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NATIONAL IMPLEMENTATION PLAN

FOR THE STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS

Ministry of Environmental Protection of Ukraine

Project # GF/2732-03-4668
Enabling Activities for the Stockholm Convention on Persistent Organic Pollutants (POPs): National Implementation Plan for Ukraine

NATIONAL IMPLEMENTATION PLAN

FOR THE STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS

KYIV 2007

The National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (NIP) was developed under the UNEP/GEF Project # GF/2732-03-4668 «Enabling activities for the Stockholm Convention on Persistent Organic Pollutants (POPs): National Implementation Plan for Ukraine» for the Government of Ukraine to provide for the implementation of Article 7 of the Stockholm Convention on persistent organic pollutants signed by Ukraine on May 23, 2001 which entered into force on May 17, 2004. According to the Convention each Party shall develop and endeavour to implement a plan to meet their obligations envisaged by the Convention.

The NIP was approved by the National Inter-Agency Coordinating Committee and the Public Council of the Ministry of Environmental Protection of Ukraine, and has been endorsed by the Ministries of Environmental Protection, Economy, Finance, Agrarian Policy, Industrial Policy, Fuel and Energy, Defense, and Ministry of Justice of Ukraine.

The National Implementation Plan for the Stockholm Convention on POPs shall be implemented by the Ministry of Environmental Protection of Ukraine in collaboration with representatives of Verkhovna Rada (Parliament) of Ukraine, the Cabinet of Ministers of Ukraine, central and local executive authorities, scientists, enterprises, NGOs and the public.

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ABBREVIATIONS AND ACRONYMS

Abbreviation	Full name
ACS	Automated Control System
ADR	The European Agreement concerning the International Carriage of Hazardous Goods by Road
AIC	Agroindustrial Complex
AMSU	Academy of Medical Sciences of Ukraine
ARC	Autonomous Republic of Crimea
NPS	Nuclear Power Station
AURIHTPPP	All-Union Research Institute of Hygiene and Toxicology of Pesticides, Polymers and Plastics
BAT	Best Available Techniques
BEP	Best Available Practices
Basel Convention	The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
CMU	Cabinet of Ministers of Ukraine
CIS/NIS	Commonwealth of Independent States / Newly Independent States
CPP	Chemical Plant Protection
COC	Chloroorganic Compounds
COP	Chloroorganic Pesticides
MSA	Municipal State Administration
CTC	Carbon Tetrachloride
CTC/PCE	Perchloroethylene Tetrachloride
DDD	Dichloro-diphenyl-dichlroethylene
DDT	Dichloro-diphenyl-trichloroethane
Doct. of Sc.	Doctor of sciences
EC	Releases Coefficient
UNEEC	United Nations Economic Commission for Europe
EU	European Union
GDP	Gross Domestic Product
GEF	Global Environment Facility
GLC	Gas-Liquid Chromatography
HCB	Hexachlorobenzene
HCCH	Hexachlorocyclohexane
IDA	International Development Association
IMF	International Monetary Fund
IW	Industrial Wastes
KCMIC	Kalush Chemical & Metallurgical Industrial Complex
KPDWI	Kiev Plant for Domestic Wastes Incineration
KMSA	Kyiv Municipal State Administration
MAC	Maximum Allowable Concentration
MAPU	Ministry of Agrarian Policy of Ukraine
MBA	Ministry of Building, Architecture and Housing and Communal Services of Ukraine
MDU	Ministry of Defense of Ukraine

Abbreviation	Full name
MEU	Ministry of Economy of Ukraine
MEPU	Ministry of Environmental Protection of Ukraine
MFSU	Ministry of Ukraine for Family and Sport
MESU	Ministry of Education and Science of Ukraine
MFU	Ministry of Finance of Ukraine
MFEU	Ministry of Fuel and Energy of Ukraine
MHU	Ministry of Health of Ukraine
MFAU	Ministry of Foreign Affairs of Ukraine
MIPU	Ministry of Industrial Policy of Ukraine
MJU	Ministry of Justice of Ukraine
MLSPU	Ministry of Labor and Social Policy of Ukraine
MM	Mass media
MOEU	Ministry of Emergencies & Affairs of Population Protection from Consequences of Chornobyl Catastrophe of Ukraine
MTCU	Ministry of Transport and Communications of Ukraine
NASU	The National Academy of Sciences of Ukraine
NATO	North Atlantic Treaty Organization
NC HWM	National Centre for Hazardous Waste Management of the Ministry of Environment Protection of Ukraine
NGO	Non-Governmental Organizations
NIP	National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants
OECD	Organization for Economic Co-operation and Development
OJSC	Open Joint-Stock Company
OP	Obsolete and Prohibited Pesticides
OECD	Organization for Economic Co-operation and Development
PAHs	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PCDDs/ PCDFs	Polychlorinated Dibenzo-p-Dioxines, Polychlorinated Dibenzofurans
PCC	Polychlorocamphene
PCP	Polychloropinene
PCPh	Polychlorophenol
Ph.D.	Philosophy Doctor
POPs	Persistent Organic Pollutants
PP	Plant Protection
PS	Pollutant substances
RSPF	The Rada for Studying Productive Facilities of the NASU
RA	Residual amount
RETP	Register of releases and transfer of pollutants
RI	Research institute
RSA	Oblastal State Administration
Rotterdam Convention	The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in the International Trade
SC	The Stockholm Convention on Persistent Organic Pollutants
SCABT	State Committee of Affairs of Broadcasting and Television

Abbreviation	Full name
SCPTRCP	State Committee for Problems of Technical Regulation and Consumers' Policy of Ukraine
SSCU	State Statistics Committee of Ukraine
SDW	Solid Domestic Wastes
SES	Sanitary and epidemic station
SFEP	The State Fund for Environment Protection
SSRN	State Sanitary Regulations and Norms
SSU	State Standard of Ukraine
SVS	State Veterinary Service of Ukraine
TACIC	The Program of European Community
TCBD	Tetrachlorobibenzodioxine
TEQ	Toxicity Equivalent
UCS	Unified Control System
UkrCGEEA	Ukrainian Classification of Goods for External Economic Activity (Harmonized System)
UkrSCP	Ukrainian System for Certification of Produce
ULQSAP	Ukrainian laboratory for quality and safety of agroindustrial products
UNEP	United Nations Environment Programme
VRU	Verkhovna Rada of Ukraine (Parliament)
WB	World Bank
WHO	World Health Organization
WTO	World Trade Organization

SUMMARY

The National Implementation Plan (NIP) for the Stockholm Convention on Persistent Organic Pollutants was developed under the UNEP/GEF Project # GF/2732-03-4668 «Enabling activities for the Stockholm Convention on Persistent Organic Pollutants (POPs): National Implementation Plan for Ukraine», with financial support of the Global Environment Facility (GEF) and in collaboration with the United Nations Environment Programme (UNEP) in accordance with «Guidance for developing a National Implementation Plan for the Stockholm Convention» developed by the UNEP and the World Bank.

NIP provides a policy framework and describes concrete interventions to achieve the national objectives and priorities regarding the POPs management and to meet the obligations assumed by Ukraine under the Stockholm Convention and other international agreements signed or ratified, accepted, approved or accessed by Ukraine. NIP seeks to encourage, facilitate and support national and local authorities in their efforts to collect and properly dispose of POPs as well as to remediate or contain sources of POPs negative impact on the environment and public health. To meet the goals a wide range of mandatory, voluntary, monitoring, remedial, and research actions have been proposed.

The national policy regarding POPs is an integral part of national environmental policy. It is driven by understanding that a comprehensive chemical safety management system needs to be developed in Ukraine It recognizes the necessity to apply prevention measures and polluter pays approach and to implement cost-effective tools.

NIP is consistent with the national sustainable development strategy and programs aimed at the harmonization of economic, environmental and social development.

NIP is composed of introduction, six chapters, list of references, and four annexes.

Chapter 1 presents background information on Ukraine and gives a survey of the country's international cooperation in the area of environment protection.

Chapter 2 deals with POPs -related issues in Ukraine.

Ukraine has a legal framework for chemical management including POPs to provide for chemical safety and control requirements, however it needs further improvement. The first step of NIP implementation envisages upgrading of the existing framework and adoption of new laws.

Administrative structure of chemical management, including POPs, is undergoing constant changes due to the re-distribution of powers between central and local executive bodies, search for more efficient instruments of regulatory policy.

One of the POPs-related urgent problems in Ukraine for the last 30 years has been the disposal of obsolete and prohibited pesticides (OP). A number of government resolutions and regulatory acts on this matter were issued in the former Soviet Union but they have not been fully implemented.

Currently the total amount of OP in Ukraine is over 22 thousand tons most of which are persistent organochorinated compounds. They are stockpiled in about 5000 storehouses of various forms of property, of which 109 are owned by the state. According to the latest inventory of 2006, the OP amount in every oblast varies from 130 to 2500 tons; while every storage unit has from 0.1 to 500 tons.

The «hot spots» are

The Autonomous Republic of Crimea	1,180.0
Vinnitsa oblast	1,073.9

Dniepropetrovsk oblast	1,211.0
Zaporizhzha oblast	1,214.0
Kyiv oblast	1,932.9
Kirovograd oblast	1,210.5
Odesa oblast	1,867.6
Sumy oblast	2,527.7
Kharkiv oblast	1,193.1

Under the former Soviet Union DDT was among the pesticides most widely used in agriculture and medicine in all oblasts of Ukraine from the late fifties to 1990.

DDT was manufactured at RADICAL plant in Kiev in 1954-1975. Its DDT (active ingredient) manufacturing capacity was:

1,000 tons per year in **1954-1960**

4,000 tons per year in **1960-1970**

7,500 tons per year in **1970-1975.**

DDT-containing substances manufactured at RADICAL plant were supplied to Ukrainian agricultural sector as well as to the former soviet republics in Central Asia and abroad.

DDT application in medicine was prohibited since 1989 by the Order of the Ministry of Health of the USSR.

According to 2006 inventory data, a total of 1,744.2 tons of DDT are stored in various oblasts of Ukraine. The largest amount of DDT (800 tons) is stored in Odesa oblast.

The OP stockpiling situation in Ukraine is becoming very dangerous and requires urgent solution.

From 1973 to 1998 in Kalush town of Ivano-Frankivsk oblast there was manufacturing of carbon tetrachloride (CTC) and perchloroethylene (PCE) with solid waste containing over 90% of hexachlorobenzene (HCB) at a rate of 540 tons per year. As of 2006 the stockpiled amount of the waste made up 11,087.6 tons.

Analysis of PCB data obtained from Ukrainian enterprises proves that the largest amounts of PCBs are used and/or located at the most power consuming enterprises of metallurgic and engineering sectors

Regarding various types of PCB-containing equipment the «hot spots» are:

a) transformers

- Donetsk oblast (25%);
- Dniepropetrovsk oblast (11%);
- Kyiv oblast (11%);

b) capacitors

- Zaporizhzhya oblast (18%);
- the Autonomous Republic of Crimea (12%);
- Dniepropetrovsk oblast (7%);

b) containing PCB liquids

- Donetsk oblast (27%);
- Dniepropetrovsk oblast (26%);
- Kyiv oblast (14%).

As of today, the inventory revealed a total of 1,002 transformers of 27 different models, and 102.032 capacitors of 157 different models as well as 250,048 kg of synthetic liquids of 8 various types.

Each transformer weighs between 490 kg and 12,000 kg while the total weight of liquid dielectric in each one varies from 160 kg to 4,160 kg. The total weight of all transformers is 5,746,540 kg, of

which PCB makes up 2,051,160 kg.

The total amount of PCB contained in the equipment and stored at Ukrainian enterprises, as estimated by the preliminary inventory, makes up about 4,240 tons.

It should be noted that experts' estimated the real amounts to be 1.5-3 times larger. These estimates are based on comparison of industrial and economic performance of Ukraine and the Russian Federation as well as data on PCBs and PCB-containing equipment in Russia showing about 10,000 transformers and 500,000 capacitors located there. Total amount of PCBs in Russia amounts up to 35,000 kg.

Therefore, the total amounts of PCBs and PCB-containing equipment currently available in Ukraine may be estimated as follows:

- transformers 1,500-3,000 items;
- PCBs in transformers 3,000-6,000 tons;
- weight of transformers 8,300-16,600 tons;
- capacitors 150,000-200,000 items;
- PCBs in capacitors 2,850-3,800 tons;
- weight of capacitors 9,000-12,000 tons;
- PCBs stockpiled 400-600 tons;
- total amount of PCBs – 6,220-10,540 tons.

Inventory of POPs releases sources from unintentional production for the period of 2002-2004 has been carried out in Ukraine to evaluate gross releases. The evaluation was undertaken based on the recommendations of the EMEP/ Corinair Guide for estimation of releases and their forecast by sources mentioned in the Guide. Guide for inventory of dioxins and furans leakage proposed by the UNEP.

Determination of the amounts of POPs releases is rather costly and is accompanied by a number of obstacles in Ukraine, that's why the inventory was based on the statistical data received from the SSCU. The following types of releases sources have been considered: incineration of domestic wastes, ferrous and non-ferrous metallurgy, electricity and heat power production, cement, brick, glass, and lime manufacturing, transport, forest fires, cellulose and paper manufacturing etc.

Total annual amounts of PCDDs/PCDFs releases in Ukraine are estimated as 2,516.5 g of TEQ in 1990 and 1,451.4 g of TEQ in 2002, of which ferrous and non-ferrous metallurgy, electricity and heat power production make up 95%.

Estimation of PCBs releases from electric equipment has been performed on the outcome data of the UNEP/ Ministry of Environmental Protection of Ukraine project on PCBs inventory.

Analysis of available published data and similar research projects carried out by Russian and Byelorussian teams helped to estimate PCBs leakage from operating equipment which makes up 0.3 kg/ton for transformers and 2 kg/ton for capacitors. Estimated total PCBs leakage made up 4,148.25 kg in 2002. However the whole PCBs leakage cannot evaporate. An assumption based on the research findings is that PCBs leakage make up 0.06 kg/ton for transformers and 0.8 kg/ton for capacitors.

Incineration is the main method of SDW disposal. 276,407.211 tons of SDW were incinerated in Ukraine in 2002. Data on the volumes of medical and industrial wastes incineration is extremely scarce in Ukraine. Besides, Ukraine does not have efficient equipment for large-scale incineration of industrial waste, though some plants have small facilities for disposing of own waste. No data is available on incineration of sewage solid residues.

Total releases of PCDs and HCB from unintentional production were estimated as 51.57 kg and 553.17 kg in 2002.

According to 2002 estimate, releases of major PAHs by all types of sources made up 196.283 tons, including 83.562 tons of benz(b)fluoranthene, 30.610 tons of benz(k)fluoranthene, 51.95 tons of

benz(a)pyrene, and 30.160 tons of inden(1,2,3-c,d) pyrene.

Low capacity stationary incineration facilities are main source of major PAHs releases in Ukraine. Ratio of this source varies from 78.4% to 91.4% of the total releases by major PAHs. The second largest category is coke manufacturing with benzapyrene releases reaching 17.8% of 2002 total volume.

As of today, the following actions have been taken to dispose of POPs:

- the first facility for OP incineration was officially certified (Elga Ltd. in Shostka town);
- a plasma method for POPs destruction was developed (its introduction is delayed due to of lack of financing;
- in certain cases defense facilities (jet engines) are applied for hazardous substances destruction, which could also be extended to POPs;
- a few small-sized facilities for thermal neutralization of vessel and medical wastes were certified and put into operation (Greenport in Odesa city, and others);
- researchers began to investigate POPs (namely PCBs) microbiological destruction in a membranous film reactor;
- technological developments to dispose of chlorine-containing organic wastes based upon aerosol catalysis were performed (Khimtekhnologia Institute of MIP);
- a possibility to use cement kilns for OP incineration was investigated.

Ukraine has a single technological facility operating in Shostka town Sumy oblast which provides for destruction of obsolete and banned pesticides. It can also be used to dispose of PCBs-containing capacitors. In 2005 the facility's capacity reached 750 tons of pesticides per year. Disposal of 1 ton of pesticides costs about UAH 12,840 (USD 2,540) including transport expences.

Under the current system for environment monitoring POPs monitoring is carried out mainly by the national and regional bodies of the Ministry of Health, Ministry of Environmental Protection, Ministry of Agrarian Policy, Hydrometeorology Committee, SCPTRCP and others. Current programs and available data on monitoring of the environment and its impact on human health, and estimation of POPs laboratories capacities are presented in particular NIP chapters.

Chapter 3 presents national strategy and priorities regarding the implementation of the Stockholm Convention and identifies NIP's priority actions.

The goal of information strategy is to set up communication system for making contacts and dissemination of information among stakeholders and raising general public's awareness on POPs issues.

Chapter 4 contains considerations on NIP estimated budget and tentative sources of project financing.

Action Plan which covers summary of measures, anticipated results, responsible institutions, financing sources, time frames and approximate costs is presented in Chapter 5.

Chapter 6 describes mechanisms of NIP implementation, evaluation and updating.

A list of the Environment International Agreements signed or ratified, accepted, approved or accessed by Ukraine, a list of laboratories participating in POPs monitoring, analytical methods and guidelines for POPs identification and quantification, and acceptable sanitary ratios of POPs are included in the annexes.

INTRODUCTION

Large-scale production of synthetic organic compounds first started in the 30-es of the XX century, and the volumes have been constantly growing. Gross world production increased from 150 thousand tons in 1935 to over 150 million tons nowadays.

Synthetic organic compounds are used in the production of pesticides, disinfectants, various types of paints, additives to plastics etc. Large amounts of these substances pose great threat to the environment and human health. Some of them were named «persistent organic pollutants» by researchers. While the risk level varies from POP to POP, by definition all of these chemicals share some common properties:

- They are highly toxic;
- They are persistent, lasting for years or even decades before degradeding into less dangerous forms;
- They are evaporate and travel long distances through the air and through water;
- They accumulate in fatty tissues.

This is a dangerous combination – persistent and mobile of POPs means that they are literally everywhere in the world, even Arctic, Antarctica and remote islands in the Pacific islands. POPs reach magnified levels- up to many thousands of times greater than background levels- in the fatty tissues of creatures at the top of the food chain, such as fish, predatory birds, and mammals, including human beings.

Idea of Convention on POPs arose in 1992, Rio de Janeiro when participants of United Nations Conference on Environment and Development declared that all people have the right on healthy and prosperous life in harmony with environment. It has been decided in Rio de Janeiro that leading industrial countries should collaborate with developing countries in order to introduce this principle into life. This collaboration should have financial and technical aid in order to ensure control and contraction of releases of toxic and persistent chemicals and waste as well as those having high level of bioaccumulation.

List of the twelve chemicals to be paid primordial attention was composed, and issue of inadmissibility of further spreading of POPs was raised at the meetings of representatives of the USA, Canada, Japan, and a number of European countries in 1994. Most of these chemicals are obsolete chlororganic pesticides and some products used in industrial processes.

The 1995 Global Programme of Action for the Protection of Marine Environment from Land-based Activities and the 1998 POPs Protocol to the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP) were responses to this serious situation. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was one of the first to address management of toxics, complemented later primarily by the Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. In addition, it was acknowledged that there was sufficient scientific evidence for immediate international action regarding 12 POPs. The Convention on Persistent Organic Pollutants (The Stockholm or POPs Convention) was adopted and opened for signature at the Conference of

Plenipotentiaries in Stockholm on May 22, 2001. The Convention came into force on May 17, 2004.

The overall objective of the Stockholm Convention is to protect human health and the environment from POPs. It makes specific reference to the precautionary principle as set forth in Principle 15 of the Rio Declaration on Environment and Development. The Stockholm Convention provides subscribing Parties with basic objectives, principles and elements to be used in developing comprehensive programs and control regimes with respect to POPs.

Nine of POPs are pesticides: aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, and toxaphene. The Convention also target two industrial chemicals: hexachlorobenzene (HCB), which is also used as pesticide and can be a byproduct or waste of manufacture and class of industrial chemicals known as polychlorinated biphenyls (PCBs). Moreover, the Stockholm Convention provides measures to reduce or eliminate releases POPs from unintentional production: polychlorinated dioxins and furans (PCDD/PCDF), hexachlorobenzene (HCB) and PCBs.

Nine chemical substances currently listed in Annex A of the Convention are subject to a ban on production and use except where there are generic or specific exemptions. In addition, production and use of DDT, a pesticide still used in many developing countries for malaria and other diseases vector control, is severely restricted, as set forth in Annex B of the Convention. Import and export of the ten unintentionally produced POPs is allowed only for the purpose of environmentally sound disposal under restricted conditions.

Special provisions are included in the Stockholm Convention for those Parties with regulatory assessment schemes to review existing chemicals for POPs characteristics and to take regulatory measures with the aim of preventing the development, production and marketing of new substances with POPs characteristics.

Releases of unintentionally produced by-products listed in Annex C are subject to continuous minimization with, as objective, the ultimate elimination where feasible. The most stringent control provision with regard to by-products is that Parties shall promote and, in accordance with their action plans, require the use of best available techniques (BAT) for new sources within major source categories.

Unlike other international agreements the Stockholm Convention is a document having direct force that is it shall not be regulated by local laws and decrees. The Stockholm Convention based on following conditions:

- It commits the international community to protecting human health and environment from POPs.
- It sets a first goal of ending the release and use of 12 of most dangerous POPs.
- It bans all production and use of the pesticides endrin and toxaphene in the countries that ratified the Convention.
- It requires all member states (known as Parties) to stop producing the pesticides aldrin, dieldrin, and heptachlor and require those wishing to use remaining supplies to register publicly for exceptions. Countries which exceptions will to restrict obliged to restrict their use of these chemicals to narrowly allowed purposes for limited time periods. The need for exceptions is to be periodically reviewed.
- It limits the production and use of chlordan, HCB, and mirex to narrowly prescribed purposes and to countries to that have registered for exceptions.
- It bans the production of PCBs but give countries until 2025 to take action to phase out the use of equipment containing PCBs. The recovered PCBs must be treated and eliminated by 2028.
- It limits the production and use of DDT to controlling disease vectors such as malaria

mosquitoes; the Convention also allows DDT to be used as an intermediate in the production dicophol in countries that have reiterated for this exception.

- It requires of governments to take steps to reduce of dioxins, furans, HCB, and PCBs as byproducts of combustion or industrial production, with goal their continuing minimization and, where feasible, ultimate elimination.
- It restricts imports and exports of the 10 intentionally produced POPs, permitting them to be transported only for environmentally sound disposal or for a permitted use for which the importing country has obtained an exemption.
- It requires of Parties to develop, within two years, national plans for implementing, and to designate national focal points for exchanging information on POPs and their alternatives.
- It established a POPs Review Committee that will regularly consider additional candidates for the POPs list. Any governments can propose a new listing by starting the reasons for its concern. The Committee will make recommendations to the Parties to the Convention who will decide as a group whether and how to list the proposed chemical. This would take the form of an Amendment, and each Party would then to ratify it.
- The Convention call to share knowledge and know-how between countries, promote technology transfer, and provide financial aid.
- It requires waste containing POPs to be handled, collected, transported and stored in an environmentally sound manner. The Convention will not allow recovery, recycling, reclamation, direct reuse or alternative uses of POPs, and it will prohibit their improper transport across international boundaries.
- The Convention seeks to increase public awareness of dangers of POPs, launch of educational programmes, and train specialists.
- It calls on governments to report regularly on efforts to implement the principles of treaty.
- The Convention's Conference of Parties is charged with collecting information and providing governments and businesses on best environmental practices and best available technologies.
- It calls on governments to encourage and to undertake further research on POPs, to monitor the health effects of the 12 chemicals, and to exchange information that that will be useful for countries with limited medical and environmental- protection resources. The Convention will also arrange for developed countries to provide technical and financial help in these fields to poorer nations. It will set up a worldwide mechanism for monitoring data on POPs that can be used by for countries to respond to the health risk posed by the chemicals.

Project # GF/2732-03-4668 «Enabling Activities for the Stockholm Convention on Persistent Organic Pollutants (POPs): National Implementation Plan for Ukraine» (further – the Project) has been implemented under financial support of the Global Environment Facility (GEF) and in collaboration with the United Nations Environment Programme (UNEP). The main goal of the Project is the development of the National Implementation Plan for POPs issues that Ukraine can effectively address the reduction and elimination of POPs with the protection human health and the environment from the effect thereof, and meet its obligations under the Stockholm Convention.

The Ministry of Environmental Protection of Ukraine (MEPU) assumed beneficiary of the Project, and the National Center for Hazardous Wastes Management of the MEPU (NC HWM) was recipient and performer of it. The National Interagency Coordinating Committee (NICC) implemented general control on fulfillment of project activities.

The NIP has been developed as interagency and intersectional document with active participation of all stakeholders, including governmental bodies, local communities, consumer groups, the business sector, scientific community, NGOs, etc.

The Project actively collaborated with a number of international Projects implemented in Ukraine for the purpose of information exchange: the international partner project with the Agency of Environmental Protection of the USA #P-169 «Management and Destruction of Obsolete Pesticides in Cherkasy in Pilot Oblasts in Ukraine (Cherkasy and L'viv Oblasts)», Ukrainian-Danish Project «Assistance toUkrainian Authorities in Management of Contaminated Sites» (2003-2005) has been implemented with financial support of Denmark government in accordance with the agreement between MEP of Ukraine and Danish Agency for Environmental Protection, and similar Project for NIP development in Kyrgyzstan.

NIP PRINCIPLES AND DEVELOPMENT

- Integration in the national development and environmental policy. The NIP was developed as a part of the national environmental policy and it is consistent with the national sustainable development strategy. The integration of POPs activities in the overall environmental policy is one of the conditions sine qua non to achieve needed efficiency and to contribute to the improving of the environmental situation in general.
- Integration of chemical management issues. One of the major themes of the NIP is that improving environmental conditions by mitigating POPs-related problems can help to stimulate economic growth and reduce poverty. The problem of POPs has to be directly related to the economic activities also as a new business opportunity. In this sense, introduction of POPs issues in national agriculture policy could bring direct benefits to this sector. Likewise, the energy sector can benefit from PCBs elimination by reducing occupational health impacts, introducing PCB-free and modern energy saving equipment and optimization of infrastructure.
- Partnership and shared responsibility. Setting up realistic objectives and effectively reaching them is possible only within a partnership of all beneficiaries (e.g. consumers, the general public) and stakeholders – the business sector, national and local authorities, local communities, NGOs, and the international community. Each part should assume its share of responsibility.
- Coordination with and building on international experience. Regional co-operation frameworks relevant international agreements (Rotterdam, Aarhus, and Basel Conventions, the Montreal Protocol, etc.) will be used to resolve the POPs issues in Ukraine.
- Emphasize pollution prevention and low-cost solutions. Remediation of POPs impacts is very costly. Prevention of their releases into the environment through adequate management systems is likely to bring positive economical, ecological, and social benefits.
- Use measurable indicators and assess performance. The NIP has to be subject to revisions and updating on regular basis(no less than once in 5 years). This obviously will be linked to the performance evaluation process.

The elaboration of the NIP followed the stepwise approach as described in the UNEP/World Bank «Guidance for Developing a NIP for the Stockholm Convention» dated December 2003.

A preliminary inventory of POPs in Ukraine was undertaken in order to provide quantitative information for initiating development of an Action Plan. The inventory provided a better understanding of the situation which allowed for setting priorities and determining the national objectives in the field of POPs minimization and elimination, a process in which national stakeholders and international experts were largely involved. On the basis of the discussed at the seminar «The National Priorities of Ukraine in the Area of Persistent Organic Pollutants Management (October 20, 2005)» and agreed priorities and objectives the first version NIP was formulated for different areas of POPs. This version has been considered and approved by responsible ministries and

stakeholders, NICC and discussed at workshops which held on June 29, 2006, with participation of representatives of national and local authorities, local and international community, research establishments, enterprises, and NGOs.

The final version of the NIP has been approved by NICC and Public Council of the Ministry of Environment Protection and has been coordinated by Ministry of Environment Protection, Ministry of International Affairs, Ministry of Health, Ministry of Economy, Ministry of Finances, Ministry of Agrarian Policy, Ministry of Industrial Policy, Ministry of Fuel and Energy, Ministry of Defense, and Ministry of Justice.

