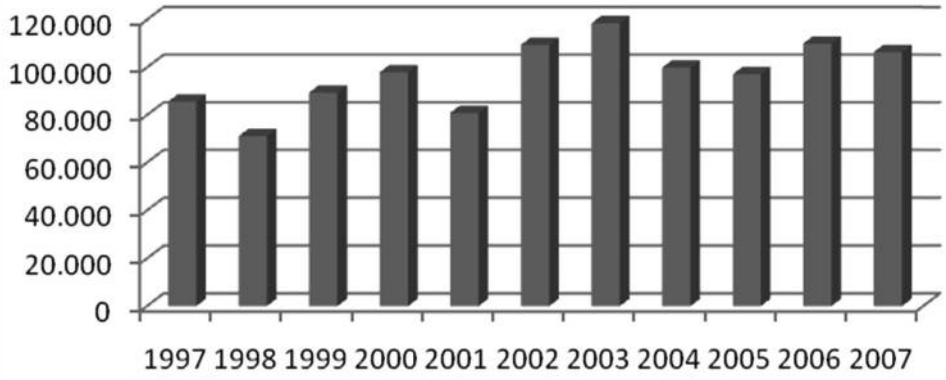


Figure 3. Sales of insecticides in the Republic of Slovenia 1997–2007 (in kg of active substance)

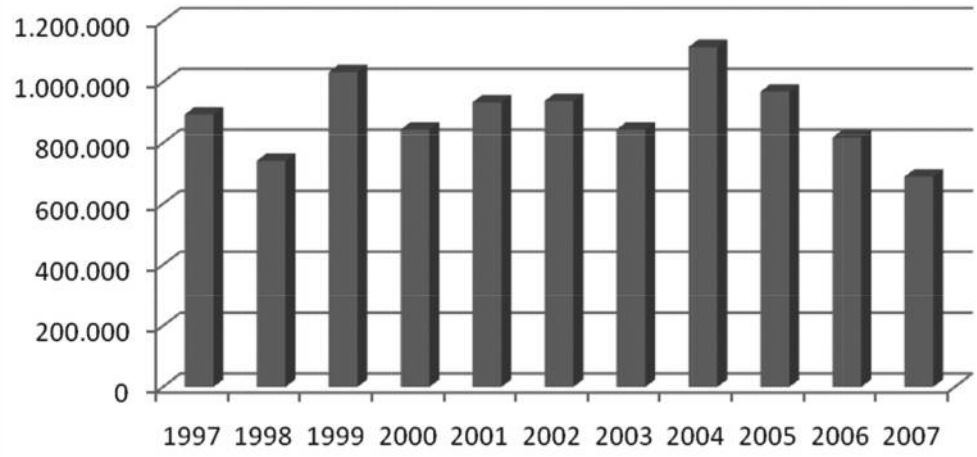


Figure 4. Sales of fungicides in the Republic of Slovenia 1997–2007 (in kg of active substance)

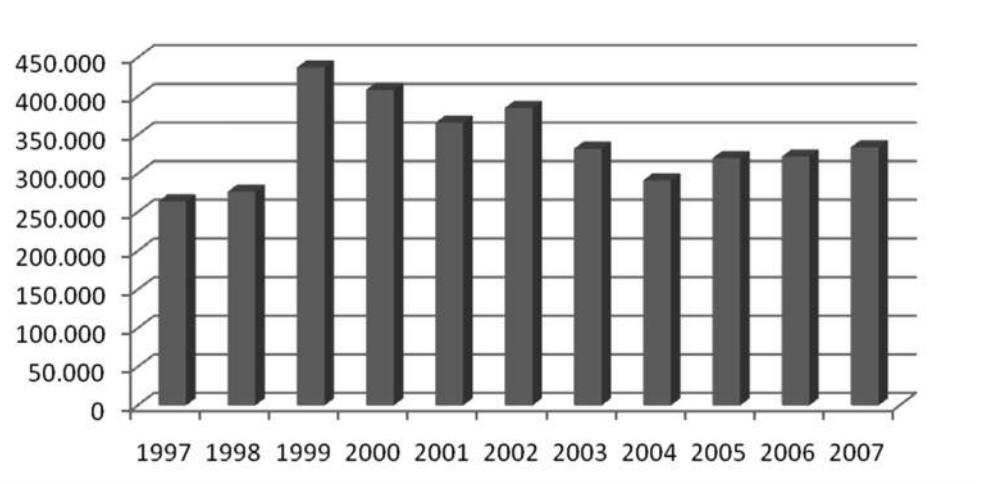
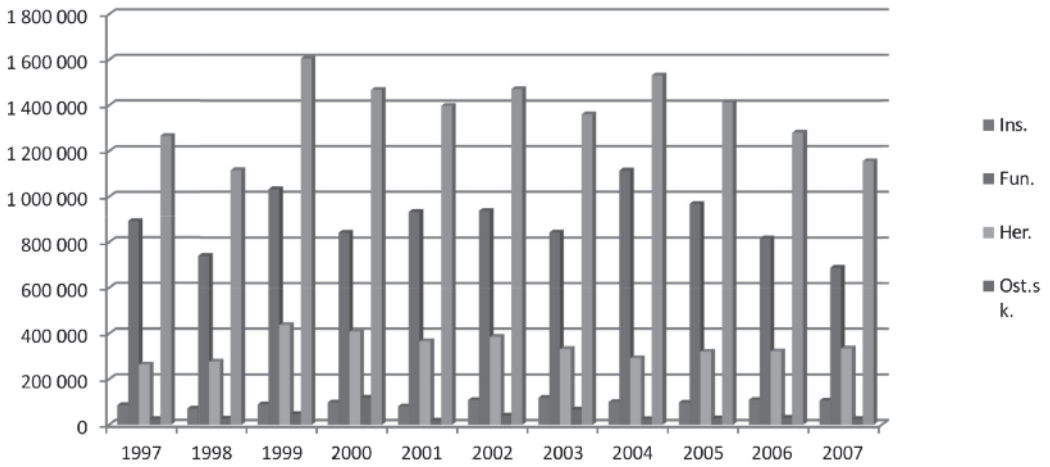


Figure 5. Sales of herbicides in the Republic of Slovenia 1997–2007 (in kg of active substance)

Figure 6. Sales of all plant protection products in the Republic of Slovenia 1997–2007 (in kg of active substance)



Between 1995 and 1999 the use of plant protection products on family farms increased from 968 tonnes to 1417 tonnes.

Unit	1990	1995	1997	1998	1999
Total (t)	2,212	1,495	1,452	1,526	1,602
Fungicides and bactericides (t)	1,045	693	694	839	886
Herbicides (t)	634	418	478	428	432
Insecticides (t)	417	260	180	154	192
Other pesticides (t)	116	124	100	105	92

Table 5. indicates the increased use of all plant protection products from 1990 to 1999 by type (fungicides and bactericides, herbicides, insecticides and other pesticides).

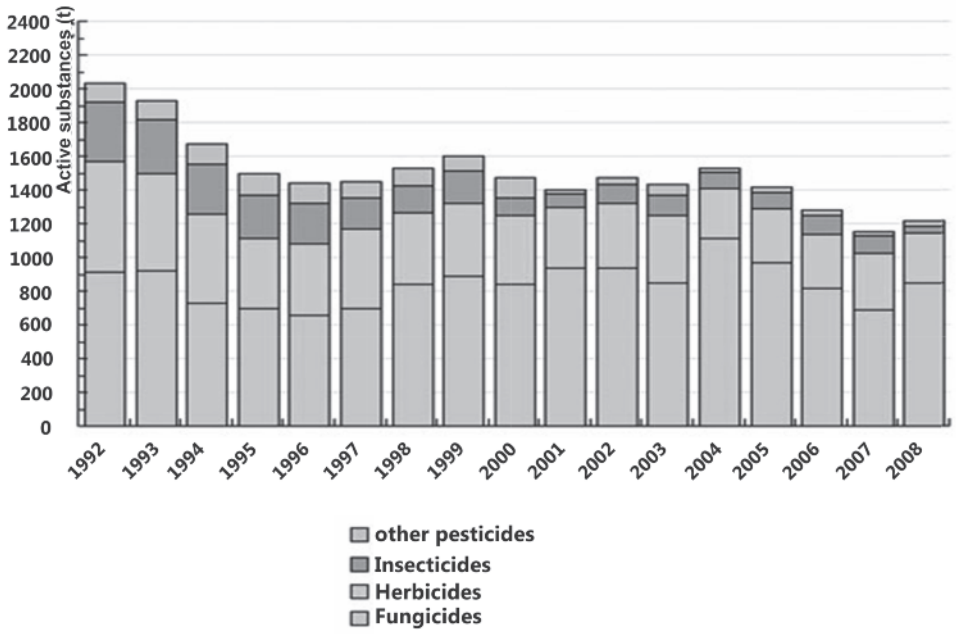


Figure 7. illustrates the sale of plant protection products in the Republic of Slovenia from 1992 to 2004 in active constituent kilograms

Unit	2000	2001	2002
Total (kg)	1,468,110	1,398,268	1,471,927
Fungicides	842,594	932,718	936,687
Herbicides	408,532	365,894	384,981
Insecticides	97,966	80,905	109,457
Other pesticides	119,017	18,751	40,802

Table 6. Total assumption of plant protection products from 2000 to 2002

In 2001, plant protection products registered in the Republic of Slovenia contained 215 active constituents. The method of applying these products is important, as well as the quantity. In 2001 there were nine authorised organisations registered with the Ministry of Agriculture, Forestry and Food to test devices for the use of plant protection products on the ministry's behalf. These organisations performed 3668 inspections (2382 inspections of sprinklers, 1277 inspections of spraying and sprinkling devices, and 9 inspections of motor sprayers and sprinklers), producing 3614 written reports on inspections performed.

The annual consumption of plant protection products on farms totalled 3.4 kg/ha of cultivated land. The highest use is on hilly lands – 9 kg/ha, much less elsewhere: 2 kg/ha on plains, and 1 kg/ha in highlands and Karstic land. Half of all agricultural holders used up to 1 kg/ha of plant protection products. Agricultural holders used 110 different plant protection products, with eight products of particular note by quantity: Sulphur-based preparations, Primextra, Dithane, Dual, Ridomil, Polyram, Antrazine and Radazin. Five are fungicides, and three are herbicides.

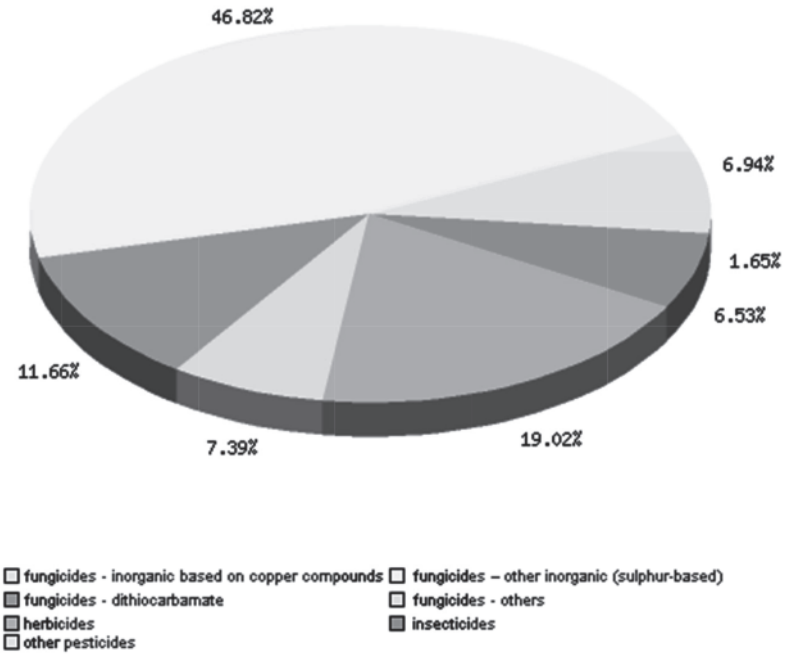


Figure 8. Proportion of sales for plant protection products in the Republic of Slovenia for 2004

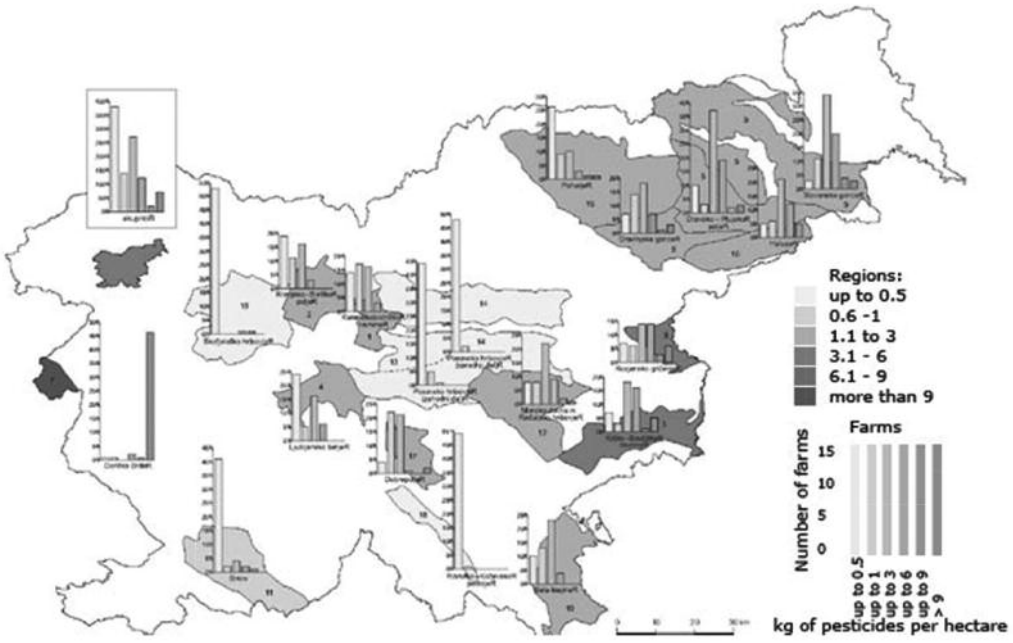


Figure 9. illustrates the use of plant protection products by Slovenian region

A major problem for farmers on family farms is a lack of information and a lack of knowledge regarding sprinkling on cultivated land. Thirteen per cent of farmers simply act according to their own experiences, 20 % of farmers act according to their own experiences and advice from specialists, with approximately half following the instructions from producers and sellers of plant protection products. Only 78 % of private farmers answered correctly when asked about the expiry date for plant protection products; 31 % of farmers on family farms did not use personal protection equipment when sprinkling, 17 % used protective clothing, and 17 % used just a mask. Approximately one tenth of private farmers disposed unused plant protection products by pouring those into land or running water.

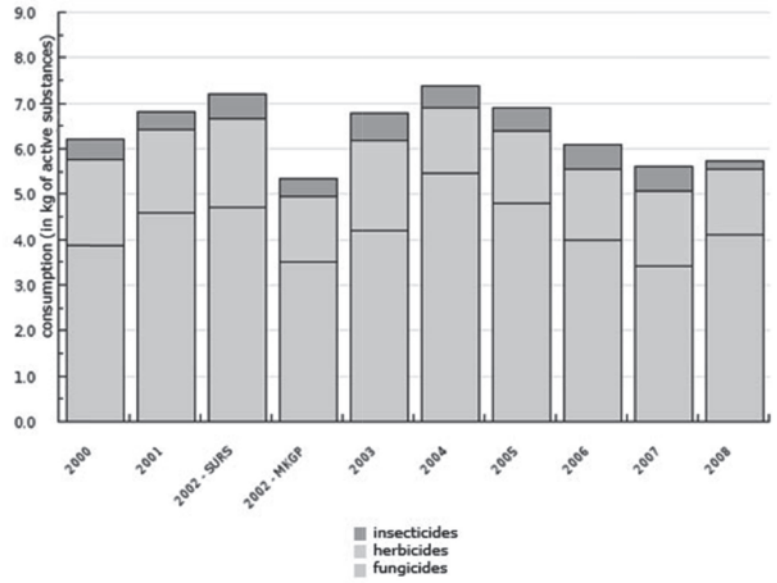


Figure 10. illustrates the consumption of plant protection products per hectare of cultivated land in Slovenia.

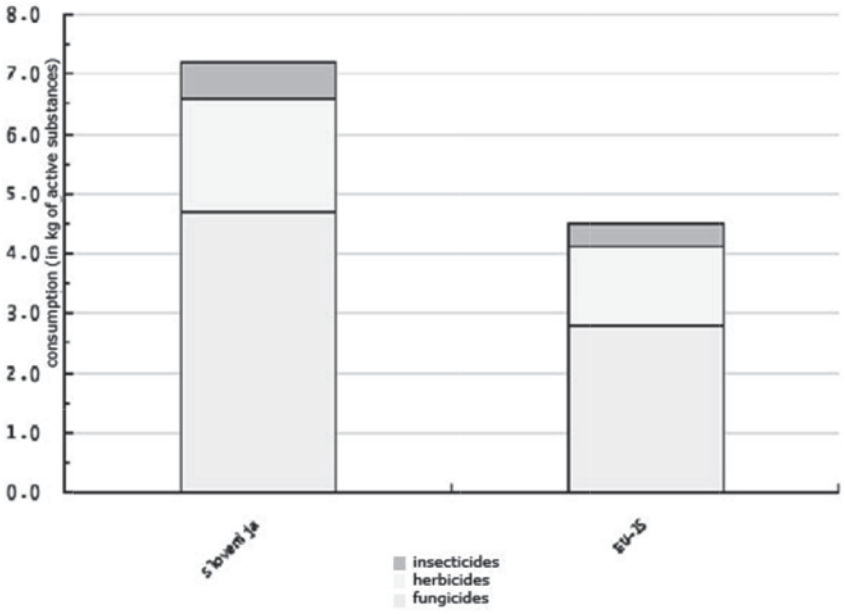


Figure 11. illustrates the consumption of plant protection products per hectare of cultivated agricultural land in the European Union (EU-15) in 1999 and in Slovenia in 2002

Use of plant protection products has been relatively constant in the past few years with some minor fluctuations. After 2004, when the use of plant protection products increased somewhat unexpectedly compared to 2002-2003 because of fungicides, in the past years the reduction trend has been continuing. In 2007 we recorded the lowest plant protection products usage since the beginning of monitoring. In 2008, the usage was again slightly higher but still considerably lower than in previous years. Based on plant protection products usage structure, fungicides still represent more than two thirds of all plant protection products in Slovenia and, among them, the largest share is represented by sulphur based inorganic fungicides which are less aggravating for the environment.

From 2000 to 2007, the use of plant protection products per hectare of agricultural land had been slightly increasing until 2004; from 6.8 kg of active substances per hectare in 2000 to 7.5 kg in 2004 and it stepped back to 6.9 kg in 2005. In 2006 and 2007, aggravation of agricultural land additionally decreased for more than one kg, to 5.74 kg of active substances per hectare which is the lowest figure to date or in the time since we are officially monitoring the sales of plant protection products. In 2008, the usage increased to 5.9 kg per hectare. In the past three years, usage of fungicides has been reduced the most and they still represented more than two thirds (69.5 %) of all used plant protection products in 2008 in Slovenia. Compared to the past three years, the use of herbicides is again lower and can be compared to 2004 with 1.44 kg per hectare. This is considerably less than during 2000-2003 when the usage had been 25 % higher in average. After seven years of fairly constant usage of insecticides, which was between 0.45 kg of active substances per hectare in 2000 to 0.53 kg in 2007, we have recorded over 50 % lower usage in 2008, accounting for only 0.2 kg per hectare. With professional use of insecticides, this must be largely the consequence of adverse weather conditions in the past year for pests to develop.

4. National monitoring of plant protection products in food

National food monitoring program represents an existing program of coordinated, regular and systematic monitoring of plant protection products remains in food and is one of the forms of official control (inspection). The purpose of the official control is efficient protection of public interests in the sense of ensuring customer protection and following the pesticide regulations.

National food monitoring program for plant protection products residue in food for 2008 with its detailed plan prepared by the Ministry of Health in cooperation with the Ministry of Agriculture, Forestry and Food. They are also responsible for legislation in the field of pesticide residue in food.

In 2001, residues of different substances were determined in the official food monitoring. Presence of pesticide residues up to maximum residue limits (MaxRLs) was spotted in 69 samples of foodstuffs (41.1 %) and in 33 samples of agriculture products (21.9 %). MaxRLs were exceeded in 1 % of foodstuff (1 sample bread) and in 5 % of agricultural products (8 samples, lettuce and potato) – Figure 12.

