

**INSTITUTIONAL AND TECHNOLOGICAL
APPROACHES ON CLEARING OF POLLUTED
TERRITORIES FROM OBSOLETE PESTICIDES
AS AN ELEMENT OF POPS**



***S. Tikhonov – Academician of the Russian Academy of Ecology,
Director, Centre for International Projects,
Moscow, Russian Federation***

Pesticide impact on health is a serious problem requiring attention of International Community as nowadays amount of pesticides exceeded 1500 names.

Relevant Pesticides is regulated by international environmental agreements:

- The Stockholm Convention on Persistent Organic Pollutants (POPs),**
- The Rotterdam Convention on Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade,**
- The Basel Convention on Transboundary Movements of Hazardous Wastes and their Disposal,**
- The International Code of Conduct on the distribution and use of pesticides.**

For the practical solution of problem connected with withdrawal from use and liquidation of obsolete pesticides as a part of POPS:

- to develop institutional measures including economic, legal and administrative mechanisms;**
- to develop technologies allowing to choose the most safe and economically sound method of their disposal.**

1. Institutional approaches

- **Analysis of national legislation, methodologies and rules on management of obsolete pesticides, assessment of their advantages and disadvantages; and enforcement practice in the sphere of pesticide management including regulation at regional/local level;**
- **Analysis of international legal commitments of the Russian Federation, governmental authorities, state subdivisions and local authorities on management of obsolete pesticides;**
- **Analysis of state administration in the sphere of safety management of obsolete pesticides, supervision and control for renewal of production and application of obsolete pesticides as well as storage, transportation, use and landfill of obsolete pesticides;**
- **Legal questions of regulation concerning recovery of polluted territories;**

- **Legal questions of stimulation of safety methods for management of obsolete pesticides, environmentally efficient technologies on destruction and disinfection of pesticides;**
- **Legal questions of use and production of substances alternative for pesticides;**
- **Legal regulation of safety of labor and health protection;**
- **Emergency measures;**
- **Determination of gaps in existing legislation of the Russian Federation relating to pesticides;**
- **Responsibility for “warrantable” and “unwarrantable” environmental pollution provided by legislation of the Russian Federation;**
- **Analysis of experience of management of obsolete pesticides in USA, Canada, European Union, Japan and other developed countries.**

1.1 Main features and disadvantages of the existing legislation:

- Difficulties in providing of adherence of requirements in particular connected with activity of insolvent enterprises;**
- System of inflexible quantitative norms;**
- Generally orientation on sewage treatment, waste disposal etc. other than on pollution prevention in technological process, rehabilitation and recovery;**
- Insufficient accounting of environmental impacts of implementation of programmes, plans, projects;**
- Contradictions between vertical (i. e. between international, national, regional and local levels) and horizontal elements of system (between various acts at the same level).**

1.2 Legal regulation of management of wastes of production and consumption

Main principles of state policy in the sphere of management of wastes is adjusted by the Federal Law № 89-FZ from June 24, 1998 “On Wastes of Production and Consumption” according to which the following stages are specified:

- **Deactivation, i.e. release from harmful contaminants;**
- **Utilization, i.e. such deactivation in the process of which useful products necessary for further production are released;**
- **Stocking, i.e. temporary placement of wastes;**
- **Collection, i.e. accumulation of hazardous wastes in the place of its formation (generation);**
- **Storage, i.e. its placement in storage facilities for further reuse or disposal;**
- **Landfill, i.e. permanent placement in special containers at special conditioned sites;**
- **Transportation, i.e. movement of wastes from sites of collection, storage, stocking to the sites for treatment or disposal, destruction;**
- **Disposal, i.e. collection, transportation, treatment, storage and landfill above and under the ground as well as activity on their recovery, recycling etc.**

1.3 Legal regulation of management of chemicals and their storage

Main normative documents and rules in the sphere of storage and management of hazardous materials include:

- Federal Law “On Industrial Safety for Hazardous Production Units,” which is the basis for industrial safety in production, storage, transportation and use of chemicals. It was adopted in August, 1997;**
- National standard (GOST) 12.1.007-76 “Hazardous Substances, Classification and General Safety Requirements”**
- National standard (GOST) R 50587-93 “Safety Certificate for Substances (Materials). Main provisions Information on ensuring safety at production, application, storage, transportation, utilisation”.**
- General Safety Rules for Explosive and Flammable Chemical, Petrochemical, and Oil-Refining Enterprises,” 1988.**

2. Technological approaches

After identification of pollution of soil with pesticides at concrete territory as a result of the carried out sanitary and laboratory researches it is necessary to carry out the following activity:

- *Size of territory;*
- *Pollution level of territory;*
- *Ground and surface water;*
- *Human factor;*
- *Potential hazard for ecological systems;*
- *Environment conditions which can strengthen or weaken the influence of pesticides on polluted territory.*

2.1 Identification and definition of sequence of disinfection of the territories polluted with pesticides:

- Receiving of authentic and timely information concerning the statistical data on dynamics of mortality from some causes;**
- Characteristic of the polluted territory with identification of source of pollution, size of territory, level of pollution, etc.;**
- Assessment of danger of the identified polluted territories;**
- The further monitoring of polluted territories and its technical assistance;**
- Creation of the National Register on territories polluted with pesticides;**
- Development of list of ecologically sound technologies and methods of deactivation of soil containing pesticides;**
- Deactivation of soil polluted with pesticides.**

2.2 List of advanced technologies on rehabilitation of territories polluted with pesticides

- **Soil treatment directly on site without its movement “in situ”:**
 - liquid-phase sintering;
 - biological treatment;
 - chemical treatment.
- **Collection of soil and its movement with further disinfection using special equipment “ex situ”;**
- **Biological treatment of polluted soil:**
 - landfill;
 - chemical treatment using “solvated electron” technology;
 - extraction per solvent;
 - high-temperature technology

2.3 Using methods of “ex situ” disposal of the wastes in the Russian Federation

The main ecological parameter for landfill of wastes should be an assessment of opportunity of pollution of drinking water and their influence on the population health.

- Underground landfill is the most safety method, but it is used only for very limited quantity of sites;**
- Storage of pesticide wastes should be considered only as temporary decision, only as a step to final disposal of wastes;**
- Landfill has many of advantages but in case of pesticides it should be used mostly for the polluted soil;**

In our opinion biological technologies based on use of specially selected alive organisms of microbes, earthworms, plants are most perspective for remediation of soil polluted with toxic chemicals.

3. EXISTING AND PERSPECTIVE TECHNOLOGIES FOR DESTRUCTION OF PERSISTANT ORGANIC POLLUTANTS (POPS) USING FOR DESTRUCTION OF PESTICIDES

Principles of environmental management of enterprises using or polluted by pesticides:

- **Environmental monitoring,**
- **Environmental passportization of enterprises,**
- **Environmental expertise of each stage of relevant activity,**
- **Environmental audit.**

3.1 Practical actions on solution of environmental problem

For practical solution of the environmental problem having a global character the complex approach is necessary and has to include:

- Scientific and technical measures (low-waste technologies, technologies for treatment and destruction of wastes, effective technologies for waste treatment etc.);**
- Administrative and technical measures (creation relevant systems of waste recycling, creation of regional and local systems of water circulation etc.);**
- Public organizational measures (environmental training and education, the environmental law, public awareness etc.).**

3.2 Technologies for deactivation of POPs including pesticides:

- High temperature incineration (destruction of organic chemicals requires high temperature at least 1200°C, duration of heat treatment is at least 2 seconds and final efficiency of destruction at least 99,99 %);**
- Cement kilns (in comparison with the temperature incineration modern cement kilns frequently have higher technical characteristics, longer period of incineration, more effective supply of oxygen and provide similar or higher destruction effect);**
- Chemical treatment (chemical treatment can be used for decomposition of hazardous wastes into component compounds. It also represents considerable hazard for population and environment as many processes in themselves are hazardous.)**
- Transportation to landfill (construction of hermetical platforms at steady geological territories distant from surface reservoirs and ground waters which should be equipped with facilities for collection and treatment of filtrate and gas)**
- New technologies.**