PART 1

COUNTRY BASELINE

1.1 GEOGRAPHY AND POPULATION

Ukraine is a country in Central and Eastern Europe that occupies southern west of the Eastern European plain and some part of Carpathians and Crimea Mountains. The length of Ukraine is 893 km from north to south and 1,316 km from east to west. The territory of Ukraine is 603, 5 thousands km2 that is 5.7% of the European territory and 0.44% of the world's territory. Ukraine is situated in temperate latitudes and has outlets to Black Sea and Sea of Azov. Geopolitical layout at the bound of western and eastern countries reflected greatly past and today's development of the country.

Ukraine has land and marine borders total length of those is 7,590 km. Land border is 5,631 km long and consists of three sections – western, northern, and eastern ones. Length of marine border is 1,959 km. Ukraine is bordering the Russian Federation (2,063 km), Belarus (975 km), Poland (542.5 km), Slovakia (98 km), Hungary (135 km), Romania (608 km), and Republic of Moldova (1,194 km) at land. Outlet to the countries of Central and Western Europe is provided with a length of the border of 2,590 km long.

Capital of Ukraine:	Kyiv city,
Area:	603,500 km2,
Population:	47.14 million people (stationary); 47.28 million people (current),
Areal extent:	West to East –1,316 km, North to South – 893 km, State border length – 7,590 km;
Extreme points:	North – village of Petrivka, Chernihivska oblast, South – cape of Sarych, the Autonomous Republic of Crimea, West – town of Chop, Transcarpathian oblast, East – village of Chervona Zirka, Lugansk oblast.
Neighboring countries:	Poland, Slovakia, Hungary, Romania, Moldova, the Russian Federation, and Belarus.

The Ukrainian administrative and territorial system is made up of the Autonomous Republic of Crimea, oblasts, districts, towns and cities, districts in towns and cities, settlements and villages. The Autonomous Republic of Crimea, Vinnitsa, Volyn, Dniepropetrovsk, Donetsk, Zhytomyr, Transcarpathian, Zaporizhzhya, Ivano-Frankivsk, Kyiv, Kirovograd, Lugansk, L'viv, Mykolaiv, Odesa, Poltava, Rivne, Sumy, Kharkiv, Kherson, Khmelnitsky, Cherkasy, Chernivtsi, and Chernigiv oblasts as well as Kyiv and Sevastopol cities are parts of Ukraine. 490 districts, 457 towns, 885 settlements of town type, and 28,562 rural settlements are in Ukraine.

7.3% of the European population and 1% of the world's population live in Ukraine. Majority of inhabitants (68%) live in towns and cities, and 32% of the Ukrainian population live in rural area.

According to data of the last population census Ukrainians compose over 70% of the population of the country. Representatives of over 100 nationalities live at the Ukrainian territory together with Ukrainians. The greatest part of them composes Russians (over 20% of the whole population of the country). Inhabitants having European nationalities come second, but their number constantly reduces and now they compose about 1% of the Ukrainian population. Significant numbers of inhabitants having come out of adjacent countries live in Ukraine. Those are first of all Belarussians number of which exceeds 400 ths. people, Moldavians (almost 300 ths.), Bulgarians (about 250 ths.), Hungarians (150 ths.), Romanians (100 ths.), Poles (250 ths.). Greeks, Tatars, Armenians, Gypsies, Germans, Gagauses, etc. live in Ukraine, too.

Number of current inhabitants of the country constantly reduces, and contraction made up over 4 million for the last 10 years. These loses are caused first of all by exceeding of the number of died over the number of born men. On January 1, 2006, number of Ukrainian inhabitants was 46.9 mln. people (but it was 51.3 mln. in 1996, 49.9 mln. in 1999, 47.6 mln. in 2004, and 47.3 mln. in 2005). Number of urban inhabitants contracted from 32.15 mln. to 32.01 mln. (by 137.1 ths. persons, or 0.4%), and number of rural ones – from 15.5 mln. to 15.3 mln. (by 204.5 ths. persons, or 1.3%). Natural decreasing of the population, migration processes, and administrative and territorial transformations were in general factors to impact changing number of inhabitants.

According to the forecasts of number, sex and age composition of the Ukrainian population till 2050 performed by the specialists of the Institute of economics of the NASU contraction of the number of inhabitants by over one third part is anticipated (to 38.5 mln. people in 2030, and to 31.0 mln. people in 2050), and part of those who have pension age is to grow up to 31.9%. Ukraine comes 11th by value of the part of inhabitants of 60 years old and more and «older» than such «demographically old» countries as Italy, Greece, Germany, Japan, Sweden, etc. (for comparison: Belarusian comes 23rd, and Russia 27th).

Ukraine is located in two climatic zones: temperate latitudes and subtropics of Mediterranean type (southern Crimean coast). In the bounds of Eastern European plain (95% of the whole territory)

as well as in the bounds of middle-altitude Carpathians and Crimean mountains (5% of the whole territory) climate is predominantly temperately continental, but at the southern Crimean coast it has some features of subtropical one. Mountain oblasts have specific climatic conditions because of vertical ruggedness, availability of slopes having various steepness, local atmospheric circulations, etc. In general, Ukraine belongs to countries with moderate climate, where change of four seasons during a year is observed. Important factors of formation of Ukrainian climate are specific features of atmospheric circulation: primary western transfer stipulates for income of Atlantic air, but air masses from Asia continent, northern latitudes, and Mediterranean Sea sometimes butt to the Ukrainian territory as well. Difference in circulation conditions of the west and the east causes growing of continentality of the climate in this direction. Changes of climatic elements in the oblast of Carpathians and Crimean mountains depend mostly on altitude of the place and exposition of the slopes: lowering of atmospheric pressure and temperature of air, increasing of quantity of precipitations, prolongation of the period with snow covering, and enhancement of wind speed are caused by rising of altitude of the site.

Black and Azov Seas have effect on Ukrainian climate, too. Increasing of humidity and evening of daily change of temperature of air are observed as well. Natural zones are clearly observed at plain territory.

Transfer of Atlantic air prevails in the Polissya, and climate is temperate and humid there. Mean temperature in January is –4...–5°C, but it reaches –7...–8°C at the east. Mean temperature in July is 17...18°C in the west and 19...20°C in the east of the Polissya. Yearly precipitations are 500-600 mm.

Climate of the Forest-steppe is temperately continental. The lowest mean temperatures are observed in the eastern Forest-steppe (–7...–8°C), but in it western part they grow to –4...–6°C. Mean temperature in July is 17...18°C at the west and 19...21°C at the east. Yearly amount of precipitations is lowered from 700 mm to 550 mm.

Zone of steppe Atlantic and continental climate covers the entire Ukrainian steppe zone including steppe part of Crimea. Mean temperature in January changes from –7°C at northern east to –2°C at southern west of the zone. Mean temperature in July is 21...30°C, and yearly amount of precipitations lowers from north to south. The latter is 250-300 mm in southern oblasts.

Ukraine has 63,119 rivers. Their total length is 206.4 ths. km, and 90% of them fall on small rivers. Geographically almost all river basins (except that of South Bug) belong to international water basins – the fact that stipulates activity of transboundary water-environmental relations and need for accelerated development of the basin water resources management.

The main sources of fresh water at the Ukrainian territory are outfalls of Dnipro, Dniester, Southern Bug, Siversky Donets, and Danube with confluents as well as small rivers of northern coast of Black Sea and Azov.

Water stock of Ukraine contains 20 ths. lakes including 953 ones having area over 0.1 sq. km, and 43 lakes are over 10 sq. km by their area. Swamps occupy relatively insignificant part of the territory, and waterlogged and excessively dewy lands are 3.6 mln. hectares, at the same time they play significant role for stabilization of resources.

1.2 POLITICAL PROFILE

Ukraine is a republic. It gained independence on August 24, 1991, upon collapse of the USSR. State power in Ukraine is exercised on the principles of its division into legislative, executive and judicial power. Bodies of legislative, executive and judicial power exercise their authority within the limits established by this Constitution and in accordance with the laws of Ukraine. The Constitution of Ukraine has the highest legal force. Laws and other normative legal acts are adopted on the basis of the Constitution of Ukraine and shall conform to it. International treaties that are in force, agreed

to be binding by the Verkhovna Rada of Ukraine, are part of the national legislation of Ukraine. The right of legislative initiative in the Verkhovna Rada of Ukraine belongs to the President of Ukraine, the National Deputies of Ukraine, the Cabinet of Ministers of Ukraine and the National Bank of Ukraine. The President of Ukraine is the Head of State and acts in its name. The sole body of legislative power in Ukraine is the Parliament – the Verkhovna Rada of Ukraine. Ukrainian parliamentarians are elected by Ukrainian citizens are held on the basis of universal, equal and direct suffrage, by secret ballot in accordance with mixed (majority and proportional) system. The Cabinet of Ministers of Ukraine is the highest body in the system of bodies of executive power. The Cabinet of Ministers of Ukraine is responsible to the President of Ukraine and is under the control of and accountable to the Verkhovna Rada of Ukraine within the limits of the Constitution of Ukraine. The executive power in oblasts, districts, and in the Cities of Kyiv and Sevastopol is exercised by local state administrations. Particular aspects of the exercise of executive power in the Cities of Kyiv and Sevastopol are determined by special laws of Ukraine. The territorial structure of Ukraine is based on the principles of unity and indivisibility of the state territory, the combination of centralization and decentralization in the exercise of state power, and the balanced socio-economic development of regions that takes into account their historical, economic, ecological, geographical and demographic characteristics, and ethnic and cultural traditions.

1.3 ECONOMIC PROFILE

The status of Ukraine at the moment of gaining independence was a special one. Its general area was less than 3% of that of the former Soviet Union, but a quarter of all the industrial potential was located there. This means that about 25% of environment pollution fell upon Ukraine.

Ukraine demonstrates quick economical development beginning from 2000 and passing ahead adjacent countries-members of the EU by its tempos. GDP in Ukraine grew by 12% in 2004, whereas that of countries-members of the EU was almost two times less for the same period.

Real GDP grew almost 1.5 times in 2000-2004. Economical growth is result of interaction of external factors, changes of internal economic politics, reforms, and institutional development. Ukraine succeeded in using of comparative advantages of international concurrence due to joining of cheap labor force with growing external demand, in particular, growth of prices of the main food of Ukrainian export at the world market. But these factors still maintain export oriented model of growth with permanent predominance of accelerated renovation in base branches such as extractive sector, metal-working, manufacture of chemical produce, and petroleum refining.

Enterprises of basic branches use world demand for items of traditional Ukrainian export, the latter having significantly grown. They surprisingly favor economical stability playing role of promoter of economical growth and bringing profits from expansion of export operations to Ukrainian economics. On the other hand, foreign commerce of Ukraine shows that domestic economics is still greatly dependent from import of energetic products from the countries of CIS as well as high technology consumers' goods and means of production from developed countries of the EU. Ukraine is able to concur with traditional raw material produce at the EU market having low added value such as metals, energy, and chemicals.

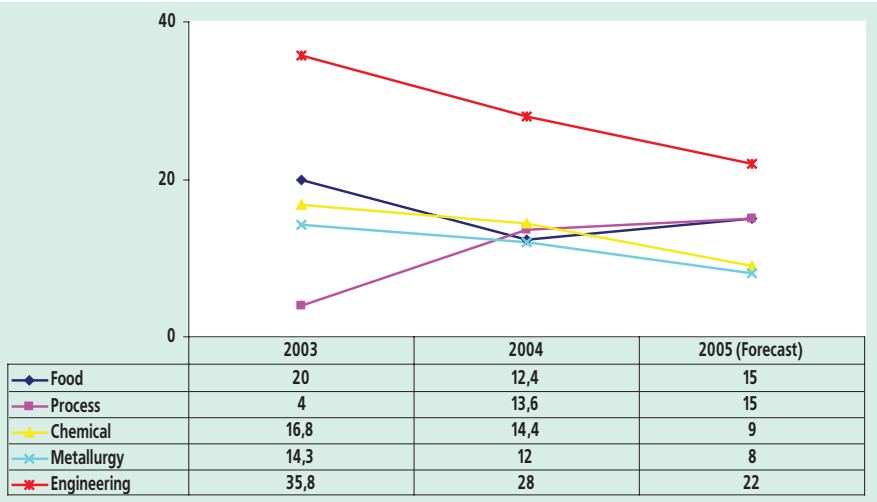
Increasing of internal demand is of equal great value for Ukraine. It became driving force for growth of industrial manufacture beginning from 2001. We shall mention food industry and engineering among branches orientated to internal market, their part in the total amount of industrial production in Ukraine exceeds 30%. Production values in food and engineering industries exceeded level of 2001 by 46% and 93%, respectively. In fact, Ukrainian food industry occupied market at that imported products had previously been dominated, and at present it is as much as 94% of the total amount of food products in Ukraine.

Ukraine demonstrates positive dynamics of mastering investments to the fixed capital during the last years. The mentioned index grew 1.8 times for the last three years. Lowering of internal (average annual) interest rate from 43.8% in 1998 to 15.5% in 2004 favored this. At that private funds of enterprises comply 62% of the investments to the fixed capital. At the same time, industrial enterprises shall engage investments of UAH 12-15 billions (USD 2.26-2.83 billions) more for advance development. However, amount of direct foreign investments to Ukraine was USD 8.4 billions in 2005, whereas it was in 1995 that Poland exceeded this sum. The greatest amount of investments to Ukrainian economics came from the USA (22%), Cyprus (20%), and Great Britain (17%).

Expenses of foreign investors to Ukrainian economics maintain at the level of 2.4% of GDP and are equal to USD 177 per head.

Ukraine has great possibilities for development of agrarian sector, almost a third part of black earth and 27% of all the arable soils of the Europe are located in Ukraine, and a third of all the inhabitants live in the country-side. Agrarian sector became leader in carrying out reforms. Thus, land and belongings relations have been rebuilt entirely in the direction of strengthening of private property institution for land and belongings, and market mechanisms have been introduced to the system of supplement of village with material and technical resources. System for attraction of credit resources of commercial banks for financing of agroindustrial works has been created, infrastructure is being formed and means for regulation of agrarian market are being perfected.

Gross production of agroindustrial sector grew by 30% during 2000 to 2004, and Ukraine got to advanced positions in the world as grain exporter. At the same time, a number of extremely difficult problems exist in development of agroindustrial complex both remained from old administrative system and being result of some mistakes in its reformation and insufficient consistency. One of the problems is deformation of production structure, and two thirds of agroindustrial produce is made under household conditions of the population those are conservative compared to scientific and technical progress and up-to-date organization of agrarian business. According to the preliminary data of 2004, a third part of the agroindustrial enterprises finished it with financial losses, and their account payable was almost UAH 12 billions at the beginning of 2005. Exhaustion of machine and tractor stock in the agriculture is 90%.



	2003	2004	2005 (Forecast)
Food	20	12,4	15
Process	4	13,6	15
Chemical	16,8	14,4	9
Metallurgy	14,3	12	8
Engineering	35,8	28	22

Fig. 1.3.1. Tempos of growth of some branches of industry, %

Lack of own resources and investments led to shortening of amount of almost all the material resources being purchased that impacts negatively observation of production technologies, and caused excessive exploitation of natural fertility of the earth as well as living labor. Therefore productivity in agrarian sector is lower than similar performance of our neighbors and competitors at present that is Poland, Slovakia, Hungary, and other countries of the Central Europe by 1.5 to 2 times. Productivity in the sector is lower compared to that in developed countries of Western Europe, the USA, and Canada, by 3 to 4 times.

Comparison of basic macroeconomic indices of economic development of Ukraine and the countries-members of the EU shows that Ukrainian economics corresponds to most of Maastricht criteria of the EU those allow budgeted deficit up to 3% of GDP, and national debt up to 60% of it. We succeeded in lowering of budgeted deficit to the level of not more than 3% of GDP beginning from 1998.

Table 1.3.1. Dynamics of macroeconomic indices in 2000-2005 (%)

Indices	2000	2001	2002	2003	2004	January to May of 2005
Tempos of increase of real GDP	5,9	9,2	5,2	9,6	12,1	4,7
Increase of industrial manufacture	13,2	14,2	7,0	15,8	12,5	6,2
Increase of agroindustrial manufacture	9,8	10,2	1,2	-11,0	19,1	4,8
Tempos of increase of investments to fixed capital	14,4	20,8	8,8	31,3	28,0	4,5*
Real available gains of the population	4,1	10,0	18,0	9,1	16,5	24,8**
Export of goods and services (trade balance)	18,8	9,7	11,1	24,1	39,0	16,8*
Balance of Adjusted budget (% of GDP)	0,6	-0,3	0,7	-0,2	-3,4	2,8
National debt (% of GDP)	45,2	36,6	33,6	29,7	24,8	18,5***
Inflation level, December compared to December	25,8	6,1	-0,6	8,2	12,3	5,7****
Unemployment	11,7	11,1	10,1	9,1	8,6	-

| January to April | ** – January to April | *** – January to April compared to forecasted GDP | | **** – up to December of 2004 |

Due to rational politics of external borrowings together with strict limitations of financing national Ukrainian debt and that ensured by the country is about 25% of GDP that is two times lower than maximum permissible value at currency of the EU. Severe control of country expenditures together with stability of national currency allowed decreasing of inflation level. Increase of real GDP in January to May of 2006 compared to the same period of 2005 is 4.0%.

Analysis of supplement of Ukrainian economics with the main production factors compared to six the most developed economics in the world (the USA, Japan, Germany, France, Great Britain, and Canadian ones) shows rather a high rating of Ukraine. Ukraine occupies the third place by agroindustrial lands, the fourth one by labor resources, and the third one by scientific potential. At the same time Ukraine like many other countries of the CIS is greatly behind developed countries by efficiency of using resources. Ukraine needs over 10 years in order to reach up-to-date average level of European countries even if yearly increase of GDP remains at average level of 10%. According to data of the WB gross national gains per person in 2004 was only 22% of the appropriate averaged index in the expanded EU.

As a result of the full-scale privatization part of private enterprises in industrial production reached 80% according to available estimations. Sector of small and medium-sized enterprises increased its part in employment from 13% of the number of labor force in 1997 to 24% of that in 2004.

Ratio of wages to cost of living of persons capable of labor (averaged in Ukraine) was 152.46% in 2004 compared to 80% in 2000. Tempos of increase of real wages exceed both tempos of increasing of GDP and tempos of inflation. Available gains of the population in 2004 increased by 72% compared to 1999. Deposits increased almost three times for the period of 2001 to 2004.

Table 1.3.2. Dynamics of sizes of cost of living and wages

Indices	2000	2001	2002	2003	2004	2005
Cost of living of a person capable of labor, UAH	287,63	331,05	365	365	386,73	453
% compared to the previous year	x	115,3	109,9	100,0	105,9	116,8
Nominal averaged month wages, UAH	230,13	311,08	376,38	462,27	589,62	764,29*
in % compared to the previous year	129,6	135,2	121,0	122,8	127,5	119,3**
Real wages, % compared to the previous year	99,1	119,3	118,2	115,2	123,8	114,4**

* – for January to May of 2005 | ** – up to January of 2005

Estimation of the level of unemployment made by the method of the International labor organization has been permanently lowering and decreased from 12% of economically active population in 1999 to 8.6% of that in 2004. But these data do not take into consideration in full size concealed unemployment in the forms of compulsory work in the regime of part-time working or forced «administrative vacations». Most of men capable of labor and working in own farms do not consider themselves employed.

Ukraine found itself at 86-th place among 104 countries in 2004 by global index of increase of competitiveness. It occupies 69-th place among 104 countries and 65-th place among 93 countries by index of business competitiveness. Level of competitiveness of Ukraine in the world goes on decreasing because of high level of corruption of Ukrainian officials.

One of the most powerful reserves for increasing efficiency and, as the consequence, competitiveness of Ukrainian economics lies in increasing of labor productivity that is now extremely low. Economical growth during the last years impact to some extent increasing of prosperity and lowering of poverty. Base social standard on the basis of that country social insurance arrangements are defined and that is applied for general estimation of living level in Ukraine is approved amount of cost of living.

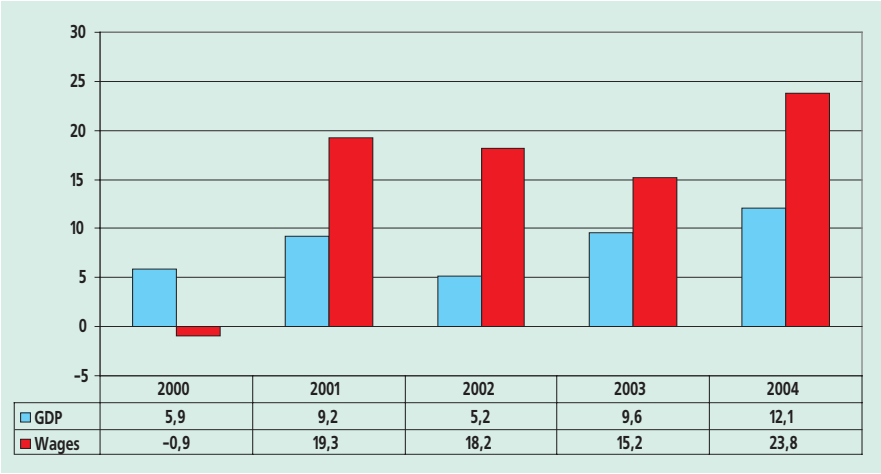
About 3 million persons or over a third part of rural inhabitants capable of labor by age are not employed that is are not employees. Averaged person expenditures of almost 85% of the rural population do not reach cost of living. Many oblast village budgets were unable to ensure implementation of the problem of compensation of lowering social aid that had earlier been rendered by great (collective) farms.

Averaged level of wages of the persons engaged in agriculture did not exceed 50% of that in economics as the whole in 2004. A great number of rural inhabitants of the most active age are obliged to leave villages and sometimes go abroad (according to some estimations 1.0 to 1.5 million persons).

Size of minimum wages increased 4.2 times during the last five years (from UAH 74 in 2000 to UAH 310 in July of 2005) that impact stable high averaged tempos of increasing wages in all the types of economic activity.

The lowest level of remuneration of labor observed in agriculture (50% of that in economics as the

whole), and the highest in financial activity (213% of that). High level of difference between oblasts by level of remuneration of labor was still observed in 2004. Its highest level (UAH 967.43) is still in Kyiv. Ratio of averaged level of remuneration of labor in Donetsk (UAH 711.50) and Ternopil (UAH 388.46) oblasts was 1.8. Real growth of GDP and wages of Ukrainian inhabitants for 2000-2004 is shown on fig. 1.3.2.



	2000	2001	2002	2003	2004
GDP	5,9	9,2	5,2	9,6	12,1
Wages	-0,9	19,3	18,2	15,2	23,8

Fig. 1.3.2. GDP and wages (real growth, %)

But wages that is the main constituent part of gains of population is still too low for implementation of their main functions. Thus, 0.9 million employees (8.5%) obtained wages that are lower or at the level of the established lowest level of remuneration of labor (UAH 237), and 3.7 millions obtained that at the level of the cost of living of persons capable of labor (UAH 387).

1.4 ECOLOGICAL POLICY

Ecological policy of Ukraine has been formed in general during years of its independence. National ecological policy is realized through purposeful national, country, and oblast programs (those for protection of environment, protection of health, and for restoration) and national and country programs for development of branches (sectors) of economics. «The main directions of country policy in the sphere of environment protection, use of natural resources, and ensuring of ecological safety» were approved by the Verkhovna Rada of Ukraine in March, 1998. This document declared long term strategy of solution of ecological problems of Ukraine.

Transition of Ukraine to international system of accounts and statistics, signature of the Kyoto protocol, and carrying out of a number of organizational measures for using of natural resources and environment protection created objective conditions for working off of conception for formulation of a system of instruments of national ecological policy that is to ensure effective protection of environment taking into consideration national specific features and traditions of using natural resources.

Effectiveness of existing activity for environment protection at the country level is not enough in general, and it does not conform to up-to-date tasks of optimum use of economic levers for formation and realization of today's country ecological policy that declares its own intentions to integrate to the EU. Specific feature of today's state of ecological policy in the sphere of estimation of its effectiveness is the system of payments for environment protection that does not comply with today's demands. The system

formed during the years of independence and did not change significantly during the last years.

Today's system for regulation in the sphere of using natural resources and ecological taxation as well as existing level of payments and taxes did not ensure permanent progress in mobilization and accumulation of financial resources and purposeful use of them for carrying out of activity for environment protection. They appeared ones to have low efficiency as mechanism of encouragement of this activity, too. The most significant payments for ecology are those for environment pollution, system of ones for special use of natural resources (mineral, water, earth, forest, and biological ones), and compensation of losses caused by infraction of the legislation. In spite of availability of the mentioned payments they still do not function properly. This does not allow reaching the main purpose that is changing of behavior of citizens and subjects of management and their encouragement to treat environment more carefully.

In general, Ukrainian economics provided more organizational and financial possibilities for increasing effectiveness of ecological policy, but they have not been used completely. For instance, financing of measures for environment protection from both the State and oblast budgets was 10% to 15% lower than that anticipated in 2004. Therefore retention and strengthening of existing tendencies of social and economical development shall be more closely connected to measures for improvement of the state of environment. Determinant role is to belong to structural changes in the real sector of economics purposed to increasing effectiveness of its functioning.

Shall note that the main amounts of expenditures for environment protection are made namely at the expense of State budget of Ukraine. Practically the only sources of financing of measures for environment protection to be realized by oblast budgets are respective funds for environment protection.

1.5 ENVIRONMENTAL OVERVIEW

Ukrainian territory possesses unique complex of physical and geographical, landscape, hydrological, structural and geological, and other parameters that favored formation of great amount of types as well as quantity of natural resources.

Availability of a few climatic zones and disposal in the oblast of two water collections that is those of Black and Baltic seas are favorable to significant changes of hydrographic network, vegetation covering, fertility of soils, and other parameters of natural and resource potential.

Great amount of natural and recreation resources at the Ukrainian territory has unsurpassed economical and ecological parameters. Unique body of black soil grounds (over 20% of the world's resources), reserves high quantity of coking coal in Donbas oblast, province of mineral water in the Carpathians (a few tens of types) including that of «Naftusya» type known all over the world as well as fields of medicinal brine and silt of the oblast near the Black sea shall be ascribed to them first of all.

Today's state of use of natural resources is still greatly inherited from the past times, and this especially applied to the oblasts of Ukraine that are overloaded due to man's activity.

One can characterize today's ecological situation in Ukraine as critical, and it has been formed for a long period because of neglect of objective laws of development and restoration of natural and resource complex of Ukraine.

Great specific weight of technologies characterized with high consumption of resources and energy is inherent to Ukrainian economics, and introduction and rising of them has been carried out by «the cheapest» mode that is without building of appropriate sewage disposal plants. That was possible because of absence of effectively functioning legal, administrative, and ecological mechanisms of using environmental resources without taking into consideration requirements concerned with environment protection.

Disproportion in disposal of production resources having taken place during long periods of time led to that Ukrainian territory exceeded by man caused overload on environment the same index of developed countries 4 to 5 times. At that plowed grounds composed 80% of the whole area of agricultural ones, and 57% of the total area of the dry land. Amount of water used in technological processes was 2 to 5 and now and than 10 to 13 times greater compared to up-to-date technologies.

Both industrial and agrarian sectors of economics have been powerful sources of negative impact on environment for decades.

Crisis in agrarian sector was first of all caused by destruction of age-old way of land management and creation of great agroindustrial complexes. Politics of excessive centralization and yearning of «giants» in management of agriculture led to problems intrinsic to industry and cities. Creation of great cattle-breeding complexes for 25 to 100 thousands of heads of neat or pigs led to formation of the most powerful sources of environment pollution in the rural area. A complex of 100 ths. pigs were kept was equal to a city with 400 ths. inhabitants by its environment pollution.

The Chernobyl catastrophe previously called accident than was the greatest man caused catastrophe and tragedy in the history of Ukrainian nation became significant component of the global ecological crisis. Over 200 ths. men were resettled from over 2 ths. settlements located in the zone contaminated with radiation.