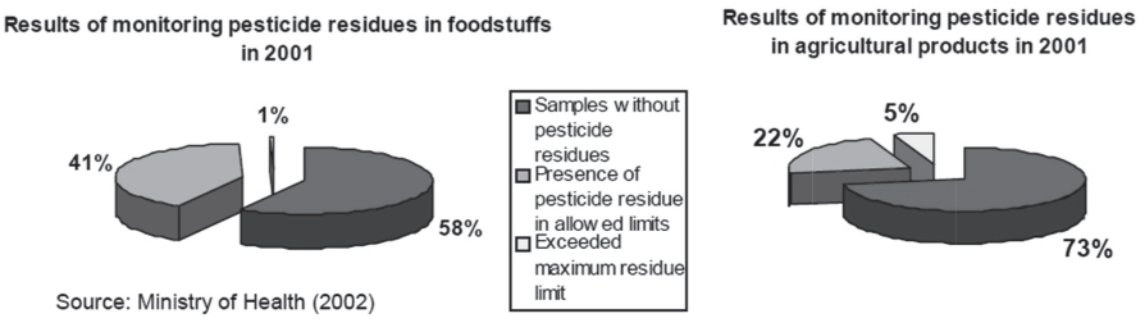


Figure 12. Pesticides residues in foodstuffs and in agricultural products in 2001

In 2008, 1297 samples of food in total were analysed, out of it 22 enforcement and 1275 surveillance samples. Enforcement samples included 2 samples of cereals, 6 samples of processed products of plant origin and 14 samples of vegetables, fruits and other plant origin. Surveillance samples included: 30 samples of animal products, 103 samples of baby food, 16 samples of cereals, 73 samples of processed products of plant origin and 1053 samples of vegetables, fruits and other plant origin. There were 730 samples without detectable residues, 547 samples with residues below or at EU-MinRL and 20 samples with residues exceeding the EU-MinRL (minimal risk level).

409 samples were originated from domestic produce, 563 from other EU Member States, 311 from Third Countries and 14 were of unknown origin.

Samples of animal products were analysed for the presence of up to 191 pesticides. From 30 surveillance samples, 28 (93,33 %) samples were without detectable residues and 2 (6,67 %) with residues below or at EU-MinRL.

Samples of baby food were analysed for the presence of up to 222 pesticides. From 103 surveillance samples 99 (96,12 %) samples were without detectable residues, 3 (2,91 %) with residues below or at EU-MinRL and 1 (0,97 %) with residues exceeding the EU-MinRL.

Samples of cereals were analysed for the presence of up to 192 pesticides. From 16 surveillance samples 11 (68,75 %) samples were without detectable residues, 3 (18,75 %) with residues below or at EU-MinRL and 2 (12,50 %) with residues exceeding the EU-MinRL.

Samples of processed products of plant origin were analysed for the presence of up to 196 pesticides. From 73 surveillance samples 57 (78,08 %) samples were without detectable residues and 16 (21,92 %) with residues below or at EU-MinRL.

Samples of vegetables, fruits and other plant origin were analysed for the presence of up to 196 pesticides. From 1053 surveillance samples 525 (49,86 %) samples were without detectable residues, 512 (48,62 %) with residues below or at EU-MinRL and 16 (1,52 %) with residues exceeding the EU-MinRL.

Organisation of monitoring programmes and sampling

Responsibilities

The competent authorities for the preparation of legislation in the area of pesticide residues in foodstuffs are the Ministry of Health in cooperation with the Ministry of Agriculture, Forestry and Food.

There are two authorities competent in the field of official control of pesticide residues in products of plant origin:

- Inspectorate for Agriculture, Forestry and Food is responsible for the control at the very first step of placing on the market of primary products by the primary producers. Trade with registered pesticides and their use is also a part of official control of Inspectorate for Agriculture, Forestry and Food.
- Health Inspectorate of the Republic of Slovenia is responsible for the control of all foodstuffs, including baby food and infant formulae, in all other stages of the production chain, including importation.

The national monitoring programme covers also some food of animal origin and the competent authorities for the control of pesticide residues in animal products are:

- Veterinary Administration of Republic of Slovenia is responsible for production, processing, packing, marketing and retail trade of non-pre-packed raw meat, a quaculture, milk and eggs (in 2008 wasn't involved yet) and
- Health Inspectorate of the Republic of Slovenia is responsible for pre-packed foodstuffs of animal origin at the retail level.

A detailed national pesticide monitoring plan, incorporating the EU co-ordinated monitoring programme, was prepared for 2008 by the Ministry of Health and the Ministry of Agriculture, Forestry and Food and was given in discussion, evaluation and confirmation to the Panel (established by the Minister of Health and

the Minister of Agriculture, Forestry and Food). The Panel comprises the representatives from the Ministry of Health, the Ministry of Agriculture, Forestry and Food, and the Phytosanitary Administration of the Republic of Slovenia, governmental and non-governmental consumer associations, official laboratories, National Chemicals Bureau, risk assessors and official control bodies.

Designing Programmes (priorities, targeting)

Commodities included into the monitoring programme are selected each year covering staple food, food included in EU coordinated programme, food offered on the Slovenian market, as part of national rolling programme and non-compliant commodities of previous year. The selection of pesticides to be sought is primarily influenced by pesticide use; potential for residues based on use pattern; toxicological profile of the pesticide; analytical capabilities.

Sampling: personnel, procedures, sampling points

Samples were taken in accordance with Commission Directive 2002/63/EC by the Inspectorate for Agriculture, Forestry and Food inspectors, Health Inspectorate of the Republic of Slovenia inspectors and contracting institution at different stage of the production, processing and distribution chain, but mainly at wholesale /retail.

Enforcement action

Follow up activities were always carried out when infringements were found (additional inspection including sampling when sample available, taking proper official measures to prevent public health, including communication of information).

5. Legislation of the Republic of Slovenia in the field of management with plant protection products

The Plant Protection Products Act, which was harmonised with the requirements of the basic European Community Directives (91/41/EEC and 79/117/EEC Directives), lays down which phyto-pharmaceutical agents were registered in the Republic of Slovenia and, thereby, approves for use. The compliance of an individual agent shall be assessed by authorised inspectors. On the basis of their opinion, the Committee for Phyto-pharmaceutical Agents decides on the registration agents. Pursuant to the conclusions of the Committee and with the consent of the Ministry of Health, the decision on registration or its refusal shall be issued by the Phytosanitary Administration of the Republic of Slovenia. Prior to its marketing, each phyto-pharmaceutical agent should be adequately classified, packed, labelled and accompanied by an information leaflet in accordance with the regulation.

In accordance with the Plant Protection Products Act, pesticides can be used by a legal and physical person in agriculture and is a market producer only if he fulfils the terms on education or professional qualification and is using plant protection products with appropriate devices for plant protection products use. Detailed requirements on plant protection products user qualification is specified in the Regulation on Professional Training and Examination of Phytomedicine (Official Gazette of the RS, no 36/02, 41/04, 17/05 and 92/06). The buyer or the user of pesticides must attend a course, acquire a Certificate of Knowledge in Phytomedicine and, based on attendance in refresher courses, regularly renew it. At the same time, the user of pesticides must follow all regulations of the Regulation of User Obligations for Plant protection products (Official Gazette of the RS, no 62/03, 5/07, 30/09) such as record keeping for using products, appropriately managing waste, meeting demands on protecting of water, bees, limitations regarding treating in urban areas and other. The user must also follow all instructions and warnings, stated on the instruction manual. Many users find current information on the Phytosanitary Administration website.

Marketing of plant protection products may be performed by legal or natural persons that have their head offices in the EU member state and are entered in the registry.To enter the registry, they should fulfil the prescribed conditions, which include the provision of facilities, equipment and staff, record keeping and delivery of the report on marketing plant protection products.

6. Instructions for proper packaging handling and management of obsolete plant protection products in the Republic of Slovenia

Since there is some confusion in the government regarding the rules in managing plant protection products packaging waste and with plant protection products waste, we have prepared some clarification and guidance regarding these wastes.

Regulations that cover this area are:

- Decree on Waste Management (Official Gazette of the RS, no 34/08; below Decree on Waste),
- Decree on Management of Packaging and Waste Packaging (Official Gazette of the RS, no 84/06, 106/06, 110/07; below Decree on Waste Packaging) and
- Decree on Waste Plant Protection Products Containing Hazardous Substances (Official Gazette of the RS, no 119/06; below Decree on Waste from plant protection products).

Waste from plant protection products packaging

Correctly cleaned waste from plant protection products packaging is returned in accordance with the Decree on Packaging. The decree is completely monitored by inspectors, competent for the protection of the environment.

We distinguish two options for returning waste from plant protection products packaging which depend on where the packaging was produced:

- Agricultural activities (companies, farms);
- Other users (gardeners).

Waste from plant protection products packaging that is created by performing agricultural activities:

1. Plant protection products waste packaging that is created by performing agricultural activities in not municipal waste (point 7, paragraph 1 of Article 3 in the Decree on Packaging) and, according to article 15 of the Decree on Packaging, it is forbidden to leave or give it to public services as mixed municipal waste or as separate fraction of municipal waste.
2. Plant protection products waste packaging that is not municipal waste must be taken by the distributor (that is the store) free of charge when the end user (farmer, company) wants to return it (Article 23 of the Decree on Packaging) – that is throughout the year.
3. The distributor (store) submits waste packaging to Company for Waste Packaging Management.
4. End users (farmer, company) can return waste packaging free of charge to any Company for Waste Packaging Management waste collection facilities – Company for Waste Packaging Management cannot demand contract signature or similar. End users can make an arrangement with Company for Waste Packaging Management for removal of the waste packaging from their courtyard (not free of charge).
5. Plant protection products waste packaging must be properly cleaned and emptied and must not contain obsolete plant protection products which means that it should be properly cleaned and emptied in the sense of good agricultural practice – plastic bottle must be rinsed with water several times and the content poured into sprayer, bags and boxes must also be properly cleaned around the corners.

Plant protection products waste packaging that is created by other users (gardeners):

1. Plant protection products waste packaging that is created by other users us municipal waste and is left to public services as separated waste packaging.
2. Public Services submit the packaging to Company for Waste Packaging Management.
3. End user (individual) can return waste packaging free of to collection facilities, managed by Company for Waste Packaging Management – they must not demand contract signature or similar.
4. Plant protection products waste packaging must be properly cleaned and emptied and must not contain obsolete plant protection products which means that it is properly cleaned and emptied in the sense of good agricultural practice – plastic bottle must be

rinsed with water several times and the content poured into sprayer, bags and boxes must also be properly cleaned around the corners.

Waste from plant protection products

- Waste from plant protection products cannot be left to collectors, we can only return them in the presence of collectors' staff and we can ask for appropriate acknowledgement of the fact that waste plant protection products was returned.

Waste from plant protection products that contain hazardous substances.

Management regulations are specified with the Decree on Waste. Execution of the Decree is monitored by inspectors, competent for environment protection, except for articles 7 and 8, which are monitored by the Agricultural Inspection Service.

Delivery points for waste from plant protection products (paragraphs 1 and 2 of Article 7 of the Decree on Waste):

- Individual distributors (stores) at sale outlets where special container or containers are prepared for separate collection and temporal storage of delivered waste plant protection products.
- Individual distributor or several distributors joined who organize delivery point of waste plant protection products, but the location must not be more than 5 km from the individual sale outlets of individual distributor (there are not such locations at the moment).

There are two possibilities to deliver waste plant protection products that depend on whether the waste from plant protection products originates:

- in agricultural activities (companies, farms),
- in other users (gardeners).

Waste from plant protection products that is created by agricultural activities:

- When supplying plant protection products, the distributor (store) must provide free submission of waste plant protection products for end users if it qualifies as waste from agriculture and the end user wants to submit it (paragraph 1 of Article 7 of the Decree on Waste from plant protection products).
- According to Article 4 of the Decree on Waste from plant protection products, waste from plant protection products which is created by agricultural activities is not municipal waste and is not allowed to be submitted to Public Services as mixed municipal waste.
- Distributor (store) takes waste from plant protection products from the end users (farmer, company) and stores it in special containers.
- Distributor (store), who takes waste from plant protection products at sale outlets, must confirm the delivery of waste plant protection products on user's request (paragraphs 3 and 4 of Article 7 of the Decree on Waste from plant protection products).
- The distributor (store) submits waste from plant protection products to the holder of the joint plan SLOPAK* or EKOL* who perform collection of waste from plant protection products in accordance with the Overall Plan for Waste from plant protection products Management, registered in proper records at the end of 2009.

  * two official companies with state license for collection of waste from plant protection products.

Waste from plant protection products which is created by other users (gardeners):

- Waste from plant protection products which is created as municipal waste (i.e. by gardeners) is municipal waste and the user submits them to Public Services as a new hazardous fraction or returns them at collection facilities, organized by Public Services.
- Public Services submit waste to SLOPAK or EKOL (see point 5 above).

Tasks of distributor (store) that are related to taking over waste from plant protection products and informing end users on possibilities of free

return of waste from plant protection products.

- Distributor (store) which takes over waste from plant protection products at sale outlets must ensure that end users have the possibility to return waste from plant protection products at least in the amount of time when plant protection products is being sold (paragraph 3 of Article 7 of the Decree on Waste from plant protection products) – that is throughout the year.
- Distributor (store) must inform the Ministry of the Environment on the manner, time and place of returning waste from plant protection products with a special form (application form for distributor on manner, time and place of returning waste from plant protection products).
- Distributor (store) must place a notification in a visible area for plant protection products buyers regarding possibilities of free waste from plant protection products submission (paragraph 1 of Article 8 of the Decree on Waste from Plant Protection Products).

7. Conclusion

The article presents the available data in the field of consumption plant protection products in the last twenty years in the Republic of Slovenia. After separation from the former Yugoslavia, the Government of the Republic of Slovenia was put in a very unpleasant situation to change the legislation in the field of using plant protection products, management of obsolete pesticides, national monitoring of plant protection products and packaging of plant protection products.

It is evident that during some years the used amounts of plant protection products increased but in the last years, after the new legislation acts were accepted by the National Parliament, the situation has improved and the use of plant protection products has decreased.

The most important result is the effort that the official state institutions begin to protect the environment in Slovenia through inspections and punishment.

The most notable progress in Slovenian agriculture, packaging, management of plant protection products and treatment with obsolete pesticides are three new legislation acts:

Decree on Waste Management (Official Gazette of the RS, No. 34/08; below Decree on Waste),

Decree on Management of Packaging and Waste Packaging (Official Gazette of the RS, No. 84/06, 106/06, 110/07; below Decree on Waste Packaging) and Decree on Waste from Plant Protection Products Containing Hazardous Substances (Official Gazette of the RS, No. 119/06; below Decree on Waste from Plant Protection Products).

We hope that the problems with obsolete pesticides will finally be solved in the near future. Lately, our competent authorities have started strictly controlling the implementation of the above mentioned acts and they have finally begun to punish the law-breakers.

8. References

1. http://www.o-mc.kr.edus.si/proj_otroci/2000/bitenc_M/Slovenia_map.htm
2. Statistical Office of the Republic of Slovenia (2003), EU Agricultural Statistics (2000).
3 .http://www.echo-o.org/pdf.files/ Poročilo-Kmetijstvo and use pesticides in Slovenia 2004_PAN_ECH02.pdf
4. Slabe, Anamarija. (2001). Organic farming in Slovenia. Accessible on: http://www.organic-europe.net/country_reports/slovenia/default.asp [8.12.2003]. Ministry of Agriculture, Forestry and Food of the Republic of Slovenia, Environmental programme ofslovenian agriculture. Accessible on: http://www.gov.si/mkgp/slo/skop/slovenija_in_slovensko_kmetijstvo/2_3.html [7.12.2003].
5. Ministry of the Environment and Spatial Planning, Report on environmental situation-agriculture 2001.
6. Statistical Office of the Republic of Slovenia (2003). Statistical Yearbook RS 2003. Accessible on:http://www.stat.si/eng/ pub.asp [7.12.2003].
7. Ministry of Agriculture, Forestry and Food of the Republic of Slovenia, Phytosanitary Administration. Personal communications, January 2004.
8. Pesticide Use in Slovenia, Pesticide Action Network Germany in cooperation with Association Agrolink 2004, Principal Author: Organisation ECHo ecology cultural diversity health, Edited: Susanne Smolka.
10. Programme for the Prevention of Pollution of the Aquatic Environment caused by Dangerous Chlorinated Hydrocarbons from Diffuse Pollution Sources, part of the National Environmental Protection Plan, Official Gazette RS 83/99.
11. Environmental indicators in Slovenia, Use of Plant Protection Products, Institute of Agriculture of Slovenia, Ljubljana 2006.
12. Irena Rejec Brancelj, Agricultural Environmental Pollution in Slovenia, Landscape Aspects of Agricultural Pollution from Dispersed Sources, Institute of Geography, Ljubljana 2001.
13. Waste Water Monitoring Programme, Ministry of the Environment and Spatial Planning, Ljubljana 2004 Official Gazettes of the Republic of Slovenia.

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 1970th and 1980th. 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, 12th, 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 γ-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 1×10-6 mg/L to 1×10-5 mg/L. Starting from 2007, concentration increased to 1×10-3 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 α, β, γ- and δ-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 β-, γ- and δ-HCH, Endrin, 4,4-DDD;
- in groundwater samples from observation wells at Slonim underground storage. Detected pesticides were represented by α- and β-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 Zatish'e village (5 kilometers from the storage). Detected pesticides were represented by α-, β-, γ- and δ-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 α-, β-, γ- and δ-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 β- and δ-HCH;
- in groundwater samples from observation wells at Postavy underground storage. Detected pesticides were represented by α-, β-, γ- and δ-HCH, Heptaclor, 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.

THE IMPLEMENTATION OF THE COMMITMENTS THE STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS IN THE RUSSIAN FEDERATION IN LIGHT OF RECENT DECISIONS TAKEN AT COP-5 OF THE STOCKHOLM CONVENTION

Oksana Tsittser
The Ministry of Natural Resources and Environment of the Russian Federation

10th anniversary of the Stockholm Convention on POPs was celebrated in 2011. Russia signed it in 2002 and ratified the Stockholm Convention in June 27, 2011. The Ministry of Natural Resources and Environment of the Russian Federation is a designated authority for Stockholm Convention on POPs implementation in the Russian Federation. In preparation for action to implement the Stockholm Convention on POPs the Russian Federation with the support of GEF has elaborated a draft National Plan for the Stockholm Convention on POPs (It is under discussion).

The main focus will be made on the implementation of measures to eliminate stockpiles of organochlorine pesticides, including DDT, PCBs stockpiles, as well as on the search and application of best available technologies and best environmental practices and also on identification and POPs quantification.

The suggestions of POPs COP-5 and COP-5 in the RK of enhanced action on the synergy of international agreements of the chemical unit (Basel, Rotterdam, Stokgolskoy conventions and other agreements) will be taken into account, including:

- strengthening the information exchange, technical assistance, and additional financial resources engagement;
- adoption of measures to improve cooperation and coordination among the Basel, Rotterdam and Stockholm Conventions.

In addressing pesticide problems the focus should be made on:

- assessing the need for DDT (if such demand is necessary)
- final disposal of DDT
- searching and implementation of environmentally friendly alternatives
- finding and sharing best available technologies by the parties for the destruction of pesticide wastes in cooperation with the Basel Convention, the Alliance for DDT and the Network for the Elimination of polychlorinated biphenyls, which is planning the publication of the journal Networks and bonuses for the most active participants
- preparation by the parties, relevant international and nongovernmental organizations, including regional centers of the information about their experience in the implementation of guidance on technical assistance and transfer of environmentally sound technologies
- Parties and others multi -stake holders information sharing of agro-ecological knowledge, experience, strategies and practices that may be used as alternatives to persistent organic pollutants in the number of pesticides

In order to optimize the implementation of commitments under the Stockholm Convention in the Russian Federation, it is important to:

- Bring all available information about the decisions and proposals to the Conference of the Parties and the Secretariat to interested organizations and institutions in Russia
- Take active steps to develop a National Implementation Plan for the Stockholm Convention on POPs to the short-term, medium-term and long-term prospects.

UKRAINE: LATEST STATUS ON ENVIRONMENTAL EMERGENCY SITUATION IN KALUSH

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1. Background Information

1.1. The production of carbon tetrachloride (CTC) and ethylene tetrachloride (ETC) started in 1973 at the former Kalush Chemical and Metallurgical Industrial Complex. This waste was generated from the production of carbon tetrachloride and perochloroethylene at this plant, the plant having an estimated production capacity of 30,000 metric tonnes per year which produced hazardous solid waste containing over 90% of hexachlorobenzene (HCB) at a rate of 540 tonnes per year. It was estimated that up to 11,000 tonnes of HCB waste was stored at a dedicated storage site which was in operation until 2000.