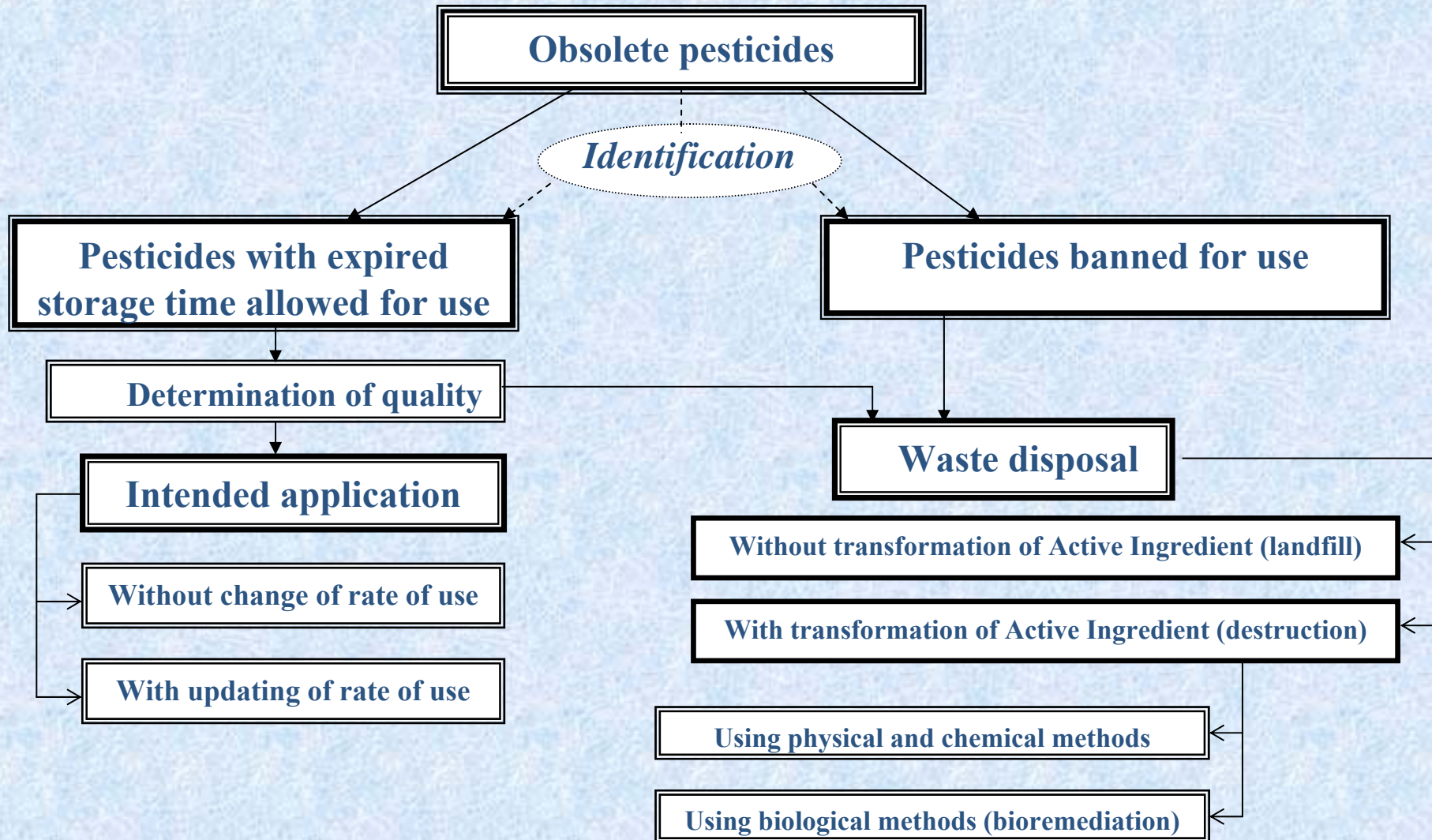
3.3 NEW TECHNOLOGIES

- **Gas-cycle hydrogenation;**
- **Electrochemical oxidation;**
- **Molten metal;**
- **Fused salt;**
- **Process of electronic solvation;**
- **Plasmochemical deactivation;**
- **Hypercritical water oxidation;**
- **Plasma arc;**
- **Underground landfills;**
- **Deep injection.**