List of the ecologically unfortunate cities of the country contained over 80 settlements, and the greatest cities and almost 80% of the great ones were in it. Other sources of ecological trouble then harmful releases and waste cause permanently growing anxiety. Those are extremely quick tempos of increasing amount of vehicles at the streets of the towns and unregulated growth of amount of domestic waste as well as formation of new and new territories turning into spontaneous landfills around great cities.

Today's ecological situation in Ukrainian industry especially that in the oblasts and centers of excessive concentration of heavy industry enterprises is characterized as complicated one. It has been formed for a long period because of neglect of objective laws of development and restoration of natural and resource potential.

Metallurgy industry including ferrous and non-ferrous ones, coke and rolled metal production, and adjacent objects and processes are branches of industry causing the greatest pollution. Pollutant substances caused by functioning of metallurgical enterprises made 29% of the total amount of them in 2004. Impact of enterprises of petroleum chemical complex upon the state of environment is characterized by release of hydrocarbons, sulfuric acid, carbon disulphide, mercury, fluorinated, and other harmful substances to the atmosphere.

High concentration of chemical and petroleum and chemical plants in some oblasts of Ukraine led to excessively high level of contamination of water sources. 70 mln. cubic meters of unpurified or insufficiently purified sewage are yearly discharged to open water bodies by chemical plants. Plants of oil and gas complex are considered objects of increased ecological risk by their impact upon environment. They are potential sources of environment pollution that can take place in the case of violation of technological regimes of functioning of equipment as well as emergency situations.

Heat energy enterprises are one of the main polluters of atmospheric air amongst industrial objects (about 30% of all the harmful releases from stationary sources to the atmosphere). Two most important problems dominate in heat power engineering: contamination of atmospheric air and pollution of soils because of stockpiling of great amount of waste (ashes, sinters, and dust).

Ecological dues of UAH 339.9 mln. in total were taken from enterprises, organizations, and institutions for pollution of environment and violation of legislation for environment protection in 2004. That is a quarter greater than that in 2003, and over half of them (UAH 183.7 mlns.) are dues for releases to the atmosphere from stationary and movable sources, 35% (UAH 117.7 mln.) are dues

for discharges of sewage to water bodies and placing of waste within the established limits, 9% (UAH 29.2 mln.) are dues for water pollution over established limits, and 3% (UAH 9.3 mln.) are dues for losses caused to nature, and losses for violation of legislation for environment protection.

UAH 352.3 mln. and UAH 4,152.2 mln., respectively were spent for capital repairs of the main means designed for environment protection and for current measures purposed to protection and rational use of natural resources carried out by enterprises, organizations, and institutions from all the sources of financing in 2004. That is a quarter greater than those in 2003. Measures for environment protection were realized by enterprises, organizations, and institutions of the country, as earlier, in the main at the expense of private funds those composed 97% of the total expenditures for capital repairs of the capital production fund (CPF) designed for environment protection as well as current expenses for measures for environment protection.

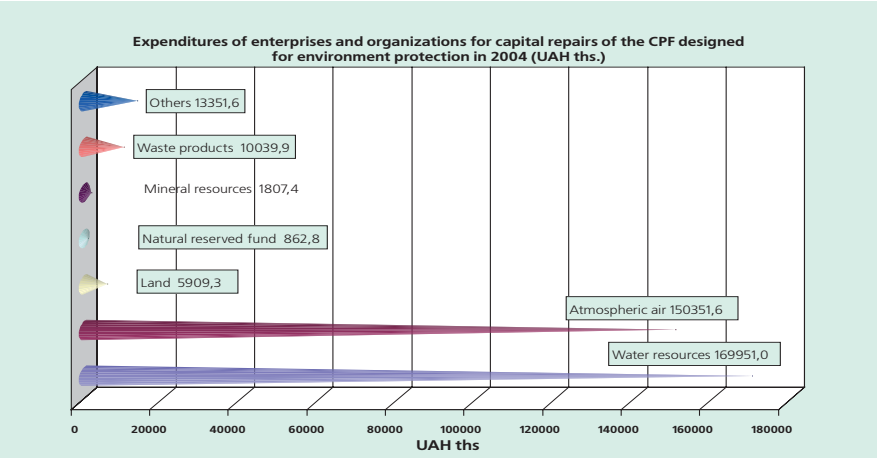


Fig. 1.5.1. Expenditures of enterprises and organizations for capital repairs of the CPF designed for environment protection in 2004

1.5.1 Land resources

Ukraine is the largest country in the Europe by its territory, and by qualitative composition of soils and biological productivity of grounds it is one of the richest countries of the world. High natural productivity determines leading role of the available land as one of the most significant types of development resources and the most valuable part of the national wealth.

Land territory of Ukraine is 60.4 mln. hectares. Structure of available land is characterized by the following performance. Agricultural lands compose 71.3% of the Ukrainian territory, including 69.2% of agricultural grounds. 77.7% of the latter are arable lands, 13.3% are pastures, 5.8% are for haying, 2.2% are perennial green plantations, and 1% of them are passes. Forests and other lands covered with woods occupy 17.3% of the territory, built-up lands are 4.1%, water bodies are 4.0%, waterlogged lands are 1.6%, and others are 3.7% of the territory of the country.

Ground covering in Ukraine is characterized with rather a great waviness and variety, and about 650 types of grounds are there. Common black soils (about 9 mln. hectares), typical black soils (over 7.2 mln. hectares), southern black soils (3.2 mln. hectares), and podsolic and deep gray forest black soils (3.2 mln. hectares) as well as turf and podsolic (1.4 mln. hectares), and deep chestnut-colored soils prevail.

Development of the territory with agriculture reached 72%, and amount of ploughed lands is 56.1% of the territory. Practice of permanent widening of arable lands as the only way of management of the branch led to that four of five hectares of agroindustrial lands in Ukraine are ploughed. No developed country in the world has such a level of amount of ploughed lands. Degradation of soils reached extremely hazardous scales in our country under such conditions, permanent natural and anthropogenic simplification of agrarian landscapes and worsening of quality performance of soils are taking place. Shortage of harvest is 10% to 20% at the grounds washed slightly, 30% to 50% at those washed moderately, and 60% to 80% at the grounds washed heavily. Therefore it is impossible to obtain stable yield without enough fertilizers, introduction of new sorts, carrying out of melioration and anti-erosion measures as well as other elements of scientific and technological advance.

Land is the most significant economical resource of the country protection and rational use of which belongs to priority tasks of the society. Significant territories are covered with grounds characterized with unsuitable properties (washed, deflated, saline, solonetzic, and excessively humidified ones). These are degraded grounds having low fertility. Area of such grounds at arable lands is over 6 mln. hectares or 20% of the square of ploughed lands.

Man caused contamination of grounds is observed in the oblasts of intensive farming and high concentration of industrial production that can cause lowering fertility of agricultural produce up to 20% to 37% as well as lowering its quality due to lowered content of vitamins, proteins, hydrocarbons, fats, etc.

Management of agriculture not grounded from ecological point of view, not balanced introduction of mineral fertilizers, overload with crops to be extracted from the soil, and low part of perennial herbages at high part of ploughed lands exert negative impact upon environment.

Long term extensive use of black soils caused progressive degradation of available lands. 18% of the Ukrainian territory are stricken with erosion, mostly in Khmelnitskiy, Vinnitsa, Chernivtsi, Odesa, Kyiv, Cherkasy, and Kirovograd oblasts as well as in the Autonomous Republic of Crimea.

Productive capacity of arable lands in Ukraine decreased in 2004 due to drastic shortening of use of organic and inorganic fertilizers (15 and 11 times, respectively compared to 1990), and, in fact, cessation of chemical melioration.

Qualitative country of arable lands is systematically worsened because of severe violation of ecological equilibrium in the balance of the main nutrition elements. The latter averaged in Ukraine in 2004 was minus 78 kg per hectare, including minus 22 kg per hectare by nitrogen, minus 9 kg per hectare by phosphorus, and minus 46 kg per hectare by potassium. Indices of intensiveness of balance were 48%, 41%, and 16%, respectively. Thus, actual indices lower than those ecologically normal several times that led to lowering fertility of soils. Application of mineral fertilizers at least 4.5 times of today's level is required to reach balance of nutrition elements of plants without deficiency.

Over 8.4 mln. hectares of agricultural lands were contaminated because of accident at the Chornobyl NPP, density of their pollution with Cesium (Cs-137) exceeds 0.1 Curie per square kilometer. The greatest amount of radio nuclides precipitated in Zhytomyr oblast (70%) and northern areas of Kyiv oblast (15%). Residual amount of them distributed as radioactive patches of various levels of activity, configuration, and size at the territories of Rivne, Volyn, Chernigiv, Vinnitsa, Cherkasy, and Ternopil oblasts. Principal factors in formation of dose loads upon population are structure of using of lands and qualitative composition of soils. Appropriate counter measures are not carried out.

Structure of lands in Ukraine is changing step by step during the last decade. Square of ploughed lands belonging to all the owners and users of land decreased by 736.0 ths. hectares, but area of passes increased by 431.2 ths. hectares. Square of feed grounds increased by 321.8 ths. hectares during the last years. This allowed provision of cattle belonging to the population with green fodders and hay.

Square occupied with perennial plants shortened by 121.9 ths. hectares.

Increased attention shall be paid to improvement of ecological state and increasing efficiency of using as well as protection of irrigated and dried lands. Works for elimination and prevention of salinization of irrigated lands and solonetz formation on them, their underflooding and pectization, decalcination, degumification, formation of podzols, and acidification shall be carried out in appropriate dimensions in order to prevent excessive drying, mineralization, mechanical depletion, and deflation erosion of dried lands.

1.5.2 Water resources

Problem of ensuring of appropriate ecological state of potential of water resources is still actual one for all the oblasts of Ukraine. Almost all surface waters and a great part of underground ones are polluted by people. This is especially appears in the oblasts where powerful industrial plants and agricultural complexes located and reveals in contamination, exhaust, and degradation of these objects. River basins mastered economically are greatly transformed that changed significantly character of water flow and water regime of water bodies. This reflected first of all in extension of floods that the most frequently lead to inundations consequences of those are very severe. Great amount of water consumption in economic activity and increasing of discharge of contaminated sewage waters to surface water bodies are the main factors of anthropogenic load on surface water resources.

Ukraine has been one of European oblasts provided with water the less sufficiently. Deficiency of water resources is partly compensated due to transit flow of rivers as well as channels and flumes that perform functions of intra-basin water re-distribution. Building of great storage pools at Dnipro for the purpose of provision of industrial centers near Kryvyi Rig city and in Donbas with electric energy and water as well as irrigation of agricultural grounds of the territories adjacent to Black sea and those in Crimea did not justify itself but led to negative ecological consequences. Over 500 ths. hectares of fertile grounds were underflooded and taken out of agricultural use, and about 100 ths. hectares of those adjacent to storage pools appeared in impoundment zone, but production of electric energy by hydroelectric power plants is less than 4% of the country's value. Phenomena of «florescence» of water and destruction of coasts became massive ones.

State of ecological system of Black sea and Sea of Azov are pre-crisis namely because of contamination of their waters with industrial and communal sewage waters from «hot spots» of the near-shore zones and contaminated discharges of such the rivers as Danube, Dnieper, Dniestr, Southern Bug, and Don.

Observation of the state of chemical pollution of surface waters witnesses that Crimean rivers and, to certain extent, those of Carpathian oblast are in satisfactory condition. The greatest amounts of polluters come to the rivers of Dnipro and Siverskiy Donets basins. Chlorides, sulfates, suspended substances, nitrates, ammonia nitrogen, magnesium, phosphates, nitrites, oil products, high-density metals, phenols, and synthetic surfactants predominate in the sewage waters charged to water bodies.

Oxygen regime of rivers and water bodies is satisfactory in general, content of dissolved oxygen in the water is within the limits of allowable norms except of the rivers of Poltava (L'viv city), Western Bug (town Kamyanka-Buz'ka), Southern Bug (Khmelnitskiy city), and Ustya (Rivne city) where occasions of oxygen deficiency took place.

Lowering or stabilization of content of mineral forms of phosphorus are observed here and there in the surface waters in Ukraine that witnesses of cessation of global process of eutrophication of natural waters with phosphorus compounds.

High level of contamination of rivers by enterprises of various branches of economics remains characteristic of the main branches of economy (table 1.5.2.1).

Ground waters remaining the main and reliable source of water supply especially in the countryside do not always correspond to the requirements toward drinking water, first of all because of elevated level of nitrogen and phosphorus compounds as well as their bacteriological pollution.

Unsatisfactory condition of water supply utilities and networks, untimely carrying out of capital repairs and current planned ones for prophylactic impacts negatively quality of drinking water taken out of centralized water supply.

Table 1.5.2.1. Dynamics of discharge of sewage waters to surface water bodies by the main branches of Ukrainian economics

Branches of economics	Amount of discharge of sewage waters in the years, millions. cubic meters				
	2000	2001	2002	2003	2004
Industry, total	6466	6024	5708	5206	4913
including contaminated	1829	1776	1759	1677	1703
unpurified	542	578	622	565	544
Agriculture, total	1142	976	1012	948	927
including contaminated	99	56	44	70	54
unpurified	96	55	43	69	52
Housing and communal services, total	3306	3096	3085	2906	2821
including contaminated	1371	1164	1109	1195	1562
unpurified	116,8	111	115	168	157
Total	**10517,0**	**10136**	**9613**	**9098**	**8697**

Exhaustion of water supply systems is 30% to 70% in various oblasts. Supply of water according to schedule and its protracted absence in water supply networks favors bacterial contamination of drinking water. Cases of disconnection of water supply objects from energy supply systems that is gross violation of the article 6 of the II section of the Ukrainian law «On drinking water and water supply» worsen situation greatly.

The country sanitary and epidemical service made 48,385 inspections of water supply utilities in 2004, and in 6,136 cases (12.7%) gross violations of anti-epidemic regime have been revealed. 307.8 ths. samples of drinking water have been researched for bacteriological performance, and in 12.8 ths. samples (4.2%) deviations from the standard have been revealed.

Problems of underflooding became more acute during the last decades that threatens safety of living of the population, lowers seismic firmness of the territories, impacts negatively management of agriculture, and accelerates migration of polluters to underground and surface water bodies.

There are many causes for that. One of them is large scale hydroeconomic and meliorative building and extremely high regulation of discharge of small rivers that caused partial loss of natural drainage of the territory and activation of landslide and karsts phenomena. The other one that caused intensification of underflooding beginning from the 60-ies to 70-ies was building of Dnipro cascade of storage pools and introduction of powerful irrigation systems to exploitation. Miscalculations took

place in designing and building of hydroeconomic and meliorative complexes, too, their exploitation was not appropriate one, and the problem became more acute because of crisis phenomena of the 90-ies. We can mention irrational use of water in all the spheres of men's activity and great unproductive losses (industry, municipal economy, and agriculture), unbalanced engineering and economical activity, closure of pits as well as their «wet conservation» among the causes. Unsatisfactory condition of water supply and sewage networks, using «wet» technologies in the industrial complex, unsatisfactory functioning or complete absence of shower sewerage systems and other systems for water discharge, natural (particularly, hydrometeorological) factors, and inactivity of economical mechanism for regulation of using water were causes to that as well.

1.5.3 Atmospheric air

Unsatisfactory condition of the atmospheric air in the settlements is caused by non-observance of technological regime of exploitation of equipment for purification from gases and dust by enterprises, including that because of limited supply of energy. That equipment is unable to function within the limits of ecological and sanitary norms. Measures for lowering releases to normative levels are not carried out in the schedule date, and up-to-date technologies of purification of releases are introduced slowly. Non-fulfillment of effective purification of releases of enterprises from gas-type admixtures and unavailability of sanitary and protective zones between industrial enterprises and residential areas are causes of unsatisfactory condition of atmospheric air, too.

Some increase of releases of harmful substances from stationary sources of pollution to the atmospheric air took place in 2004. They increased by 1.6% in the whole country and reached 4,151.9 tons.

A great number of oblasts with high level of contamination are city industrial centers with high density of population at the same time. Releases increased in conversion to a resident in urbanized Donetsk and Dniepropetrovsk oblasts those are characterized with the highest levels of contamination of atmosphere (Fig. 1.5.3.1).

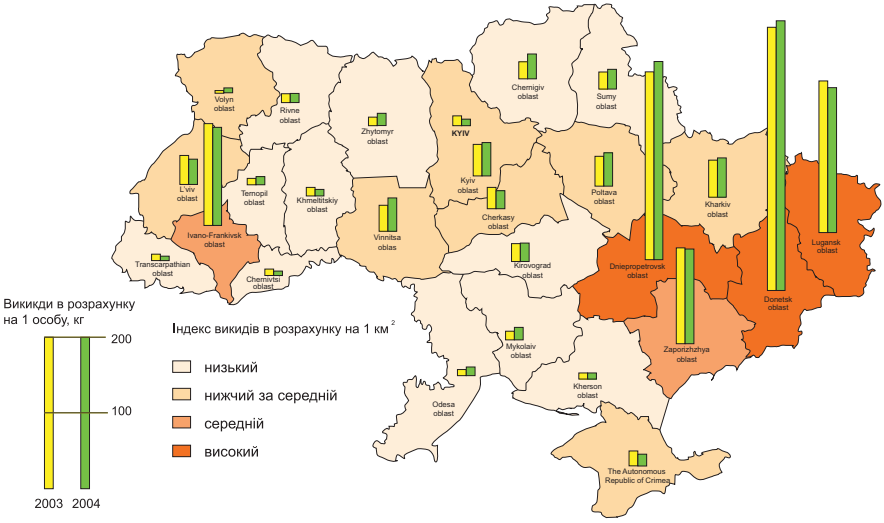


Fig. 1.5.3.1. Release of harmful substances from stationary sources of pollution in the oblasts of Ukraine in 2004

Tendency to increasing releases from vehicles is observed, too. Those increased by almost 67 ths. tons in 2004 compared to 2003, and this fact results from further increasing of import of old vehicles produced abroad, enhancement of the number of transit ones, etc. Releases from movable sources reached 33.3% of their total amount in the country.

Problem of pollution of the atmospheric air caused by releases from vehicles as well as impact of its physical factors is revealed the most acutely at great traffic centers being industrially developed cities. One of the causes for increasing pollution of the atmospheric air is growing haul of passenger cars being private property of citizens.

Coming of harmful substances to the atmosphere from vehicles in the oblasts rich with industrial objects prevails over releases from stationary sources. Negative impact is boosted by unfavorable territorial and planning structure of many towns, too, because of encirclement of plants with housing encounters formed in the previous years as well as pass of transit traffic through the towns that increases their gas pollution greatly. Release of led is estimated as 260 tons to 300 tons in the whole country. As a result of this, pollution in great cities reaches levels exceeding those allowed by National standards, and population of such cities is impacted to risk of development of deceases caused by air pollution.

Excessive concentration of industrial objects and vehicles at the Ukrainian territory led to extreme anthropogenic load on environment. Therefore, despite the tendency toward shortening amount of releases from industrial objects to the atmospheric air observed during the last 10 years, problem of its sanitary protection did not lose its actuality.

We shall note that in spite of some shortening of amount of releases from industrial objects to the atmospheric air, significant increasing of participation of exhaust gases to pollution of atmospheric air is observed due to permanent growth of amount of vehicles, especially in the great Ukrainian cities.

The highest levels of pollution of atmospheric air are observed from year to year in the settlements of oblasts located close to Donetsk and Dniepropetrovsk. Amount of releases of pollutants to the atmospheric air from industrial objects is about 80% of the total gross releases of all industrial enterprises in the country. Inhabitants dwelling within sanitary and protective zones are exposed to the most unfavorable impact of the harmful factors. A number of industrial plants function at the territory of Ukraine normative sanitary and protective zones from those to residential areas are not observed. Over 97 ths. persons live within sanitary and protective zones of industrial plants in Donetsk oblast, and 50 ths. persons – in Lugansk oblast, etc.

Insufficient supply of haulage enterprises with control gauges and using low-quality fuel because of absence of its state express control remain the main drawbacks in organization of activity for environment protection at them.

However, level of pollution of the atmospheric air with harmful substances remains high on the whole of the country. Power plants as well as enterprises of coal, metallurgy, extracting, chemical, and petroleum and chemical industries, works for manufacture of cement and building materials still made the greatest contributions to pollution of the atmospheric air like in the previous years.

Movable sources that is motor, railway, water (sea and river), and aviation transport as well as special, agricultural, and building machines contribute greatly to releases of pollutants to the atmospheric air. General amount of releases from stationary sources (except of special, agricultural, and building machines) was 2,174 tons in 2004, and this is 3.3% or 70.6 ths. tons greater than that in 2003. Amount of releases from motor transport was 2,076.9 tons in 2004 (95.5% of the total amount of releases from all the movable sources).

The greatest amounts of releases of pollutants from movable sources were observed in Donetsk (237 ths. tons), Dniepropetrovsk (170 ths. tons), Kharkiv (146.8 ths. tons), Zaporizhzhya (121.5 ths. tons), Lugansk (120 ths. tons), and Odesa (111.5 ths. tons) oblasts, as well as in the city of Kyiv.

Tendency to increasing of releases of pollutants from stationary sources is observed as well that results from stepwise increasing of sizes of production, renewal of work of industrial objects having stood idle, great exhaust of equipment, and non-fulfillment of measures for air protection in the stated terms.

The main causes of insufficient tempos of decreasing of amount of releases and levels of pollution of atmospheric air are low level of utilizing capacity of available installations for purification of gases, non-fulfillment of measures for lowering releases of pollutants to the atmosphere in the stated terms, slow tempos of introduction of low and non-waste technological processes, great amount of sources of releases not equipped with installations for gas purification, and great amount of equipment outdated morally and physically.

1.5.4 Forest resources

Ukrainian forests perform a predominantly ecological function that is those for protection of water bodies, protective, and recreation ones, and have limited exploitation significance. General area of the lands of forest fund is 10.8 mln. hectares, and 9.4 mln. hectares of them are covered with forest vegetation. Resources of wood exceed 1.7 bln. cubic meters. Averaged yearly increase in the forests of the State committee of forestry is 4 cubic meters per hectare and changes from 5 ones in the Carpathians to 2.5 ones in the steppe zone. Percentage of forest land in Ukraine is 15.6%.

Square covered with forests at the territory of Ukraine shortened three times during the last 500 years under the impact of anthropogenic factors. In the first millennium of the Common Era forests were spread almost over the whole territory except for the Steppe zone.

Forests are located irregularly at the territory of the country. Percentage of forest land in the various native zones of Ukraine has significant differences and is far from optimum that is those at that forests impact climate, grounds, and erosion processes the most effectively and provide country economics with sufficient amount of qualitative wood. The greatest forestlands are located in Marshy Woodlands and in the Ukrainian Carpathians, and cover 26.1% and 40.5% of the whole territory of the oblast, respectively, but in the oblasts of the Forest-steppe and the Steppe these indices are 12.2% and 3.8%, respectively.

Age-old structure of forestlands does not allow performing its functions. A forestation is dived to underwood (32%), middle-aged (44%), ripening (13%), and ripe trees (11%).

For the purpose of keeping forestry Ukrainian forests were passed to permanent use to the enterprises of the State committee of forestry (68.3%), agrarian complex (24%), MODU (2.2%), MOEU (1.6%), MEPU (0.8%), and others (3.1%).

Almost all the Ukrainian forestlands are subjected to intensive anthropogenic impact. Forests located in the oblasts of Dniepropetrovsk and Zaporizhzhya, Lisitchansk and Rubizhne and Severodonetsk, and Cherkasy and other industrial agglomerations are exposed to the greatest man-caused load. Sanitary and hygienic as well as protective functions of the forests are lowered because of impact of industrial releases. The accident at the Chornobyl NPP made colossal loss to Ukrainian forests. Those are contaminated with radio nuclides at the area of 3.5 mln. hectares, and 200 ths. hectares of forests were completely taken out of exploitation. Excessive felling in middle-aged and ripening forests is the reason of weakening of phytocenoses.

1.5.5 Wastes

A number of normative and legal acts for various aspects of management of waste have been developed and introduced in Ukraine, proper system for management is in the process of formation, and some elements of economical mechanism have been introduced, but realization of real measures is carried out slowly. Problem of waste is still rather acute both in Ukraine as a whole and in its oblasts

because of their formation in great amounts and non-effective management system in the sphere.

Specific feature of Ukrainian economics both in the past and at present is great part of extractive, fuel and energy, metallurgical, and chemical industry having high specific and total waste formation indices.

Lowering of absolute waste formation indices has been observed in Ukraine in the 90-ies, but that lowering was due to economical crisis and shortening volumes of industrial production and was not due to technical and technological progress. Reverse tendency to growing of absolute volume of waste formation has been observed beginning from 1999-2000. Process of their stockpiling progresses, respectively. According to statistical accounting, increasing of volumes of formation and stockpiling both in industrial and domestic sectors has been observed in 2004 as well.

The greatest volume of waste formation is generated by industrial sector of economics, and with enterprises of mining and metallurgy complex. According to the data of MEPU part of metal mining enterprises in the structure of waste formation is 70.53%, that of metallurgical ones is 24.97%, that of chemical-recovery ones is 2.61%, that of ferroalloy ones is 1.4%, that of pipe ones is 0.23%, and that of ones for manufacture of fireproof items is 0.14%.

About 90 mln. tons of uncovered and accompanying mining rocks, 23.5 mln. tons of metallurgical cinders, 26.3 mln. tons of waste of metallurgical manufacture, etc. have been generated at the enterprises of mining and metallurgical complex in 2004. The greatest part of waste in non-ferrous metallurgy compose those generated in concentration of titanium and zirconium ores (7.9 mln. tons), red cinders of alumina processing manufacture volume of those reached 1.5 mln. tons, cinder of nickel production (0.51 mln. tons), etc. 590 ths. tons of phosphogypsum, 32 ths. tons of distiller suspensions, 1,780 ths. tons of lime and magnesium waste, 3.680 ths. tons of limestone, 226.6 ths. tons of green vitriol, 152 ths. tons of hydrolysis sulfuric acid, etc. were generated at the chemical plants.

Fuel and energy complex occupies the second place by volumes of waste formation. 29.2 mln. tons of waste of coal extraction and concentration were generated at the enterprises of coal-mining industry in 2004. 7.33 mln. tons of ashes and cinder waste were generated at thermoelectric power plants and other incineration installations.

Gross mass of stockpiled waste at the objects of Ukrainian armed forces is about 200 ths. tons. Unavailability of facilities for complete utilization of all the types of waste and first of all the most hazardous components of rocket propellant, mixed explosives as well as those containing hexogen, and ammunition, led to their stockpiling in hazardous amounts. Conditions of storage and elimination of waste are still critical ones, and that is conditioned by absence of proper financing of carrying out operations with waste.

Volume of generation of waste considered as secondary raw materials (53 types of them) was 215.13 mln. tons in 2004. Increasing of volume of formation of waste belonging to this group by 10.8% is observed compared to 2003 that corresponds with growth of manufacture and GDP in general.

According to the expert estimation (the RSPF of Ukraine), total amount of generation of all the categories of waste is at least 690 to 700 mln. tons. They are characterized with high territorial concentration in some mining oblasts – Donbas, Krivbas, L'viv-Volynskiy, and some others.

Generation of toxic waste at Ukrainian enterprises in 2004 was 62.9 mln. tons. Their amount lowered by 16.1 mln. tons, that is by 25.6%, compared to 2003. But all this decrease of formation of toxic waste falls to Dniepropetrovsk oblast and, according to available information, is caused by re-qualification of those produced by mining and industrial complex from the category of toxic ones to that of non-toxic ones. Therefore, this lowering is of «statistical» character and does not correspond with appropriate technological measures.

Total amount of stockpiling of toxic waste was 1.59 bln. tons at the beginning of 2005 compared to 2.74 bln. tons at the beginning of 2004.

The greatest amounts of toxic waste are generated in Donetsk (36.1% of the total amount),

Dniepropetrovsk (30.8%), Lugansk (15.1%), Zaporizhzhya (9.3%), and Kirovograd (2.0%) oblasts.

One of the most acute and that concerned to environment protection problems is still managing solid domestic (communal) waste. According to the data of the State committee of municipal economy, amount of removal of solid domestic waste increases from year to year. It reached 39.13 mln. cubic meters in 2004, including 24.29 mln. cubic meters removed by municipal organizations. Increase was 5.8% compared to the previous year. One shall bear in mind that the mentioned figures do not reflect real formation of waste in full scale because it is not all the Ukrainian population that is supplied with municipal service.