1.2. At the same time, during the Soviet era, the Kalush mine was the largest producer of potassium salt in Ukraine and one of the largest in the Soviet Union. As the result of previous activity of the enterprise, there are large deposits of potassium salts (10 million m^3) conserved in the Kalush area and presenting a large environmental threat not only for local citizens, but also for the whole Dniester basin.

1.3. Nowadays the production has been stopped. JSC "Oreana" – former national chemical industry leader – has met the bankruptcy with the tax debt of more than 1,6 Bln. UAH. In the same time it owns the Daughter Enterprise "Kalush Potassium Plant" (KPP). Tailings as well as the Dombrovskiy open-cast mine and Novo-Golyn mine are shown on the KPP balance sheets.

Plan of the "Zone of Environmental Emergency Situation"

1.4 HCB storage is located in 6 km to the North-West from town of Kalush.

It had 10 sections. In sections 1-8 HCB was packed in steel drums (2/3 pure HCB and 1/3 soil) put one on another in 3 rows directly inside the soil. The height of soil "heat" is about 1

meter. No hydroisolation was done. In Sections 9 and 10 HCB was put into the soil in bulk, also without hydroisolation.

The HCB storage is crossed by high voltage power supply line, has few natural streams and ponds and is located higher than the town. Therefore, HCB was found in the ground waters directly inside the town (proved by EC-UN mission).

2. State Plan on reacting on the emergency situation

In the beginning of February 2010, President Yuschenko announced town of Kalush and few villages of Kalush District of Ivano-Frankivs'ka Oblast as the "Zone of Environmental Emergency Situation". As the result, the State plan for immediate response on this situation was created and approved by the Cabinet of Ministers. The plan foresaw the following measures:

- smoothing of the North board of the Dombrovskiy open-cast mine;
- construction of the brine pipeline from tailing #2 to Dombrovskiy open-cast mine;
- upcast of brines from the tailing #2 into the Dombrovskiy open-cast mine;
- export of 8500 MT of HCB from HCB storage.

The Cabinet of Ministers allocated about 400 Mln. UAH from the reserve fund for the implementation of these measures.

Strategically two other steps should follow the fulfillment of the first stage.

The second stage will have to foresee following steps:

- the recultivation of the tailings #1 and 2 with using of the material of the tailing dams;
- final exporting or possible local incineration of HCB;
- geophysical monitoring of the development of carst processes, and, based on these studies, creation of the plan of migration of habitants from the dangerous zones.

The third stage should determine what to do with the brines in the Dombrovskiy open-cast mine. There are still debates on this matter.

Position of one small group of scientists assumes the creation of a big lake there with fresh water on top and brines on the bottom of the quarry; the majority of the involved people consider this position being absolutely ridiculous. They believe that only the organization of production of potassium salts from the brines can save the whole situation and bring some feasibility to the project.

Choosing this strategic decision is quite important in order to understand what should be done as the emergency steps in the current situation.

3. Development of the situation

3.1 International Activity

3.1.1 A Joint United Nations – European Commission Environmental Emergency Response Mission has visited Kalush in March and has produced its recommendations in the report Technical Scoping Mission, Kalush Area, Ukraine, March 2010, in May 2010.

3.1.2 In the end of March 2010, the international conference took place in Kalush with the participation of Ukrainian authorities, Moldavian diplomats, Spanish, German and local experts.

3.1.3 In June 2010, the Waste Governance – ENPI East produced the report "Terms of Reference, Kalush Area, Ukraine" where a road map was described how to deal with the project.

3.1.4 The RT, devoted to Kalush environmental emergency situation, was organized by the EU-funded PPRD-East project (as a part of emergency assistance component) and National Institute of strategic studies of Ukraine on the 30th-31st of August 2011.

The participants of the RT were the Ukrainian officials, the representatives of EC and UNDP, PPRD-East Experts, including Mr. John Vijgen, Advisor to the Ambassador of Moldova to Ukraine.

The main idea of the RT was to fix the current situation and find out the ways of solving of the whole complex of Kalush environmental problems.

3.2 Local Activity

3.2.1 In order to fulfill the job, called as "Conservation of Dombrovskiy open-cast mine" the company has been chosen by not clear and transparent procedure. Due to various number of reasons, first of all heavy rains in Kalush area, they managed only to complete about 40% of smoothing of the North board of quarry and constructed about 80% of brine pipeline (according to the first stage of State plan, mentioned in Par. 2) practically in the end of the year. Also due to the heavy raining the level of the water in the open-cast mine became much higher (NB: The average annual water inflow into the open-cast mine is about 3.2 Mln. Cubic meters. In 2010 the qty of inflowed precipitation and ground water was definitely higher). Finally, about 40 Mln. UAH from the State Plan, mentioned in Par. 2, were diverted from "Conservation…" to "Purchase of Medical equipment". Such state-of-the-art equipment, for ex. MRT diagnostics, was bought and successfully installed in Kalush, but the major construction jobs were suspended.

3.2.2. In April 2010, the information appeared about illegal disposal of different hazardous wastes on board of the Dombrovskiy open-cast mine, including animal waste and toxic wastes, probably HCB. There was no official reaction on lots of letters and articles in the papers. During the rain period in Summer – Autumn of 2010 these boards have already been flooded, so it is nearly impossible to prove or dispute this information. However, the presence of HCB at this location creates an additional serious danger.

3.2.3. Due to slow construction works and weather conditions, the tailing #2 was nearly full and the risk of its overflow was quite high. As the result the local authorities made the only right decision and pumped out brines by existing in that time pipeline into the Golyn mine. By this measure they reduced the water level in the tailing and managed to have the reserve of about

Landslips on the North Board of Dombrovskiy open-cast mine

500.000 cubic meters of precipitation water (about 50 cm in height) for the 2011.

3.2.4. The Spanish owned "Tradebe" Plant, located in Southampton (UK), was chosen as the partner for incinerating of 8,500 MT of HCB. But after start of the excavation of the HCB landfill due to corrosion and decay of drums the estimated qty of HCB together with contaminated soil turned out to be up to 22,500 MT. 8.500 MT of HCB together with drums and soil were packed in big bags and transported by railway to 2 Black-Sea ports – Nikolaev and Oktyabr'skiy. From there by 3 ships the waste was delivered to UK.

3.2.5.President ordered to clean Ukraine from all toxic wastes by 2012.

3.2.6.The Israelian Company S.I. Group Consort has been chosen as the National Operator for exporting the obsolete pesticides nationwide, MNCB from Gorlovka and HCB from Kalush.

3.2.7.The State of Ukraine allocated the record amount of money for fulfillment the ambitious task of the President.

3.2.8.During the last 4 months of 2011 Israelian company S.I. Group Consort exported outside of Ukraine:

- 10477.74 MT of obsolete pesticides from all regions of Ukraine
- 9485.43 MT of HCB (Kalush)
- 2350.00 MT of MNCB (Gorlovka)

Total value of exported toxic wastes was 22317.17 MT. This is one of the most impressive examples of cleaning the particular country from obsolete chemicals within one year. All the works were financed directly by the State of Ukraine.

During 2012, the State of Ukraine is planning to make the proper inventarization of contaminated soils and to clean the area from HCB. The international and local experts will be involved in all inventarization and valuation works.

On the 17th of April, the Government of Ukraine has allocated 120 Mln. UAH (15 Mln USD) for the final exporting of HCB out from Kalush. The IWG will start supervising the site works from the middle of June.

THE WORLD BANK PROJECT OUTPUTS AND STATUS OF THE STOCKHOLM CONVENTION RATIFICATION IN THE REPUBLIC OF UZBEKISTAN

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Abstract

Obsolete pesticide (OP) stockpiles in the Former Soviet Union (FSU) countries remain a serious and widely recognized long-term risk for human health and the environment. Because of the fact that obsolete pesticides are mostly persistent organic pollutants, they are also very dangerous in a global level for public health and wildlife. It is very important to take urgent decisions on disposal of obsolete pesticide stocks, as the associated consequences are increasing.

The main goal of the project on technical study of obsolete pesticides that has been carried out in three Central Asian republics was the removal of obsolete stocks. Within the project, the training organised in the polygon addressed issues of safe waste management and risk assessment in the priority sites. Recommendations on facilities with different methods of removal of burial sites, in short and long term, have been presented by the experts.

Cleaning up of soil, contaminated by pesticides, is an important task for environmentalists, microbiologists and specialists in agriculture. The center "Healthy soil" established in the republic is specializing in the diagnosis of the soil. Scientifically substantiated recommendations on improving of soil fertility by biological methods, on raising plants which could be resistant to diseases, on accelerating their maturity dates, and many other helpful tips are provided by the experts from the center.

Key words: burial site, Yangiaryk, Navruz, obsolete pesticides, wind erosion, risk assessment, bioremediation, phytoremediation.

Introduction

Obsolete and unused stocks of pesticides remain a global environmental problem. Their accumulation is a direct result of many years of negligence in pesticides handling.

Ongoing international collaborative programs and projects for removal of obsolete pesticide stocks emphasize the importance, urgency and necessity both in the interest and coordination of international efforts to address this problem.

At the initiative of the World Bank (WB) Obsolete Pesticides Technical Study in the Kyrgyz Republic, the Republic of Tajikistan and the Republic of Uzbekistan started in 2009. The project was implemented by a Consortium of TAUW (Tauw BV), Milieukontakt International, International HCH & Pesticides Association (IHPA), Witteveen en Bos and Green Cross Switzerland. The project team has studied Navruz burial site and central pesticide store in Surkhandarya, as well as Yangiaryk burial site in Khorezm region of the Republic of Uzbekistan.

No direct and unacceptable threat to human health and the environment have been identified at Navruz burial site and "Uzselhozhimiya" central warehouse of mineral fertilizers where obsolete pesticides are stored in the special premises. Therefore, according to experts' opinion, there was no need for urgent action on these sites. Experts of the Consortium were focused primarily on Yangiaryk burial site as it is located in the desert, and is unfenced. An inventory of the burial site was carried out jointly with specialists of the State Committee for Nature Protection and representatives of the regional inspectorates of analytical control of the country. They completed a ten-day training module on safe handling of hazardous stockpiles of obsolete pesticides and risk assessment for humans and the environment from exposure to such stockpiles.

Yangiaryk burial site study has started from a

visual observation of the site with initial area of five hectares. According to the records, 175 tonnes of OP were buried there. At present, rusty barrels and cardboard pesticide packaging are scattered over 18 hectares. Wind erosion, unauthorized waste collection in the past and removal of topsoil from former agricultural airfields to the site, have expanded the contaminated area.

Inventory

During the inventory soil samples from the most contaminated parts were taken, as well as water samples from the collector and ground water for organochlorine pesticides analysis. A portable well was installed in the most low-lying part of the burial site for taking ground water samples.

The area examination showed the presence of wind erosion on the site. In the past, the burial site was not a solid sand dune as it is today – photographic images prove that previously the ground level has been higher. The picture on the right shows piles of sand on which liquid has been spilled in the past. Sand with oily substances resistant to wind erosion has taken various forms, and piles of oil contaminated sand protruded awkwardly over the surface. Samples taken from one of these blocks showed presence of petroleum hydrocarbons which corresponded to diesel fuel.

Then soil samples were examined from the territories of former agricultural airfields located alongside the road and on the road itself. They showed high concentrations of extractable organochlorines. Samples of presumably uncontaminated soil showed very high concentration of extractable components.

Inventory results

Organochlorine pesticides such as DDT, DDD, DDE and HCH in amounts far exceeding the maximum allowable concentration were found in the groundwater samples. Also, high concentration of DDT was detected in water samples taken from the collector reservoir near the burial site.

At Yangiaryk burial site a place was found where 98 tonnes of *Butiphos* were burned in the 70s. The soil samples showed the presence of DDT and its metabolites as well as HCH isomers above the maximum allowable concentrations. Dioxins were found in concentration not exceeding the maximum permissible limits.

A survey of Yangiaryk and Navruz burial sites included standard parameters of risk assessment, which were used for design and description of a conceptual model of the sites. Yangiaryk burial site is located on sandy soil in desert area. The access is limited, but the perimeter is unfenced. Containments, in which the substances were buried, are partially damaged. Direct contact with the waste is possible, however, the dumpsite is quite far from the village. Precipitations and erosion processes might facilitate contamination of various environmental sites.

The amount of OP contaminated soil exposed to wind erosion and the natural impacts is as follows:

- In the range of 2-50 mg/kg of extractable organochlorine components: at the burial site – 4,000 m^3; soil from the airfield – 2,500 m^3.
- Soil slightly contaminated by extractable organochlorine pesticides in the range 0.5 - 2 mg/kg of dry substance: at the burial site – 24,000 m^3; soil from the airfield – 6,000 m^3.

Navruz burial site is located in a desert area. The area of a burial site itself is 20 m^2 while the fenced area is 5 hectares. The site is fenced and guarded. The nearest village is located 20 km far from the burial site. The river is five kilometers from the dumpsite. According to the records, the amount of buried OP is 65 tonnes.

Risk assessment

Risk assessment focuses on pollution impact analysis, including direct contact of human beings with the source of pollution, as well as direct contact of people with contaminated soil, of cattle and wild animals with surface waters, including an indicative assessment of the risks to the ecosystem as a whole.

Pesticide concentration in topsoil samples from airfields at Yangiaryk burial site exceeded the maximum allowable concentration of DDT and

metabolites more than 5 times, HCH and metabolites over 80 times. In other samples HCH content exceeded the maximum allowable concentration from 6 to 23 times. We can conclude that regular contact with the contaminated topsoil at the site poses a risk.

Risk levels to people and animals at Yangiaryk burial site.

- Unfenced area; Heavily contaminated topsoil;
- Contaminated water in collector reservoir;
- Ground water in depression (lowlands) are heavily contaminated with DDT;
- There are no vegetation, birds and animals at the dumpsite.

The local population may be adversely affected by pesticide residues through consumption of foodstuffs, especially those of animal origin such as milk of cattle and using contaminated water from an irrigation canal near the burial site as drinking water.

Based on these assessments, a significant impact on the ecosystem cannot be excluded since the concentration of harmful substances in the soil exceeds the maximum allowable concentration. At Yangiaryk burial site the contamination has affected a significant part of numerous animal and bird species habitats. Consequently, Yangiaryk burial site-related risks to the ecosystem are not excluded.

Risk levels to people and animals at Navruz burial site.

- The area is fenced and guarded;
- Hazardous substances content in the soil burial exceeds the maximum allowable concentrations;
- There is no direct contact with topsoil;
- Groundwater is deeply located;
- The burial site is far away from surface water.

Navruz burial site-related risks are lower, the dumpsite perimeter is fenced and guarded. The nearest village is far away and there are no canals and water reservoirs nearby. The project also assessed the environmental conditions of OP storage in Surkhandarya and Khorezm regions. There is no need in urgent environmental protection actions there and OP storageconditions were found satisfactory by the experts.

Rehabilitation burial sites

As far as Yangiaryk burial site is concerned, there is a need for urgent action to enhance the environmental condition and the experts propose specific short-term, medium-term and long-term activities for mitigation and elimination of acute, potential and latent risks. The proposed short-term activities include the following: Establish a management system; Establish a security guards system; Build a fencing around the site; Prevent wind dissemination of OP; Repackage easily accessible OP scattered at the site, and soil from the former agricultural airfields.The proposed short-term measures are simple and cost effective and enable to eliminate the acute risks. At the same time, they will create a safe environment for future operations. The experts pay special attention to wind erosion at the site. According to their assumptions, the effects of wind pollution can be observed in the range of 20 kilometers downwind from the burial site. If proper management of the facility ceases, the situation will become worse.

Medium-term and long-term activities might include: Containment of OP spreading by collection of them in special pits; Destruction of highly OP contaminated soil on-site; Prevention of surface water runoff contamination; Treatment of the top layer of soil (bioremediation, phytoremediation). To restore the heavily polluted soil layer it is proposed to remove the soil and deliver it to the central site, where the soil may be biologically treated in specially designed pits. The remaining contaminated soil can be treated on-site using bio- and phytoremediation, described in the report by the experts. Scientists of the Academy of Sciences of the Republic of Uzbekistan possess certain experience in remediation of soils contaminated with organochlorine pesticides by microbial destruction, using bacterial strains that are

actively destroying the HCH (hexachlorocyclohexane) and PCBs (polychlorinated biphenyls).

A research and coordination diagnostic center "Healthy Soil" was established under the Institute of Microbiology of the Academy of Sciences. The Center specialists diagnose soils, using modern research methods – microbiological, botanical and biochemical. They develop evidence-based and tested recommendations for improvement of soil and fertilizer application, combining conventional farming techniques with biological methods, which results in production of environmentally friendly products.

Destruction of obsolete pesticides

At one of the seminars organised within the project, the representatives of experienced waste management enterprises of Europe, America, Japan and others have presented modern hazardous waste treatment technologies. Stockpile destruction methodology selection was carried out in accordance to certain criteria. The Consortium experts used criteria stated in the Basel and Stockholm Conventions as well as in documents prepared by the UNEP. The available technologies are described in bulletins, published on the Convention website, as well as on International HCH & Pesticides Association website. Information on technologies contains the following general information about the methods of treatment and destruction.

As for Yangiaryk burial site, the experts recommend to destroy hazardous substances directly in situ and places of their storage for the following reasons: Destruction of hazardous substances at places of their storage will save the cost of unsafe repackaging and transportation All the available budget could be spent on the irreversible destruction of pesticides Destruction of OP in places of their storage will make it possible to combine the process of soil restoration with waste destruction. The project has surveyed two landfills and it is necessary to continue studying the remaining 11 burial sites in the country to assess the risks, too. Then it will be possible to develop the National Implementation Plan for the Elimination of OP. We continue to hope for speedy ratification by the national government of the Stockholm Convention on Persistent Organic Pollutants. At present, Ecological Movement of Uzbekistan party has 15 seats (according to the quota) in the Legislative Chamber of Oliy Majlis (Parliament) where the Law on the Convention will be passed. The party is a non-governmental non-profit public organization whose primary purpose is facilitating enforcement of Uzbekistan citizens' rights to a healthy environment and protection of their health. Ratification of the Stockholm Convention by the Republic of Uzbekistan is under the auspices/patronage of the Environmental Movement of Uzbekistan.

PROGRESS ON OBSOLETE PESTICIDES IN THE FAO-GEF PROJECT IN KAZAKHSTAN

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In Kazakhstan, the environmental problems connected with accumulation and storage of large volumes of forbidden, unusable and unallocated obsolete pesticides and their containers remain relevant. The agriculture is a strategic priority sector of the economy of Kazakhstan providing food safety of the country. Today, the bulk of agricultural producers are presented by private enterprises. Basically it is the peasant (farmer's) economy quantity of which has reached 122 thousands farms. Private farms of the population began to play a big role.

Increase in volumes and quality of a crop at the present stage is reached through introduction of special means – fertilizers and cultivation of areas under crops by pesticides for protection of agricultural crops.

Obsolete pesticides found in the old warehouses are stored without supervision and unpacked, creating risk to population and the environment. Pesticides in warehouses are often found as mixtures require identification (using expensive physical and chemical methods of the analysis). These abandonded chemical warehouses are semi-destroyed and hard to identify.

At present time, there are five operating ranges-burial grounds in Kazakhstan.
From earlier revealed 1544 t. of obsolete and unusable pesticides, at these landfills were buried 1438 t. However, it is necessary to consider that detailed inventory of obsolete and unusable pesticides and their containers were done only on 20 % of territory.

The main reasons leading to accumulation of obsolete pesticides are:

- prohibition of already purchased products due to increased toxicological or ecological concern;
- decrease in demand for pesticides because of their insufficient efficiency, low storage stability and high fire danger; breach of package integrity;
- expired products.

Among the pesticides, which are stale in warehouses, there are products that were applied in agriculture more than 40 years ago.

Besides it is important to address the issue of the disposal of pesticide containers. According to preliminary data of national inventory, the number of pesticide containers exceeds 300 thousand units. Containers pose real threat for the population, as it is often used for the household purposes, for storage of food and water. The population has little awareness about related health risk.

Large volumes and deterioration of unused and banned pesticides, poor storage conditions in damaged containers, possibility of unauthorised access to them, and uncontrolled use by local population, creates risk to local population and the environment, especially during natural and technogenic emergency situations (floods, fires, major accidents etc). This underlines the priority of the issue of obsolete pesticides and its relation to a number of environmental and social problems demanding an immediate and efficient solution.

In Kazakhstan there is no technology of recycling of this type of waste, re-use for other purposes, placement and storage in conventional landfills in the open form is expressly prohibited by sanitary and ecological legislation. The only solution in this situation is a safe disposal of containers from the chemicals in the permanently operating, specialized landfill for toxic waste.

In order to establish obsolete pesticide management system, the Ministry of Environment of the Republic of Kazakhstan within the sectoral program "Zhasyl Damu" in 2011-2014 envisages measures in two directions: "A detailed inventory of all types of persistent

organic pollutants and obsolete pesticides“ and “Removing and repacking of obsolete pesticides from warehouses and cemeteries “.