For recovery of soil from obsolete pesticides the following methods is successfully used:

- **Anaerobic Bioremediation Using “Blood Meal”;**
- **Bioremediation Using «DARAMEND»;**
- **In Situ Thermal Desorbtion.**

Scheme of measurement on identification of the status of obsolete pesticides and their management



As an example: ACAP Obsolete pesticides Project

Obsolete pesticides in Russia

- Approximately 24 000 tonnes based on existing documentation
- Mostly in the Southern agricultural regions
- Approximately 10% in the Arctic region ~3,000 t

Project activities

- 1st meeting in October 2001
- Arctic Council countries participated in the Project
- To protect the arctic environment from pesticide emissions:
 - by improving the storage conditions of obsolete pesticides
 - by analyzing unidentified stocks
 - by pesticide demonstrating destruction (100 t)
 - by supporting Russian Federation to ratify and enforce the UNECE POP- and Stockholm POP- conventions

Phase I

- Inventories of obsolete pesticides in 12 selected priority regions of the RF that impact the Arctic
- Includes screening analysis for the presence of mercury, arsenic and chlorinated organics

Phase II

- Improvement of temporary storage conditions
 - repackaging and labeling
 - consolidation of stocks of waste pesticides
- Assessment and selection of the best available technologies and methods for destruction/disposal of pesticides stocks.

Phase III

- Implementation of a model demonstration project for the environmentally sound destruction/disposal of 100 tons of obsolete pesticides
- Depending on destruction plant availability

Project status

- Detailed inventory, repackaging, screening analyses, and storage ACAP activities completed in:
 - Archangelsk
 - Komi Republic
 - Magadan
 - Omsk
 - Tyumen
 - Republic of Altai
- Work in progress in:
 - Altai Krai
 - Kurgan
 - Sakha Republic

Project Status

Region (oblast)	Estimate before project (t)	After detailed inventories (t)	Amount analyzed (t)	Amount repackaged (t)
Arkhangelsk	41	62	14	57
Komi Republic	14	19	6	13
Magadan	16	23	8	23
Omsk	464	540	77	390
Tyumen	40	233	149	120
Altai Rep.	20	50	12	24
Altai Krai	1414	251	245	103
Sakha Rep.	100	38	37	38
Kurgan	646			
Krasnoyarsk	38			
Kamchatka	9			
Murmansk	3			
TOTAL	2805	1216	548	768

Project Finances

Region (oblast)	Project funding (\$USD)	Regional Funding (RUR)
Arkhangelsk	29,180	1,171,000
Komi Republic	25,183	41,000
Magadan	6,600	1,310,000
Omsk	38,080	20,000,000
Tyumen	43,360	6,665,000
Altai Rep.	43,272	not allocated
Altai Krai	50,000	1,000,000
Sakha Rep.	32,545	7,851,000
Kurgan	15,000	
Krasnoyarsk		
Kamchatka		
Murmansk	5,505	
TOTAL	288,725 \$USD	36,859,000 RUR 1,316,400 \$USD

Lessons learned

- **Field work is not possible in winter period**
- **SG meets in regions: expensive but useful**
- **Regions get active – invest on storages & disposal**
- **Environmentally sound disposal technique - availability critical**
 - **packaging material degrades**
 - **pesticides disposed in ways that are not according to the internationally accepted practices**
 - **pesticides disposal not to specialized places**

Thank you for your attention

Centre for International Projects (CIP)

58b, Pervomaiskaya str., Moscow,

105043, Russian Federation

Tel.: (495) 165 05 62

Fax: (495) 165 08 90

E-mail: tse@eco-cip.ru; centre@eco-cip.ru