According to the data of official sources, general amount of toxic waste stockpiled in 2004 exceeded 1,586.7 mln. tons that corresponds to about 2.6 ths. tons per square kilometer. About 21.7 mln. tons of waste belonging to 1st to 3rd categories are included to this amount. Waste contaminated with compounds of heavy metals prevails among harmful waste of all the classes of danger. The main sources of waste are enterprises of chemical and metallurgical industries.

Anthropogenic load upon environment in some oblasts greatly surpassed averaged national level because of placement of toxic waste at the storage places for organized stockpiling as well as at the territories of some enterprises. Thus, this index was almost 12 times greater in Dniepropetrovsk oblast, and 5 times in Donetsk oblast. Prevention of violation of norms for managing toxic industrial waste demands especial attention at present.

1.6 SUSTAINABLE DEVELOPMENT POLICY

Transition to sustainable development is political goal of Ukraine. Strategic planning of transition to sustainable development did not yet become formal characteristic of system policy. Complicated and intensive process of establishment of state institutions, formation of legislation for environment protection, new public and political as well as ecological relations, and social and economical reforming as well as perception of ideology of sustainable development as state strategy in the XXI century prevailed at the first stage of the ten-years period (up to 1997). First steps toward official recognition of worldwide strategy of sustainable development at national level were made in 1997-1998. Thus, National committee for sustainable development of Ukraine of the Cabinet of Ministers has been created, and governmental draft Conception of sustainable development of Ukraine has been prepared. Conception of sustainable development of settlements has been approved by the Verkhovna Rada on December 24, 1999. The main directions of state policy in the part of ensuring sustainable development of settlements, and legal and economical paths of its realization are defined in this document. Problem of development of national strategy of harmonization of vital activity of the community and stable growth becomes more and more actual. Strategy of sustainable development of Ukraine is in the stage of finishing at present, and discussion of its draft continues. Special authorized body of executive power is being created for ensuring realization of the Strategy and carrying out of monitoring of realization of defined tasks as well as their stage-by-stage specification. Development of its status is entrusted to the Cabinet of Ministers of Ukraine.

Evidence of stepwise growth of real perception of ideology of sustainable development at oblast and local levels is practice of development of concepts of sustainable development of separate settlements. Thus, draft Concept of sustainable development of Kyiv city was developed at the end of 2000, and later that of Mariupol town was developed.

Economical strategy combined with social strategy of transition to sustainable development is defined by a number of documents basic of those is President of Ukraine epistle to the Verkhovna Rada of Ukraine «European choice. Conceptual bases of strategy of economical and social development of Ukraine for 2002 to 2011» as well as Decrees of the President of Ukraine «On strategy of overcoming

poverty», «On Concept of development of protection of health of Ukrainian population», «On the main directions of land reform», and others.

Ecological strategy in turn is defined by official documents basic of those we shall consider «The main directions of the state policy of Ukraine in the sphere of environment protection, use of natural resources, and ensuring ecological safety» (approved by Decree of the Verkhovna Rada of Ukraine dated March 5, 1998), and other national and state ecological programs.

National policy of European integration and entry of Ukraine to WTO demands development and approval of national ecological policy taking into account decisions of the Johannesburg meeting for sustainable development and Pan-European Kiev conference «Environment for Europe». But the problem is that approved strategically national documents are rather declarations than conceptual base for development of national ecological policy. Conception of sustainable development of Ukraine to define national priorities of ecological and economical politics is not approved.

"The main directions of the state policy of Ukraine in the sphere of environment protection, use of natural resources, and ensuring ecological safety» approved by the Verkhovna Rada of Ukraine in 1998 do not correspond by now to today's ecological requirements and policy of European integration. Their actualization with orientation to national and not state level is required. As a matter of fact, that shall be new ecological policy based upon international ecological obligations of Ukraine concerned with climate fluctuation, preservation of biological variety, and fighting origination of deserts. It shall take into account ecological requirements and mechanisms of WTO, decisions of Johannesburg meeting, and Kiev conference «Environment for Europe».

Institutional and functional European structure is purposed to maximum delegation of authorities to oblast and local levels of management. The main function of central governing bodies is planning and control of realization and correction of national ecological policy.

Introduction of principles of sustainable development and European integration is entrusted to MEPU (ecological constituent part of sustainable development), MEU (economical constituent part of that), and MLSPU (social one).

But non-stability of administration of the mentioned key ministries approved significant obstacle on the way of system introduction of the principles of sustainable development and European integration. The National committee for sustainable development of the Cabinet of Ministers of Ukraine is firstly confined with consultative and advisory functions and secondly has not become driving center of sustainable development. National council for sustainable development formed in 2003 subordinate to the President of Ukraine did not assemble to hold a meeting but a single time.

Functions of administrative and institutional infrastructure of MEPU with its oblast departments and specialized subdivisions (inspection for ecological control, nature and reserved fund, etc.) are confined by valid legislation and first of all by Ukrainian law «On environment protection» that is not adapted to European ecological legislation and did not correspond to principles of sustainable development.

Problem of ecological regulation in Ukraine lies in weak practical application of the laws. This is explained by imperfection of normative and administrative mechanisms and regulative functions of authorities.

1.7 RELEVANT INTERNATIONAL COLLABORATION AND OBLIGATION

International collaboration in the sphere of environment protection and use of natural resources is carried out by MEPU, MFAU, the State Committee of Land Resources, the State Committee of Water Resources, and other central executive authorities with participation of concerned local

bodies, scientific organizations, NGOs, and others by the following directions: development of collaboration and contractual relations, obtaining of aid, and implementation of international programs and projects.

International collaboration is carried out by way of interaction with international organizations, among those Organization for Security and Co-operation in Europe (OSCE), North Atlantic Treaty Organization (NATO), United Nations Environment Programme (UNEP), United Nations Development Program (UNDP), United Nations European Economic Commission (UN EEC), Global Environment Facility (GEF), World Bank, U.S. Environmental Protection Agency (US EPA), Technical Assistance for the Commonwealth of Independent States (TACIS), and bodies created for realization of international bilateral and multilateral agreements in the sphere of environment protection Agreements signed or ratified, accepted, approved or accessed by Ukraine.

Ukraine is Party of 19 Conventions, 53 bilateral and multilateral Agreements, 18 Protocols, 28 Memorandums, and 6 Declarations in the sphere of environment protection and use of natural resources. Information on membership in international Agreements/organizations for environment protection signed or ratified, accepted, approved or accessed by Ukraine in Annex A.

- Ukraine is Party of the following international agreements in the sphere of management of chemical substances including POPs and chemical safety:
- Convention of prohibition of development, production, stockpiling, application of chemical weapons, and their destruction (Paris, 1993, Ukrainian law #187-XIV dated 1998);
- Convention of the UN on fighting illegal circulation of drugs and psychological agents (Vienna, 1988, Ukrainian law #1000-XII dated 1991)
- Convention on safety in application of chemical substances in manufacture (Geneva, 1990, Ukrainian law #179);
- Convention on fighting danger caused by carcinogenic substances and agents under industrial conditions, and measures for its prevention (Geneva, 1974, Ukrainian law #139);
- Convention on protection from danger of poisoning with benzene (Geneva, 1971), and Convention on transboundary influence of industrial accidents (Helsinki, 1992);
- Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam, 1998, Ukrainian law #169-IV dated 2002);
- Stockholm Convention on Persistent Organic Pollutants (Stockholm, 2001);
- Convention on excess to information, participation of the society in the process of taking decisions, and excess to justice for problems concerned to environment (Arhus, Denmark, 1998, Ukrainian law #832-XIV dated 1999);
- European Agreement on international road transportation of dangerous cargoes (Geneva, 1957, Ukrainian law #1511-III dated 2000);
- Convention on estimation of influence upon environment in transboundary context (Espo, Finland, 1991, Ukrainian law #534-XIV dated 1999);
- Convention on transboundary pollution of air at great distances (Geneva, 1979);
- Convention on protection of Black sea from pollution (Bucharest, 1992, Ukrainian law #3939-XII dated 1994);
- International convention on civil responsibility for loss from pollution with oil (Ukrainian law #44-IV dated 2002);
- Vienna convention on protection of the ozone layer (Vienna, 1985);
- Directive of the European Council 67/548/EEC dated 27th of June, 1967, on convergence of legal acts, norms, and administrative requirements concerned to classification, packaging, and marking of dangerous substances;
- Directive of the European Council 76/769/EEC dated 27th of June, 1967, on convergence

of lawful acts, norms, and administrative requirements of the countries being parties as to limitation of issue to the market and use of some dangerous chemical substances and preparations;

- Directive of the European Council 98/82/EEC dated 9th of December, 1996, on control of risks of great accidents with participation of dangerous substances;
- Directive of the European Committee 93/67/EEC dated 20th of July, 1993 to country principles of estimation of risks for men and environment caused by substances registered in accordance with Directive of the European Council 67/548/EEC;
- Directive of the European parliament and European Council 1999/45/EEC dated 31st of May, 1999, on convergence of legal acts, norms, and administrative requirements of the countries being parties concerned with classification, package, and marking of dangerous mixtures;
- Directive of the Committee 2000/32/EC as to introduction of an amendment in accordance with technical progress in 26 times to Directive of the Committee 67/548/EC on convergence of lawful acts, norms, and administrative requirements of the countries being parties concerned with classification, package, and marking of dangerous substances;
- Regulations of the European Council #2455/92 dated 23rd of July, 1992 as to export and import of some dangerous chemicals;
- Regulations of the European Council #3135/94 dated 15th of December, 1994, to introduce amendments to Annex 1 of the Regulations (EEC) #2455/92 as to export and import of some dangerous chemicals;
- Decision of the European committee dated 21st of December, 1984, on the list of chemical substances registered in accordance with Directive of the European Council 67/548/EEC as to classification, packaging, and marking of dangerous substances;
- Decision of the Committee dated 26th of June, 1998, as to harmonized criteria for liberation from obligations in accordance with article 9 of the Directive of the Council 96/82/EC on control of risks of great accidents with participation of dangerous substances;
- Regulations of the European Council dated 16th of June, 1988 as to export and import of some dangerous chemical substances to the Community;
- Regulations of the European Council #793/93 dated 23rd of March, 1993 as to estimation and control of risks caused by available substances, and other management directives of the European Council;
- Introduction of principles and regulations of the Action program «Agenda for the XXI century» approved by the Conference of the UN for Environment and Development in Rio de Janeiro in 1992, and Global meeting for stable growth in Yokhannesburg in 2002.

Necessary conditions for implementation of the requirements of the mentioned as well as other documents of the European Council are as follows:

- creation of national infrastructure able to ensure effective implementation of the requirements of conventions, protocols concerned with them, directives, decisions, and regulations of the European Council;
- perfection of normative and legal base for ensuring conditions for implementation of obligations according to protocols concerned with conventions;
- creation of mechanism for estimation of influence of the level of pollution of environment with chemical substances;
- increasing of level of safety of enterprises of chemical and adjacent spheres of production, particularly, chemical and ecological safety;
- development of projects for joint implementation of terms and requirements of conventions and protocols;

PART 2

ANALYSIS OF POPS PROBLEM IN UKRAINE

2.1 EXISTING POPS LEGAL AND REGULATORY FRAMEWORK

An effective legal and regulatory framework of managing chemical including POPs and waste has been created in Ukraine. Current legal acts include all the generally accepted norms and principles as to safety requirements, control, and responsibility. We shall note at the same time that development and improvement of the legislative framework as well as organizational structure of the state management framework of environmental protection as a whole and hazardous substances and wastes in particular has not been followed by timely revision and development of additional sub-legal acts. This gap shall be overpowered at initial stages of NIP implementation.

In order to realize legislation in force a number of appropriate sub-legal acts shall be developed additionally at all the levels that is national, oblast, and branch ones. Appropriate tasks shall determine priority of the measures in the NIP framework.

Significant aspects concerned with an improvement of the legal base in the area of POPs management are as follows:

- necessity exists of clearer determination of property relations to hazardous wastes on the whole and those containing POPs in particular bearing in mind both waste stockpiled at the territories of enterprises and old storage of liquidated farms as well as territories with contaminated sites. Clear determination of owners of wastes containing POPs, equipment containing them and out of use, materials contaminated with POPs, and territories is an important condition of any progress in carrying out obligations under the Stockholm Convention;
- legal base concerned with the objects for waste stockpiling located at the territories of industrial plants and belonging to them needs to be further developed with regard to the order of their stockpiling, and their control and responsibility;
- rights and duties of authorities and administrations to be involved to the sphere of management of hazardous products including POPs and equipment and materials containing them shall gain more clearness;
- existing system for permissions for allocation and storage of waste products needs improvement; and
- legislation shall favor further improvement of official statistics concerned with hazardous wastes with basic types and categories of POPs to be separated.

Passing legal acts on ecological audit and ecological requirements in privatization process shall ensure some progress concerned with the mentioned problems. In particular, they introduce the

category of mandatory audit. Introduction of information on sharing responsibility for loss induced to environmental is foreseen to be introduced to purchase contracts.

The prior task is an improvement of the system of registration and accounting as a base for hazardous waste management both for implementation of valuable gathering, processing, and analysis of data concerned with all the groups of POPs. Under their factual absence an inventory having been carried out in Ukraine is qualified merely as preliminary one and shall be transferred to more severe documental base (in particular, it shall foresee search of information on contaminated sites). We shall note at the same time that state statistical accountability in accordance with the Form #1 («Toxic wastes») gives minimum amount of necessary information confined to OP in fact, but database consists of 19 thousand items.

Registration of POPs releases in Ukraine at present is being realized in the framework of general system for control and registration of releases of pollutant substances to the atmosphere from industrial sources only. The system is based on indices of Maximum Allowable Concentrations (MAC) or Tentative Safe Exposure Level (TSEL) of many hundreds substances. A number of POPs is among them, too, but neither MAC nor TSEL of PCBs, dioxins/furans, and some other POPs in the community air are not stated.

Moreover, criteria of safe content of pollutant substances in the air of working areas (about 1,300 substances) stated in the USSR for conditions at working places in the system of labor protection are still valid in Ukraine. These values are not available for POPs except for benz(a)pyrene and PCBs. At the same time, hygienic norm concerned with the list of substances, products, and processes carcinogenic for human being is approved by the Order of the MHU. POPs are among proper compounds in the list, too.

Significant regulatory part in solution of the problem of stockpiled PCBs is to pertain to regulation of requirements to their storage at the territories of plants. At present the document to state proper requirements regarding hazardous wastes is Sanitary Norms and Regulations 2.2.7.029-99 «Hygienic Norms for Industrial Wastes Management and Determination of Their Class of Danger for Human Health». It does not reflect up-to-date approach to these problems and in fact transfers practice of 1980-ies formed in the former USSR to the domestic ground. Storage of hazardous wastes not limited in time is legitimized in fact without any stimulating mechanism for their elimination.

The same order of storage is transferred to «License Conditions of Carrying out Activity for Implementation of Operations in the Area of Hazardous Wastes Management».

The base roles in the system of permissive regulatory documents concerned with handling hazardous substances belong to «Order of Obtaining Permission for Production, Storage, Transportation, Use, Landfill, Destruction and Utilization of Poisonous Substances Including Products of Biological Technologies and Other Biological Agents» approved by the Decree of the Cabinet of Ministers of Ukraine #440 dated 1995-06-20, and «License Conditions of Carrying out Activity for Implementation of Operations in the Area of Hazardous Wastes Management» approved by the joint Order of the Ministry of Environmental and Natural Resources and the State Committee of Ukraine for Regulatory Policy and Entrepreneurship in 2001. Their validity is spread to POPs, but specificity of handling them and specific features of tasks concerned with their storage, neutralization, processing, etc. do not find necessary reflection in these documents. At that extent of this discrepancy makes speak not on amendment of the mentioned «Order» but on development of a separate order in the framework of NIP implementation (in accordance with proper requirements of the Stockholm convention and differentiated concerning the main groups of POPs).

As to «License Conditions», requirements concerned with storage of wastes at the territories of enterprises and a number of other positions are imperfect and contradictory from the view-point of POPs. Necessity of their adjustment or revision is obvious from the view-point of qualification,

organizational, technological, and other aspects of activity concerned with destruction or neutralization of PCBs-containing equipment, materials, and wastes. This document shall allow for requirements of EU Directive 96/61/EU concerning integrated pollution prevention and management (IPPC Directive) and foresee:

- Development of action plans in case of emergency situations;
- Development of procedures of elimination of places for stockpiling of wastes generated in the past and future periods;
- Implementation of procedures of analytical control of production processes, sampling, and monitoring of the state of air, soils, and ground water; and
- Development of plans for closing of enterprises.

«General Requirements as to Carrying out of Processing, Utilization, Destruction, or Further Using of Low-grade and Hazardous products Deduced from Use» approved by the Decree of the Cabinet of Ministers of Ukraine #50 dated 2001-01-24 require attention from the view-point of solution of the problems concerned with POPs. In particular, this document states list of enterprises having obtained right to process some types of the mentioned produce, including hazardous wastes in some cases. The mentioned decree and its proper requirements can be regarded as some prototype of a document concerning management of PCBs and some other POPs.

«Instruction on Order and Criteria of Taking to State Account the Objects that Cause or Can Cause a Negative Impact on Human Health and Atmospheric Air State» approved by the Order of the Ministry of Environmental and Natural Resources of Ukraine #177 dated 2002-05-10 establishes additional possibilities for regulation of issues concerned with solution of the POPs issue. It introduces «the List of Pollutant Substances and Threshold Values of Potential Releases Liable to State Account». In particular, the main substances belonging to the POPs entered the list thus allowing holding additional orders for control of account and responsibility of enterprises.

2.1.1 Laws

Legal relations concerned with chemical safety and chemical substances management are regulated by Ukrainian Constitution and a number of Laws including the following: «On Environmental Protection», «On Ensuring Sanitary and Epidemic Well-being of the Population», «On Prohibition of Development, Production, Stockpiling, and Application of Chemical Weapons as well as Their Destruction», «On Pesticides and Agrarian Chemicals», «On Circulation of Drugs, Psychotropic Substances, Their Analogues, and Precursors in Ukraine», «On Wastes». They are regulated by separate sections of Law of Ukraine's «On Licensing Certain Kinds of Economical Activity», «On Objects of Increased Danger», «On Transportation of Dangerous Cargoes», «On Insurance», «On Introduction of Changes to Some Law of Ukraine's in Order to Ensure Taking into Account Ecological Requirements in Privatization Process», «On Plants Protection», «On Lands Protection», «On State Control of Use and Protection of Lands», «On Ecological Expert Examination», «On Ecological Audit», «On Atmospheric Air», «On Customs-tariff», «On Drinking Water and Water Supply», Water Codex of Ukraine, Land Codex of Ukraine, Forest Codex of Ukraine, «On Animal World», «On Plant World», etc.

Introduction of some regulations of these legislative acts is realized in accordance with normative and legal acts of the Cabinet of Ministers of Ukraine concerned with the management of poisonous substances, wastes, pesticides, and chemical substances having military designation. Responsibility for violation of legislation in force is stated according to Administrative and Criminal Codices of Ukraine.

2.1.2 Regulatory and Legal Framework of the Cabinet of Ministers of Ukraine

The laws set up the base of the state policy in the area of chemical substances management including pesticides and agrarian chemicals. Problems concerned with their state registration, manufacturing, import, application, and storage including destruction and utilization of OP are regulated. But the mechanism of introduction of the norms determined by the laws is realized in normative and legal acts of the Cabinet of Ministers Ukraine, in particular:

Decrees of the Cabinet of Ministers of Ukraine:

- «On approval of the Regulations of State Registration of Potentially Dangerous Chemical and Biological Substances» №869 dated 12th of November, 1992;
- «On Approval of the Order of Obtaining Permission for Manufacturing, Storage, Transportation, Use, Landfill, Destruction and Utilization of Poisonous Substances Including Products of Biological Technologies and Other Biological Agents» №440 dated 20th of June, 1995;
- «On Approval of the Regulations of Hygienic Regulation and State Registration of Dangerous Factors and Order of Payment of Works for Carrying out Hygienic Regulation and State Registration of Dangerous Factors» №420 dated 13th of June, 1995;
- «On Approval of the Order of Giving Permissions for Import and Application of Not Registered Pesticides and Agrarian Chemicals Manufactured Abroad» №288 dated 4th of March, 1996;
- «On Implementation of Ecological Control in the Points of Passing the State Boundary» №198 dated 20th of March, 1995;
- «On Approval of the Order of the State Registration of Availability and Use of Pesticides and Agrarian chemicals» №881 dated 2nd of November, 1995;
- «On approval of the Order of Admittance (Certification) for Right to Work Concerned with Transportation, Storage, Application, and Trade with Pesticides and Agrarian Chemicals» №746 dated 18th of September, 1995;
- «On Approval of the Order of Carrying out of State Tests, State Registration and Re-registration, and Publication of Lists of Pesticides and Agrarian Chemicals Permitted for Use in Ukraine» №295 dated 4th of March, 1996;
- «On Introduction of Changes to Decrees of the Cabinet of Ministers of Ukraine №288 and №295 dated 4th of March, 1996», and №800 dated 7th of June, 2006;
- «On Approval of the Order of Deduction, Utilization, Destruction, and Neutralization of Unusable and Prohibited for Use Pesticides and Agrarian Chemicals, and Their Package» №354 dated 27th of March, 1996;
- «On Approval of the Order of Provision of Bodies to Carry out State Control of an Application of Pesticides and Agrarian Chemicals with Standard Specimens of Pesticides and Agrarian Chemicals, and Methods for Determination of Their Residual Amounts» №288 dated 19th of February, 1996;
- «On Some Measures for Introduction of the London Guiding Principles for Exchange with Information on Chemical Substances in International Trade in Ukraine» №1263 dated 17th of October, 1996;
- «On approval of the Regulations on the State System for Environmental Monitoring» №391 dated 30th of March, 1998;
- «On Approval of the List of Especially Dangerous Chemical Substances Manufacturing and Selling of Those Requires Licensing» №1287 dated 17th of August, 1998;

- «As to the Problem of Regulation of Export and Import of Ozone Depleting Substances and Products Containing Them» №393 dated 30th of March, 1998;
- «On Encouragement of Implementation of the Convention on Prohibition of Development, Manufacturing, Stockpiling, and Application of Chemical Weapons, and on Their Destruction» №2230 dated 9th of December, 1999;
- «On Introduction of Changes to Some Decrees of the Cabinet of Ministers of Ukraine in the area of Pesticides and Agrarian Chemicals Management» №1794 dated 7th of December, 2000;
- «On Approval of the List of Drugs, Psychotropic Substances, and Precursors» №770 dated 6th of May, 2000;
- «On Approval of the Procedure of the Control on Transboundary Movements of hazardous Wastes and their Utilization/Disposal, and the Yellow and the Green Lists of Wastes» №1120 dated 13th of July, 2000;
- «On Approval of General Requirements Towards Carrying out of Processing, Utilization, Destruction, or Further Using of Low-grade and Dangerous Products Deduced from Use» №50 dated 24th of January, 2001;
- «On Approval of the Order and Regulations of Compulsory Insurance of Responsibility of the Exporter and the Person Responsible for Utilization (Elimination) of Hazardous Wastes» №1219 dated 19th of August, 2002;
- «On Approval of the Order of Carrying out Inspection of Ecological Quality Indexes of Mineral Oils Sold by Wholesale and Retail Trade» №488 dated 14th of April, 2004;

order of the Cabinet of Ministers of Ukraine №294-p dated 1st of June, 2002 «On Creation of Industrial Infrastructure for Destruction of Prohibited and Unusable Pesticides».

2.1.3 Regulatory and Legal Framework of the Ministries and other Authorities

One of the constituent parts of the legislation in the area of chemical substances management, including POPs are the acts of ministries and departments those are in force. We can mention the following ones among them.

- Order of the Ministry of Environmental and Natural Resources of Ukraine №294 dated 30th of July, 2002 «On Approval of the Instruction on Considering Requests and Giving Permissions for Manufacture, Storage, Transportation, Use, Landfill, Destruction, and Utilization of Poisonous Substances Including Products of Biological Technologies and Other Biological Agents».
- Safety regulations and order of elimination of consequences of emergency situations with dangerous cargoes involved at their transportation by railway transport approved by Order of the Ministry of Transport of Ukraine №567 dated 16th of October, 2000. Annex 2 of the p. 4.3 of the Regulations approves emergency cards for dangerous cargoes (№601 to 646, 801 to 836, and 901 to 907).
- Order of the Ukrainian State Chemical Committee №22 dated 15th of June, 1995 «On Approval of the Temporary Regulations on State Tests and Registration of Chemical and Biological Means of Protection, Pheromones, and Regulators of Vegetation and Fertilizers in Ukraine».
- Order of the Ministry of Environmental and Natural Resources of Ukraine №56 dated 19th of February, 2001 «On Approval of the List of Research Institutes, Institutions, and Organizations Having the Right to Carry out State Tests of Pesticides and Agrarian Chemicals».

- Order of the Ministry of Environmental and Natural Resources of Ukraine №116 dated 22nd of March, 2001 «On Size of Payment for Carrying out of Expert Examination, State Registration, and Re-registration of Pesticides and Agrarian Chemicals».
- «Methodical Guidelines for Hygienic Estimation of New Pesticides» approved by the MH of the USSR №4263-87 dated 13th of March, 1987.
- Order of the MHU №204 dated 9th of July, 1997 «On Approval of Methodical Guidelines «Medical and Biological Estimation of Non-traditional Food Raw Materials and New Food Substances».
- «The List of Pesticides Prohibited for Use in Agriculture that cannot be registered or Re-registered in Ukraine» approved by the Ukrainian State Chemical Committee and coordinated with the Ministry of Environmental Protection and the MHU. 87 products are on the List including those ascribed to persistent organic pollutants (Aldrin, Chlordan, DDT, Dildrin, Endrin, Heptachlorine, Hexachlorobenzene, etc.).
- State Sanitary Norms and Regulations 8.8.1.002-98 «Hygienic Classification of Pesticides by level of Their Danger» approved by the Order of the Head Sanitary Inspector of Ukraine №2 dated 28th of August, 1998.
- Order of the Ministry of Agrarian Politics, the Ministry of Environmental and Natural Resources, and the MHU №315/376/412 dated 18th of October, 2001, registered by the Ministry of Justice of Ukraine on the 14th of November, 2001 with the №951/6142 «The Order of Carrying out of Complex Inventory of Places for Stockpiling of Chemical Means for Plants Protection Those are Prohibited for Use in Agriculture or Unusable».
- Order of the State Committee of Ukraine for Regulatory Policy and Entrepreneurship and the State Committee of Industrial Politics of Ukraine №40/70 dated 22nd of February, 2001, registered by the Ministry of justice of Ukraine on the 12th of March, 2001 with the №213/5404 that approves «The License Conditions of Carrying out Economical Activity for Manufacture of Pesticides and Agrarian Chemicals, and Wholesale and Retail Trade with Pesticides and Agrarian Chemicals».
- Order of the State Committee of Ukraine for Regulatory Policy and Entrepreneurship and the State Committee of Industrial Politics of Ukraine №29/98 dated 18th of March, 2003, registered by the Ministry of Justice of Ukraine on the 3rd of April, 2003 with the №258/7579 that approves the Order of control of observation of the License conditions of carrying out economical activity for manufacturing of pesticides and agrarian chemicals, and wholesale and retail trade with pesticides and agrarian chemicals.
- Order of the Ministry of Agrarian Politics of Ukraine, the Ministry of Internal Affairs of Ukraine, and the MHU №163/588/217 dated 18th of June, 2002 «On Strengthening of State Control and Supervision of Trade with Pesticides and Agrarian Chemicals».
- Order of the Ministry of External Economical Relations and Trade of Ukraine №294 dated 27th of May, 1996, registered by the Ministry of Justice of Ukraine on the 13th of June, 1996 with the №298/1323 «On Approval of the Order of Selling of Nonfoods».
- The State Sanitary Regulations 8.8.1.2.001-98 «Transportation, Storage, and Application of Pesticides in National Economy» approved by Order of the Head Sanitary Inspector of Ukraine №1 dated 3rd of August, 1998.
- Order of the State Committee of Ukraine for Regulatory Policy and Entrepreneurship and the Ministry of Transport of Ukraine №140/825 dated 26th of November, 2001, registered by the Ministry of Justice of Ukraine on the 4th of December, 2001 with the №1004/6195 «On Approval of the License Conditions of Carrying out Economical Activity for Carrying out Aviation and Chemical Works».