The Ministry of Agriculture has provided guidance to all akimats at the local level to allocate finances for the work of managing obsolete pesticides.

Employees of the ministries have passed training at a FAO seminar on management of obsolete pesticides which was held in Bishkek (Kirgizstan). The curricula for workers of the agriculture, interested public organizations and departments, are made.

MANAGEMENT OF POPS IN KYRGYZ REPUBLIC

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After gaining independence, Kyrgyzstan is actively involved in international efforts to address the environmental problems. One of these efforts is joining the Stockholm Convention on Persistent Organic Pollutants (POPs), the main objective of which is to protect human health and environment from negative consequences of POPs production and use.

The accumulation of banned and obsolete pesticides started during planned economy of Former Soviet Union (FSU). In Kyrgyzstan, pesticides included in the list of POPs (hereinafter referred as POPs-pesticides), have not been produced earlier and are not produced now. POPs- pesticides were delivered centrally through the Association "Kyrgyzselhozchimiya". Prohibition on using the POPs-pesticides in agriculture was introduced 20 years ago with orders of the former Ministry of Health Care of the USSR.

To control pests, weeds and pathogens, around 5 000 tonnes of pesticides were used annually in Kyrgyzstan, including POPs-pesticides, consisting up to 30% of the total amount. During the last 10 years, the amount of imported pesticides is 350-400 tonnes.

By the end of the 1980s, the total amount of pesticide supply decreased. It was mainly due to the replacement to more effective drugs with significantly lower consumption rates per 1 ha. Further decrease of pesticide supply is related both to a break of existing economic relations as a result of the collapse of the USSR and to decreasing creditability of the farms.

During the last 15 years POPs-pesticides are not imported and re-exported. But shelf life of most pesticides is 2-3 years, so obsolete and unusable pesticides, including those in the POPs list, continue to accumulate in storage sites. In 1989, 47.9 tonnes of banned pesticides were accumulated in storages, and by the end of 1994 – 170.8 tonnes. But this record of pesticides is not complete, as since denationalization of Republican Scientific Production Association "Kyrgyzselhozchimiya", and the break-up of the collective and state farms, the accurate record has not been kept.

Accumulation of banned and obsolete pesticides, including POPs, took place because of the following reasons: incorrect assessment of demand for specific formulations; inadequate registration of pesticide usage; prohibition to use them during improper storage; off-season purchase and inefficient system of marketing; poor organization of storage and registration; funding centralized supply of pesticides without taking into account the actual needs.

An attempts have been made to solve the problem of elimination of banned and obsolete pesticides disposing them into so called burial places. For this purpose, in 1973-1980, 3 places have been allocated for burying such pesticides: near the village of Kochkorka, Naryn oblast, and near the village Kyzyl-Bairam and in the area of Ak-Chabyr, Suzak district of Jalal-Abad oblast. A total of 1876.38 tonnes of pesticides have been buried, including 1033.4 tonnes of POPs-pesticides.

Part of pesticides were scattered to both central and small storages of former collective and state farms, that do not meet safety requirements or have been destroyed.

The 72% of the total number of storages do not not meet the sanitary and hygienic norms. In typical storages, one of the problems is corroded and leacking containers, contamination of adjacent land, surface and ground water.

To date, Kyrgyzstan has signed and ratified the following international conventions: the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal; the Convention on Biological Diversity; the Convention on Long-Range Transboundary Air Pollution; the United Nations

Framework Convention on Climate Change; the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade; the Vienna Convention for the Protection of the Ozone Layer; the Convention on Environmental Impact Assessment in a Transboundary Context; the Convention on Wetlands; the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters; the Stockholm Convention on Persistent Organic Pollutants; The United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa; the Montreal Protocol on Substances that Deplete the Ozone Layer.

A number of laws on chemicals management have been adopted with special focus on pollution prevention and safe use of chemicals for human health. More specifically, Land Code, Forest Code, Water Code, laws "On Environment Protection", "On Air Protection" "On Ecological Expertise", "On Biosphere Reserves", "On Wildlife", "On Drinking Water", "On Production and Consumption Wastes", "On Protection of the Ozone Layer".

The use of chemicals, including pesticides in real sector industries, is regulated by a law and regulation complex. These are laws "On Sanitary and Epidemiological Welfare of Population", "On Chemicalization and Plant Protection", "On Environmental Protection", "Air Protection" and several others, as well as by other legal acts.

The System of state registration of pesticides is carried out by the Ministry of Agriculture. Environmental and health care authorities are actively involved in the process of evaluation and selection of pesticides. Currently, about 400 names of pesticides are registered.

In complying and updating "The List of Pesticides and Agrochemicals Permitted for Use in the Kyrgyz Republic" state agencies strictly follow Annex III of the Rotterdam Convention; banned pesticides are not included in this list which is updated every five years.

Integration of activities on the Rotterdam Convention to the framework of national system of chemicals management was done by issuing Government Decree "On Measures to Protect Environment and Public Health from Adverse Effects of Certain Hazardous Chemicals and Pesticides" from July 27, 2001, N 376. By this Decree, the list of 25 chemicals and pesticides, which were banned in the country, and 5 substances, which are subject to prior informed consent procedure, are approved. Currently, a coordination of the list of new substances for inclusion in this Decree is ongoing with state authorities.

Control and registration of flow of substances, including POPs, through customs border of the Republic, are carried out without special preferences. In addition, requirements of Government Decree from April 06, 1999, N 193 "On Measures for the Control of Transboundary Movements of Hazardous Wastes and Other Wastes" are taken into account according to obligations of Kyrgyzstan on the Basel Convention.

More than 15 ministries, agencies and services are involved in the management of chemicals handling. Governmental bodies within their competence are elaborating normative legal documents, state and industry programs on ensuring safety of chemicals on different steps of their life cycle, supporting research in related field, use administrative and economic sanctions for to ensure safe chemicals handling.

The State Agency on Environment Protection and Forestry (hereafter referred as State Agency) is conducting a unified policy on environment protection, rational nature management and ensuring environmental safety of the country.

The Ministry of Agriculture shapes the state policy on use of chemicals in agriculture, state registration of plant protecting agents, ensures control on safe working environment during use and storage of pesticides;

The Ministry of Economic Regulation is elaborating prognoses and determining prospects for production, use, import, export and registration of chemicals, setting priorities and ensuring internal and external trade of chemicals;

The State Customs Service is implementing state regulation of exports and imports of chemicals;

The Ministry of Health Care is conducting a unified state policy on prevention harmful effects of chemicals on human health and environment, diseases and poisoning etc.

The following projects have been implemented or are under implementation in Kyrgyzstan at the moment:

Rehabilitation of burial places and former storages of pesticides requires quite a lot of financial resources, which is possible in the framework of international projects.

Project: "Utilization of Pesticides, Banned and Unsuitable for Using in Agriculture, in Kyrgyzstan". The project addressed the following objectives: revealing banned and obsolete pesticides by inventory of storage places; transportation of samples for analysis; evaluation of their chemical and physical condition and determination of the class of toxicity; identification of methods and ways of disposal and on this basis, elaboration technological conditions, and economical assessment of expenses, related to disposal of such pesticides.

Project: "Technical Study of Obsolete Pesticides in Kyrgyzstan, Tajikistan, and Uzbekistan". In 2007-2008, in the framework of the project, 13 inactive storages of pesticides have been cleaned. As a result, centralized storage of about 100 tonnes of repacked obsolete pesticides was organized. Centralized storage was assigned to local authorities.

In October 2009, with the financial support of Canada Trust Fund, a technical study of storages of pesticides and burial place Suzak, Jalalabat oblast, Kyrgyz Republic, was done by a working group, consisting of representatives of stakeholders and state structures. Based on the results of risk assessment it was found that ten of 25 sites are priority storages. There are 250 tonnes of obsolete pesticides in these storages and 145 m^3 of heavily contaminated soil. Besides ten priority sites, there are nine areas with low priority, there are no obsolete pesticides here, but perhaps, there is a highly contaminated surface soil. On at least two sites, there are buried pesticides.

Burial place Suzak A is still visited by "illegal diggers", and pesticides are spread over the territory. Especially DDT is taken out of the site for sale on local markets. The total estimated amount of exposed pesticides is about 1000 tonnes, the amount of still buried in trenches pesticides is estimated to be ~2000 tonnes (as of 2009). Obsolete pesticides have contaminated surface soil; rain water, accumulated in holes and ruts, is also contaminated. Over the years, pesticides are leaked to approximately 15000m^2 of the soil. The estimated volume of the highly contaminated soil is 8250 m^3, the volume of contaminated soil is 5000 m^3 and the volume of slightly contaminated soil is 4500 m^3.

The situation on the burial site is a direct and unacceptable threat to human health and environment, and immediate measures should be taken.

Project: "Reducing the Risk of Obsolete Pesticides and Management of Contaminated Sites". Expected results: repacking, collection, transportation, temporary storage and final disposal of about 1000 tonnes of POPs-pesticides and wastes by means of the cost-effective, environmentally acceptable and safe ways bio- or phytoremediation on selected priority sites; elaboration of normative legal acts on management, storage and disposal of banned and obsolete pesticides; strengthening national capacity for conducting monitoring.

Project: "Management and Disposal of PCBs in Kyrgyzstan". Objective: Minimization the risks to the public and environment from management of polychlorinated biphenyls.

Tasks: Inventory of sources of PCBs and increasing awareness on risks; elaboration of normative legal acts on management of PCBs; Equipping state laboratory with analytical equipment; Organizing storage of PCB wastes. Expected results: Prevention an accidental discharge for equipment and materials, up to completely safe disposal and ensuring environmentally safe storage; step-by-step

decommissioning priority transformers; equipping analytical laboratory and strengthening capacity on monitoring.

Project: "Initiative on Cooperation of UNDP and UNEP in the Integration of Proper Management of Chemicals to Development Plans and Processes of Development". Objective: support the Government in assessing the regime of appropriate management of chemicals. Tasks: collection and analysis of primary national data on chemicals; determining the degree of relationship between the prioritized main problem areas, related to chemicals, public health and the quality of environment; identifying areas of management of chemicals, and development of phased plan to address these issues.

Project: "Management of Banned and Obsolete Pesticides in Central Asia and Turkey". Objective: minimizing risks to human health and the environment from management of banned and obsolete pesticides. Tasks: inventory of obsolete pesticides; plan for fencing/disposal; cleaning small, but priority storages with POPs.

On May 16, 2002 Kyrgyzstan signed the **Stockholm Convention** and ratified it on 19 July 2006. In 2007 by the order of the Government, the authorized body on environment protection has assigned a coordinating and executive body on implementation of the Convention, at the present time it is the State Agency.

On July 03, 2006 the Government approved the National Implementation Plan (NIP). For effective realization of the NIP, by order of the Government from October 02, 2007 №372-p, Coordinating Committee on promoting realization NIP was formed and composed of: Director of State Agency – Chairman of Coordinating Committee, state secretaries, deputy ministries, directors of state agencies, involved to management of chemicals.

In Kyrgyzstan, pesticides are also used against mosquitoes. To promote the transition to safer alternatives the project "Presenting and Increasing Transition to Safe Alternatives to DDT for Control of Transmissible Diseases in Countries of Southern Caucasus and Central Asia". The following activities are planned on this project: demonstration of the possibility of using alternatives to DDT; cleaning small, but priority storages with POPs; supporting existing regional mechanisms for disseminating information.

Problems attached to the implemention of the Stockholm Convention:

Absence of proper control and low living standards of the rural population provide a basis for contraband import of POPs-pesticides, especially in border areas. In Kyrgyzstan, POPs-pesticides are accumulated because of contraband import and theft from open "burial places" and stocks of private farms.

On markets of the country, banned DDT is publicly sold; it was illegally imported from China in small tubes.

In the south of the country, cases of pesticide poisoning have been reported. This is due to opening burial sites and contraband import cheap DDT from Uzbekistan.

In March 2010, cases of pesticide poisoning on site of burying obsolete pesticides Sasyk, Suzak rayon, Jalal-Abad oblast, where 53 sheep and 12 cows died after drinking pesticide-contaminated rainwater. Owners of this cattle sold poisoned meat and it led to the hospitalization of 32 residents of the nearby villages.

By decision of Security Council of Kyrgyzstan at the beginning of 2010, the Center of Environmental Security under State Environmental Agency was organized, which is responsible for meeting obligation on all environmental conventions related to chemicals

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OBSOLETE PESTICIDES IN KHATLON REGION OF TAJIKISTAN

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Center on Implementation of Stockholm Convention on POPs in Tajikistan

The Stockholm Convention provides main directions of international cooperation aimed at reduction of emissions and elimination of persistent organic pollutants (POPs).

Tajikistan signed the Stockholm Convention on POPs in 2002 and ratified it in 2006. In 2007, the Government approved the "National Implementation Plan (NIP) to the Stockholm Convention on Persistent Organic Pollutants". NIP contains political will of the Republic of Tajikistan (RT) concerning POPs, and its implementation strategy, activity plan on national goals attainment, priorities of POPs management and fulfillment of Tajikistan's obligations under the Stockholm Convention on POPs. In the NIP, the presence of pesticides listed as POPs is stated as a priority environmental problem posing risks for environment and public health. NIP makes provisions for inventory, repacking and destruction of obsolete pesticides (OPs); elimination of risks for environment and public health by rehabilitation of identified storing sites and pits with buried pesticides. Establishment of environmentally friendly system for pesticides handling, is an obligation of the country under the Stockholm Convention [1].

Pesticides were commonly used during the Soviet era. The list of pesticides consisted of more than 80 items, including organochlorines: DDT, aldrin, hexachlorobenzene, heptachlor, dieldrin, toxaphene, lindane, chlordane, endrin and endosufhan. The difference between the total amount of pesticides delivered to Tajikistan, and the volumes that were used in agriculture, contributed to the accumulation of the considerable quantity of the OP and the banned pesticides. At present, OPs included to POPs list, in most cases are stored improperly and constitute a serious risk for the environment (soil quality degradation, pollution of surface and groundwater, vegetation etc.), public health, drinking water and foodstuff, especially livestock products. The risks are caused by pesticide warehouses (pesticides residues, mixture pesticides with soil, contaminated constructional materials and tools), contaminated soil and buried pesticides.

The key target of activities implemented during the last period was determination of priority actions for elimination of sources of pollution of environment and water resources by OP, including POPs pesticides, in Khatlon region (southern part of the country), being a zone of intensive agriculture and thus a consumer of significant volume of pesticides. As a result of implementation of projects «Obsolete Pesticides Technical Study in the Republic of Tajikistan» (in 2009 – 2010) and «POPs Pesticides Elimination, Mitigation and Site Management Project» (in 2010-2011) it was identified that to date there are 8161 tonnes of OP, including POPs pesticides, and 170000 m^3 of contaminated soil with different level of pollution in Khatlon Region.

There are several factors of need for implementation of rehabilitation activities in Khatlon Region:

High number of potential sources of the environment pollution by OPs, including POPs, at Vaksh Burial Site (VBS) are represented by pesticides, warehouses and pits with buried pesticides.

Government and local authorities are taking actions on mitigation of negative effect of OPs, including POPs, on environment and public health, but insufficient financing and technical means decrease the effeciency of such actions;

Majority of local people are unaware of potential negative impact of pesticides listed as POPs, and of principles of safe handling of OPs.The target group of undertaken activities is local population of Khatlon Region which might be under negative impact of warehouses and pits with buried pesticides. Another group which is the

most interested in elimination of source of pollution is the population living nearby the VBS.

Warehouses. There are 162 pesticides warehouses in use on the territory of Khatlon Oblast since Soviet era; and inventory conducted in 2010 covers 80 of them. The total amount of OPs, including POPs, in these warehouses is about 161 tonnes. The majority of warehouses are privatized, many of them are in poor technical condition – destroyed buildings with open doorways, with disturbed roof, pesticides residuals and mixes pesticides and soil. There are cattle grazing and crops handling nearby warehouses. Very often former warehouses are used for forage storing (Figure 1).

Figure 1. Warehouse sections with pesticide residues, and mixture of pesticides with soil - a, b, c); cattle grazing nearby warehouse d); storing hay in former warehouse - e); arable land and fruit tree nearby former warehouse – f).

Sometimes the sections of former warehouse are used for construction of living house where adults and children are living, arrangement of household and gardening n adjacent area (Figure 2). Usually the territory around a warehouse is densely populated, intensively irrigated and used for crops production. There are cases when the land territory around an existed warehouse or foundation of former warehouse is sold under new construction; and earth works and leveling are implemented. The most contaminated materials (polluted soil with specific smell and destroyed packing – plastic bags, paper etc.) remain under new foundation. Thus, a new pit with buried OP is being established against regulation. Such a practice lead to formation of a new source of direct and indirect human exposure.

Figure 2. Houses constructed in the place of former pesticides warehouse, and homestead land with vegetable garden.

Vaksh Burial Site. This site was selected on the basis of the following criteria:

- VBS is the biggest burial site for pesticides in Tajikistan and in its present condition, it poses a threat to the environment and public health;
- Technical characteristics of the site are satisfactory and will allow to prevent large-scale spreading of OP, including POPs pesticides, into environment in case of necessity in tapping of trenches and implementation of rehabilitation works;
- Rehabilitation of VBS will considerably decrease chemical pollution of soil in the site and will allow preventing access to the site for grazing cattle.

VBS was established in the beginning of 1970s in accordance of standards for construction of such a site. It used to have stable management system, guarding, recording of all pesticides to be buried. There were a fence on the perimeter of the site and trees planted on the erosion control terraces. According to the information updated in 2009 – 2010, there were about 9000 tonnes of pesticides buried on the VBS during the period of its operation. The current state of the burial site has been deteriorated. The management system no longer exists, while fence and guarding have been removed. Existing situation allows local people to enter the burial site without any

restriction to dig out buried pesticides and use them for plant treatment or for sale. On the VBS, in total, 37 of 41 existed tranches are tapped by diggers (Figure 3).

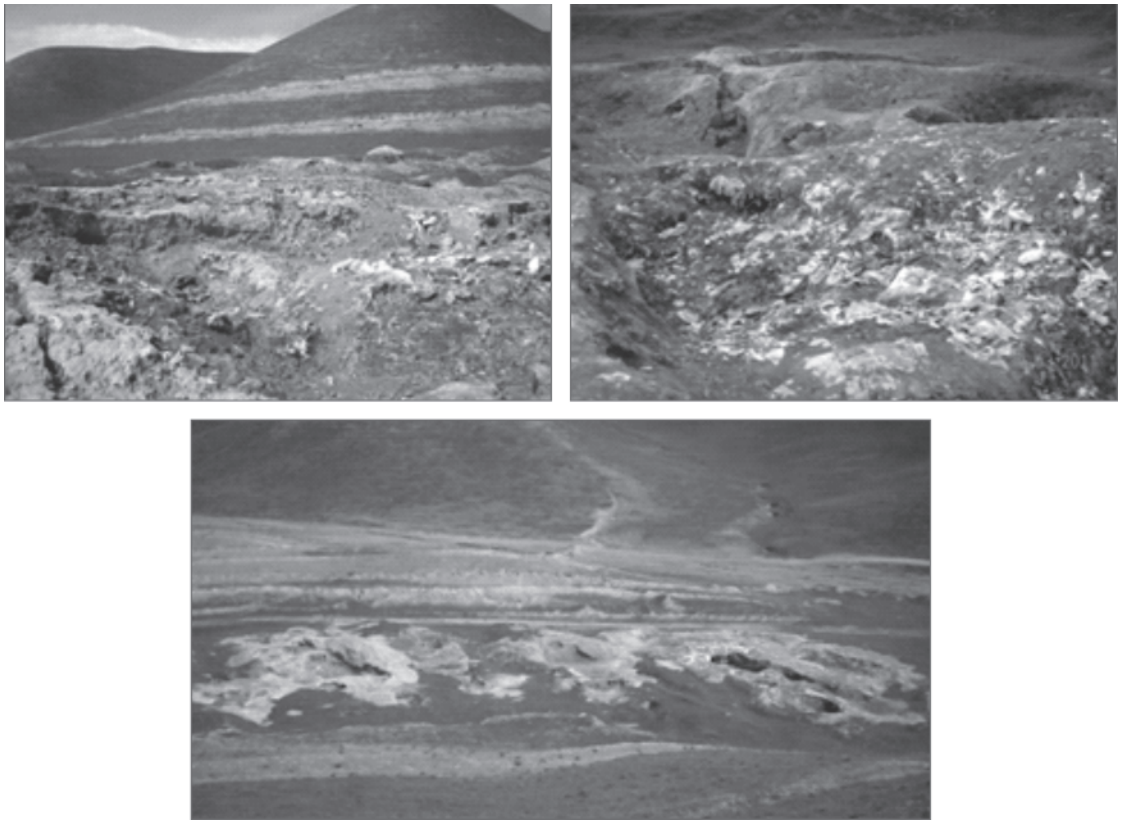


Figure 3. Tranches tapped by diggers

The cattle grazing on the burial site and adjacent areas, and the drinking water collected in the pits formed after activities of diggers (Figure 4). Cases of loss of cattle in the area of the burial site were registered. At present, there is about 4000 tonnes of OPs, including POPs, mainly DDT, at

Figure 4. Cattle grazing on the Vaksh Burial Site.

the VBS. About 1500 tonnes of pesticides are located in tapped trenches and on surface, and about 2500 tonnes – in the untapped trenches. About 140000 m^3 of soil is contaminated, of which 22000 m^3 is heavily contaminated, e.g. pesticides content is 50 or more mg/kg soil.[2]

Results of soil analysis for extractable organochlorine components (EOC, mg/kg) show that on the burial site and adjacent territory, referred to as hotspots (surface with clear signs of

contamination), the contamination of topsoil is 1.1 mg/kg. The topsoil in distance dozen meters from the burial site is without visual signs of contamination, with pollution level < 0.3 mg/kg. Pollution level of undisturbed subsoil samples under hotspots is insignificant – 0.3-0.67 mg/kg. Soil samples of 6 m deep have higher EOC level – 8.5-18.0 mg/kg. Increased EOC level shows soil permeability. However, due to the fact that groundwater level in the area is below 30 meters, it is assumed that groundwater is unaffected by pesticides. Undisturbed soil is contaminated by organic pollutants insignificantly. The maximum concentration of DDT observed in the topsoil of VBS hotpots is 0.19 mg/kg; DDE – 0.17 mg/kg and DDD – 0.045 mg/kg, and also alpha-HCH – 1.031 mg/kg; beta-HCH – 0.209 mg/kg and gamma-HCH – 1.588 mg/kg.

The following receptors: diggers of buried pesticides; cattle (cows, sheep, horses, donkeys) grazing on contaminated areas; wildlife of VBS area or migrating through its territory, are exposed to the direct contact with contaminated substances.

Besides direct contact, there is a risk of pollutants dissemination from the source to adjacent areas, what can be assessed as potentially indirect exposure route. In this case, the main receptors of direct and indirect exposure are: pastures – due to wind dispersal of pollutants, and contamination of vegetation grazed by cattle; water in rain pools; livestock products; confluent of Vaksh River, flowing in 7.5 km downstream of VBS runoff area; inhabitants of Vaksh and adjacent settlements using river water for domestic use, drinking and irrigation. Risks for such receptors are very high.[3]

Results of socio-economic impact assessment connected with prohibition of access of local cattlemen and farmers to VBS showed that hundreds of families and farmers use territory of VBS for pasturing almost the whole year round. Existing situation requires urgent actions to address the siuation and restric access to VBS. The VBS area is the minor share (about 0,05%) of the pastures around, thus establishment of fence and prohibition of access to the site will not affect a living standard of population living in adjacent settlements. The majority of 700 respondents (household heads and heads of farms) agreed with proposed installation of fence and rehabilitation of VBS.

Pits with burial pesticides. During the implementation of the Project "Obsolete Pesticides Technical Study in the Republic of Tajikistan" (2009 – 2010), the pits with illegally buried pesticides were investigated near some of former warehouses.[2] Total amount of pesticides buried in such pits is ~ 4000 tonnes, and total amount of contaminated soil is about 12600 m^3 [2]. Location of pits within settlements nearby water bodies, pastures and agricultural lands are aggravate the situation (Figure 5).

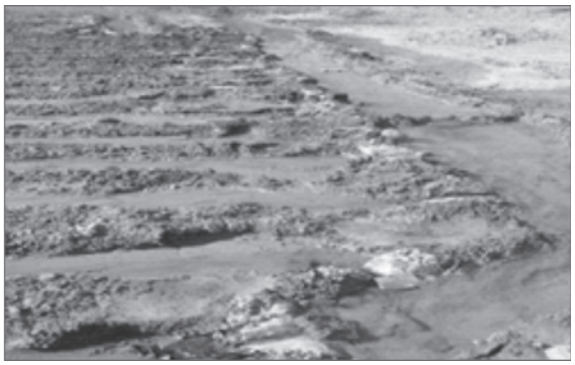
A house built up on the site with buried pesticides. Inhabitants use water from the water body located just nearby to pit with buried pesticides.

Small water body on the site used by local people. Canal crossing contaminated site. Behind the water body, there is another pit with buried pesticides.

Pit with buried pesticides under the road near the house. Pesticides residuals on the surface are spreading by wind, especially after passing of vehicles.

Pit with buried pesticides. Agricultural lands and residential area are located below the site.

Irrigation ditch passing the pit with buried pesticides and connected to general irrigation system, also used as a source of drinking water



Vegetable garden which is laid out on top of pit with buried pesticides.

Figure 5. Pits with illegally buried pesticides

Spreading of pollutants from the pits takes place in the following ways:

- Wind dispersal resulting in pollution of large areas around households, agricultural lands, gardens, water canals and ditches, especially during the dry period. Pits with burial pesticides are commonly covered by poor vegetation only. Sometimes those pitsare tapped, which raises the risk of spreading the most contaminated substances;
- Sheet erosion;
- Infiltration into the soil. This factor is particularly relevant to sites with damaged surface of pits with buried pesticides and topographic low relief, where water is collected after rainfall.

Existing situation leads to pollutants entering the food chain and increasing the risk for public health. According to the results of WHO/UNEP survey conducted in 2008 in 23 countries, Tajikistan is in the leading position (23) on DDT content in breast milk – 8500 mg/kg of fatty tissue; while DDT content in breast milk in India is 3000 mg/kg of fatty tissue (position 22).

Significant volume and condition of OPs in the region, storage conditions and condition of burial sites, improper packaging, risk of unauthorized access and application of OPs pose risks for environment and public health as a result of pollution of soil, water bodies, and animal and plant products. These underline urgency of the problem of utilization/destruction of OPs.

It is recommended that mitigation measures are taken on areas of warehouses of poor condition, on pits with buried pesticides and on VBS, to eliminate continued direct and indirect negative effect to potential receptors identified for each site.

Required measures/activities:

Warehouses

1. Cleaning of warehouses and adjacent territory from OP, packaging and mixture of pesticides with soil (MPS).
2. Repacking of OP.
3. Transportation and storing of repacked OP and MSP on the Intermediate Collection Store (ICS) or burial of repacked contaminated materials on the VBS until their final destruction.
4. Cleaning or demolition of warehouses with following burial of contaminated construction materials and tools on VBS.

Vaksh Burial Site

1. Rehabilitation of fence, erosion control terraces and guarding.
2. Relocation and containment of 1500 tonnes of OP from tapped tranches for storing until their final destruction.
3. Containment of 2500 tonnes of OP in untapped tranches for storing until their final destruction.
4. Soil detoxification.
5. Establishment of monitoring program to prevent additional risks which may cause due to residual impurity.
6. Preservation of stable vegetational cover to prevent spreading of contaminated soil by wind.

Pits with buried pesticides

1. Identification of pits with buried pesticides
2. Opening of pit with buried pesticides.
3. Excavation of buried pesticides and repacking.
4. Packing of contaminated soil
5. Transporting of repacked OPs and contaminated soil to ICS for storing or to VBS for burial until final destruction
6. Refilling of pits by clean soil
7. Site leveling.

References:

1. National Implementation Plan of the Republic of Tajikistan on the Stockholm Convention on Persistent Organic Pollutants. Dushanbe, 2007.
2. Final Report on Obsolete Pesticides Technical Study in the Republic of Tajikistan, Tauw Consortium, 2010.
3. Environmental Impact Assessment and Environment Management Plan for GEF/WB Project «POPs Pesticides Elimination, Mitigation and Site Management Project», Dushanbe, 2011.

SESSION 2. NEW POPS

INTRODUCTION TO NEW LISTED POPS - GUIDE TO RELATED KEY INFORMATION MATERIALS, DOCUMENTS AND SHORT MOVIES REDUCING CHEMICAL EXPOSURE, POLLUTION AND RISKS

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INTRODUCTION and GUIDANCE

Persistent Organic Pollutants (POPs) are organic chemicals that are resistant to environmental degradation through chemical and biological processes. POPs persist in the environment for long periods, are capable of long-range transport, bio-accumulate in human and animal tissue and bio-magnify in food chains with potentially significant impacts on human health and the environment[1,2].

To protect human health and the environment from POPs a global international treaty has been ratified by meanwhile 176 nations: The Stockholm Convention (www.pop.int)[1,2].

The implementation of the Convention is managed by the Secretariat of the Stockholm Convention and implanted with the support of several UN agencies (UNEP, UNDP, UNIDO, UNITAR and FAO). From Civil Society side the implementation is supported by the International POPs Elimination Network (www.ipen.org) - a global network of more than 700 public interest organizations in more than 100 countries. IPEN has developed the NGO guide on POPs[2] and an introductory film on POPs pollution[3] and many more resource materials on POPs and other chemicals (www.ipen.org)[4].

Chemicals in the Convention

The Convention initially covered the so-called 'dirty dozen' chemicals made up of nine pesticides: aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene (HCB), mirex and toxaphene; two industrial chemicals: hexachlorobenzene and polychlorinated biphenyls (PCBs) and unintentional chemical by-products including dioxins (PCDD) and furans (PCDF).

The Convention has an updating mechanism where parties to the Convention can suggest new POPs to be listed, if they meet the criteria (persistence, toxicity and long range transport) and the criteria assessed by the POP Reviewing Committee (e.g. risk and socio-economic evaluation). In August 2009 nine new chemicals, 'the nasty nine', were added to the Stockholm Convention. This amendment entered into force on 26. August 2010.

These are:

- Pesticides: chlordecone (kepone), α-hexachlorocyclohexane, β-hexachlorocyclohexane, and γ-hexachlorocyclohexane (lindane);
- Industrial chemicals: commercial pentabromodiphenyl ether (c-PentaBDE), commercial octabromodiphenyl ether (c-OctaBDE), hexabromobiphenyl (HBB), and perfluorooctane sulphonic acid (PFOS), PFOSF and related chemicals.
- Unintentionally produced POP: pentachlorobenzene (PeCB).

Several of the new listed POPs (PFOS, OctaBDE, PentaBDE, HBB) have been used in the production of a wide range of goods in daily life and have contaminate our "stuff" which surrounds us in daily life. These chemicals can have adverse impacts on human health during their entire life cycle: production, use phase, recycling phase and from disposal.

[1] www.pops.int/documents/convtext/convtext_en.pdf
[2] http://www.ipen.org/ipenweb/documents/book/ngo_guide_pops.pdf
[3] http://www.ipen.org/ipenweb/info.html
[4] http://www.ipen.org/ipenweb/documents/ipen_education.html

The challenges of the life cycle of our "stuff" and the toxic chemicals therein have been summarised in the film "Story of Stuff"[5] from Annie Leonard. A brief introduction into the single new POPs is included in the IPEN POPs guide[2]. Facing these challenges of the life cycle of commercial goods of daily life and the toxic chemicals therein call for more sustainable production and consumption in the future. Such an approach will give opportunities to progressive companies and Green Economy (UNEP 2011)[6].

The Stockholm Convention Secretariat has developed several guidance materials including e.g.

- "The nine new POPs"[7]
- The "Start-up Guidance on new POPs"[7]
- The "Step-by-step companion guide to the review and updating of the National Implementation Plans" [7]

The Step-by-step Companion Guide explains the steps of the process for the review and updating of the NIP (in accordance with guidances adopted by the Conference of the Parties): When reviewing and updating their NIP, parties should take into account the need to implement the following measures with respect to the newly listed POPs:

- Implement control measures to reduce or eliminate releases from intentional production and use (Article 3 and 4)
- Develop and implement action plans for unintentionally produced chemicals (Article 5)
- Develop and implement strategies for identifying stockpiles, products and article in use, and wastes with POPs (Article 6)
- Include the new chemicals in the programme for the effectiveness evaluation (Article 16)
- Include the new chemicals in the reporting (Article 15)

The Companion Guide shortly explains each step of the process for the review and updating of the NIP in accordance with the following guidance adopted by the Conference of the Parties. Detailed guidance materials are under development and are planned for June 2012. Parties can get financial support for the update of their NIP from the Global Enabling Facility.[8]

THE NEW LISTED POPs[7]

PentaBDE, OctaBDE and HBB

Production & use: These three chemical groups are brominated flame retardants to reduce the flammability of synthetic materials. They were produced from the 1970's until 2004 and used e.g. in plastic in electronics, polyurethane foam in vehicles (cars, busses, trains etc.), mattresses, synthetic textiles or carpet padding from polyurethane recycling (UNEP/POPS/ POPRC. 6/2)[9].

Toxicity[10]***:*** The compounds are partly classified as possible human carcinogen. They have several toxic effects to humans and wildlife including hormone disruptive activities.[7]

Practical relevance: Although the listed chemicals are not produced anymore, they still exist in products, in the recycling flow, and landfills[35] and they can cause harm to humans and the environment throughout their life cycle (Shaw et al 2010)[8]. The life cycle of e.g. electronic equipment is summarized in the film "Story of Electronics"[11] highlighting the health and environmental effect of simple recycling methods using open-burning and smouldering in developing and transition countries (Basel Action Network: Exporting Harm[12], Greenpeace: Poisoning the poor[13]). Today PBDEs can be found in plastic toys and household goods with direct exposure to vulnerable groups. This shows that the recycling flow of such plastic is not

[5] http://www.storyofstuff.org/movies-all/story-of-stuff/
[6] http://www.unep.org/greeneconomy/Portals/88/documents/ger/GreenEconomyReport.pdf
[7] http://chm.pops.int/Implementation/NewPOPs/Publications/tabid/695/Default.aspx
[8] GEF/C.39/Inf5 http://www.thegef.org/gef/GEF_39_Inf5
[9] Stockholm Convention document from 6th POP Reviewing Committee meeting (UNEP/POPS/POPRC.6/2)
[10] http://www.meriresearch.org/Portals/0/Documents/01-REH%2025%284%292010%20SHAW%20FINAL%20printed.pdf
[11] http://www.storyofstuff.org/movies-all/story-of-electronics/

controlled.[6]

In 2010 about 200 Scientists have signed the San Antonio statement[14,15] emphasizing that there are better alternatives for brominated and chlorinated flame retardants and that they should be phased out globally and substituted by Greener Solutions (see The Substitution Principle[16]; GP Safer Chemicals within REACH[17] or http://www.subsport.eu/).

PFOS, PFOSF and related chemicals

Production & use: PFOS production has decreased in industrial countries but it is still produced e.g. in China, Italy and Germany. PFOS and related chemicals were/are in a range of industrial uses and in many daily goods. Industrial uses of PFOS and related chemicals include e.g. chromium plating, oil production, production of synthetic carpet, semi-conductors. AFFF fire fighting foam, Areas where AFFF foam have been used for practice or fire events or PFOS using industries have deposited production waste, can be contaminated with PFOS and should be further assessed (UNEP/POPS/POPRC.6-13 pp.19-24)[18]

PFOS used in daily goods included e.g. impregnation of synthetic carpets, leather, textiles and furniture, polishes for floors and cars and impregnation of paper used for grease and water repellence (e.g. fast food wrapping, pizza or popcorn boxes, backing paper) (UNEP/POPS/POPRC.6/INF/8)[19]. PFOS has even been used in cosmetics.

Toxicity[14]: PFOS has been related to reduced sperm quality in men. In animal studies PFOS cause cancer, physical development delays, endocrine disruption, and neonatal mortality.[14]

Practical relevance and exemptions for industrial use*:* For several of these applications the Stockholm Convention has granted specific exemptions. PFOS is however no longer allowed to be further used in cleaners, floor waxes, paints and cosmetics. PFOS is often substituted by other fluorinated chemicals and a wide range of other hazardous chemicals are still used in such sensitive applications like cosmetics even in industrial countries ("Story of Cosmetics")[20] calling for a better protection of the consumers by policy makers. Also for cleaning agents and floor polishes PFOS has been used and related chemicals are still used highlighting the necessity for consumers to select and minimize hazardous chemical exposure from articles used in daily life like e.g. cleaning agents, soaps, cosmetics, and other personal care products or pharmaceuticals (Daughton 2001[21])

For PFOS and PFOS-precursors the process of substitution is addressed by the Stockholm Convention and a summary on alternatives have been compiled (UNEP/POPS/POPRC.6/INF/8)[17] and will be updated within the Stockholm Convention process. The PFOS/precursor elimination process could become an example how substitute toxics from products (Substitution Principle[16]).

Lindane (gamma-HCH), alpha-HCH and beta-HCH

Production & use: Technical hexachlorocyclohexane (HCH) and Lindane (gamma-HCH) were some of the most extensively used organochlorine pesticides. The application of Lindane and technical HCH during the last six decades has resulted in global environmental contamination of enormous dimensions (Vijgen 2010[22], Vijgen 2006a,b[23,24]). In the production of Lindane, 85% of the raw product are HCH waste isomers largely consisting of POPs alpha-HCH. Therefore for each tonne of lindane about 10 tonnes of POPs

[12] ban.org/E-waste/technotrashfinalcomp.pdf
[13] http://www.greenpeace.org/raw/content/international/press/reports/poisoning-the-poor-electonic.pdf
[14] http://ehp03.niehs.nih.gov/article/info:doi/10.1289/ehp.1003089
[15] http://www.ipen.org/ipenweb/documents/work%20documents/ehpembarg%20sas%20101023fi.pdf
[16] Thorpe Beverly, The Substitution Principle, www.cleanproduction.org/Publications.php
[17] http://www.greenpeace.org.uk/MultimediaFiles/Live/FullReport/6031.pdf
[18] Stockholm Convention document from the 6th POP Reviewing Committee meeting (UNEP/POPS/POPRC.6-13 pp.19)
[19] Stockholm Convention document from 6th POP Reviewing Committee meeting (UNEP/POPS/POPRC.6/INF/8)
[20] http://www.storyofstuff.org/movies-all/story-of-cosmetics/
[21] http://epa.gov/esd/bios/daughton/book-summary.htm

waste have been produced.

Toxicity: The listed HCHs/Lindane are classified as potentially carcinogenic to humans and/or adversely affect wildlife and human health.

Practical relevance and exemption[7]: This waste was mainly disposed in an uncontrolled manner around the different production sites and is causing large scale ground water and soil pollution with possible threat to human and the ecosystem (Vijgen 2010[22], 2006a[23]). The amount of 4 to 7 million tonnes of disposed HCH waste isomers is comparable to the historic production amount of all other listed POPs together. This and related challenges are addressed since 20 years by the International HCH & Pesticide Association (www.ihpa.info).

The Stockholm Convention has granted a time-limited exemption for the use of Lindane for second line treatment of head lice and scabies. An important step towards the complete cessation of Lindane production worldwide is the identification, and acceptance, of suitable cheap and readily available alternatives to the exempt uses of the pesticides. A summary documentation of the International POPs Elimination Network (IPEN 2009[25]) has documented the safe, efficacious use of alternatives to lindane for treatment of head lice, including hot air treatments, wet combing, cetaphil cleanser and dimethicone lotion. The efficacy of these alternatives matched or exceeded that of lindane without the development of resistance or toxic effects in the patient.

In relation to scabies treatment, a variety of safer but effective alternatives to the use of Lindane are documented including sulphur in petrolatum, permethrin, oral ivermectin in combination with topical permethrin and keratolytic therapy, as well as certain medical oils (IPEN 2009[23]).

Chlordecone

This pesticide was mainly produced from 1958 to 1976 in the USA and in France until approx. 1990 and has been used as insecticide mainly in banana plantations. Therefore this "new" POP is not considered to have contemporary relevance except for contaminated sites at the production and areas with former high application. However some of the substitutes for Chlordecone has been listed in the Pesticide Action Network (PAN) "International List of Highly Hazardous Pesticides"[26] and in particular systemic insecticides like Neonicotinoids threatens bee and other pollinator populations (Buglife)[27] currently leading to another silent spring (Tennekes 2010)[28]. The new FAO approach[29] and NGOs that might help to guide and encourage the substitution of such hazardous pesticides have developed "An NGO Guide to hazardous Pesticides and SAICM"[30].

Pentachlorobenzene (PeCB) is an unintentionally produced POP and is formed together with other unintentionally POPs like hexachlorobenzene (HCB) and Dioxins in different processes (UNEP/POPS/POPRC.6/INF/21)[31]. The major sources are associated with the production of chlorinated solvents (e.g. tetrachloromethane, tetrachloroethene, trichloroethene, and ethylene dichloride) which generated 10,000 tonnes of HCB waste (containing also PeCB) for single factories (Weber et al 2011)[32]. The pesticide pentachloronitrobenzene (PCNB; quintozene) which degrades partly to PeCB is another important source. Detailed information can be found in the POP Review Committee document UNEP/POPS/POPRC.6/INF/21[27].