- Order of the State Committee of Ukraine for Regulatory Policy and Entrepreneurship and the Ministry of Transport of Ukraine №70/434 dated 1st of July, 2002, registered by the Ministry of Justice of Ukraine on the 24th of July, 2002 with the №607/6895 «On Approval of the License Conditions of Carrying out Economical Activity for Rendering Services for Transportation of Passengers and Cargoes by Air Transport and the License Conditions of Carrying out Economical Activity for Carrying out Aviation and Chemical Works».
- Method of deduction, utilization, and destruction of agricultural raw materials and foodstuff exposed to influence of pesticides and agrarian chemicals and having become unusable approved by Chief Deputy Head Sanitary Inspector of Ukraine on the 7th of March, 1996, №5.08.07/306.
- Order of the Ministry of Agricultural Produce №239 dated 6th of August, 1996 «On Approval of the Order of Carrying out State Supervision and State Control of Observation of Legislation Concerned with Pesticides and Agrarian Chemicals framework of Plant Cultivation».
- Methodical Guidelines №5.08.07/1232 dated 11th of October, 1995 «Order and Periodicity of Control of Food Raw Stuff and Foodstuff by Safety Performance» approved by the MHU, the State Committee of Foodstuff, the Ministry of Agricultural Produce, and the Ministry of Fish Industry.
- Instruction on the order of carrying out state sanitary inspection of food raw stuff and foodstuff being imported (temporary) №5.08.12/416 dated 28th of April, 1994.
- State Sanitary Norms and Regulations 8.8.1.2.3.4-000-2001 «Permissible Doses, Concentrations, Amounts, and Levels of Content of Pesticides in Agricultural Raw Materials, Foodstuff, Air of Working Areas, Atmospheric Air, Surface Water, and Soils».
- State Sanitary Norms and Regulations «Drinking Water. Hygienic Requirements to Quality Performance of Water of Centralized Communal and Drinking Water Supply».

2.2 ADMINISTRATIVE STRUCTURE OF CHEMICALS MANAGEMENT INCLUDING POPS

According to the Law of Ukraine «On Environmental Protection» dated 1991-06-25 #1264-XII state management in the sphere of environmental protection is realized by the Cabinet of Ministers of Ukraine, local authorities and state authorities with special statues of the environmental protection and use of natural resources as well as other state bodies in accordance with the Ukrainian legislation.

The Cabinet of Ministers of Ukraine carries out an implementation of environmental policy determined by the Verkhovna Rada, and coordinates functioning of ministries and departments as well as other institutions and organizations concerned with environmental protection. It establishes order of development and approval of ecological norms, limits of using natural resources, discharge of pollutants to the environmental, and allocation of wastes. The Cabinet of Ministers establishes the order of determination of dues for environmental pollution, allocation of wastes, and other modes of harmful impact on it, and takes decisions on stopping (temporary) or cessation of functioning enterprises, institutions, and organizations irrespective of their property forms and subordination in case of violation of legislation on environmental protection by them. It is in the head of external relations of Ukraine in the area of environmental protection (Law of Ukraine «On Environmental Protection»).

MEPU is the main body in the system of central bodies of executive power for the problems of ensuring implementation of the state environmental policy. It is assignee of the Ministry of Environmental and Natural Resources and preserves all the functions concerned with management of POPs directly or indirectly.

In particular, MEPU organizes development and implementation of national programs for environmental protection, ensuring of ecological safety, implements common scientific and technical policy, and coordinates activities of central and oblast bodies of executive power framework. The following can be mentioned among functional obligations of the Ministry:

• implementation of state control of observation of norms and regulations in the sphere of protection of environmental resources including land, its bowels, surface and underground water, atmospheric air, forests, and other objects of vegetable and animal world, maritime medium, and requirements concerned with ecological safety including those in the points of passing the state frontier of Ukraine in the area of waste management;

• organization and implementation of state ecological expert examination;

• organization of carrying out environmental monitoring;

• development of proposals as to improvement of the system for registration, accountability, and state statistics concerned with the problems being in the sphere of competence of the Ministry;

• approval of norms and regulations for environmental protection, ecological safety, and waste management;

• implementation of measures for adaptation of the Ukrainian legislation to that of the European Union within the limits of its authorities and implementation of the regulations of the appropriate international legal acts party of those Ukraine is to the national legislation;

• participation in works for standardization, certification, accreditation, and metrological ensuring in the sphere of environmental protection and ecological safety together with appropriate bodies of executive power;

• rendering permissions (licenses) in the stated order for releases and discharges of pollutant substances to the environmental, allocation, transboundary movements, and carrying out other operations in the area of waste management, the Ministry is the national competent authority for the problems of transportation of hazardous wastes and their elimination;

• organization of carrying out state tests of pesticides and agrarian chemicals manufactured domestically and abroad;

• carrying out of state registration of pesticides and agrarian chemicals in accordance with established procedure, and approval of lists of pesticides allowed for use in Ukraine, and establishing orders of their application;

• implementation of accreditation of institutions and organizations to carry out state tests of pesticides and agrarian chemicals, rendering permissions on their import to Ukraine, and manufacturing of pilot batches and application of not registered pesticides and agrarian chemicals for carrying out state tests, researches, and for other instances foreseen by the legislation;

• implementation of international collaboration in the sphere of environmental protection and ensuring ecological safety;

• participation in working out of international agreements of Ukraine, and maintenance of Ukrainian interests in appropriate international organizations;

• coordination of activity of central bodies of executive power for the purpose of ensuring implementation of obligations caused by participation of Ukraine in international organizations and international agreements concerned with the problems belonging to the competence of the Ministry;

• organization of work concerned with attraction of international technical aid in the sphere of environmental protection and ensuring ecological safety; and

• encouragement of ecological education and ecological training of the citizens, implementation of collaboration with organizations for environmental protection, and approval of regulations on social control in the sphere of environmental protection.

- **MEPU** has enough rights for ensuring implementation of tasks laid upon it, in particular, examination of enterprises, institutions, and organizations irrespective of their property forms including military and defense objects, and objects belonging to the Ministry of Internal Affairs and Security Service of Ukraine. Examination is done for the purpose of control of observation of requirements concerned with environmental protection, and limitation, temporary prohibition (delay of activity) of these enterprises, institutions, and organizations in case of violation of norms and regulations of environmental protection if that is foreseen by the legislation, and application of economical sanctions to them for violation of the requirements of the legislation.

MEPU realizes its authorities directly or through the specially authorized body of executive power in the Autonomous Republic of Crimea and State Departments of the environmental protection in the oblasts and the cities of Kiev and Sevastopol as well as other institutions and organizations belonging to the sphere of its management.

MEPU interacts with other central and oblast bodies of executive power, the Council of Ministers of the Autonomous Republic of Crimea, bodies of oblast self-governing, and appropriate bodies of other states, and international organizations.

Decisions made by **MEPU** are obligatory for implementation by central and oblast bodies of executive power as well as bodies of self-government, enterprises, institutions, organizations irrespective of their property forms, and citizens in cases foreseen by the legislation.

MEPU and **SSCU** are responsible for maintenance of the national register for protection of atmospheric air in accordance with the Decree of the Cabinet of Ministers #1655 dated December 13, 2001. State registration includes registration of objects exerting negative impact, maintenance of primary registration of sources at the objects, compiling of state statistical accountability by stationary and movable sources exerting negative impact, and carrying out of inventory of releases and amount of pollutant substances at the mentioned objects. Registration of such objects is done by **MEPUU** in accordance with criteria established by it.

MEPU and its territorial bodies realize gathering, processing, and generalization of materials obtained during inventory of the objects exerting negative impact, carry out processing of the state statistical accountability concerned with protection of atmospheric air and inventory materials, and creates databank on the mentioned objects, measures being realized or planned for improvement of the state of atmospheric air.

SSCU and its territorial divisions carry out gathering, processing, and generalization of the state statistical accountability concerned with protection of atmospheric air, and render overall statistical data in the sphere to **MEPU** and other bodies of executive power free of charge.

We shall note that «The Instruction as to Order and Criteria of State Registration of Objects Exerting or Able to Exert Negative Impact on Human Health and Condition of Atmospheric Air, and Types and Amounts of Pollutant Substances Emitted to the Atmospheric Air» approved by the Order of the Ministry of Environmental and Natural Resources of Ukraine #177 dated 2002-05-10 involves POPs in «the List of Pollutant Substances and Threshold Values of Potential Releases by Those State Registration Being Implemented».

The State Ecological Inspection, the State Inspection for Protection of the Black Sea, the State Inspection for Protection of the Azov Sea of functioning as constituent parts of the Ministry and subordinate to it perform direct control functions as to observation of requirements of the legislation on environmental protection, implementation of requirements described in conclusions of the state ecological expert examination, and observation of ecological safety requirements. These divisions of the Ministry perform state control including that in the process of transportation, storage, application, utilization, destruction, and neutralization of pesticides

and agrarian chemicals, hazardous chemical substances as well as industrial, domestic, and other types of wastes.

Listed above authorities of **MEPU** and its bodies are theoretically completely sufficient for carrying out inventory of POPs releases and their sources, development and organization of measures for implementation of the Stockholm convention on POPs, and ensuring financing of the measures foreseen by it from internal and external sources. On the other hand, there is no any specialized subdivision in the Ministry at the level of department or section that is responsible for organization and coordination of activity concerned with management of POPs in Ukraine only. There are no similar subdivisions in the bodies of the Ministry, too.

Problems concerned with pesticides are regulated by Law of Ukraine «On Pesticides and Fertilizes» dated 1995-03-02 #86/95-BP and Decree of the Cabinet of Ministers of Ukraine «On State Supervision and State Control of Observation of the Legislation on Pesticides and Agrarian Chemicals» #226 dated 1996-02-19. Responsible bodies of executive power are **MAPU**, **MHU**, and **MEPU**. The latter carries out state supervision and state control of observation of norms and regulations of ecological safety at the time of transportation, application, storage, utilization, neutralization, destruction, and landfill of pesticides and agrarian chemicals including obsolete and banned ones.

MAPU renders licenses for wholesale and retail trade with pesticides and agrarian chemicals, and realizes state control of observation of the legislation on plants protection, pesticides and agrarian chemicals, and ensuring timely use of vegetation regulators within the limits of its authority. In particular, one of the problems being acute and unsolved till now is control of retail trade with pesticides including spontaneous one. Because of it plans of joint inspections of trade with pesticides and agrarian chemicals were developed and fulfilled in 2002 and 2003 by the Ministries of agrarian politics, internal affairs, and health. Coordination of this activity was entrusted to the Head of the State Plants Protection Inspection of **MAPU**.

According to the legislation in force, veterinary and agrochemical laboratories as well as those for control of toxicology check residual amounts of pesticides and agrarian chemicals in surface waters used for agricultural needs, soils at the lands having agricultural designation, fodders, and agricultural products and raw materials.

MHU is the head body in the system of central bodies of executive power to realize state politics in the sphere of health protection and sanitary and epidemic well-being of the population. The following functional obligations of **MHU** are significant from the view-point of the POPs issue:

- implementation of control and supervision of observation of the sanitary legislation, national standards, and criteria and requirements purposed to ensuring of sanitary and epidemic well-being of the population;
- ensuring carrying out of state sanitary and hygienic expert examination in accordance with the legislation;
- studying, analysis, and forecasting of indices of the state of health of the population irrespective of the state of the medium of men's vital activities;
- participation in development of measures purposed to banning of harmful impact of environmental factors upon human health;
- implementation of control of elimination of causes and conditions of origination and spreading of infectious deceases, mass ones not being infectious, and poisoning and radiation affection of men;
- approval of state sanitary norms, regulations, and hygienic norms;
- participation in development and introduction of ecological norms; and
- co-ordination of all the national standards, technical specifications, industrial specimens, and other normative and technical documentation for objects that can impact negatively population health.

MHU realizes environmental monitoring in the places of living and rest of population, in particular, at natural territories of resorts by analyzing state of atmospheric air (content of harmful chemical substances). Surface waters of dry lands and drinking water, sea waters, and mineral and thermal waters, medicinal dirt, ozocerite, and brine of lakes and estuaries (chemical, bacteriological, radiological, and virological performance) are being analyzed, too. Soils are analyzed by content of pesticides, heavy metals, and bacteriological and virological performance. Physical performance of all the mentioned media is determined as well.

MIPU carries out licensing activity concerned with manufacturing of pesticides and agrarian chemicals (vegetation regulators only) as well as manufacturing of especially hazardous chemical substances (in accordance with the list determined by the Decree of the Cabinet of Ministers of Ukraine #1287 dated August 17, 1998). This is regulated by article 9 of the Law of Ukraine «On Licensing of Certain Kinds of Economical Activity» dated 2000-06-01 #1775-III, Law of Ukraine «On Introduction of Changes to Some Ukrainian Legislative Acts for the Purpose of Their Bringing to Correspondence with Legislative Acts in the Sphere of Licensing» dated 2006-01-19 #3370-IV, and Decrees of the Cabinet of Ministers of Ukraine #1698 dated 2000-11-14 and #1560 dated 2004-11-17.

The mentioned state structures began arranging coordination of activity for solution of the POPs issue in Ukraine in the last three years. In particular, joint Order of the three Ministries (MAPU, Ministry of Environmental and Natural Resources of Ukraine, now named MEPU, and MHU) #315/376/412 dated 2001-10-18 was prepared. Its name is «On the Order of Carrying out of Complex Inventory of the Places for Stockpiling of Banned and Obsolete Pesticides in Agriculture as well as Chemical Means for Plants Protection». Creation of the commission for carrying out an inventory engaging State Sanitary and Epidemiological Services of MHU in the oblasts and the Autonomous Republic of Crimea as well as territorial bodies of the Ministry of Environmental and Natural Resources and MAPU was foreseen. Activity for carrying out of inventory was coordinated by Interdepartmental scientific and technical council for organization and coordination of implementation of the national program of toxic wastes management of the Ministry of Environmental and Natural Resources of Ukraine.

2.3 ASSESSMENT OF POPS PESTICIDES AND INDUSTRIAL WASTES, AND POTENTIALLY CONTAMINATED SITES

2.3.1 Assessment of POPs Pesticides and Contaminated Sites (Annex A, Part I)

According to the data of the Head State Plants Protection Inspection of MAPU income of means for plant protection (PP) to Ukraine varied in rather wide measures at various periods. In particular, it was 200 to 192 thousand tons in the period of 1965 to 1969, and decrease to 92 thousand tons was in 1971 followed further recovery of income in 1985 to the level of 1965. Tendency to decrease of income of PP to Ukraine is observed from 1985, and it stabilized at the level of 19 to 20 thousand tons per year beginning from 1999 till now. Dynamics of PP income (thousand tons) to Ukraine for the period of 1965 to 2000 is shown on fig. 2.3.1.1.

Amount of PP being used shows stable tendency to decrease from 184 to 156 thousand tons per year for the period of 1985 to 1988 and stabilization at the level of 13 to 17 thousand tons beginning from 1999. Dynamics of PP use (thousand tons) in Ukraine for the period of 1985 to 2005 is shown on fig. 2.3.1.2.

Decrease of level of income and use of PP in Ukraine is concerned first of all with decrease in rate of application products their higher efficiency, and reducing paying capability of agricultural manufacturers.

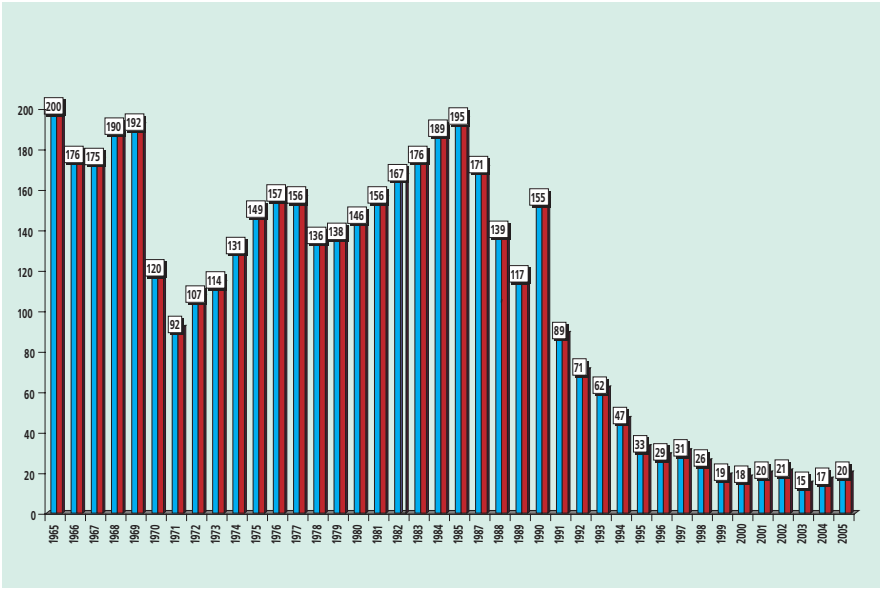


Fig. 2.3.1.1. Dynamics of income of PP to Ukraine for the period of 1965 to 2000, thousand tons

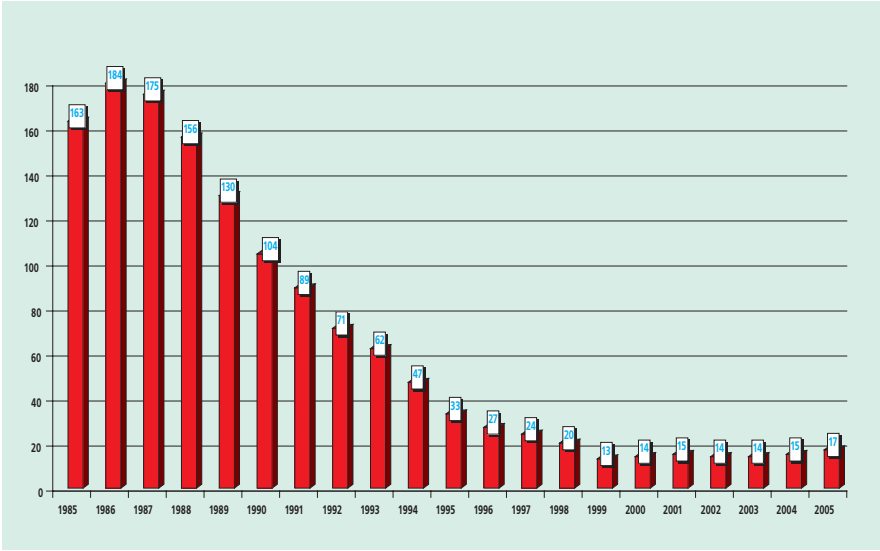


Fig. 2.3.1.2. Dynamics of PP use in Ukraine for the period of 1985 to 2005, thousand tons

According to the data of MAPU, 8,470.6 tons of products of the POPs group were used in 1967 and 1968 in Ukraine, and their list and amounts are shown in table 2.3.1.1.

Table 2.3.1.1. List and amount (tons) of products of the POPs group used in Ukraine at sowing of potato and other nightshade crops in 1967 and 1968

Name of product	Amount of products used, tons
1967	
DDT – 50% (paste)	564,1
DDT – 25% (emulsion)	883,3
DDT – 20%(emulsion)	129,4
DDT – 50% (wettable powder)	24,8
DDT – 20%(wettable powder)	237,1
DDT – 5,5% (dust)	3570,8
Hexachlorocyclohexane(emulsion)	16,6
Hexachlorocyclohexane – 12% (dust)	224,3
Metaphos – 2,5% (dust)	385,1
Toxaphene	95,9
Total:	**6132,4**
1968	
DDT – 50% (paste)	242, 8
DDT – 20 – 35% (emulsion)	1687,8
DDT – 20%(emulsion)	129,4
Toxaphene	278,2
Total:	**2338,2**

Period of 1971 to 1990 is characterized with stepwise introduction into practice of prohibitions and limitations concerned with persistent chlororganic pesticides. Status of POPs pesticides in Ukraine is shown in table 2.3.1.2.

Table 2.3.1.2. Status of POPs pesticides in the USSR and Ukraine

POP	Status	Year	Reference
The USSR			
DDT and DDT products	Using prohibited	1970	«List of pesticides application of those is prohibited or severely restricted by MH of the USSR» (MH of the USSR, 1989)
Aldrin	Using prohibited	1972	
Dieldrin	Using prohibited	1985	
Heptachlor and its mixtures with HCB and thiram	Using prohibited	1986	
Endrin	Using prohibited		
Technical hexachlorocyclohexane (hexachlorane)	Using prohibited	1986	
Hexachlorocyclohexane, 25% powder based on phosphorus meal	Using prohibited at flax and tobacco plantations		
Toxaphene	Limitation of the sphere of application except for fighting weevil at white beet plantations and protection of seed of perennials	1986	
Hexachlorocyclohexane, 12% dust	Prohibited using at cabbage, tobacco, lucerne, potato, grape, and fruit crops plantations	1987	

POP	Status	Year	Reference
Ukraine			
Aldrin, hexachlorocyclohexane (mixture of isomers), lindan, HCB, heptachlor and its mixtures with HCB and thiram, DDT and products based upon it, DDD, DDE, Dieldrin, Endrin, Toxaphene, and Chlordan	Using, registration, and re-registration are prohibited	1997	«List of pesticides prohibited for using in agriculture that cannot be registered or re-registered in Ukraine» (the State chemical committee of Ukraine, approved on 1997-08-05; co-coordinated by MHU of Ukraine and by Ministry of Environmental and Nuclear Safety of Ukraine, 1997)

Prohibition of application of the mentioned pesticides led to stockpiling of their residual amounts at storage places of oblast departments of Ministry of agriculture as well as at Ukrainian farms.

Ukraine was manufacturer and exporter only one POP pesticide till 1995, namely DDT. Its manufacture in Ukraine has been ceased in 1986.

According to the data of SSCU, separate codes for goods positions of POPs pesticides having entered to the list of the SC are not foreseen by Ukrainian classification of goods for external economic activity (UkrCGEEA). A single code of UkrCGEEA exists containing «Hexachlorobenzene and DDT». Another UkrCGEEA code called «hexachlorocyclohexane» (lindan) exists for a POP pesticide having entered to the list of the Protocol on POPs of the Convention of EEC UNO dated 1979 on transboundary pollution of air at great distances. Therefore it seems impossible to obtain more profound information of situation on export/import of POPs pesticides at present. According to the official data submitted by SSCU in answer to MEPU inquiry 147 kg of HCB and DDT and 250.5 kg of hexachlorocyclohexane were imported for the period of 1996 to 2004. Appropriate values are shown in table 2.3.1.3.

Table 2.3.1.3. Figures concerned with export and import of POPs pesticides in Ukraine for the period of 1996 to 2004, kg

Years	Name of product	Customs code	Amount, kg		Difference
			Export (E)	Import (I)	I-E, kg
1996	hexachlorocyclohexane	290351000	272,00		- 272,00
1997	DDT	290362000			
1998	HCB and DDT	290362000		100,00	100,00
1999	hexachlorocyclohexane	290351000		250,00	250,00
1999	HCB and DDT	290362000		47,00	47,00
2000	hexachlorocyclohexane	290351000		0,25	0,25
2001		290351000			
2002	hexachlorocyclohexane	290351000		0,25	0,25
2003		290351000			
2004	HCB and DDT	290362000		0,10	0,10
Total	**HCB and DDT**	290362000	**0**	**147,10**	**147.10**
	hexachlorocyclohexane	290351000	**272,00**	**250,50**	**-21,50**

Enterprises to manufacture POPs pesticides are not available in Ukraine at present. All PP imported to the country are controlled in accordance with the legislation by appropriate state bodies. Import/export of pesticides are ascribed to licensed types of activity. Chlororganic pesticides are no more used in Ukraine officially.

Availability of significant amount of obsolete (OP) and banned pesticides in Ukraine that has been stockpiled for decades and greatest amount of those are being stored under unsuitable conditions causes real threat of environmental pollution and threat to health of the population residing close to places of their storage (photos 2.3.1.1 to 2.3.1.4).




Photos 2.3.1.1 to 2.3.1.4 Typical storage places of OP

Unfortunately, the problem concerned with OP has not been getting its proper solution for over 30 years. It was even in the former USSR that a number of decrees and orders have been made concerned with it, but not a single of them have been fulfilled completely due to various reasons.

Therefore solution of the problem of neutralization of OP is to become one of the priority tasks in the area of hazardous wastes management.

Law of Ukraine «On the National Program of Toxic Wastes Management» foresees implementation of a number of pilot projects with technological decisions as to neutralization and destruction of OP as well as ensuring their safe storage.

In order to fulfill the mentioned laws, a number of sub-law acts of various levels have been passed including the Prescription of the Cabinet of Ministers of Ukraine dated June 1, 2002 #294-p «On Creation of Industrial Infrastructure for Destruction of Banned and Obsolete Pesticides».

A complex inventory of the places for stockpiling of banned and obsolete pesticides has been carried out by the oblast bodies of MAPU, MEPU, and MHU in concordance with this document.

Inventory has been carried out in accordance with the requirements of normative and methodical document «Order of Carrying out of Complex Inventory of Places for Stockpiling of Banned Pesticides as well as Obsolete for Use in Agriculture, and Chemical Means of Plants Protection» approved by the Order of MAPU, Ministry of Environmental and Natural Resources, and MHU dated 2001-10-18 #315/376/412 registered by Ministry of Justice of Ukraine on November 14, 2001 with the #951/6142.

Actualization of data obtained at the time of carrying out an inventory of OP was performed in 2005 and 2006. Information on amount of OP including POPs, and storage houses obtained during the mentioned period are shown in tables 2.3.1.4 and 2.3.1.5.