Toxicity: PeCB is moderately toxic to humans and very toxic to aquatic organisms.

[22] http://www.springerlink.com/content/g62g810418512421/fulltext.pdf
[23] http://ew.eea.europa.eu/Agriculture/Agreports/obsolete_pesticides/lindane_production.pdf
[24] http://ew.eea.europa.eu/Agriculture/Agreports/obsolete_pesticides/lindane_annexes.pdf
[25] http://www.ipen.org/ipenweb/documents/ipen%20documents/alternatives%20lindane%20report%2009.pdf
[26] http://www.pan-germany.org/download/PAN_HHP-List_101216.pdf
[27] http://www.buglife.org.uk/Resources/Buglife/Neonicotinoid%20insecticides%20report.pdf
[28] http://www.disasterinthemaking.com/
[29] http://www.fao.org/docrep/014/i2215e/i2215e.pdf
[30] http://www.ipen.org/ipenweb/documents/book/hazpesticides_guide.pdf
[31] Stockholm Convention document from the 6th POP Reviewing Committee meeting (UNEP/POPS/POPRC.6/INF/21)

Practical relevance: The remediation of such sites often cost in the order of 10s to 100s of million $ (Weber et al. 2008).[33] The contaminated sites highlight the necessity that wastes from organochlorine productions need to be managed in an environmentally sound manner and that alternative products need to be promoted (Substitution Principle[16]).

RECOMMENDATIONS

Recommendations from POP Reviewing Committee and COP5 on new POPs risk reduction

Detailed recommendations about how to address some of new POPs in the implementation of the Stockholm Convention have been developed from the POP Review Committee and COP5 for PFOS, PentaBDE and OctaBDE (UNEP/POPS/POPRC.6-13 pp.19-24)[34].

Screening and substitution of POPs and other persistent toxic compounds: As a general recommendation it needs to be stressed that most developing/transition countries have no or not sufficient destruction capacity for the end of life treatment of POPs and articles containing POPs or other critical chemicals. The inventory, management and export of such chemicals and materials is time consuming and expensive as revealed by the 10 years Stockholm Convention activities for PCB (3 million tonnes PCB containing equipment with an estimated management cost of 6 to 15 billion $USD[35]). The same is true for the large pesticide stockpiles in Africa (50000 tonnes with estimated management cost of 250 million $USD)[36] and East Europe/Asia (estimated to 240000 tonnes with estimated management cost of 1 billion $USD). Often materials containing POPs and other critical chemicals were/are disposed. However these landfilled/dumped POPs/ chemicals can leach or evaporate over time and contaminate the wider environment and humans (Weber et al 2011).[37] Contemporary and past experience of industrial countries show that the remediation of such deposits can cost 10s to 100s of million $[33] Therefore it is highly recommended that POPs and critical chemicals should be phased out and substituted as soon as possible and exemption should be avoided where alternatives exist.

A critical substitution approach for POPs and the screening and ban of other persistent and toxic chemicals is in particular important since today only 22[38] POPs are listed in the Stockholm Convention but from the approximately 100000 different industrial chemicals produced and in use today several hundred are considered to have POPs properties and thousands have adverse health effects. More than 300 industrial chemicals are detected in mothers milk[39,40] – the most valuable food for the next generation[41].

Furthermore, most developing and transition countries have no or no sufficient destruction capacity for the end of life treatment of POPs and articles containing (new) POPs or other critical chemicals which often results in open burning or deposition of POPs containing materials and other critical chemicals. These landfilled/dumped POPs and other hazardous chemicals can leach or evaporate over time and contaminate environment and humans[37].

CONCLUSION

The challenges with POPs (health, environment, management, stockpiles and contaminated sites) highlight the necessity of life-cycle- thinking approach and the use of safer chemicals as could be achieved by strict chemical legislation (Greenpeace: Safer Chemicals within REACH)[42], by considering the precautionary

[32] http://www.dioxin20xx.org/pdfs/2011/5002.pdf
[33] http://www.springerlink.com/content/0q10km8582605r1x/fulltext.pdf
[34] Stockholm Convention document from the 6th POP Reviewing Committee meeting UNEP/POPS/POPRC.6-13 pp.19
[35] Stockholm Convention (2010) PEN Magazine, Issue 01, 12/2010.
[36] World Bank (2002) Project Brief 11th September 2002. New York: World Bank.
[37] http://wmr.sagepub.com/content/29/1/107.full.pdf
[38] Endosulfan was listed in 2011 in the Stockholm Convention.
[39] www.foeeurope.org/publications/2005/toxic_inheritance.pdf
[40] www.ipen.org/ipenweb/documents/ipen%20documents/breastmilk%20cop4.pdf
[41] www.ehponline.org/members/2008/116-10/EHP116pa426PDF.pdf

principle (Sutton 2009)[43] and by substituting toxic chemicals in products (http://www.subsport.eu/; The Substitution Principle[16]) or re-designing products (www.cleanproduction.org, Story of Electronics[11], Story of Stuff[5]) (Figure 1). Such approaches leading to more sustainable production will bring opportunities and benefits to progressive industries greening the economy[6] and can be supported by activities within the implementation of Chemical Conventions or the "The Strategic Approach to International Chemical Management" (www.saicm.org; An NGO Guide to SAICM[44]). The consumer on the other hand should be educated and motivated to move towards a more sustainable consumption - taking the right choice of products considering e.g. eco-lables[27], locally produced goods, resource efficiency, sustainable procurement, or fair trade. This is also a necessary support for industries which are moving towards resource efficiency[45] and sustainable production and products.

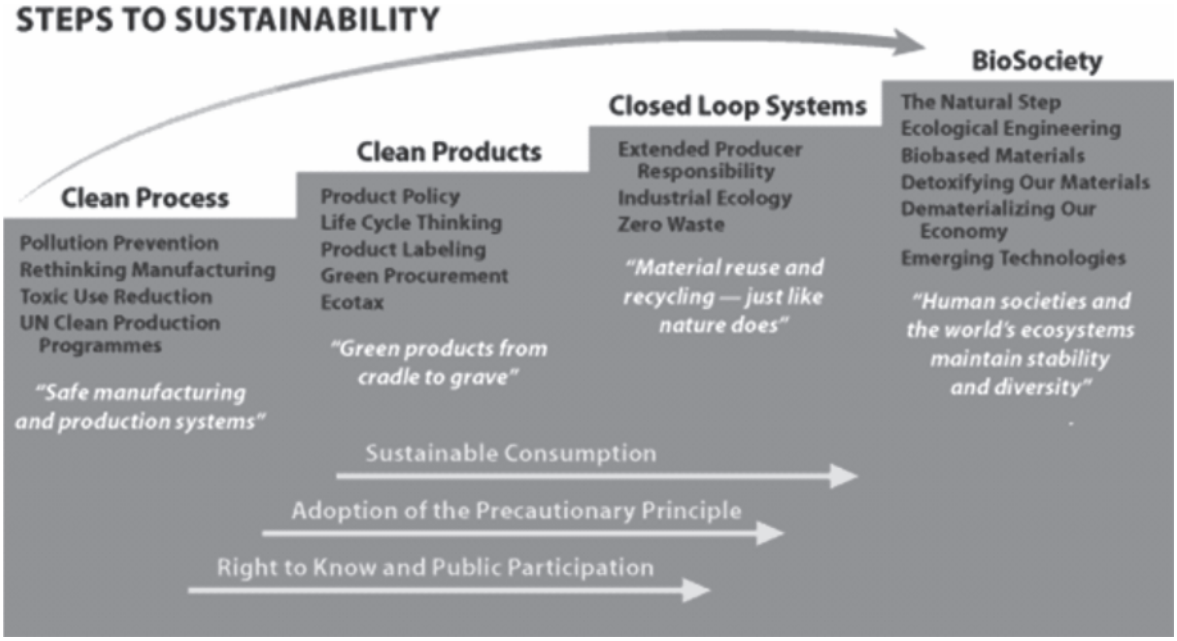

Figure 1. Steps to Sustainability (www.cleanproduction.org)

THE SHORT FILMS - introducing into the challenges of chemical pollution and the non-sustainable life cycle of our production and consumption and showing different solutions

"The Big Picture"

The film introduces into the problem of persistent organic pollutants (POPs). These are toxic man-made chemicals accumulating in the food chain finally reaching humans mainly via daily food intake (especially meat and other animal products). New POPs are however also present in consumer goods (e.g. electronics, synthetic carpets, fast food wrapping paper) resulting in indoor exposure. The film highlights the relevant exposure of the unborn child and of babies and the related risks for the development of a child.

http://www.youtube.com/watch?v=TBZrjOttFns

[42] http://www.greenpeace.org.uk/MultimediaFiles/Live/FullReport/6031.pdf
[43] http://www.sehn.org/pdf/Advancing%20the%20Precautionary%20Agenda.pdf
[44] http://www.ipen.org/ipenweb/documents/book/saicm%20introduction%20english.pdf
[45] Film: "Beyond climate change" http://umweltbundesamt.de/ressourcen-e/faktor-x/ressourcenkurzfilm.htm

"The Story of Stuff"

The "Story of Stuff" is a film of the American environmental educator Annie Leonard. She describes the non-sustainable material life cycle of the consumer society and use the example of the US. This example is true for many societies in other industrial countries and the richer society classes in developing and transition countries. The film shows the destruction of our EARTH theses consumption pattern are causing. The film demonstrates the necessity for life cycle thinking and the move towards sustainable production and sustainable consumption for building a closed material cycle society. The film also highlights that large material consumption is leading to a "work-consume-through away lifestyle" finally increasing unhappiness due to the reduction and loss of the "stuff" what really matters (time with family and friends; personal development; contribution to a healthy society) as a warning for societies moving towards a consumption society.
http://www.storyofstuff.org/movies-all/story-of-stuff/

"The Story of Electronics"

The Story of Electronics from Annie Leonard describes the life cycle of our electronic products including the negative effects of uncontrolled recycling practices using open burning and the impacts of non-sustainable, and learn about the electronics industry's "design for the dump" mentality. Join us in championing product take back to motivate companies to make less toxic, more easily recyclable and longer lasting products.
http://www.storyofstuff.org/movies-all/story-of-electronics/

"The Story of Cosmetics"

The story of cosmetics highlights that even in some industrial countries today toxic chemicals are used in sensitive consumer products like cosmetics. The film calls for a better protection of consumers by improving current legislation on chemicals including in particular cosmetic articles which is a direct exposure via skin. The film also emphasizes that the consumer has a responsibility to choose products of companies taking specific care that "Green Chemicals" are used. This supports industries developing and marketing sustainable products.
http://www.storyofstuff.org/movies-all/story-of-cosmetics/

"Beyond Climate Change – Flow"

The 10-minute film explores the issue of wastage of our natural resources, reflects our consumption-oriented lifestyle through impressive imagery and illustrates how global material flows are linked. Facts and figures caution viewers to take responsibility without discouraging them. The film ends with the camera moving through the town of tomorrow with many examples of sustainable approaches.
http://umweltbundesamt.de/ressourcen-e/faktor-x/ressourcenkurzfilm.htm

LANDFILLS AND WASTEWATER TREATMENT PLANTS AS SOURCES OF POLYBROMINATED DIPHENYL ETHER (PBDE) CONTAMINATION

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[4]Public Interest Consultants, Swansea, Wales/UK

Introduction

Polybrominated diphenyl ethers (PBDEs) are of global concern to scientists and regulatory agencies because of their persistence, ubiquitous detection in the environment, bioaccumulation in wildlife, aquatic organisms and humans, and their adverse health impacts[1]. As a result in May 2009 commercial PentaBDE, together with the hexa- and hepta- congeners of commercial OctaBDE and hexabrominobiphenyl (HBB), were listed as the first brominated flame retardants[46] to be controlled by the Stockholm Convention[2,3].

Whilst many countries had stopped production of commercial PentaBDE and OctaBDE by the late 1990s they continued to be manufactured in the US until 2004. Production of commercial hexabrominated biphenyl ceased in 1976 and due to early phase out and lower production volume[47] are found at about one to two orders of magnitude lower concentrations in fish, for example, and are therefore of less concern. Commercial PentaBDE and OctaBDE were (and DecaBDE still is) added to a wide range of commercial and consumer products to increase their flame ignition resistance[4]. The principal uses of PentaBDE was for polyurethane foam (PUF) in furniture, mattresses, and vehicle interiors with minor uses for circuit boards in electronics, textiles and PUF in insulation foam. OctaBDE was used mainly for plastic products such as computer and TV casings. PBDEs were used as additives in flame retardants and so products containing them release PBDE/BFRs into the environment during their entire life cycle, which includes production, use, recycling (mainly to carpet padding for PentaBDE), and disposal.

PBDE use in relatively short life consumer goods such as electronics has resulted in increasing disposal of PBDE containing wastes within landfills, supplementing an already substantial PBDE stock at these sites. It is estimated that about 80% of products containing PBDEs have been disposed in landfills with most of the remainder being incinerated or recycled into other products[6,7].

For developing and transition countries the proportion of consumer products deposited to landfills is likely to be even greater. Furthermore POP PBDEs are exported within electronic wastes to developing/transition countries, where they are often incorporated into recycled materials or improperly disposed, often by open burning. These practices have resulted in human and environmental exposures and contamination of new products.

There is a growing evidence that brominated flame retardants are leaching from landfills and contaminating the environment[8-10]. A number of studies have documented the releases of PBDE and other BFRs from landfills [8-11]. It has also been demonstrated that releases of PBDE from landfills impact human communities living near or on the landfills in developing countries[11,12].
The extent of the distribution of PBDEs from landfills and sewage treatment plants to the wider environment, including surface waters (rivers and lakes), sediments, and fish has not been investigated in detail. In 2000 to 2006, as part of the Minnesota Pollution Control Agency (MPCA) Emerging Contaminants Program, a comprehensive PBDEs study was undertaken[7,13]. This paper summarizes the findings of this multiple phase study as an example on how to

[46] Currently hexabromocyclododecane (HBCD) is evaluated by the POPs Reviewing Committee for listing in the Convention.
[47] Only about 6000 tonnes hexabromobiphenyl have been produced from 1970 to 1976 (United States) and have stopped

assess chemicals in consumer products for further regulatory and policy making purposes.

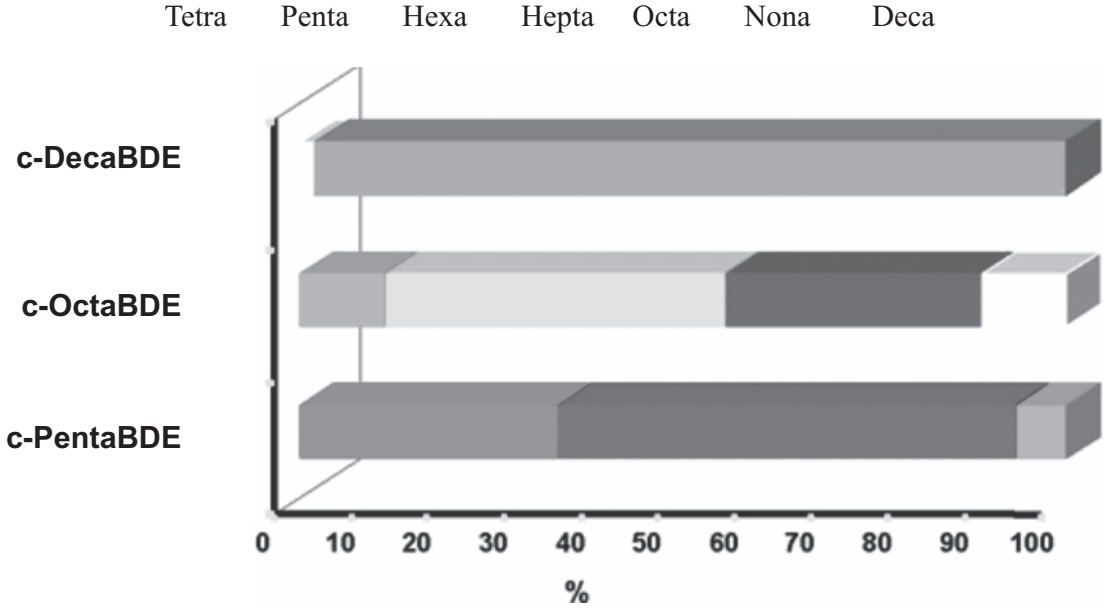

Figure 1. Example of homologue distribution of commercial c-PentaBDE, c-OctaBDE and c-DecaBDE (distribution can vary significantly between producer and lot).

Materials and Methods

The MPCA developed a sampling plan for the purpose of assessing the life cycle of PBDE with respect to its contamination potential. During a 5 year program samples from different environmental matrices with potential sources and receptors of PBDEs were collected during the summer of 2001 through 2005. The sampling efforts were targeted at landfill leachates, sludges and effluents of waste water treatment plants (partly receiving leachates from landfills). In addition, fish and sediment samples were collected from rivers below WWTP effluent discharges from six major river basins in Minnesota (Mississippi, St. Louis, Red, Rainy, Minnesota and St. Croix).

Using a high volume water sampler, Infiltrex-300, pursuant to procedures described elsewhere[13], wastewater effluent discharges and ground water samples were collected. TEF-1000 PUF ambient air samplers were used for 48-72 hours to monitor the releases from landfill gas. Samples of sediment, sludge, and leachates were collected and placed in a solvent rinsed dark glass container, and then stored at –20°C. Fish samples were wrapped in a solvent rinsed aluminum foil and stored at –4°C. All samples were sent for PBDEs analysis to a commercial laboratory for PBDEs analysis. Samples were spiked with a suite of $^{13}C_{12}$ labeled internal standards and further analyzed by high resolution GC/HRMS.

Results and Discussion

Landfill Leachate

Five landfills (three municipal, one industrial, and one demolition) were sampled for leachates and where available, sludge generated from leachates to determine the presence and concentration of PBDEs. At all five landfills, PBDE in leachates were detected at the ppb level: the total PBDEs concentrations ranged from 29 - 248 ng/l. The demolition landfill had the highest total PBDE concentrations. The currently unregulated DecaBDE (BDE 209) was the major contributor to the total PBDEs contamination (60% to 98% of the total PBDEs). Other dominants congeners in landfill leachates were, in order of concentration, BDE-99, 47, 207, 100, and 153 and therefore comprise mainly POPs PBDEs now listed in the Stockholm Convention.

During the second phase of the study, leachates, landfill gas (diffused in surrounding ambient air), and groundwater samples were collected from a closed landfill located in Duluth, Minnesota. Analysis detected PBDEs in all samples. Total PBDE values included leachates (7.1 ng/l), ambient air of diffused landfill gas (up to 17.3 ng/m3 total of vapor and particulate phases), and groundwater monitoring wells (0.052 ng/l total of dissolved and particulate phases). The dominant PBDE congener in the closed landfill leachates was the POPs BDE-47, followed by POPs BDE-99, and BDE-209. Of the individual PBDE congeners in surrounding ambient air, BDE-47 had the highest concentration (8.23 ng/m3), followed by BDE-209, BDE-99, BDE-28/33, and BDE-100. Except for the BDE-209 which was found predominantly in the particulate phase, the remaining lower brominated BDEs were found at a higher level in vapor phase. Of the individual PBDE congeners in groundwater samples (particulate and dissolved phases), BDE-209 had the highest concentration (0.033 ng/l all in particulate phase) and accounted for 63% of total mass of PBDE. BDE-47 and BDE-99 together accounted for 20% of total mass of PBDE and were detected mostly in the dissolved phase.

***Waste Water Treatment Plants and Contaminant Distribution via Sewage* Sludge**

Sewage sludge is a large sink for a range of toxic chemicals including POPs and can be an important pathway for the distribution of these chemicals into the environment. In most countries sewage sludge is spread on agricultural land.. During wastewater treatment, over 90% of PBDEs are transferred into sewage sludge due to their hydrophobic nature, resulting in contamination of sewage sludge in concentrations similar to household dust[14-16].

Two domestic wastewater treatment plants, the MWCC-Metropolitan and Western Lake Superior Sanitary District, were selected for the first screening phase of this study (2001) to assess the presence of PBDEs in WWTPs as potential sources of releases to the environment. Samples of raw or activated sludge were taken after primary and secondary treatment processes, while samples of dewatered or final sludge (MWCC-Final and WLSSD-Final) were taken after the final treatment processes. The total PBDE concentrations in these samples ranged from 889-5,305 ng/g (dry weight). The dominant congeners in the sludge samples were BDE-209> BDE-99> BDE-47> BDE- 100, respectively. The total concentrations of three PBDE congeners (47, 99, and 209) in sewage sludge samples from communities in the Lake Superior and Lake Michigan watershed was 2604 ng/g (dry weight) and 1679 ng/g (dry weight), respectively. As shown in Table 1,these values can be compared with the USEPA Targeted National Sewage Sludge Survey Sampling and Analysis[17]:

Additional samples were taken at the influent, effluent, and sludges of the WLSSD Waste Water Treatment Plant which receives leachates from the WLSSD Landfill. Samples of three different influents representing different industrial and domestic discharges to WLSSD WWTP were collected. The total PBDE concentrations ranged from 106 to 262 ng/l. The dominant congeners were BDE-209> BDE-47> BDE-99> BDE-100. The high volume samples were collected from effluents to detect the PBDE concentrations in dissolved and particulate phases. The total PBDE concentrations were 0.91 ng/l. More than 70% of total PBDEs were found to be in particulate phase.

Table 1: PBDE concentration in US sewage sludge; Nationally-Representative Estimates for 34

Analytes Estimates Statistically Adjusted to Represent 3,337 Pots (>1 MGD) [17]

Analyte	Observed Values		Estimates							
			Percentiles					Summary Statistics		
	Minimum	Maximum	99th	98th	95th	90th	50th	Mean	Standard Deviation	Percent POTWs with Detected Conc
PBDEs (ng/kg)										
BDE-47 (2,2',4,4'-tetrabromodiphenyl)	73,000	5,000,000	2,650,430	2,212,077	1,688,881	1,329,167	570,448	709,174	523,791	100
BDE-99 (2,2',4,4',5-pentabromodiphenyl)	64,000	4,000,000	2,696,928	2,248,181	1,713,370	1,346,295	574,559	716,362	533,447	100
BDE-153 (2,2',4,4',5,5'-hexabromodiphenyl)	9,100	410,000	265,395	220,098	166,454	129,902	54,117	68,334	52,685	100
BDE-209 (decabromodiphenyl)	150,000	17,000,000	15,836,435	11,645,502	7,360,103	4,898,034	1,162,523	2,181,237	3,462,942	98.5

The dominant congeners were BDE-47> BDE-99> BDE-209 (only in particulate phase was detected). The total PBDE concentrations in samples of primary, secondary, and final sludge (biosolids) in WLSSD were 620, 926, and 931 ng/g (dry weight), respectively. The dominant congeners in all sludge samples were BDE-209 > BDE-99> BDE-47> BDE-100, respectively.

The data correspond with high concentrations of PBDEs in U.S. sewage sludge of up to 3 mg/kg dry weight 14, 17. These levels are 10 to 100-fold higher than concentrations reported in European sludges. In addition, the concentrations of Deca-BDE in US sludge is at ppm levels (Table 1) and much higher than Deca-BDE concentrations reported in Dutch or Swiss sewage sludge samples (0.009-0.2 mg/kg dry weight). It is important to note that POP PBDE levels in Swiss sewage sludge have shown decreases over time, which is in line with the reduction of their usage in Europe, while the concentration of DecaBDE have increased by 500% over a similar timeframe, causing a total increase of 400% in total PBDEs. These findings indicate that with respect to PBDEs/BFRs countries should not focus singularly on POP PBDE but should address brominated flame retardants as a chemical group and manage related wastes holistically.

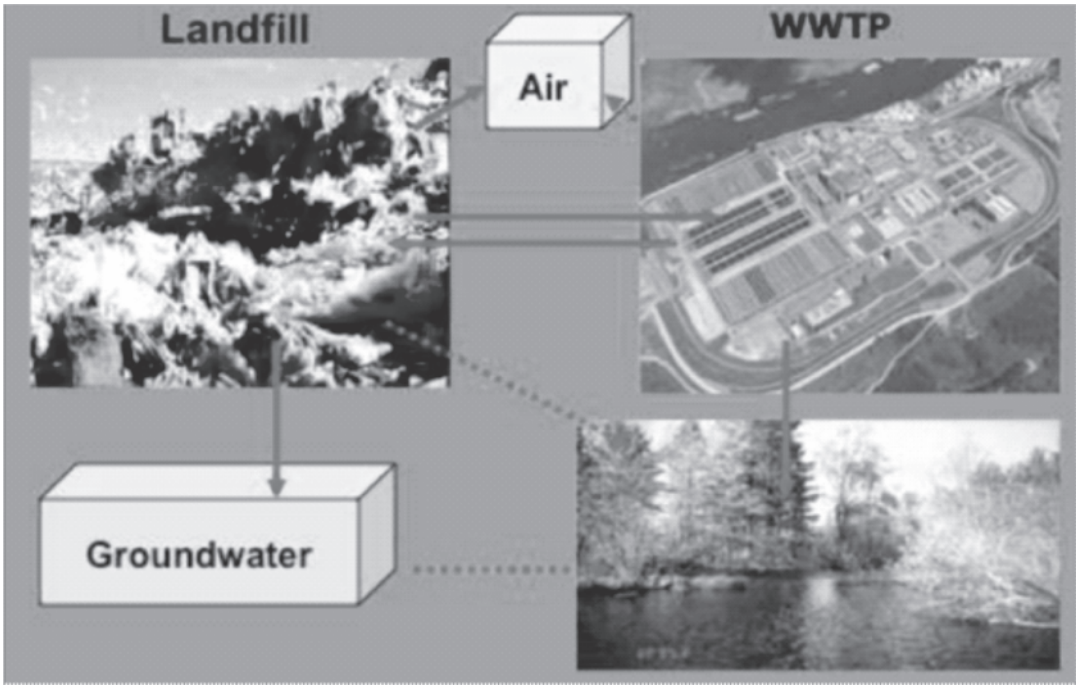

Figure 1. Substance flow of PBDEs (and other semi-mobile POPs) in landfills and wastewater treatment plants and contamination of groundwater and surface waters (including fish).

The sewage sludge ("biosolids") analyzed in the Minnesota study were applied to farmland, as they are in most parts of the US and in many other countries. Accordingly this practice may transfer PBDE to soils and possibly ground and surface waters, with a potential to expose humans via fish contaminated from these sources or via meat and/or milk from cows grazing on these farmlands.

This study revealed that the substance flow of PBDEs (and other semi-mobile POPs) in landfills, wastewater treatment plant, into the environment (air and ground water and via sewage sludge to soil) could be significant (Figure 1).

PBDE contamination in Sediment and fish samples

During the 2001 PBDE study, sediment samples from the major rivers in Minnesota (Mississippi, St. Louis, Red, Rainy, Minnesota, and St. Croix Rivers) were analyzed for PBDEs with the objective of quantifying current concentrations of PBDEs in the major river basins in Minnesota. A composite sediment sample representing five individual sampling locations was taken from each river. A high lipid fish species (carp or sucker) was collected from the same part of the river from which sediments were sampled. Three fish of the same species and similar size class (+ 10 cm) were composited for PBDE analysis. Sediment and fish sampling below the effluent discharges from treatment facilities helped determine the presence and concentrations of PBDEs in aquatic environments impacted by wastewater effluents.

The total PBDE concentrations in fish were high and ranged from 113 to 3400 ng/g lipid weight. The dominant congeners in fish samples were BDE-47> BDE-99 or BDE-100> BDE-49> BDE-153 & BDE-154 which are all POP PBDEs. The total PBDE concentrations in sediment samples ranged from 6 to 1950 ng/g TOC. Sediment samples primarily consisted of BDE-209> BDE-99 > BDE- 100 > BDE-47 and BDE-49. The high fish to sediment ratio for the lower brominated more toxic POP PBDE congeners are a result of higher bioavailability, combined with debromination of DecaBDE and other highly brominated PBDE in fish to form lower brominated POP PBDE[18].

Conclusion

This study served to exemplify how an environmental ministry may implement well-planned research programs to assess the fate of persistent chemicals as a base for policy making in a state/country to evaluate the fate of persistent chemicals present in consumer goods and consider remedial measures. The results demonstrate that PBDEs are ubiquitous environmental contaminants, revealing how the use of brominated flame retardants in consumer goods may eventually contaminate the environment. There are currently no global limitations to define a threshold for PBDE contamination in leachate or sewage sludge. Levels in sediments and fish discovered were elevated to the extent that at least some sections of rivers could be considered as PBDE contaminated sites. In addition, there are no regulatory limitations for PBDE that define whether a soils, sediments, or fish, are contaminated, in spite of the fact that certain PBDEs are now listed as POPs.

Although many countries ceased production of PentaBDE and OctaBDE in the 1990s, manufacture in the US continued until 2004 and DecaBDE is still produced in large quantities. The flows of POP PBDEs from households into landfills and wastewater treatment plants may be expected to decrease in all countries. At the same time, however, additional PBDE containing waste (particularly DecaBDE) are being deposited in landfills, adding to an increasing PBDE burden in landfills. In the US PBDE stocks, including DecaBDE, in landfills are estimated in the range of hundreds of thousands of tonness and are being slowly released into the environment, while for other regions with lesser flame retarded-infused consumer goods could be considerably lower. Environmental releases will continue for decades, possibly centuries. The kinetics of degradation results in slow leaching behavior from plastic materials, and slow degradation of DecaBDE10 with degradation products also resulting in the release of lower brominated PBDEs and meth/hydroxyBDEs into the environment.

The study illustrates that landfill leachates and WWTP effluents and sewage sludges ("biosolids") are key sources of PBDEs into the

environment and that persistent chemicals like BFRs should not be deposited [19]. Considering their unsustainable life cycle, challenges of recycling and difficulties in the end of life management [20, 21] a prudent alternative is to substitute PBDE use with more environmental benign alternatives1. This requires that national chemical policy regulates brominated flame retardants as a group rather than continuing to attempt to regulate by individual congeners – an approach which destined to failure.

References

1. Shaw SD, Blum A, Weber R, Kannan K, Rich D, Lucas D, Koshland CP, Dobraca D, Hanson S, Birnbaum LS. (2011) Halogenated Flame Retardants: Do the Fire Safety Benefits Justify the Risks? Reviews on Environmental Health 25(4) 261-305
2. Stockholm Convention (2009) UNEP/POPS/COP.4/SC-4/18 listing of tetrabromodiphenyl ether and pentabromodiphenyl ether.
3. Weber R, Watson A, Webster T (2010) New POPs – The unique challenge of controlling PBDEs under the Stockholm Convention. BFR 2010, Proceedings 5th International Symposium on Brominated Flame Retardants. April 7-9. Kyoto Japan.
4. Alaee M, Arias P, Sjödin A, Bergman A (2003) *Environment International* 29: 683-689.
5. Alcock RE, Sweetman A J, Prevedouros K, Jones K C (2003) *Environment International* 29: 691
6. Petreas M, Oros, D (2009) *Chemosphere* 74: 996-1001.
7. Oliaei F, King P, Hamilton C (2002) Organohalogen Compounds 58: 185-188.
8. Osako M, Kim Y-J, Sakai S-i (2004) *Chemosphere* 57(10): 1571-1579
9. Odusanya, D.O.,Okonkwo, J.O. Botha, B., (2009) *Waste Management* 29(1): 96-102
10. Danon-Schaffer, M.N. (2010). Polybrominated Diphenyl Ethers in Landfills from Electronic Waste Feburary 2010. PhD University of British Columbia Vancouver, Canada.
11. Athanasiadou M, Cuadra SN, Marsh G, Bergman A, Jakobsson K (2008). *Environ Health Perspect* 116(3): 400- 408
12. Kunisue T, Ohtake M, Someya M, Subramanian A, Chakraborty P, Tanabe S (2006). *Organohalogen Compounds* 68: 1619-1622.
13. Oliaei, Fardin (2005) Flame Retardant: Polybrominated Diphenyl Ethers (PBDEs) in Minnesota. Minnesota Pollution Control Agency (MPCA) – Legislative Report. PP. 34.
14. Hale, R. C., M. J. La Guardia, et al. (2006) *Chemosphere* 64: 181-186.
15. La Guardia, M. J., R. C. Hale, et al. (2010) *Environ Sci Technol.*
16. Song, M., S. Chu, et al. (2006) *Environ Sci Technol* 40(20): 6241-6246.
17. USEPA (2009). Targeted National Sewage Sludge Survey Sampling and Analysis Technical Report EP A-822-R-08-016. Washington DC, U.S. Environmental Protection Agency Office of Water.
18. UNEP (2010c) Debromination of brominated flame retardants. Stockholm Convention document for 6th POP Reviewing Committee meeting (UNEP/ POPS/POPRC.6/INF/20) Geneva 11-15. October 2010.
19. Weber R, Watson A, Forter M, Oliaei F (2011). Persistent Organic Pollutants and Landfills - A Review of Past Experiences and Future Challenges. Waste Management & Research 29 (1) 107-121.
20. UNEP (2010a) Technical review of the implications of recycling commercial penta and octabromodiphenyl ethers. Stockholm Convention document for 6th POP Reviewing Committee meeting (UNEP/POPS/POPRC. 6/2) Geneva 11-15. October 2010.
21. UNEP (2010b) Technical review of the implications of recycling commercial penta and octabromodiphenyl ethers. Stockholm Convention document for 6th POP Reviewing Committee meeting (UNEP/ POPS/POPRC.6/INF/6) Geneva 11-15. October 2010.

δ-HEXACHLOROCYCLOHEXANE – POTENTIAL MARKER OF UNKNOWN ENVIRONMENTAL PROCESSES?

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Abstract

Three of the nine new Stockholm Convention persistent organic pollutants (α-, β- and γ-hexachlorocyclohexanes) are some of the major persistent organochlorine compounds found in the environment worldwide. Both technical HCHs mixture (65-70 % α-HCH, 14-15 % γ-HCH and other compounds) and lindane (> 99 % γ-HCH) have been used as broad-spectrum insecticides since the early 1950s for a variety of purposes in agriculture, forestry, and public health.

The total world production has been estimated to several million tons. It means that these new POPs represent a a very old and very broad problem. We can expect the releases of HCHs into the environment from various hazardous waste sites, stockpiles and residues of technical HCHs and lindane production, contaminated sites from former production plants, disposal site, old storage with obsolete mixtures.

δ-Isomer represents a special case. This isomer has the highest log Kow (4.14), strong tendency to soil organic matter sorption, higher water solubility, tendency to accumulation in sediments. The available information concerning to δ-isomers are much more scare or main published data are round limits of detection.

Some very unexpected levels and quite uncommon ratio of isomers were found in some highly contaminated sites (Spolana Neratovice, Czech Republic; Chapaevsk, Ufa, RF; Bitterfeld, Germany; OHIS in Skopje; Kenya). The results were also confirm by the data from MONET Network (Monitoring NET work for determination of POPs on ambient air using the polyurethane foam) operated by the RECETOX.

Introduction

Three of the nine new Stockholm Convention persistent organic pollutants (α-, β-and γ-hexachlorocyclohexanes) are one of the major persistent organochlorine compounds found in the environment worldwide [1]. Both technical HCHs mixture (65-70 % α-HCH, 14-15 % γ-HCH and other compounds) and lindane (> 99 % γ-HCH) have been used as broad-spectrum insecticides since the early 1950s for a variety of purposes in agriculture, forestry, and public health [2].

Case of HCHs isomers

α-, β- HCH by itself is neither intentionally produced nor placed on the market. It was produced as a constituent of technical HCH used as organochlorine insecticide or chemical intermediate to manufacture enriched HCH (lindane). Whereas lindane is still used in some countries, the use of technical grade HCH has been banned there since the 1970s.

The total world production has been estimated to several million tonnes [3,4]. In Eastern Europe and in parts of Asia and Africa, the technical mixture was in widespread use for much longer. Other problem is that a huge amount of obsolete waste of these technical mixtures, which is estimated round 4 million t worldwide. It means that this new POPs represent very old and very broad problem. We can expect the releases of HCHs into the environment from various hazardous waste sites, stockpiles and residues of technical HCHs and lindane production, which are not always controlled or maintained safely [5] and represent worldwide problem. Serious problems of environmental burden of HCH isomers are also connected with the contaminated sites from former production plants, disposal site, old storage with obsolete mixtures.

Environmental fate of HCH isomers

The hexachlorocyclohexane isomers have the different properties and environmental

behaviour. α-Isomer is presented mainly in air and water due to its higher volatility and higher water solubility. β-Isomer has a less vapour pressure, higher melting point than α and higher occurrence in soils. γ-Isomer is environmentally ubiquitous, it is the most water soluble and prone to leaching. δ-Isomer has the highest log Kow (4,14), strong tendency to soil organic matter sorption, higher water solubility and tendency to accumulation in sediments.

Based on their properties, the velocity of aerobic degradation decreased in the following sequence: γ>α>β≥δ. Biomagnification was confirmed for α and β. The γ-, α-, β- isomers were detected in biota and also in human body (blood, milk, fat tissue). For α- and β- isomers the exposure in development stage were described.

The main attention in the various monitoring programmes and research projects was/is focused on α-, β- and γ-isomers. The available information concerning to δ-isomers are much more scare or main published data are round limits of detection.

HCHs story in the Czech Republic

Czech Republic (or former Czechoslovakia) was country which produced and widely used early the HCHs technical mixtures and lindane latter on. This problem is mainly connected with the factory Spolana Neratovice. Estimation of POPs in soils on the country scale as example of country burden and country contribution for the Czech Republic, was prepared by the Centre RECETOX. To assess the risks connected to the POP burdens in soils was proceeded in several steps. In the first step, a country wide POPs inventory of soils, their properties and contamination levels was performed based on country available monitoring data [6,7]. This inventory was focused only on the POPs in agricultural, forest, grassland type of soils, all industrial hot spots and highly contaminated sites were excluded. As a second step, a model estimating total burdens and associated potential risks for human and wildlife, was developed [8,9]. δ-HCH represents in this estimation 24.16 t from 303.23 t of HCHs (7.97 %), it means that this estimation is in a very good agreement with the generally described percentage of δ -HCHs in technical mixtures (6-10 %).

Howver these numbers represent an estimation without any hot spots, without any potentially highly contaminated sites - storages, dumps, unsaturated and saturated zones in the area of former producer. This amount of this isomer can be higher and question is if the isomer ratio in these highly contaminated sites is the same, similar or different. We can find the answers in the results from long-term environmental monitoring programmes.

MONET – monitoring network for POPs in ambient air

In the last few years, passive air samplers (PAS) using the polyurethane foam as new and a cheap and versatile alternative to the conventional high volume air sampling tools for the air quality monitoring, were developed, tested and applied as part of international programmes (Stockholm Convention, EMEP) as well as in some countries on the national scale [10].

MONET programme (MONnitoring NETwork) was prepared and is managed and co-ordinated by RECETOX as the Regional Centre of the Stockholm Convention for the region of Central and Eastern Europe. The summary report with the results of the ambient air POPs monitoring activities in the Central and Eastern European region (CEEC), Central Asia, Africa and Pacific Islands were published recently [10]. From March 2009, in the co/operation with the EMEP (European Monitoring and Evaluation Programme), MONET-Europe was started and covered whole Europe. It will be the first study concerned with the determination of temporal and spatial trends of POPs in ambient air of whole European continent.

For many of the participating countries, these activities generated first data set on the atmospheric levels of POPs. This was a reason why the background monitoring was accompanied with the screening of the extent of contamination in the individual countries. Important results of all these measurements are spatial and temporal information concerning to POPs including HCHs in ambient air.

Programme MONET – HCHs data round the Globe [10]

Levels of HCHs were generally low (median value below 30 ng filter^{-1} during the 28 days of exposure) except for the sites where it was produced or stored. The highest median levels were measured at several sites in Romania (Turda 2.3 μg, Onesti 1 μg filter^{-1}), similar extreme (2.5 μg filter^{-1}) was also found at Kitengela site in Kenya. Hundreds of nanograms of HCHs per filter were measured in Ufa and Chapaevsk in Russia, near the Spolana chemical factory in the Czech Republic or in Skopje, Macedonia. The background site in Kyrgyzstan had the highest median levels of HCHs, followed by the sites in Togo, Tunisia, Romania, Moldova, Ukraine and Serbia. As the background levels of HCHs are usually quite uniform, such results indicate some local sources of HCHs. South Africa and Fiji were again the cleanest sites in the project [10].

As far as the δ-isomer is concerned, the reported data from ambient air monitoring including MONET results are very low, usually round LOQ. Again, these results are generally in good agreement with the composition of technical mixtures and physical-chemical properties of this isomer - less volatility and the highest K_{OW}.

However, completely different situation has been observed in the highly contaminated sites – in the areas of former production facility, dumps, storages, such as for example Spolana Neratovice, CR, Chapaevsk, Ufa, Bitterfeld, OHIS in Skopje, Kenya [10].