Table 2.3.1.4. Amounts of OP and IW of the POPs in administrative units by 2006-03-31

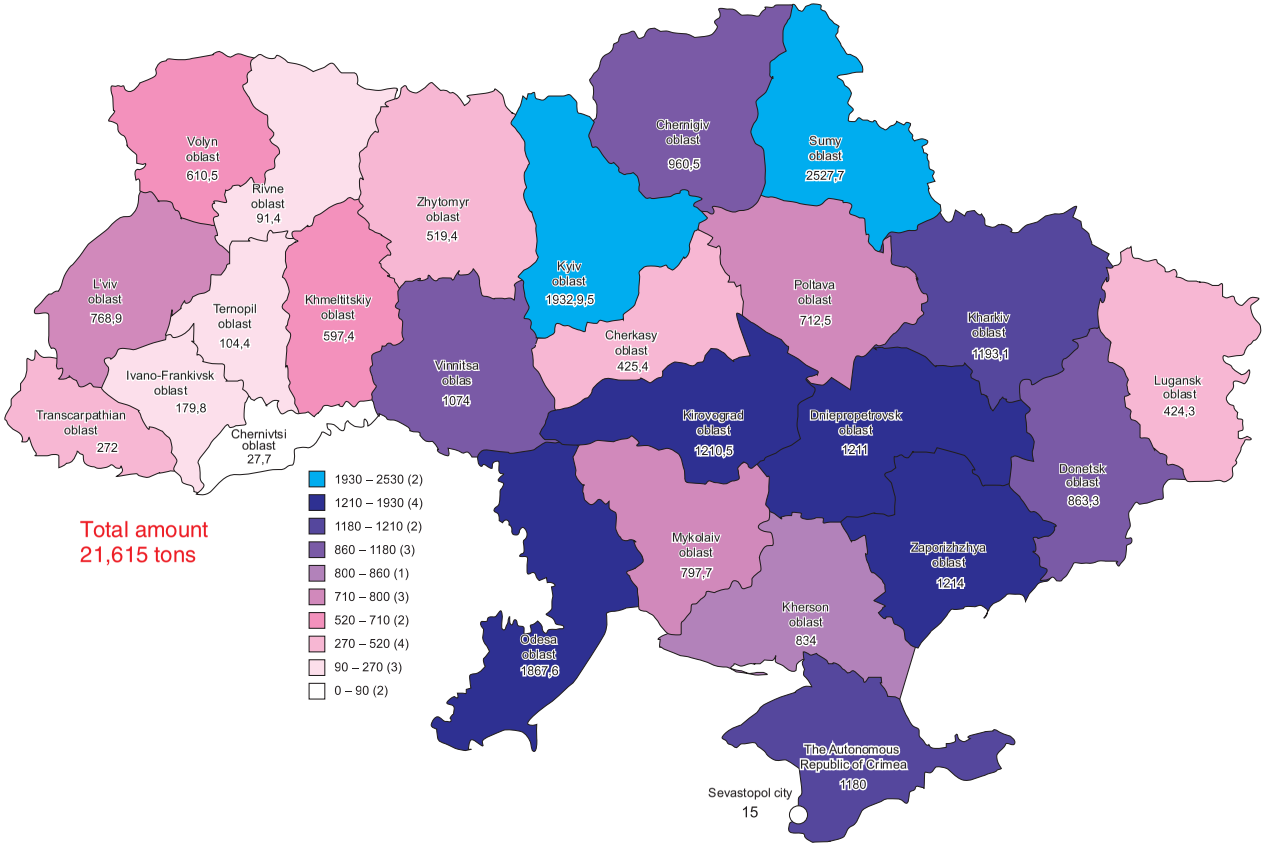
Administrative units	Obsolete and banned pesticides (OP)	Not determined pesticides (NDP)	POPs Pesticides from the total amount of OP					IW containing POPs (HCB)	Total of NDP + OP belonging to the POPs group + IW containing POPs
			DDT	Hepta chlor	Hexachloro cyclohexane (lindan)	HCB	Total amount of POPs pesticides		
1	2	3	4	5	6	7	8	9	3+8+9
Total in Ukraine	21614,9	18582,0	1744,2	1,5	273,2	0,3	2019,2	11088	31689,2
ARC	1180,0	712,6	106,6	1,2			107,8		820,4
Sevastopol city	15,0								
Vinnitsa oblast	1073,9	1027,1	46,6	0,3			46,9		1073,9
Volyn oblast	610,5	561,9	3,4				3,4		565,3
Dniepropetrovsk oblast	1211,0	1143,0	0,5		0,2		0,7		1143,7
Donetsk oblast	863,3	849,6	13,4			0,3	13,7		863,3
Zhytomyr oblast	519,4	321,2	0,8		6,9		7,7		328,9
Transcarpathian oblast	272,0	217,5	41,9		2,5		44,4		261,9
Zaporizhzhya oblast	1214,0	1072,9	141,1				141,1		1214,0
Ivano-Frankivsk oblast	179,8	179,8						11088	11267,8
Kyiv oblast	1932,9	1649,6	265,0		2,4		267,4		1917,0
Kirovograd oblast	1210,5	1210,5							1210,5
Lugansk oblast	424,3	326,1	0,4				0,4		326,5
L'viv oblast	768,9	766,3	2,7				2,7		769,0
Mykolaiv oblast	797,7	797,7							797,7
Odesa oblast	1867,6	838,2	1016,3		13,1		1029,4		1867,6
Poltava oblast	712,5	508,0	86,7		117,8		204,5		712,5
Rivne oblast	91,4	58,8			4,1		4,1		62,9
Sumy oblast	2527,7	2463,0	9,8		54,9		64,7		2527,7
Ternopil oblast	104,4	92,4	4,5		7,5		12,0		104,4
Kharkiv oblast	1193,1	1193,1							1193,1
Kherson oblast	834,0	834,0							834,0
Khmeltitskiy oblast	597,4	549,0	0,1		48,3		48,4		597,4
Cherkasy oblast	425,4	335,0	4,4		15,5		19,9		354,9
Chernivtsi oblast	27,7	1,4							1,4
Chernigiv oblast	960,5	873,3							873,3

Table 2.3.1.5. Number of OP storages according to the data of preliminary inventory – sites potentially contaminated with POPs in administrative units (by the 1st quarter of 2006)

Administrative units	According to data of complex inventory	
	total	of centralized type
ARC	156	2
Vinnitsa oblast	276	7
Volyn oblast	96	14
Dniepropetrovsk oblast	228	5
Donetsk oblast	291	1
Zhytomyr oblast	520	8
Transcarpathian oblast	50	5
Zaporizhzhya oblast	224	3
Ivano-Frankivsk oblast	104	0
Kyiv oblast	278	9
Kirovograd oblast	192	9
Lugansk oblast	207	0
L'viv oblast	183	9
Mykolaiv oblast	161	6
Odesa oblast	184	11
Poltava oblast	140	6
Rivne oblast	72	0
Sumy oblast	335	5
Ternopil oblast	109	2
Kharkiv oblast	155	26
Kherson oblast	100	5
Khmeltitskiy oblast	260	2
Cherkasy oblast	324	1
Chernivtsi oblast	20	1
Chernigiv oblast	318	10
TOTAL	**4983**	**147**

Analysis of the data shown in table 2.3.1.4 shows that the greatest amounts of stockpiled OP are located in Sumy, Kyiv, Odesa, Zaporizhzhya, Dniepropetrovsk, Kharkiv, and Vinnitsa oblasts as well as the Autonomous Republic of Crimea – 2,527.7; 1.932.9; 1,867.6; 1,214.0; 1,211.0; 1,193.0; 1,073.9; and 1,180.0 tons, respectively. Distribution of OP (tons) in administrative units according to inventory results (by the 1st quarter of 2006) is shown on fig. 2.3.1.3.

Fig 2.3.1.3. Availability of unusable and prohibited for use pesticides (tons) by administrative section according to inventory results (by the state by the 1st quarter of 2006)



Inventory results shall be considered preliminary ones, and they shall be permanently actualized.

We have to note that the data submitted do not take into account mass of package for storing of OP as well as the fact that soil, sand, waste, etc, may get to it with OP in the process of re-package.

According to the status by 2006-03-31 amount of substances that shall be handled as POPs stockpiled in Ukraine is to be considered 31,689.2 tons. Distribution of OP with NDP and IW containing POPs in administrative section in accordance with preliminary inventory (by the 1st quarter of 2006) is shown on fig. 2.3.1.4.

Works for implementation of the measure «Ensuring Environmentally Safe Storage of Obsolete CPP in the Places of Their Stockpiling» in the ARC as well as in Donetsk, Volyn, Transcarpathian, Kyiv, Kirovograd, Lugansk, L'viv, Mykolaiv, Poltava, Rivne, Sumy, Kherson, Kharkiv, Cherkasy, and Chernigiv oblasts have been carried out according to the national program of toxic wastes management and corresponding oblastal ones.

These works have been carried out in fact by the only scheme that is re-package of OP to safe containers in the places of their stockpiling, and transportation of these containers to grounds nearby specially prepared for this.

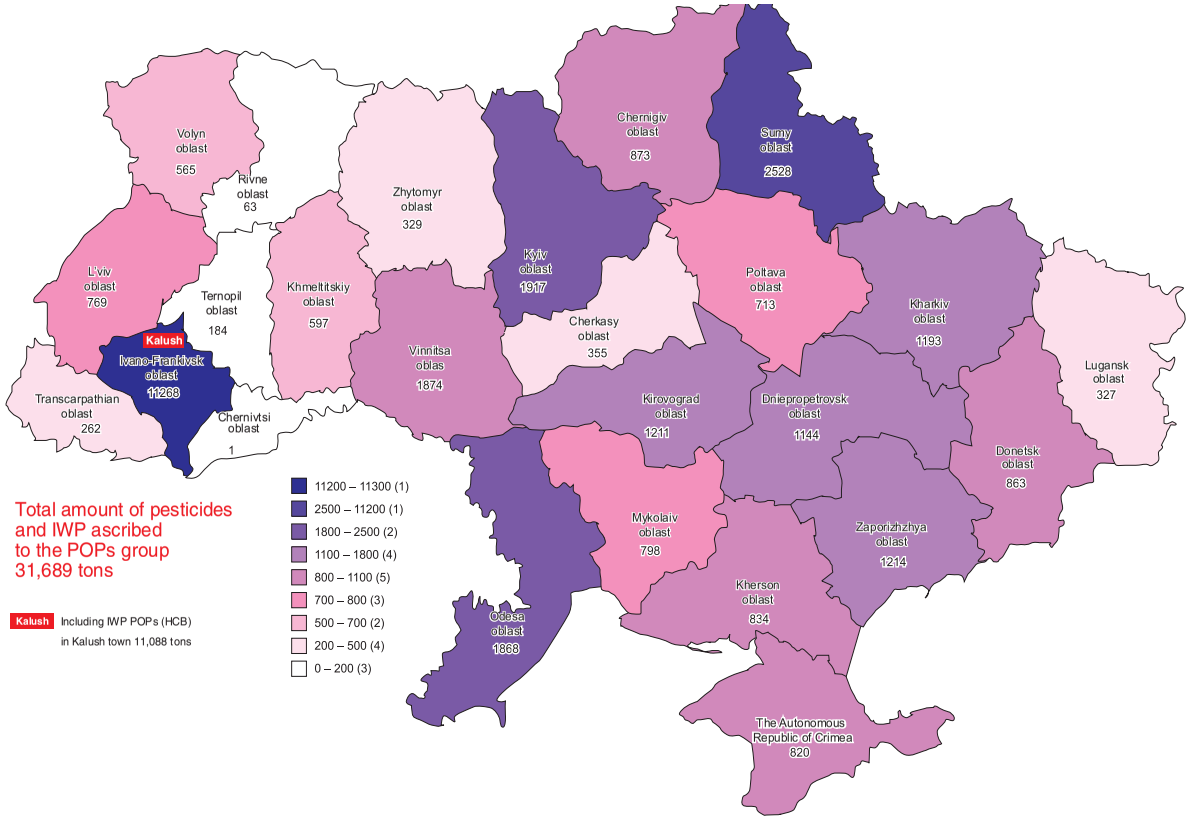
Over 5.0 thousand tons of OP have been isolated in containers in this way, and at that about 3.000 tons of OP have been put into plastic containers, and over 2.000 tons to ferroconcrete ones.

But a single technological installation for OP destruction having been licensed is functioning in Ukraine at present. It is located at «Elga» Ltd. in the town of Shostka in Sumy oblast, and its productiveness is 500 tons per year (photos 2.3.1.5 and 2.3.1.6).

Photo 2.3.1.5. View of the installation for OP destruction at «Elga» enterprise

Photo 2.3.1.6. Process of charging OP to the installation for their destruction at «Elga» enterprise

Fig. 2.3.1.4. Distribution of OP with NDP and IW containing POPs in administrative units in accordance with preliminary inventory (by the 1st quarter of 2006)



In 2005 Productivity of the installation for destruction of OP was increased to 750 tons per year.

Works concerned with solution of the problems of OP in Ukraine are being carried out in the framework of implementation of the following measures:

- Ukrainian-Danish project «Elimination of Risks Related to Stockpiled Obsolete Pesticides in Ukraine»,
- Ukrainian-Danish project «Assistance to Ukrainian Authorities in Management of Contaminated Sites» (2003-2005); and
- international partner project with the Agency of Environmental Protection of the USA #P-169 «Management and Destruction of Obsolete Pesticides in Pilot Oblasts in Ukraine (Cherkasy and L'viv Oblasts)».

Modernization of a centralized storehouse has been implemented in the framework of implementation of the Ukrainian-Danish project «Elimination of Risks Related to Stockpiled Obsolete Pesticides in Ukraine». Its purpose was temporary storage of 200 tons of OP stockpiled in Lozovaya district of Kharkiv oblast under conditions meeting international standards. OP brought to the storage house were preliminary packed to plastic containers.

Complete re-package of OP at three storage in L'viv oblast (6.0 tons in Kniselo village, 4.3 tons in Bakivtsi village, and 4.7 tons in Grusyatychi village) have been performed, and storage in Grusyatichi village have been completely emptied of pesticides, and those in Bakivtsi village have been emptied partly in the framework of implementation of the international partner project with the Agency of Environmental Protection of the USA #P-169 «Management and Destruction of Obsolete Pesticides in Cherkasy in Pilot Oblasts in Ukraine (Cherkasy and L'viv Oblasts)». 6 tons of OP taken from L'viv oblast and 13.5 tons of those taken from Cherkasy oblast has been destructed at «Elga» Ltd. enterprise, and containers for re-package of pesticides have been purchased and delivered to Cherkasy oblast (photos 2.3.1.7 to 2.3.1.10).

Moreover, pre-discoveries for technologies of chemical processing of pesticides to less toxic products have been started, and studying of residual pesticides in soil, water, plants, fish, and breast milk of animals have been done (sampling performed at Grusyatychi village).

Photos 2.3.1.7 to 2.3.1.10. Process of re-package of OP, Grusyatychi village, L'viv oblast

Exploratory research for development of some remediation technologies has been started in 2005 at the Ukrainian Laboratory for Quality and Safety of Agriculture Products (ULQSAP) in the framework of the same project. Laboratory and vegetation tests have been carried out on the basis of ULQSAP , and field ones at Grusyatychi village, L'viv oblast as well as Kvitky village, Cherkasy oblast. Development sites in Grusyatychi village at those research tests for remediation of soils contaminated with POPs have been carried out are shown at photos 2.3.1.11 and 2.3.1.12.

We have to note that technologies for remediation of soils introduced into practice are not available virtually in Ukraine now. Program of research anticipated studying of remediation effect of both plants alone and of those at joint application with sorbents. Ability of 10 crops to remediation has been studied at both sites. Determination of residual amounts of pesticides has been carried out in accordance with generally accepted methods (Methods for determination of micro amounts of pesticides in foodstuff, fodders, and environmental).

Research works for studying of ability of soil microorganisms to destruction of some pesticides available at storage in Cherkasy and L'viv oblasts are being carried out in the framework of the Project as well. Results obtained are of some interest, but this research is a development one and requires detailed elaboration.

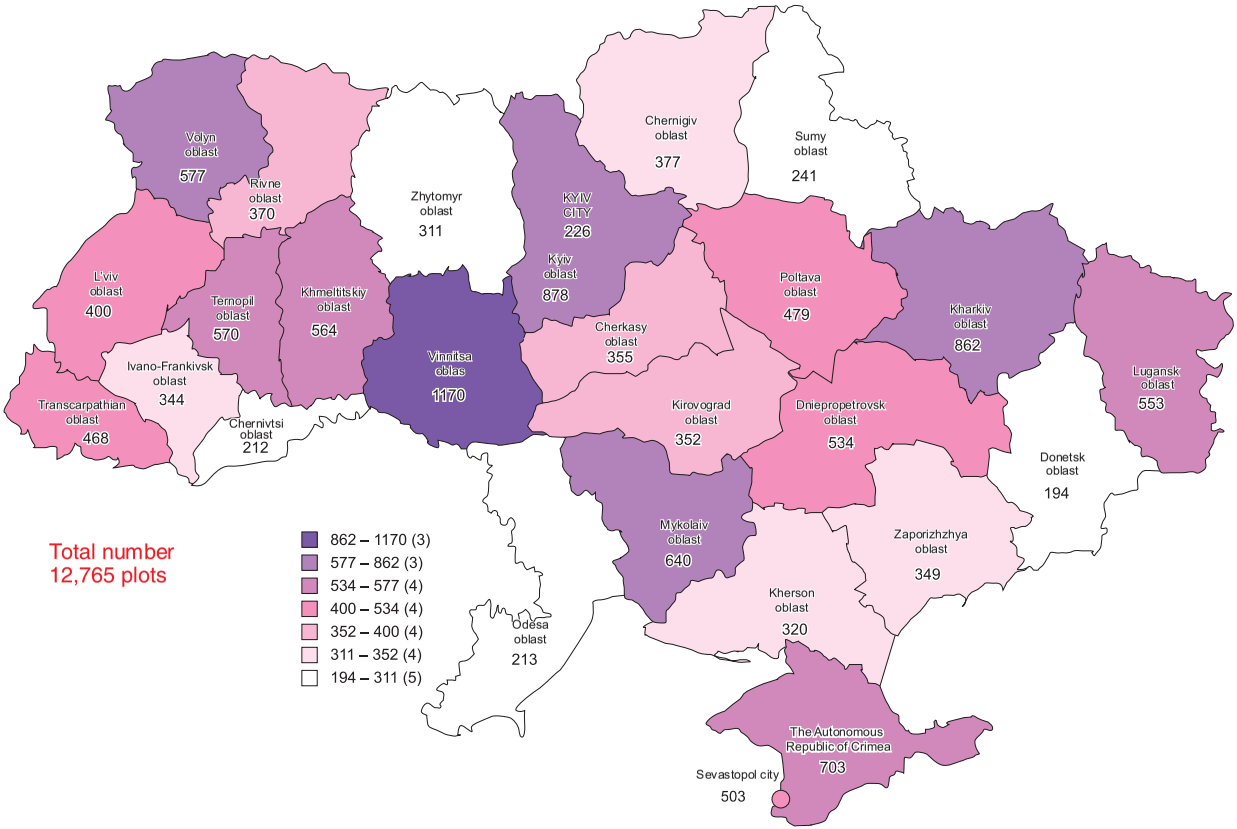
Photos 2.3.1.11 and 2.3.1.12. Trial pots for remediation of OP contaminated sites in Grusyatychi village

Ukrainian-Danish Project «Assistance to Ukrainian Authorities in Management of Contaminated Sites» (2003-2005) has been implemented with financial support of Denmark government in accordance with the agreement between MEP of Ukraine and Danish Agency for Environmental Protection. Assistance in familiarization with experience of European Countries in the sphere of management of contaminated sites, and organizational and methodical support to oblast authorities (at oblast level) in carrying out inventory and registration of contaminated sites have been carried out in the framework of its implementation. A number of measures for training of specialists of the State Departments of Ecology and Natural Resources in the oblasts in the problems of registration and inventory of contaminated sites have been carried out, too. Information on number of contaminated and potentially contaminated sites according to the inventory results in administrative units (by to 2005-11-05) is shown in table 2.3.1.6. Distribution of contaminated and potentially contaminated sites in administrative units (according to the state of the 4th quarter of 2005) is shown on fig. 2.3.1.5. These data shall be considered as preliminary ones, too, and they require permanent actualization.

Table 2.3.1.6. Number of contaminated and potentially contaminated sites according to the inventory results in administrative units (by to 2005-11-05)

Administrative units	Registered
ARC	703
Vinnitsa oblas	1170
Volyn oblast	577
Dniepropetrovsk oblast	534
Donetsk oblast	194
Zhytomyr oblast	311
Transcarpathian oblast	468
Zaporizhzhya oblast	349
Ivano-Frankivsk oblast	344
Kyiv oblast	878
Kirovograd oblast	352
Lugansk oblast	553
L'viv oblast	400
Mykolaiv oblast	640
Odesa oblast	213
Poltava oblast	479
Rivne oblast	370
Sumy oblast	241
Ternopil oblast	570
Kharkiv oblast	862
Kherson oblast	320
Khmeltitskiy oblast	564
Cherkasy oblast	355
Chernivtsi oblast	212
Chernigiv oblast	377
Kyiv city	226
Sevastopol city	503
Total	**12765**

Fig. 2.3.1.5. Availability of contaminated plots and potentially contaminated ones by administrative section (ac-cording to the state by the 4th quarter of 2005)



2.3.2 Assessment of DDT issues (Annex B)

Development of technology of DDT synthesis is considered one of the most significant achievements of organic chemistry in the 20th century. The mentioned product has been widely used in agriculture and for medical purposes. They managed to decrease greatly disease incidence with malaria and to achieve higher yield of agricultural crops due to DDT application.

Development lot of DDT in the form of anti parasite pencils was manufactured by the plants of the former USSR in 1946, and full-scale production of the mentioned product started in 1947. According to yearly reports of MAPU, amount of DDT-based products applied in Ukraine made 7,470.5 tons in 1967 and 1968 (table 2.3.2.1)

Table 2.3.2.1. Amount (tons) of DDT-based products applied in Ukraine in 1967 and 1968

Name of product	Amount of products applied, tons
In 1967	
Spread of DDT – 50%	564,1
Emulsion of DDT – 25%	883,3
Emulsion of DDT – 20%	129,4
Wettable Powder containing DDT – 50%	24,8
Wettable Powder containing DDT – 20%	237,1
Dust of DDT – 5,5%	3570,8
Total:	**5410,5**
In 1968	
Spread of DDT – 50%	242, 8
Emulsion of DDT – 20-35%	1687,8
Emulsion of DDT – 20%	129,4
Total:	**2060,0**

DDT was deduced from «The List of Chemical and Biological Products for Fighting Pests, Plant Diseases and Weeds Permitted to Application in Agriculture in the USSR» in 1970 because of its high persistency and acutely expressed cumulative behavior. Its coming to alimentary chains of men is possible due to a number of objective reasons. DDT impacts negatively reproductive function, decreases vital capacity of descendants, has cytogenetic and embryotoxic properties, and causes immunological changes in human and animal organisms.

Period of 1971 to 1990 is characterized with stepwise introduction into practice of prohibitions and limitations of DDT application declared in the 1960-ies.

Thus, use of DDT in agriculture formally ceased in 1970, but its income to Ukraine through «Ukrsilgosphimia» system lasted till 1978. Averaged monthly income of DDT to Ukraine in 1974 to 1978 was 1,066.77 tons by active ingredient (a. i.). Amount of DDT income to Ukraine for the period of 1974 to 1979 is shown in table 2.3.2.2.

Table 2.3.2.2. Amount of DDT income to Ukraine by a.i. for the period of 1974 to 1979

	Years					
	1974	1975	1976	1977	1978	1979
Amount, tons	46,425	1098,36	3239,17	902,5	47,4	0

Moreover, production of DDT was carried out at «Radical» plant in Kyiv city from 1954 to 1975.

The workshop for DDT manufacture was created in 1954, and the manufacture in fact lasted till 1975.

During this period manufacturing capacity of DDT in conversion to active substance was:

- 1,000 tons per year in **1954 to 1960;**
- 4,000 tons per year in **1960 to 1970;** and
- 7,500 tons per year in **1970 to 1975.**

Dust has been produced at the enterprise from the substance manufactured, and content of a. i. was 5% at the beginning, but it was raised to 22% later.

A workshop for production of highly concentrated dusts (up to 75% in conversion to a. i.) was built at the enterprise in 1973 by order of «Zovnishtorg» association of the USSR. The dust produced has been supplied to India only. Production capacity was 4,000 tons per year, and it was determined by India's demand in the product.

Manufacture of a. i. of DDT ceased in 1975. Highly concentrated powders containing DDT have been produced at the plant upon cessation of manufacture of it's a. i. The latter has been supplied from Dzershinsk town (Russia). Manufacture of preparatory forms ceased in 1985. About 70,000 tons of DDT dusts have been produced from 1973 to 1985.

The workshop for manufacture of a. i. of DDT (both buildings and equipment) has been dismantled and destroyed in 1980.

The workshop was purified and reconstructed upon cessation of dusts manufacture. Reconstruction was performed by specialized building and assembly organizations of the Ministry of chemical industry of Ukraine.

DDT products manufactured at «Radical» plant have been supplied to enterprises of «Soyuzsil'gosphimia» association. The greatest amounts of DDT products have been supplied to Central Asian republics of the USSR as well as countries located at Indo-China.

According to archive materials DDT application for medical purposes started in 1945 to 1950 and lasted till 1990.

DDT has been used in all the oblasts of Ukraine from 1945 to 1972 mainly for fighting malaria mosquitoes (treatment of rooms) in malaria hotbeds. DDT was later substituted with carbophos because of its high toxicity and mosquitoes' resistance to it as well as other chloroorganic products.

It was in 1956 that malaria was eliminated as mass decease of men in Ukraine. Mostly "imported" cases of malaria from the countries unfavorable by this decease have been registered from then, and both Ukrainian citizens and foreigners fall sick with it.

Import of malaria to Ukraine increased 1.5 times during the last 3 years. 332 cases of malaria imported by civil citizens from 36 far foreign countries and 4 countries of the CIS have been registered during this period. In 254 cases (76.5%) Ukrainian citizens, and in 78 cases (23.5%) foreigners fell sick. Three-day malaria Vivax that represents epidemical danger took place in 68.7% of all the registered cases. 504 cases of falling sick military men performing peacemaking mission have been registered, and tropical malaria was in most cases.

119 cases of imported malaria in 20 oblasts of Ukraine were registered in 2005, and 39 civil

citizens and 80 military men were among those who fell sick. 21 imported cases in 14 oblasts were registered in 2006.

A number of factors to complicate epidemiological situation concerned with malaria arose during the last years in Ukraine. They condition on risk of infection with malaria as well as possibility of its spread among population, and they are connected to various social and economic as well as natural and climatic conditions.

The main of them are:

- migration of the population, especially in summer month (tourism and working by contract in epidemic oblasts, business trips of business men, home-coming of season workers, migration of refugees and re-settlers from epidemic oblasts, etc.);
- development of private economical activity (fish-breeding, building of irrigation constructions, roads, reclamation of lands for purchased (summer residence) sites, increase of private animal sector, etc.);
- decrease of livestock of cattle and elimination of great farms that had been biological barrier for sanguivorous anthropoids and protected the population from their mass aggression;
- financial and administrative reasons that led to contraction of the number of workers of medicine and prophylactic as well as sanitary and epidemiological profiles, first of all in the country-side;
- unavailability of domestic medicine product for medical treatment and chemical prophylactic of malaria as well as insecticides for fighting mosquitoes, and deficiency of imported ones;
- 46.4% of areas of ponds at the Ukrainian territory being anophelogenic that exceeds allowable epidemic threshold 4.6 times and favors intensive breed of malaria mosquitoes;
- Global warming; and
- raise of sporadic cases of falling sick with malaria caused by imported ones.

Bearing in mind complicated epidemic situation related to malaria in the world sanitary and epidemic service of MHU carries out permanent epidemic supervision of malaria that includes system dynamic monitoring of malaria carriers at the territory of the country, implementation of timely medicine and prophylactic measures with sick persons and malaria parasite vectors, training of medical workers, and permanent explanatory work with the population concerned with malaria prophylactic.

Ecologically safe «Bacticide» larvicide's made in Russia and permitted for application in Ukraine by MHU is applied for the purpose of controlling quantity of malaria mosquitoes, in places for mass rest of population, and by epidemic needs.

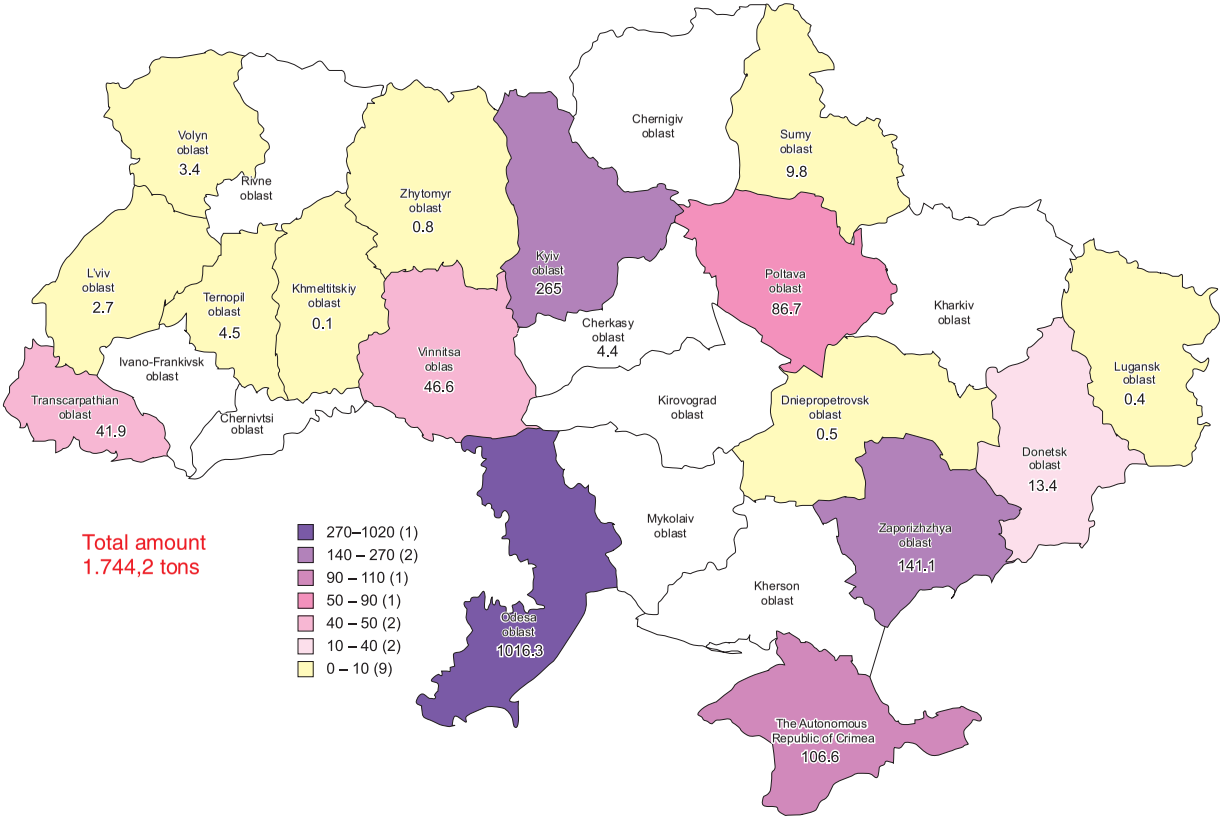
Residual amounts of DDT are not used in the system of health protection beginning from 1989 that was foreseen by order of the MH of the USSR dated 1989-03-02 #138 «On Prohibition of DDT Application».