Case of Spolana Neratovice

The Spolana Neratovice factory, former producer of OCPs including HCHs, which is situated approximately 25 km north of Prague at the Elbe River, is in this time probably one from the most renown and studied sources of POPs contamination in the Czech Republic [6,7]. The decontamination and remediation of site started at 2005 with using of the unique base catalysed dechlorination non-combustion technology (BCD). These processes of site remediation consist from the decontamination and demolition of 2 buildings, excavation and treatment of surrounding soils of these two buildings, treatment of chemicals stored closed to main building, dissemble and treatment of the process unit and backfill and final restoration [6,7].

The remediation of the chemical factory including the buildings heavily contaminated with pesticides and dioxins, and contaminated soils started in 2006. An extensive field work including the relocation of contaminated soils was the first part of the project. Remediation activities caused significant (up to 1.5 order of magnitude) increase of the POP, mainly HCHs contamination of the ambient air both, within the factory, and in neighbouring residential areas [7]. During the second phase, this contamination, dropped back as soon as the field works with contaminated soil were terminated and determined ambient air levels were very low. But during the third phase – the remediation of the second building and unsaturated zone under this building, higher levels of HCHs than during the first phase were determined again.

δ- Levels

The evaluation of ongoing monitoring programme results, leads to the fact that data about the δ-isomer levels and occurrence published in literature and reports are relatively scare and presented levels are in units of % - up to 10 % of total HCH mixture [1-5].

The evaluation of remediation procedure of the area of Spolana Neratovice using of BCD technology summarized that process was effective, successful. But following risk analysis and some research studies mentioned, we can still find some POPs problems in this area, and the remediation of all area is still not completed. Question is what we know about this site? What could happen under the surface during last years? These results mainly summarized α-, β-, γ-isomers levels and evaluation of presented levels and the ratio among the isomers is very similar for whole period of site monitoring. But what δ-isomer?

As mentioned earlier, MONET data concerning to δ-isomer in ambient air from this area and in the vicinity of the Spolana Neratovice, are in a very good agreement with data from other site in

the CR – area of company δ- represents 5-10 % of HCHs ambient air mixtures, outside, near to LOQ [10].

But during the third phase of remediation, we have found that δ-isomer represented 25-33 % of HCHs air levels as a result of the excavation of unsaturated zone. Similarly the percentage of δ-isomer in soil samples from the sites connected with the former OCPs production sites were 22.1 – 26.8 %.

Also in some other MONET sites that represent former production facilities, higher percentage of δ-isomer were found - OHIS Skopje, Macedonia (suburban area) 10-15 % of δ-isomer, Chapaevsk, Russian Federation (outside factory) – 5 – 13 %; or in Kitangela, Kenya – pesticide dumpsite – 45-60 % in air and round 45 % in soil [10].

Higher level of δ-isomer in ambient air was detected in Konya, Turkey during the measurements between August 2006 and May 2007 at four different locations [11]. Konya is the biggest plain in Turkey located in Central Antalya and accounts for 17 % of all agricultural land. The mean concentration of HCHs ranged from 1 065 to 2 386 pg m^{-3}, and the percentage of δ-isomer in these samples ranged from 29 to 34.8 % (n=10). The observed values of HCHs and other OCPs in Konya can demonstrate potential illegally usage in the course of agricultural activities and gardens or there are residues of past use in the environment.

OCPs were measured also in top soils from 11 agricultural areas in the area of large disused industrial plants in the Leipzig-Halle region at various distances from emitters [12]. Percentage of δ-isomers in the HCHs mixture in the A-horizons of the studied areas varied from 2.20 to 17.1. Nine from eleven δ-HCH contents were higher than 10%. Furthermore, the loadings indicate that, in addition to β-HCH, large δ-HCH fractions also occur as a degradation product whereas α-HCH appears to be only influenced by this ratio relatively slightly.

Levels of chlorobenzenes and hexachlorocyclohexanes (HCHs), including δ-isomer was determined in the atmosphere at three different sites near Bitterfeld and Leipzig [13]. One site (Greppin) was near the former chemical plant Bitterfeld-Wolfen and the landfill „Antonie“, where the significantly higher levels of HCB and α- and β-HCHs were determined. In Bitterfeld the undesired by-products of the lindane production (round 70 000 t of α-, β- and δ-isomers) were deposited. More than 10 % of δ-isomer was also detected in some ambient air samples there.

The contents of OCPs were determined in a tropical coastal environment (southeast coast of India) [14]. The concentration of HCHs (4 isomers) ranged from 1.45 to 35.6 ng m^{-3} during the period 1993-1994 and concentrations of δ-HCH ranged between 0.2 to 1.76 ng m^{-3} which represent range 0 and 20.9 % of the technical mixture (n=9).

Conclusion

Generally, higher levels of β- and δ- indicate older contamination by the technical mixtures of HCHs because α, γ isomers can be easily metabolised, and they will not be detected in these samples. The α- and γ- isomers are also higher volatile and we can expect the losses via volatilisation. The β-, δ-isomers are much more stable, they can strongly interact with dissolved organic matter and they can be easily transported to deeper horizons and cumulate there. In this special case of δ-isomers, it has higher biological and chemical persistence in comparison with γ; lower volatility and biological activity in the comparison with α; the same or lower potential to degradation and to accumulation in biota and soil as β. In summary, due to persistence, low degradability, higher K_{ow}, less volatility it has higher tendency to soil accumulation. It will depend on the site-specificity, depth, present biological activity, level of contamination.

Future challenge

Is the observed percentage of δ-isomer in some environmental mixtures of HCHs a result of natural accumulation processes or some unknown environmental transformations in deeper layers of soils, dumping sites and sediments.

Acknowledgements

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References

1. UNEP Stockholm Convention, United Nations, Geneva, 2001 – 2011 – decisions and background document – www.pops.int
2. Fiedler, H., Hub, M., Hutzinger, O. Stoffbericht hexachlorcyclohexan (HCH). Bericht Nr. 9/93 der Landesanstalt fur Umweltschutz Baden-Wurtemberg (Hrsg.), Karlsruhe (1993).
3. Breivik, K., Pacyna, J. M., Munch, J. Use of α-, β-, γ-hexachlorocyclohexane in Europe, 1970-1996. Sci. Total Environ. 239, 151-163.
4. Li YF. *Sci. Total Environ.* 2003; 232:121.
5. International HCH and Pesticide Association – documents of the IHPA Conferences (http://www.ihpa.info/).
6. Holoubek I, Čupr P, Jech L, Ocelka, T, Kužílek V, Vácha R, Škarek M, Matoušek J, Kočan A. *Organohal. Compds.*, 2003; 61: 353.
7. Holoubek I, Klanova J, Cupr P. *Organohal. Compds.*, 2007; 69:861.
8. Holoubek I, Dušek L, Sáňka M, Hofman J, Čupr P, Jarkovský J, Zbíral J, Klánová J. *Environ Pollut.* 2009;157:3207.
9. Čupr P, Bartoš T, Sáňka M, Klánová J, Mikeš O, Holoubek I. Sci. Tot. Environ. 2010; 408:486.
10. Klánová J, Čupr P, Holoubek I, Borůvková J, Přibylová, P, Kareš R, Kohoutek J, Dvorská A, Komprda J. Towards the Global Monitoring of POPs. Contribution of the MONET Network. 2009. Masaryk University, Brno, Czech Republic. ISBN 978-80-210-4853-9
11. Ozcan S, Aydin ME. *Clean*, 2009; 37: 343-348.
12. Manz M, Wenzel KD, Dietze U, Schuurmann G. *Sci. Total Environ.* 2001; 277:187.
13. Popp P, Bruggemann L, Keil, P, Thuss U, Weiss H. *Chemosphere* 2000; 41:849.
14. Rajendran RB, Venugopalan VK, Ramesh R. *Chemosphere*, 1999; 39:1699.

RISKS LINKED TO THE HISTORICALLY CONTAMINATED SITES WITH HCH IN ROMANIA

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Keywords: contaminated soils, risks, POPs, Turda

INTRODUCTION

The Site used as dump site for hazardous waste known as Lindane, is recorded in the Contaminated Sites Inventory data base managed by ANPM and was based on the Identification Questionnaire (Record no. APMCJ00022). Former UCT operated within administrative borders of Turda Municipality, industrial area. The factory operations' commenced in 1913-1914 known as Solvay Soda Factory. After nationalization in late 40's the UCT produced HCH (as a substitute to DDT) and more other 18 chemicals. The former UCT closed its operations in October 1998 [7]. The uncontrolled disposal of HCH waste allowed contaminant's migration outside the site and its transfer in the food chain: the source of transmitting the HCH contaminated ground-water/airborne-pasture/milk/dairy products/human receptors.

CONCLUSIONS ON PHASE I ESA [1]

The PHASE I ESA has revealed the following evidence of *recognized environmental conditions* in connection with the Site [5]:

- Most likely impact to the soil (on the surface and subsurface) and groundwater is generated by the potential for contamination with Lindane and heavy metal containing waste. The Site's potentially contaminated areas are shown graphically in drawing no.1.
- The uncontrolled disposal of HCH waste allowed contaminant's migration outside the site and its transfer in the food chain: the source of transmitting the HCH contaminated groundwater/ airborne- pasture/milk/dairy products/human receptors.
- The lack of safety enclosure area measures has allowed residents to collect the waste with Lindane content and then to trade it in the neighboring localities or even at longer distances (Piatra Neamt – east of Romania) for purposes which have a high risk for human health (using it as insecticide for construction wood or as pesticide for agricultural lands).

CONCLUSIONS ON PHASE II ESA [2]

The purpose of this Phase II ESA was to determine if the subsurface soils and/or groundwater on the Site are environmentally impacted by historical/current uses and to address the *recognized environmental conditions* identified for the Site during the *Phase I ESA[3]*. A surface layer of material 0.5 – 1.2 m thick was described as powdery grey to grey/brown and in some areas an organic odour notified (*"...the smell of chloride pesticides."*). The general appearance of this layer was the only indication of waste material being present across the site.
Metal compounds data screen identified some exceedances of arsenic (>60% of samples), and some exceedances of lead in spots (~20% of all samples). Contamination with HCH within site soils across the low lying area at the Turda site is widespread. Shallow organic contamination of soil mainly with total HCH and lead was identified at a depth up to 2.5 mbgl for the area where the test pits and boreholes were completed. Shallow metals contamination on soil mainly with arsenic was identified at depths up 4.0 mbgl for the area where the test pits and boreholes were completed. Groundwater quality at the Turda site shows low impact by mercury, BTEX and pesticides.

RISK ASSESSMENT

The risk assessment and the remedial options have been outlined on the basis of the knowledge and understanding of the Conceptual Site Model. All the information has been used for the evaluation of relevant contamination source ˇ pathway ˇ receptor for the location and the most appropriate remedial action. For the Risk

Assessment, the values within the limits of Romanian standards/orders/regulations have been used, and where no threshold values exist according to the Romanian regulations, alternative standards have been used from the *Drinking Water Directive*.

THE CONCEPTUAL SITE MODEL [4]

A preliminary Conceptual Site Model (CSM) has been prepared to illustrate the principal risk drivers at the Turda site. This is shown as Figure No. 2.

CONFIRMED POLLUTION LINKAGE (SOURCE–PATHWAY–RECEPTORS)

With reference to the above analytical data and the CSM, there is a clear pollutant linkage between the waste materials across the Turda site (S1) and members of the local community (R1), via direct (dermal) contact (P1), ingestion of contaminants directly (P1) or via uptake on foodstuffs (P3). Similarly there is a confirmed pollutant linkage between wind-borne dust (S1) and members of the local community (R1) via direct inhalation (P2).

REMEDIAL ACTION OBJECTIVES (ˆRAOˇ)

Based on site history, field investigations and laboratory results for soils and groundwater it is confirmed the presence of HCH contaminant on the 8.0 hectares investigated area. The main source of soil contamination on the site is the total HCH from the waste piles spread on the area. Since the waste has been disposed of in piles not all the soil for the entire 10 ha area is contaminated. The estimated volume of contaminated soil with HCH contaminants of 32,000 m3 is based on the 10.0 ha investigated area where only 16 soil samples were above 2 mg/kg total HCH (screening criteria for sensitive land use) and then extended to the total contaminated area of 10 hectares as reported by ANMP questionnaire. Therefore total HCH is higher than maximum accepted values in probably less than 50% of the potential contaminated area of 10 ha.

Therefore the main RAOs for this pilot project application are the following:

1. Elimination of surface and shallow source of contamination; and
2. Elimination of contact risk to the land users.

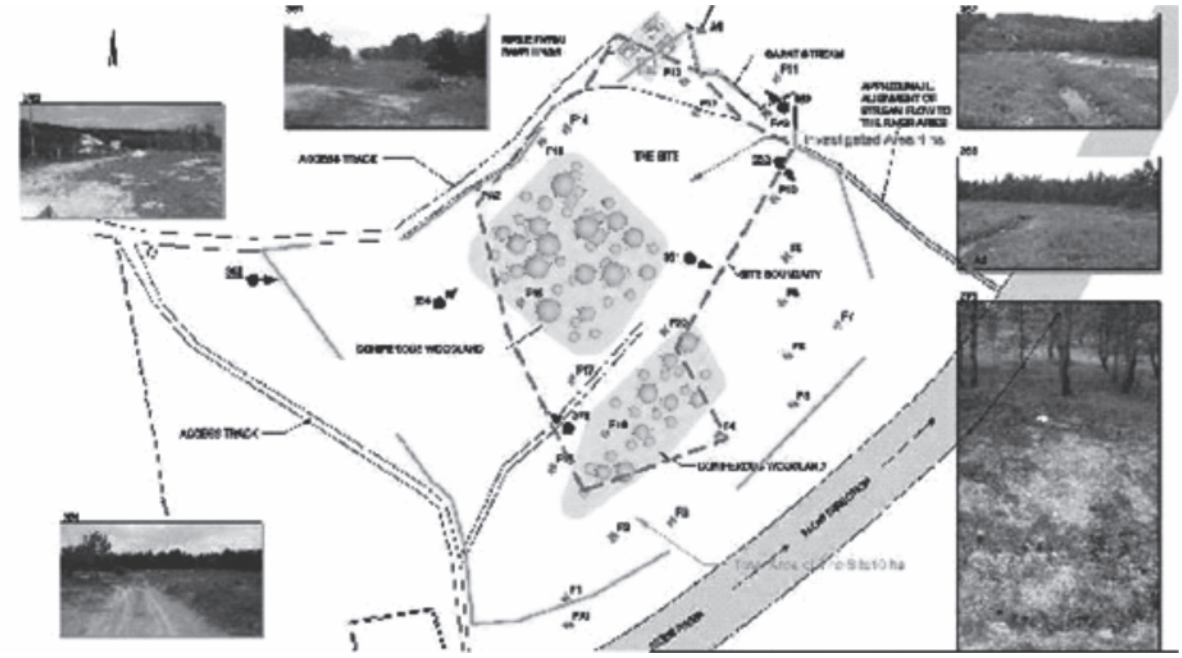

Figure 1. Site walk over.

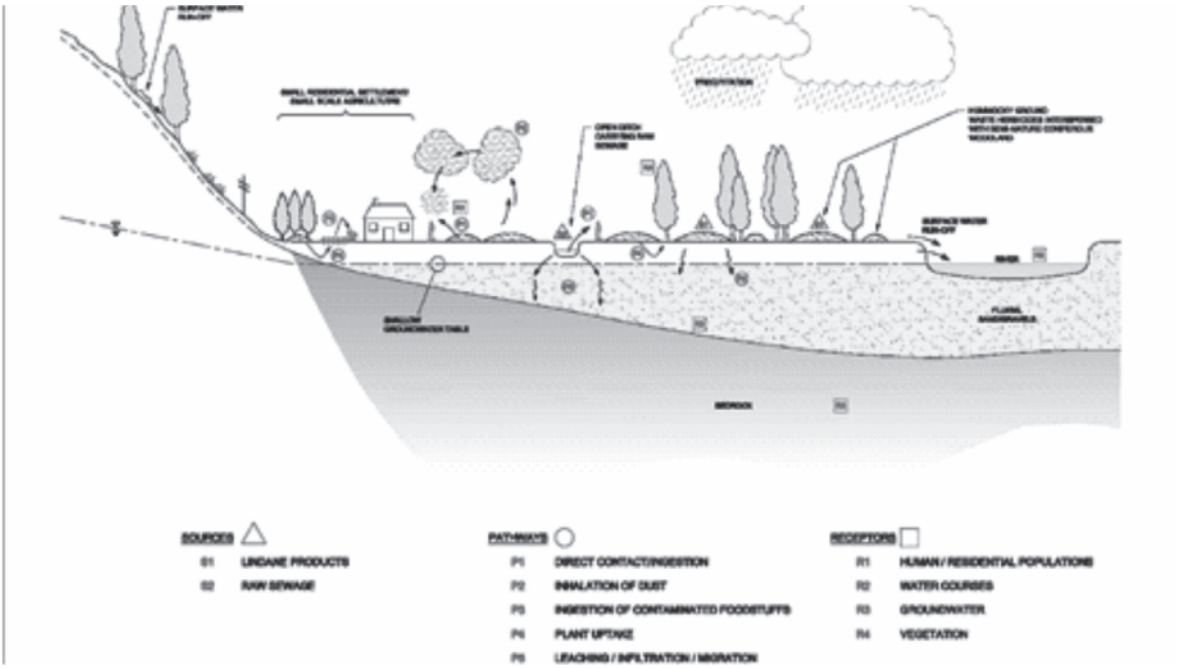

Figure 2. Conceptual Site Model.

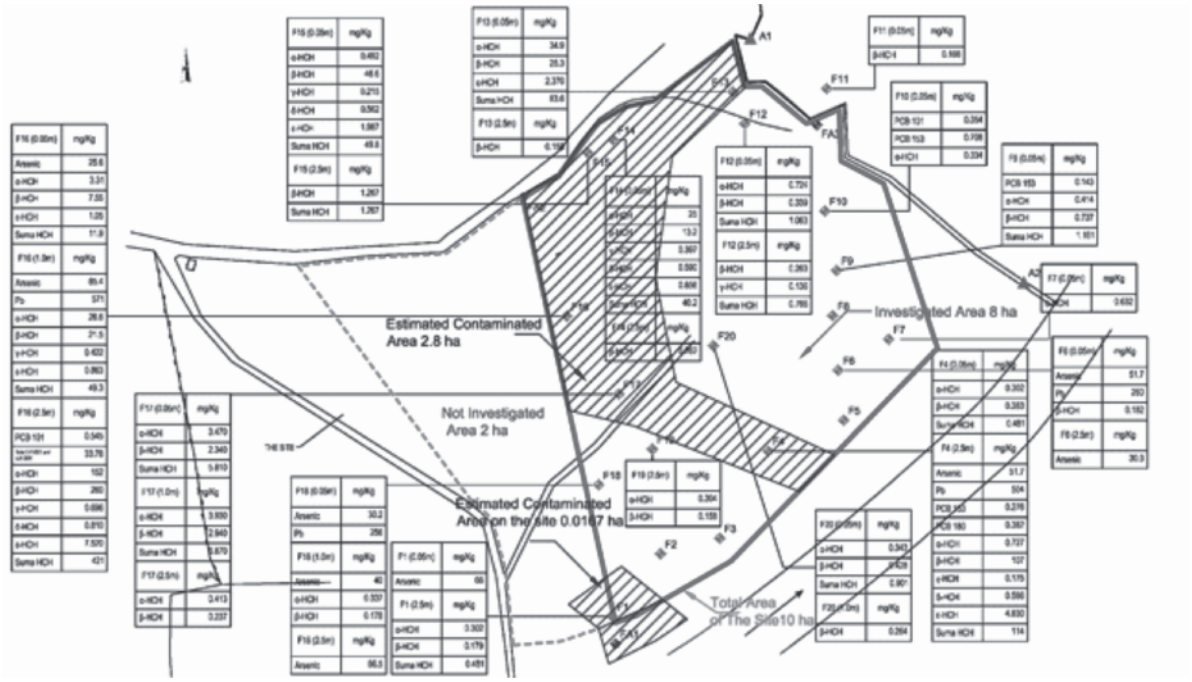

Figure 3. Elevated concentrations in soil.

References

1. Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process I - ASTM E 1527 – 05; Copyright © American Standards for Testing and Materials International
2. Standard Practice for Environmental Site Assessments: Phase II Environmental Site Assessment Process II - ASTM E1903 - 97(2002); Copyright © American Standards for Testing and Materials International
3. Characterization and Monitoring Technologies – Hazardous Waste Clean-Up Information; CLU-IN, U.S. EPA (http://www.clu-in.org)
4. Handbook of Complex Environmental Remediation Problems – Kevin John Philips, FPM Group Limited; Copyright © 2004, the McGraw-Hill Companies.
5. PHARE 2006/018-147.03.03/04.07 Rehabilitation of the historically polluted site-Hazardous Waste Deposit UCT – Posta Rat, TURDA