The population is recommended to apply products recommended by MHU and available in the framework of drugstores as well as other means.

A significant document to deal with the problems of malaria prophylactic is Decree of the Head sanitary inspector of Ukraine dated 2004-09-16 #29 «On measures for malaria prophylactic in Ukraine». This decree foresees concrete measures to be implemented in the country by bodies of executive power, oblast authorities, tourist agencies, enterprises, institutions, and organizations irrespective of their property forms as well as population.

Approximate yearly value of anti malaria measures in the country including hydroengineering, disinfection, and chemical prophylactic ones is about UAH 67.5 mlns.

Figure 2.3.2.1. Availability of DDT amounts (tons) in administra-tive section according to inventory results (by the state by the 1st quarter of 2006)



DDT product was allowed for application for the purpose of medical disinfection to fight pediculosis by order of MH of the USSR dated 1979-01-17 #60. Soap containing 5% of DDT has been used for treatment of loused persons.

DDT product is not used for medical purposes in Ukraine at present.

DDT product has been used as basic insecticide means according to data of MDU and according to preliminary data of the MDU 23.3 tons of DDT is stockpiled at its storages.

According to the dates of preliminary inventory 1,744.2 tons of DDT is stockpiled at storages in various oblasts of Ukraine by the state by the 1st quarter of 2006. Data concerned with revealed amounts of DDT in administrative units by the mentioned moment are shown in table 2.3.2.3. Distribution of DDT amounts revealed by inventory results in administrative units (by the 1st quarter of 2006) is shown on fig. 2.3.2.1.

Table 2.3.2.3. Revealed amounts of DDT in administrative units (by the 1st quarter of 2006)

Administrative units	Revealed amount of DDT, tons
ARC	106,6
Vinnitsa oblast	46,6
Volyn oblast	3,4
Dniepropetrovsk	0,5
Donetsk oblast	13,4
Zhytomyr oblast	0,8
Transcarpathian oblast	41,9
Zaporizhzhya oblast	141,1
Ivano-Frankivsk oblast	not found
Kyiv oblast	265,0
Kirovograd oblast	not found
Lugansk oblast	0,4
L'viv oblast	2,7
Mykolaiv oblast	not found
Odesa oblast	1016,3
Poltava oblast	86,7
Rivne oblast	not found
Sumy oblast	9,8
Ternopil oblast	4,5
Kharkiv oblast	not found
Kherson oblast	not found
Khmeltitskiy oblast	0,1
Cherkasy oblast	4,4
Chernivtsi oblast	not found
Chernigiv oblast	not found
Total	**1744,2**

We have to note that the greatest amount of DDT (over 1,000 tons) is stockpiled in Odesa oblast. In particular, a burial ground for land disposal is located at worked-off sector of «Altestove» lime-pit of the former «Odesabudmaterialy» trust. It is located at the distance of 1 km southwest of Altestove settlement on the left hand from «Odesa– Kyiv» motor road and 800 tons of DDT is buried there. The object belongs to state enterprise «Odesa merchant port».

The site for building of a storehouse for temporary landfill of land disposal taken from «Mozdok» sunken steam ship was given to the Black Sea Steamship Line (BSDL) in accordance with decision of the executive committee of Bilyavtsy district council dated 1978-05-19 #281, and designing of the storage place performed by design bureau of BSDL.

Two ferroconcrete bunkers each having dimensions of 44 m × 18.2 m and three sections were erected at the site of 0.23 hectares (47 m × 47 m) in the area.

Worked-off space of the lime-pit was cleansed to land layer of myopic clay, and a layer of crumpled clay 1 m thick was laid to the prepared surface from the area having true altitude of 45 m. Than a concrete layer 0.3 m thick was made, and cement buckle of a thin layer of 0.05 m laid over it.

Bunker #1 (western part of the storage place) was filled with «DDT-75» pesticide taken from «Mozdok» sunken steam ship and other chemical substances, and they were buried in 1979.

Total 909.5 tons of chemicals were buried in that bunker in 1979 and they are being stored there. 800 tons of dichlorodiphenyltrichloroethane (DDT-75), 41 tons of bimethylaniline, 49 tons of ortho-nitrotoluene, 18 tons of alpha-naphtalenelamine, and 1.5 tons of chemicals of unknown composition are there.

13 containers containing chemical wood and pest killers buried in 1986 are contained in the bunker #2 (a half of the section #3 is partitioned off with the wall made of «CP-4» blocks based upon cement solution). 1.6 tons of ortho-nitrotoluene, 0.7 tons of sodium dichromate, 4.5 tons of bisphenol, and 5.35 tons of zeazine (12.3 tons in total) were put to the bunker #2.

Total amount of buried hazardous substances is 921.8 tons. The most hazardous from the view-point of amount and toxicity is DDT-75 and its metabolites formed during the period of storage lasting over 25 years.

The bunkers filled with chemicals have been covered with ferroconcrete plates, and cement buckle of 0.05 m have been laid over it. Water proof layer of crumpled clay 1 m thick has been laid over the cement buckle, and that layer has been covered with a layer of ground of over 0.5 m thick.

Site of the burial ground for land disposal was enflamed with drainage shoots and enclosed with barbed wire and ferroconcrete poles of 2.5 m to 3.0 m high from the ground surface at the perimeter of 47 m × 48 m. Warning signs have been installed and are still available. View of the land disposal of 800 tons of DDT which located nearby Altestove settlement (Odesa oblast) is shown on photos 2.3.2.1 and 2.3.2.2.

Photos 2.3.2.1 and 2.3.2.2. View of the land disposal of 800 tons of DDT which located nearby Altestove settlement (Odesa oblast).

State enterprise «Odesa merchant port» worked out and coordinated the program of monitoring research of the state of the landfill, and a contract with the Ukrainian research and designing Institute of Ukrainian Navy for its implementation has been signed. A complex of chemical and biological researches of the soils, and underground and surface waters in the place of the landfill for chemical weed and pest killer's allocation has been made by this institute. Conclusions have been made on their basis that content of DDT, DDT, DDE, and γ-HCCH (lindan) did not exceed established permissible concentrations of these substances in all the 12 samples in 15 places for soil control and 4 places for water control.

We shall note on the assumption of analysis of the revealed amounts of DDT in the oblasts of Ukraine that the greatest ones of the latter are stockpiled in Odesa, Kyiv, Zaporizhzhya, Poltava, and Vinnitsa oblasts as well as in the ARC. They comply 1,016.3, 265.0, 141.1, 86.7, 46.6, and 106.6 tons, respectively by the 1st quarter of 2006.

2.3.3 Assessment of HCB – Industrial Waste of CTC/PCE manufacture (Annex A, Part I)

Technological line for manufacturing of carbon tetrachloride (CTC) and perchloroethylene (PCE) was commissioned in 1973 in the city of Kalush, Ivano-Frankivsk oblast, at the territory of the former Kalush Chemical and Metallurgical Industrial Complex (KCMIC). Its owner is «Oriana-Halev» Ltd. at present. Rated capacity of the manufacture was 30,000 metric tons per year with the following assortment of the produce: 18,000 metric tons of CTC and 12, 00 metric tons of PCE, but this proportion could change in accordance with the requirements of the market.

Manufacture of CTC/PCE functioned rather stable at maximum capacity up to 1993 to 1994, but it was reduced up to 1998. It has not been used from 1998 in spite of its operability. CTC composed the greatest part of sold produce as raw material for chladones manufacture in the Russian Federation, and PCE and CTC were sold as diluters to the states of the former USSR as well as abroad.

Manufacture of CTC/PCE was based on well-known technology by "Stauffer" firm (Germany) that included direct chlorination of industrial carbon raw materials (methane in the main). Solid waste ascribed to the first class of danger formed in the manufacturing process at the amount of 540 tons per year, and **hexachlorobenzene (HCB)** content in them reached over 90%. Emissions of HCB to the atmosphere reached 0.12 tons per year.

Design documentation for CTC/PCE manufacture anticipated two variants of destruction of HCB as a by-product that is incineration or landfill. A physical and chemical property of these waste not meeting technical requirements of incineration process, the letter has not been mastered. Therefore placing of HCB at the polygon for solid toxic waste was foreseen according to the technological schedule. This polygon is located at a distance of about 5 km from the main CTC/PCE manufacture, 1.5 km from Verkhne village, and 1.35 km northwest of Mostishche village at the specially delivered plot of 5.15 hectares in area. Relief of the plot is plain with insufficient inclination to Sapogiv River flowing 50 m from the polygon. Sapogiv river flows into Kropyvnyk one, the latter flows into Sivka river, and Sivka flows into Dniester river. River basin of Sapogiv is located at lands with meadow flora, and these lands are waterlogged. Sivka River is of fish industry water use, but supervision points at the river are not available.

Ground waters of the polygon are represented by two water-bearing horizons. The first one is located at the depth of 2.8 m to 6.0 m, and its thickness reaches 1 m. The second horizon is located at the depth of 7.8 m to 9.3 m, and its thickness varies from 0.5 m to 8.5 m.

The polygon (photos 3.3.3.1 to 2.3.3.3) was introduced in 1973, and it was designed for 405 years of use in accordance with the permit for stockpiling of waste. Expansion of the polygon and improvement

of its construction were undertaken in accordance with the decisions of the design bureau of the «Khlorvinil» industrial association and Ivano-Frankivsk branch of «Ukrkomundorproekt».

Photo 2.3.3.1. View of the «Oriana-Halev» Ltd. polygon for HCB solid toxic waste produced by «Oriana-Halev» Ltd., Kalush town, Ivano-Frankivsk oblast, where 11,087.6 tons of HCB are stored

Photo 2.3.3.2. View of a closed modules of the polygon with incomplete remediation of soils

Photo 2.3.3.3. View of a module of the polygon poured with water

The polygon for solid toxic waste is composed of surface warehouse and 12 modules. Now their condition is as follows:

– **8 modules** (#1 to #8) for HCB landfill are closed and re-cultivated in accordance with the design;

– **2 modules** for HCB landfill (9th and 10th) are covered up with insufficient layer of ground and covered with film, but one of them (the 10th one) has been half used and filled with water; and

– **2 modules** are open, and their excavations are filled with water.

Bottom and sides of the open modules are covered with polymer film 0.2 mm thick.

According to the design of "Ukrkomundorproekt" a vertical clay diaphragm 0.7 m wide and 10 m deep up to water proof ground has been installed around the polygon in the ground, re-cultivation of closed modules has been performed, and the polygon has been fenced.

Now the fence is not available in fact although it has been renewed several times. A turnpike has been set at the entry of the polygon, and an amenity room for watchmen has been built. Guard in daytime is carried out, too.

Technology of landfill of waste was as follows. The ones packed in steel barrels of 200 l capacity covered with layer of clay soil have been stockpiled at the surface storage place at the polygon for solid toxic waste. Upon reaching availability of 1,000 tons, waste were placed to a specially prepared module in two layers, and covered with isolated layer of soil of 1 m thick, covered with polyethylene film of 0.2 mm thick, as well as layer of plant soil of 0.2 m thick.

According to the decision of the general designer, landfill of other than HCB waste was anticipated

at the polygon generated in manufacture of vinyl chloride and polyvinyl chloride.

The last landfill of HCB waste in modules #9 and #10 took place in August of 2000.

According to the registration certificate of the place for removal of waste of the polygon for solid toxic ones rendered by "Oriana-Halev" Ltd. in 2001, 11,325.5 tons of waste has been buried at the polygon, and we can mention among them:

– 11,087.6 tons of HCB (first class of danger);

– 250.7 tons of solid residue of equipment cleaning (third class of danger); and

– 14.2 tons of solid substances taken out of centrifuges (third class of danger).

Design organization «NDI PROEKTRECONSTRUKCIYA» developed working draft "A single development landfill of 200 tons of pesticides at the polygon for toxic waste of «Oriana-Halev" Ltd. in Kalush town», but it has not been realized because of unavailability of proper financing and any specialized organization.

«Oriana-Halev» Ltd. is still owner of the polygon for toxic waste.

Control of impact of the polygon on the environment has been carried by the enterprise till 2004. Sampling of surface and underground waters as well as atmospheric air and their analyses have been performed by laboratories of «Lukor» CJSC and «Oriana-Halev» Ltd., and state sanitary control has been performed by Kalush district sanitary and epidemic station.

Chernivtsi complex hydro geological party (CHGP) and L'viv geology and research expedition (GRE) studied factual state of contamination of geological medium of the former KCMIC in 1991 to 1993 including the territory where manufacture of CTC/PCE had been realized. The system for monitoring has been developed and introduced, and a number of sight holes has been built according to the recommendations of Chernivtsi CHGP for the purpose of controlling pollution of the environment.

The system for monitoring of impact of the polygon on environment consists of:

- **10 sight holes** (photo 2.3.3.4) for controlling of the state of ground waters (5 pair section lines complied of two holes each from various sides of clay diaphragm within the territory of the polygon and beyond it);
- **2 permanent section lines** for controlling of the state of the surface waters of Sapogiv river (above and lower its current nearby the polygon) that belongs to the category of fish industry water use of the Dniester basin and flows at a distance of 15 m from the territory of the polygon;
- **places for observation** of the state of soils (within the territory of the polygon, at the buffer area, and at the dwelling zone); and
- **points for observation** of the state of the atmospheric air.

Photo 2.3.3.4. View of one of the sight holes of the polygon

HCB has not been found in underground waters during the period of observations performed by the enterprise.

It is planned to realize ultimate cessation of CTC/PCE manufacturing in 2006 to 2007 with financial aid of the World Bank. Constituent part of the plan of its closure is the Plan of ecological management purposed to solution of the problem of controlling potential ecological effect caused by this activity as well as improvement of supervision and safety measures at the polygon for toxic waste where HCB is stockpiled.

We shall take into consideration that manufacture of CTC/PCE as well as storage and landfill of waste belong to «the List of categories of activity to represent elevated ecological danger» approved by Decree of the Cabinet of Ministers of Ukraine dated 1997-07-27 #554. Therefore monitoring of surface and ground waters as well as soils shall be conducted with performing analyses ones in 6 monthousand, and it will be realized on account of «Oriana-Halev» Ltd.

The State Sanitary Inspection in Ivano-Frankivsk oblast revealed some violations in 2002 as the result of inspections of the polygon for toxic waste mentioned above, when observation of ecological demands was checked. In particular, HCB was packed in 200 l barrels not completely hermetically, and they began corroding 2 to 3 years later for layer of clay and gravel ground does not ensure impermeability. We can forecast on the assumption of this that destruction of the package during the following 3 to 5 years because of corrosion, and contaminations of the geological medium within the bounds of the polygon with HCB belonging to the first class of danger are to take place. Therefore it is necessary to carry out complex of works for analysis of the state of HCB storage that is in the barrels buried in the modules and determination of its chemical composition. Documentation for safe carrying out of appropriate works as well as technical documentation for HCB being waste of the manufacture shall be developed. Technologies of HCB destruction acceptable from ecological and economical view-points shall be worked out, and some organizations able to realize them shall be found. The most significant problem at that is ensuring financial provision of implementation of these works drawing international technical aid.

2.4 ASSESSMENT OF PCBS ISSUES (ANNEX A, PART II)

The main characteristics of PCBs and electrotechnical PCB-contained equipment.

Liquid chlorobiphenyls have been produced industrially abroad from the 1930-ies with various commercial names («pyranol» and «inertyn» in the USA, «aroclor» and «pyranol» in Great Britain, «clophen» in Germany, etc.). Liquid chlorobiphenyls belong to the group of synthetic isolating liquids according to the classification accepted by American Society for Testing Materials (ASTM), and that group is called by a general name «ascarels». Properties of these liquids are incombustibility and unavailability to evolve gases able to explode or form explosive mixtures with air under the influence of electric arc.

Synthesis of chlorobiphenyls in the USSR was realized by A.A.Adrianov in 1934. Technical liquids of this class have been manufactured by the Soviet industry in the Russian Federation at the plants of industrial associations of «Orgsteklo» (Dzerzhynsk town) and «Orgsintez» (Novomoskovsk town). These isolating liquids have been produced with the names of «trichlordiphenyl (TCD)», «sovol», and «sovtol». In particular, «sovol» represents a mixture of homologues and isomers of chlorobiphenyl that corresponds to pentachlorobiphenyl by an extent of their chlorination. Sovols manufactured by the mentioned enterprises of the former USSR differed by their designation and had the following technical names: sovol for plasticizing (technical specifications TU 6-01-4683387-39-90) and sovol for electric insulation (report «PCBs in the Russian Federation: Inventory and criteria

of selection of priority actions for PCBs handling» dated 1999). About 180 ths. tons of various sorts of PCBs were manufactured during all the period of functioning these plants (1939 to 1993).

High dielectric permeability of liquid chlorobiphenyls made for their effective application as impregnation material for electric capacitors with paper dielectric. Application of these liquids instead of capacitor oils allows significant increasing (by 40% to 50%) of specific capacity and reactive power of capacitors having established dimensions or significant decreasing of dimensions and mass of capacitors having established capacity. Additional advantage of capacitors of this type is their fire and explosion safety. Liquid chlorobiphenyls having higher solidification points (they correspond to trichlorobiphenyls by an extent of their chlorination) or mixtures of pentachlorobiphenyls with low viscosity chlorinated hydrocarbons (trichlorobenzene and chloroethylbenzene) were used for the purpose of ensuring stability of electric characteristics. Impulse capacitors have been impregnated with nitrosovol that represents a mixture of pentachlorobiphenyl with α-nitronaphtalene for the purpose of achieving highest specific capacity.

Chlorobiphenyls with chlorination extent corresponding to penta- and hexachlorobiphenyl were used for internal isolation and chilling of transformers. Ratio of chlorobiphenyl to trichlorobenzene has been chosen in accordance with the requirements toward viscosity and solidification point of filling liquid. Mixture composed of 64% of pentachlorobiphenyl (sovol) and 36% of trichlorobenzene named «sovtol-2» is the closest one to transformer oil by its viscosity. Its specific weight is 1.52 g/cm3, and its solidification point is –40°C. «Sovtol-1» (75% of sovol and 25% of trichlorobenzene, specific weight 1.53 g/cm3, and solidification point – 25°C) and «Sovtol-10» (90% of sovol and 10% of trichlorobenzene, specific weight 1.54 g/cm3, and solidification point –7°C) are used, too.

Capacitors containing liquid polychlorinated biphenyls have been manufactured according to GOST 1282, GOST 18689, and some technical specifications, but transformers have been manufactured in accordance with GOST 16555 and some technical specifications, too. The following have been revealed when performing analysis of nomenclature and performance of power transformers and capacitors containing PCBs.

Three-phase hermetic step-down transformers of both general designation of «ТНЗ» type having power of 25 kW·A to 2500 kW·A and special transformers for welding, rectifying, and transformer installations «ТНП», «ТНПУ», «ТНЗС», and «ТНЗПУ» types belong to power transformers. They have been filled with sovtol as insulating and chilling liquid, and mass of that has been 160 kg to 4160 kg. Chirchic transformer plant (Chirchic town, Uzbekistan) and industrial association «Uralelectrovazhmash» were producers of those transformers.

As to electric capacitors, their nomenclature and quantity is a great deal wider. These are cosine ones of «КС» and «КСК» types, capacitors for longitudinal compensation of power transmission lines (PTL) of «КСП» type, shunt ones for direct current of «КСШ» type, capacitors for electric thermal installations of 50 Hz frequency of «КСЭ» type, and 0.5 to 10 Hz frequency capacitors of «ЭС», «ЭСВ», «ЭСВП» and «ЭСВК» types as well as the others belong to them. It is known a wide range of capacitors for transformer installations as «ПС», «ПСК», «ФСК», «ГСК» types and others. Impulse capacitors of «ИС» type having capacity of 2.8 to 200 mcF for voltage of 2.8 to 25 kV are applied in electric technological installations. Relatively small capacitors for using as ballast ones and for increasing power coefficient of starting and regulation devices of luminescent lamps of «ЛСМ», «ЛСЕ1», and «ЛСЕ2» types having capacity of 0.5 to 100 mcF and designed for voltage of 250 to 400 V compose a separate group.

Trichlorobiphenyl, sovol (pentachlorobiphenyl) as well as its mixtures with various additives (for example, nitrosovol) were used as impregnating and insulation liquids in the capacitors. The main manufactures of capacitors containing polychlorinated biphenyls were Ust-Kamenogorsk capacitor plant and «Condensator» pilot plant (Serpukhov town, the Russian Federation). Leninakan capacitor

plant (Leminakan town, Armenia) manufactured capacitors of «ЛСМ» and «ЛСЕ» types.

PCBs and PCB-containing equipment has not been produced at the territory of Ukraine, and synthetic liquids, capacitors, transformers as well as other equipment produced in Russia, Kazakhstan, and Armenia as well as Poland and Czechia have been used.

Inventory of PCBs in Ukraine was carried out according to the UNEP Chemicals methodology which provides for a step-by-step approach to revealing PCBs-containing or PCBs-contaminated materials and electrical equipment, following the priorities indicated in the Annex A Part II of the Stockholm Convention on POPs. Gathering and processing data related to the sources of PCBs in Ukraine has been carried out. This information was obtained from over 4,500 the greatest Ukrainian enterprises engaging a number of Ministries and other Authorities.

Supplement of the specially developed database (mainly with information on transformers, capacitors and synthetic liquids being used, maintained as reserves, or out of use) has been carried out on the basis of the analysis of manufacture and categories of using PCBs as well as technical documentation for electrotechnical PCB-containing equipment having been manufactured in the former USSR and some foreign countries. Works for collecting an appropriate information in the ministries and regions were organized taking into account «Guidelines for location and identification of PCBs in waste products and equipment» developed within the project «PCBs Inventory in Ukraine» in 2003 with due account of the UNEP Chemicals methodology. National experts defined corresponding categories of economic activity and the list of brands of electrotechnical equipment and synthetic liquids containing PCBs that can be used at the enterprises of transport as well as industrial, agroindustrial, fuel and energy, and defense complexes of Ukraine.

An administrative reporting form of enterprises concerned with their produce and wastes containing PCBs as well as an instruction for their compilation, developed taking into consideration the available system of gathering information by bodies of state statistics as well as «Guidelines for location and identification of PCBs in waste products and equipment» have been used for carrying out PCBs inventory in Ukraine. Form and structure of accounting have been approved by the Ministry of Environment and Natural Resources of Ukraine № 1-PCBs (for one-time use only). Information has been rendered by enterprises and their structural departments as well as institutions and organizations irrespective of their property forms. Working groups for carrying out the inventory as well as proper divisions of ministries and departments were responsible for the solution of POPs problem in Ukraine implemented control of rendering reports.

More accurate definition of the list of electrotechnical PCB-containing equipment available in Ukraine compiled by data of the corresponding technical documentation (that of manufactures of the former USSR as well as those of some foreign countries) has been realized in the framework of GEF/UNEP Project «Enabling Activities for the Development of National Implementation Plan for the Stockholm Convention on POPs in Ukraine». The list contains information on the producers of such equipment, its designation, composition of the dielectric, and amount of PCBs in the most brands. Results of gathering information as to produce and waste containing PCBs according to №1-PCBs form have been used in compilation of the list. Methodical foundations for creation of proper software for systematization and analysis of information obtained have been worked out. A Software product «PCBs in Ukraine» developed in 2003 in the framework of carrying out the UNEP Project «PCBs Inventory in Ukraine», has been used for gathering and processing additional information.

The results of carrying out the inventory are shown as primary tables containing information on the amount and types of transformers, capacitors, and synthetic liquids, containing PCBs, by administrative sharing and in the section of the main branches distribution by economic activity categories and property forms of enterprises. Results of processing the information obtained

on enterprises of transport as well as industrial, fuel and energy complexes of Ukraine are shown separately.

Primary tables contain complete list of brands of synthetic liquids, transformers, and capacitors revealed as well as the results of performed calculations of PCBs content in them. Quantities of electrotechnical equipment being used, reserved or out of use are determined for each mentioned brand.

Overall tables containing preliminary list of total amount of PCBs at Ukrainian objects obtained on the basis of the inventory results by processing the reports of about 4,500 enterprises compiled in accordance with №1-PCBs form are given below. The maps and diagrams reflecting the distribution of PCBs and the PCB-containing equipment in administrative units of Ukraine and among basic branches are shown in the Annex (PCB).

Table 2.4.1. Overall results on the amount of PCBs-containing liquids (oils).

Trade name	Total amount, kg	In reserve or out of use, kg
TOTAL:	**250047,5**	**108708,8**
Askarel	12000,0	2400,0
Hexol	177,2	177,2
Delore	8680,0	0
Clophene	304,8	304,8
Pyranol	4195,0	4195,0
Sovol	867,2	741,0
Sovtol	218823,3	100890,8
Trichlorobiphenyl	5000,0	0

Table 2.4.2. Overall results on PCBs inventory at the enterprises of Ukraine under an administrative sharing

Administrative unit	Transformers			Capacitors			Synthetic liquids	
	ps.	%	PCB (kg)	ps.	%	PCB (kg)	kg	%
UKRAINE	1002	100	**2051160**	102032	100	**1938608**	**250048**	100
AUTONOMOUS REPULIC OF CRIMEA	31	3,1	**59220**	9782	9,6	**185858**	**0**	0
VINNITSYA REGION	16	1,6	**33000**	1971	1,9	**37449**	**300**	0,1
VOLYN REGION	39	3,9	**124060**	4109	4	**78071**	**724,8**	0,3
DNIEPROPETROVSK REGION	114	11,4	**265545**	7322	7,2	**139118**	**64684**	25,9
DONETSK REGION	250	24,8	**601370**	5727	5,6	**108813**	**67530,3**	27,1
ZHYTOMYR REGION	39	3,9	**60160**	1067	1	**20273**	**0**	0
TRANSCARPATHIAN REGION	9	0,9	**4205**	1403	1,4	**26657**	**4,8**	0
ZAPORIZHZHYA REGION	16	1,6	**15040**	18021	17,6	**342399**	**13360**	5,3
IVANO-FRANKIVSK REGION	28	2,8	**47270**	1125	1,1	**21375**	**4800**	1,9
KYIV REGION	114	11,4	**221830**	1874	1,8	**35606**	**36000**	14,4
KIROVOGRAD REGION	27	2,7	**41960**	2704	2,7	**51376**	**0**	0
LUGANSK REGION	58	5,8	**97845**	6281	6,2	**119339**	**177,2**	0,1
LVIV REGION	6	0,6	**4240**	2318	2,3	**44042**	**0**	0
MYKOLAIV REGION	17	1,7	**47580**	4265	4,2	**81035**	**5360**	2,1
ODESA REGION	22	2,2	**34360**	1667	1,6	**31673**	**0**	0
POLTAVA REGION	67	6,7	**127130**	5694	5,6	**108186**	**23980**	9,6
RIVNE REGION	8	0,8	**8745**	2110	2,1	**40090**	**3600**	1,4
SUMY REGION	9	0,9	**24180**	7253	7,1	**137807**	**12560**	5
TERNOPIL REGION	8	0,8	**9360**	1944	1,9	**36936**	**4800**	1,9
KHARKIV REGION	25	2,5	**42510**	6532	6,4	**124108**	**5142,4**	2,1
KHERSON REGION	13	1,3	**25360**	1125	1,1	**21375**	**0**	0
KHMELTITSKIY REGION	8	0,8	**8880**	1516	1,5	**28804**	**0**	0
CHERKASY REGION	28	2,8	**48630**	1172	1,1	**22268**	**0**	0
CHERNIVTSI REGION	5	0,5	**4840**	1129	1,1	**21451**	**0**	0
CHERNIGIV REGION	3	0,3	**6880**	2259	2,2	**42921**	**0**	0
KYIV CITY	41	4,1	**86960**	1402	1,4	**26638**	**7024**	2,8
SEVASTOPOL CITY	1	0,1	**0**	260	0,3	**4940**	**0**	0

Table 2.4.3. Overall results on the number of PCBs-containing transformers, by types of their application, usage and/or storage

TYPES OF APPLICATION (transformers)	Total number	Including:					
		In operation	In reserve	Out of operation	Of them in storage:		
					indoors	outdoors	at dedicated site (landfill)
TRANSFORMERS OF ALL TYPES:	**1002**	**793**	**112**	**97**	**57**	**11**	**37**
General-purpose transformers	809	651	93	65	37	9	27
Special-purpose transformers	188	137	19	32	20	2	10
Transformers of foreign production	5	5	0	0	0	0	0

Table 2.4.4. Overall results on the number of PCBs-containing capacitors, by types of their application, usage and/or storage

TYPES OF APPLICATION (capacitors)	Total number	Including:					
		In operation	In reserve	Out of operation	Of them in storage:		
					indoors	outdoors	at dedicated site (landfill)
CAPACITORS OF ALL TYPES	102032	77403	10161	14468	4034	10707	749
Reactive power compensation units	85908	65406	7869	12633	2914	10546	195
Electric motors	374	352	7	15	15	0	0
Electric transport	221	220	1	0	0	0	0
Thermal - electric units	8561	5276	1868	1417	800	143	474
Electric main bucking-out systems	3703	3091	348	264	166	18	80
Electric technological installations	968	964	4	0	0	0	0
Converter installations	803	793	10	0	0	0	0
Capacitors units and systems	16	2	4	10	10	0	0
Capacitors of foreign production	1458	1285	50	123	123	0	0

Table 2.4.5. Results of preliminary inventory of PCBs and electric PCB-contained equipment in the section of the main branches

Section	Transformers			Capacitors			Synthetic liquids	
	ps.	%	PCB (kg)	ps.	%	PCB (kg)	ps.	%
FUEL AND ENERGY COMPLEX ALTOGETHER	**49**	**100**	**81950**	**40 319**	**100**	**766061**	**0**	**100**
Coal industry	0	0	0	904	2,2	17176	0	0
Oil and gas complex	32	65,3	54410	1146	2,8	21774	0	0
Electric energy complex	17	34,7	27540	38269	95	727111	0	0
INDUSTRIAL COMPLEX	**725**	**100**	**1564635**	**36580**	**100**	**695020**	**196776**	**100**
Food industry and processing of agricultural products	63	6,3	107370	2316	2,3	44004	0	0
Production of leather and leather footwear	10	1	15570	125	0,1	2375	0	0
Production of wood and wooden raw materials	8	0,8	12300	194	0,2	3686	0	0
Cellulose and paper industry, and publishing	0	0	0	112	0,1	2128	0	0
Production of coke, petroleum refining products, and nuclear fuel	35	3,5	55025	2258	2,2	42902	0	0
Chemical industry	27	2,7	76260	3602	3,5	68438	60892,8	24,4
Production of rubber and plastic items	98	9,8	181580	305	0,3	5795	64861,2	47,1
Production of other non-metal mineral items	8	0,8	10900	1298	1,3	24662	0	0
Metallurgy and metal processing	300	57,5	717370	12572	76,5	238868	30197,5	12,1
Production of machinery and equipment	148	14,8	330450	8332	8,2	158308	27664,8	11,1
Production of electronic and electrotechnical equipment	0	0	0	27	0	513	0	0
Production of transport equipment	24	2,4	46410	4254	4,2	80826	13160	5,3
Other produce not belonging to other groups	0	0	0	35	0	665	0	0
Textile industry and sewing of clothes	4	0,4	11400	1150	1,1	21850	0	0
TRANSPORT ALTOGETHER	**17**	**100**	**16845**	**2357**	**100**	**44783**	**9905**	**100**
Railway transport	0	0	0	27	1	513	0	0
City and motor transport	2	12	320	379	16	7201	0	0
Transportation by pipelines	4	24	8000	509	22	9671	9905	100
Water transport	0	0	0	3	0	57	0	0
Auxiliary transport services	11	64	8525	1402	59	26638	0	0
Post and communication	0	0	0	37	2	703	0	0
OTHER BRANCHES	**211**	**100**	**387730**	**22776**	**100**	**432744**	**43366**	**100**
TOTAL	**1002**	**100**	**2051160**	**102032**	**100**	**1938608**	**250047**	**100**

Analysis of the obtained data concerning amount of PCBs revealed at enterprises belonging to various branches of industry throughout the territory of Ukraine shows that the greatest amounts of PCBs are at the most power consuming enterprises. The distribution of PCBs amounts in the different industrial branches among the various regions of Ukraine correlates with the distribution of the industries over the regions. For example, the highest concentration of enterprises of metallurgical and processing industry is in the Eastern part of Ukraine. The inventory results confirm that the greatest amount of PCBs in electrotechnical equipment is also located within this region. According to the data concerned with distribution of PCBs in the industrial complex of Ukraine their greatest amounts are used or stored at the enterprises belonging to metallurgical and engineering branches of industry.

The «hot spots» in Ukraine from the view-point of availability of synthetic PCBs - containing liquids as well as PCBs-containing equipment are:

by transformers *(fig. 2.4.1)*	by capacitors *(fig. 2.4.2)*	by synthetic PCBs-containing liquids *(fig. 2.4.3)*
Donetsk region (25%)	Zaporizhzhya region (18%)	Donetsk region (27%)
Dniepropetrovsk region (11%)	ARC (12%)	Dniepropetrovsk region (26%)
Kyiv region (11%)	Dniepropetrovsk region (7%)	Kyiv region (14%)

There were found a total of 1,002 transformers of 27 different models and 102.032 capacitors of 157 different models as well as 250,048 kg of synthetic liquids of 8 various sorts, containing PCBs.

The data given reflect amounts of PCBs, containing in transformers and capacitors as well as amounts of PCBs-containing synthetic oils. Amounts of PCBs, containing in transformers and capacitors, have been calculated on the basis of an analysis of performance capability of corresponding brands of electrotechnical equipment taking into consideration expert estimations.

Gross mass of each transformer is between 490 kg and 12,000 kg, and the mass of liquid dielectric in each of them varies from 160 kg to 4,160 kg. **Total mass** of all these **transformers** is **5,746,540 kg**, and **PCBs mass** in them is **2,051,160 kg**.

Capacitors of 30 models PCBs-containing comprise 90.5% (92,360 items) of the total number of those revealed in Ukraine. Average mass of PCBs in a capacitor belonging to this group is 19 kg. Total **mass of PCBs** in the revealed capacitors is estimated as **1,938,608 kg**, and total **mass of capacitors** containing PCBs is **4,937,811 kg**.

Thus, according to the results of preliminary inventory total amount of PCB containing in the equipment and stored separately at the Ukrainian objects is estimated as

$$\mathbf{M_{PCBs} = 2,051,160 + 1,938,608 + 250,048 = 4,239,816\ kg \approx 4,240\ tons.}$$

It has to be noted that experts indicate the data given are likely to be underestimated by factors of 1.5 to 3 times. These estimations are based, in particular, on comparison of industrial and economic performance of Ukraine and the Russian Federation as well as estimated data concerning PCBs and PCB-containing equipment in Russia. According to those estimations, there are about 10,000 transformers and 500,000 capacitors at the territory of Russia. Total amount of PCBs in Russia is about 35,000 kg.

Therefore, forecast estimations of current amount of PCBs and PCB-containing equipment in Ukraine may reach the following values:

- total amount of transformers is 1,500 to 3,000 items;
- total mass of PCBs in the transformers is 3,000 tons to 6,000 tons;
- total mass of transformers containing PCBs is 8,300 tons to 16,600 tons;
- total amount of capacitors is 150,000 to 200,000 items;
- total mass of PCBs in the capacitors is 2,850 tons to 3,800 tons;
- total mass of capacitors is 9,000 tons to 12,000 tons;
- total mass of PCBs stockpiled is 400 tons to 600 tons; and
- total mass of PCBs is 6,220 tons to 10,540 tons.

Fig. 2.4.1. Availability of transformers containing PCBs in accordance with administrative distribution obtained by inventory results, items/kg of PCBs (by the 1st quarter of 2006)

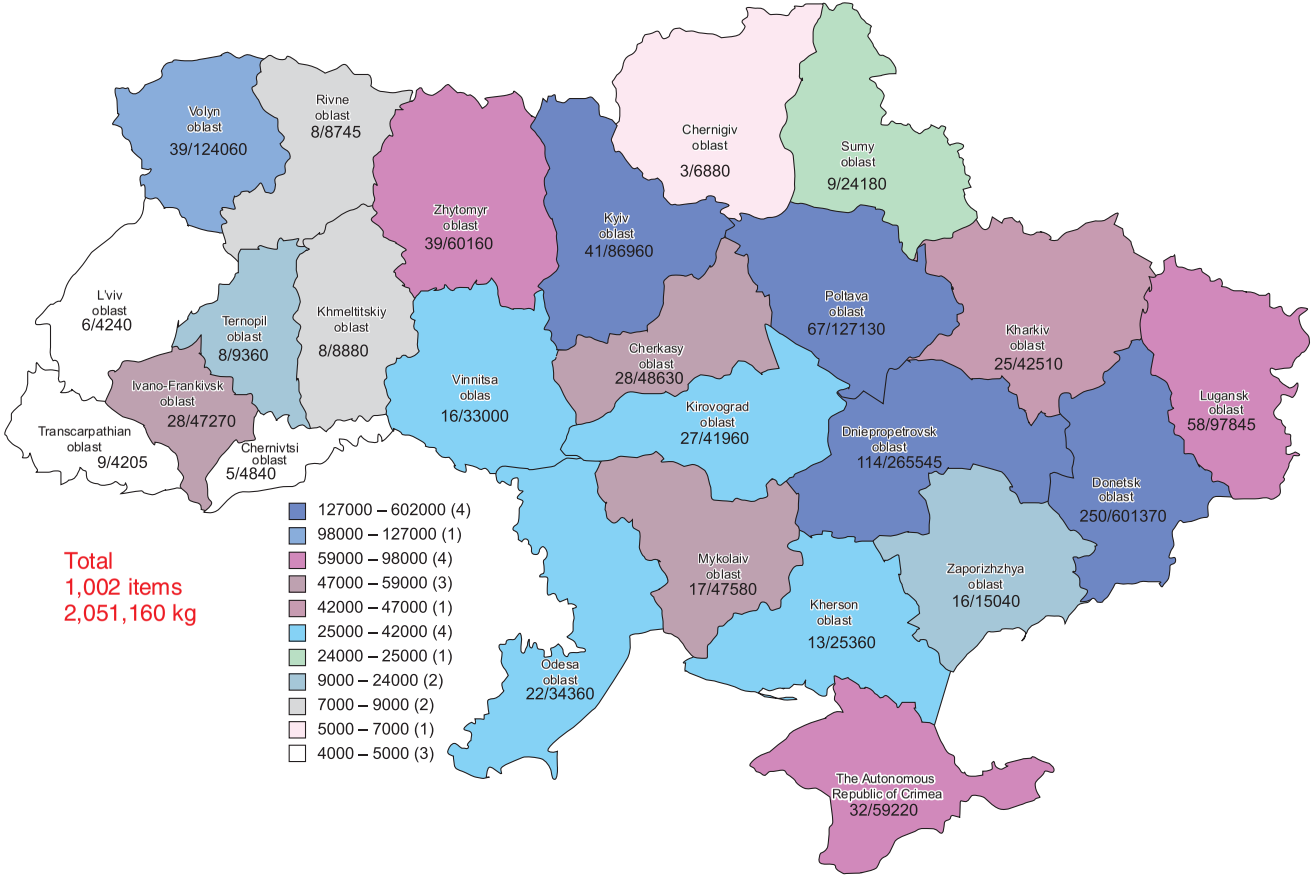


Fig. 2.4.2. Availability of capacitors containing PCBs in accordance with administrative distribution revealed by inventory results, items/kg of PCBs (by the 1st quarter of 2006)

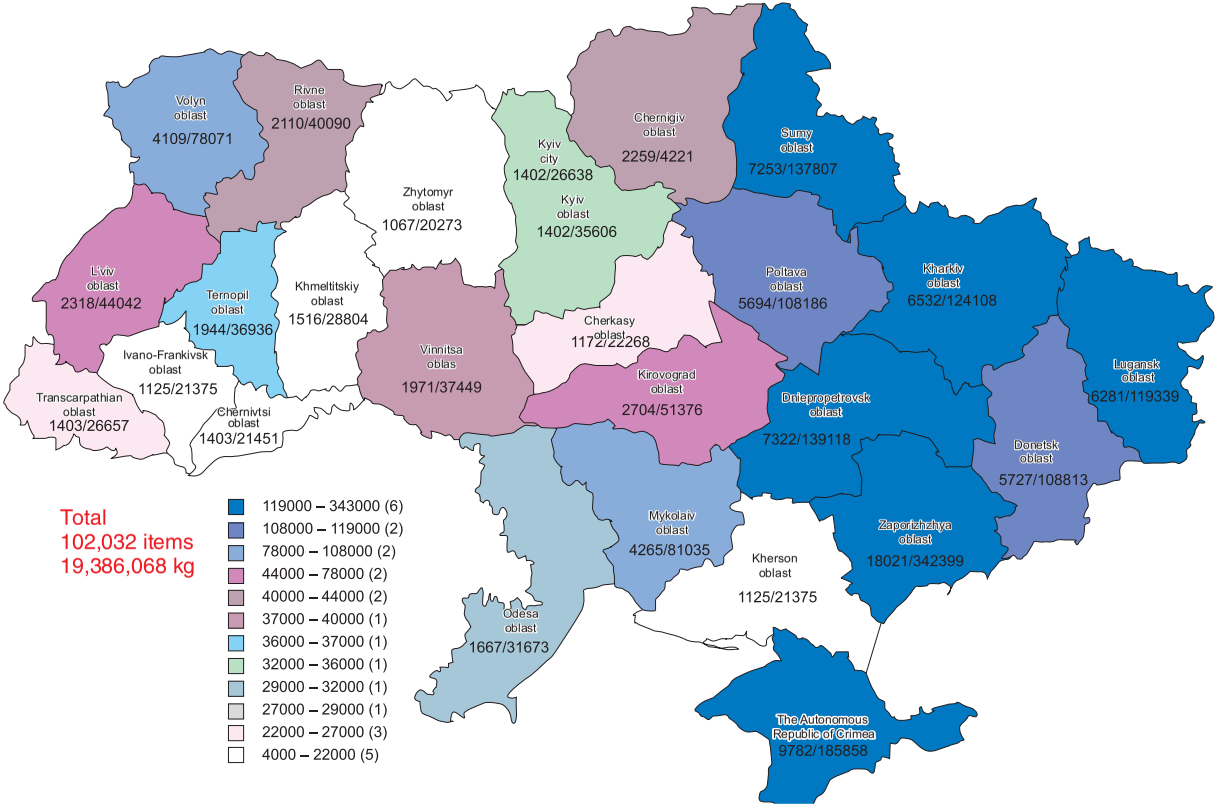


Fig. 2.4.3. Availability of synthetic liquids containing PCBs in accordance with administrative distribution revealed by inventory results, kg (by the 1st quarter of 2006)

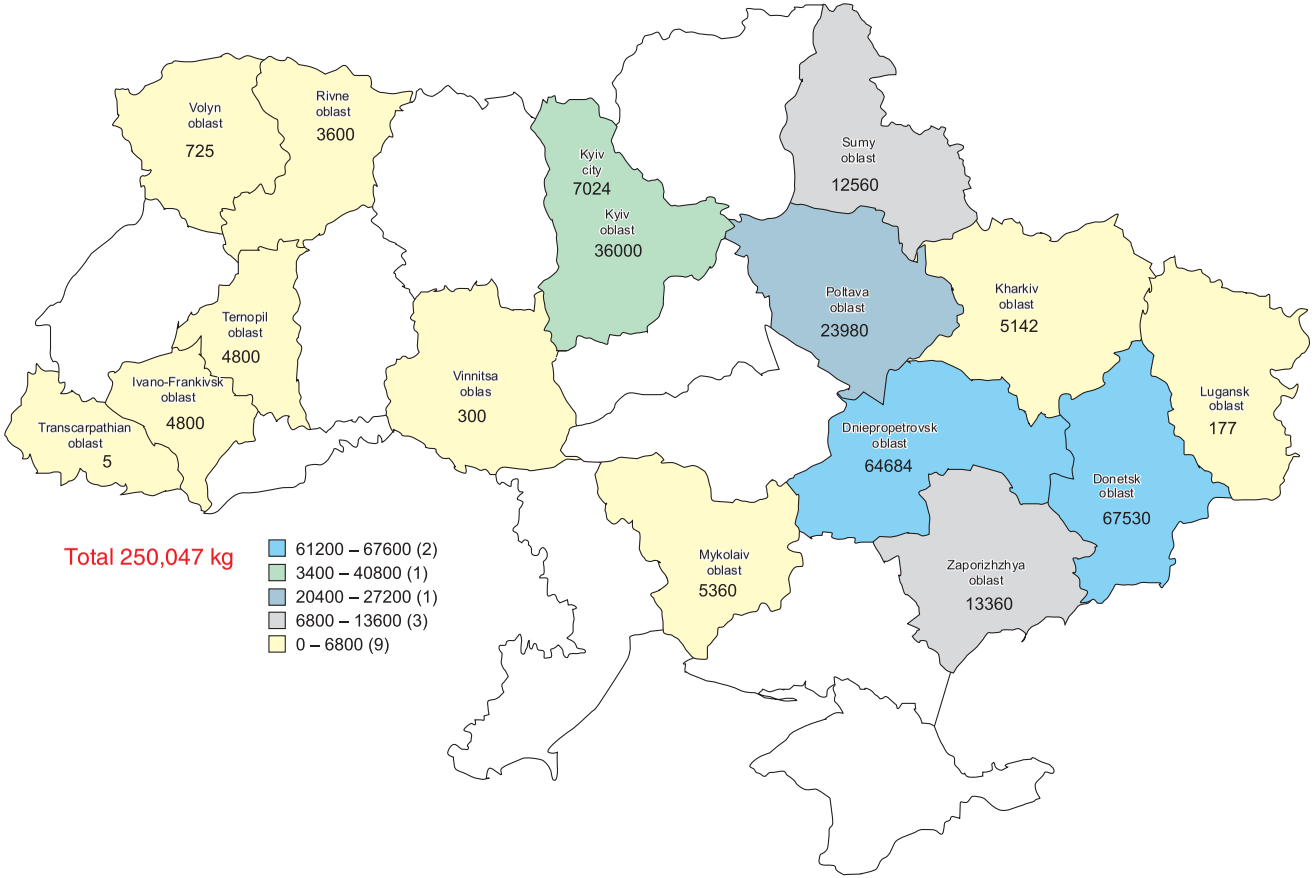
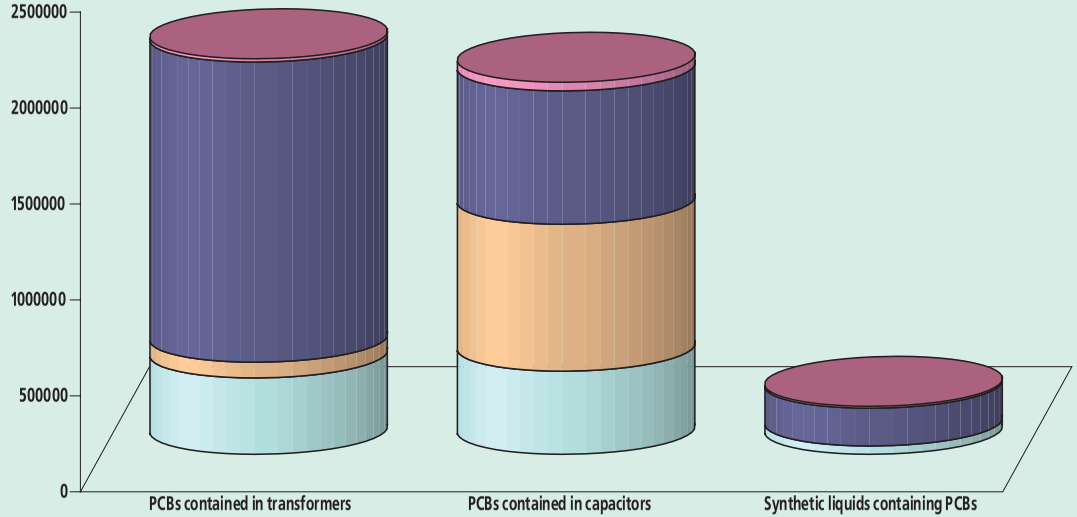


Fig. 2.4.4.

Contribution of the main economic complexes to total amount of PCBs according to inventory results (in accordance with the state by 2005), kg



	PCBs contained in transformers	PCBs contained in capacitors	Synthetic liquids containing PCBs
TRANSPORT	16845	44783	9905
INDUSTRIAL COMPLEX	1564635	695020	196776,3
FUEL AND ENERGY COMPLEX	81950	766061	0
OTHER BRANCHES	397730	432744	43366
TOTAL	2 061 160	1 938 608	250 047

It is obvious therefore that the mentioned data on the availability of PCBs and PCB-containing equipment in Ukraine shall be considered as preliminary ones, and their inventory is to be continued bearing in mind development of new methods of compiling registers.

We shall note as well that purposeful research for revelation of **PCBs-contaminated sites** determination of an extent of their contamination and implementation of the activities concerned with their management including measures for their registration and stepwise remediation has not been carried out in Ukraine until recently.

Requirements for safety management of PCBs-containing equipment, materials and wastes as well as their storage, registration, package, label etc. are restricted by general provisions concerning dangerous wastes and cannot be reckoned sufficient from this point of view. **Regulation of BAT and BEP application, procedures of remove from use production tools etc. are not used.**

Ensuring regulation of industrial and ecological safety in carrying out works connected with gathering, storage, labeling and packaging, primary processing, and transportation of PCB-containing equipment and materials as well as POPs-containing wastes are insufficient from the view-point of up-to-date scientific and technical experience. Creation of a proper system of norms, regulations, instructions and guides as well as rendering them appropriate juridical status is of great significance for successful solution of the problems concerned with implementation of the requirements of the Stockholm Convention.

There is no specific normative and technical regulation of POPs management in Ukraine, but general norms concerned with dangerous wastes developed mainly in the 1980-ies were not sufficiently systematic and they are out-dated at present and do not take into account new scientific and technical experience. Their partial revision at national level (SanPiN 2.2.7.029-99) shall not be considered successful as has been mentioned above. As to significant number of documents, problems of legal succession as well as departmental membership and control are not regulated. There is no sufficient accuracy in separation of power of authorities, especially concerned with permissive and control functions.

Thus, requirements to registration, reporting, and safety of management equipment, materials, and PCBs-containing wastes as well as their storage, etc. are restricted with general regulations concerned with dangerous waste and cannot be considered sufficient but a bit in this respect.

The following problems are outlined from generalization of the situation concerned with PCBs management in Ukraine:

- Significant extent of vagueness concerned with scales of proper tasks in the network of implementation of the requirements of the Stockholm Convention by Ukraine exists because of a lack of monitoring, purposeful registration, and measures for revelation of stockpiles of PCBs - containing equipment, materials and wastes as well as PCBs-contaminated sites, etc.
- It is rather obvious that enterprises and organizations using PCB-containing equipment and keep corresponding wastes as well as ones sites those can be contaminated **have not sufficient information** on real availability and content of POPs for proper identification and measurements have not been carried out purposefully.
- Enterprises do not conduct systematic registration of PCB-containing equipment, materials, etc. especially those out of operation, dismantled and stored. The maintenance staff **does not have information as to content of PCBs in dielectric oils** and other objects of use, losses and amounts of POPs income to the environment are not being followed and POPs contaminated sites are not being revealed.
- Technological and technical possibilities for disposal of old transformers, capacitors, other goods and POPs-containing wastes, proper regulations have not been worked out, and their stockpiles falls to general and rather indistinct requirements toward dangerous wastes.

Regu*lated requirements* as to package of PCB-containing wastes, their label, disposal and treat in case of leakages and discharge of PCB-containing oils from transformers as well as specific requirements as to reporting and control are **unavailable**, too.

It is obvious that development of the following national standards harmonized with the European Norms is advisable in the process of work for development of normative and technical base concerned with PCBs and PCB-containing equipment:

- EN 50195:1998 Norms and Regulations for Safe use of completely tight Ascarel-containing electric equipment;
- EN 50225:1998 Norms and regulations for safe use of completely tight electric equipment filled with oils that may be contaminated with PCBs;
- EN 1528-1/2/3/4:2000 Fat products. Determination of pesticides and polychlorinated biphenyls (PCBs). Part 1: General provisions. Part 2: Removal (extraction) of fat, pesticides, and PCBs, and determination of composition of fat. Part 3: Purification methods. Part 4: Determination and test for conformity with technical specifications;
- EN ISO 15318:2002 Pulp, paper, and papery produce. Determination of 7 specific polychlorinated biphenyls (PCBs);
- EN 12766-1/2:2002 (U) Mineral oils and oils being used. Determination of PCBs and similar compounds. Part 1: Extraction and determination of some substances of PCBs class with gas chromatograph using an electron capture detector. Part 2: Calculation of polychlorinated biphenyl (PCB) content.

Terms of removal of PCBs - containing equipment shall correspond to the requirements of the Stockholm Convention and shall take into account stated terms of use of this equipment.

PCB-containing synthetic liquids as well as PCB-containing equipment has not been manufactured in Ukraine but has been imported mainly from Russia.

Manufacture of PCBs as well as PCB-contained equipment in Russia stopped in 1989. Averaged term of transformers use is 28 to 30 years and that of capacitors is 24 to 25 years. Therefore PCBs - containing equipment has been used not less than 15 years (after 1989) and a great part of it has been used for a period close to endpoint term or exceeding the latter (unfortunately, exact information on this is unavailable).

The following terms of implementation of the main measures as to remove and destruction of PCBs-containing synthetic liquids and equipment have been proposed bearing in mind mentioned information:

1. To remove from use of PCBs-containing equipment till 2025 taking into consideration the following priorities:

- to identify **(till December, 2008)**, to label **(till December, 2009)** and remove from use equipment greater than 1 per cent PCBs in volumes more than 5 liters **(till December, 2025)**;
- make determined efforts to identify and remove from use equipment greater than 0.005 per cent PCBs in volumes more than 5 liters **(till December, 2025)**.

2. To provide the environmentally sound waste management for removal of liquids containing PCBs and PCB-contaminated equipment with a content above 0.005 per cent not later than **December, 2025**.

3. To provide the environmentally sound waste management for disposal of liquids containing PCBs as well as equipment contaminated with them not later than **December, 2028**.

4. To identify the PCBs contaminated sites and to provide a complex of actions for their remediation **(beginning from January, 2016)**.

2.5 ASSESSMENT OF RELEASES FROM UNINTENTIONAL PRODUCTION OF ANNEX CHEMICALS (PCDD/PCDF, HCB AND PCBS)

It is foreseen in accordance with the Article 5 as well as the Annex C of the Convention to take measures by the Parties as to reduce POPs releases from unintentionally production, namely dioxins (PCDDs), furans (PCDFs), hexachlorobenzene (HCB), and polychlorinated biphenyls (PCBs) for the purpose of their permanent minimization and, if possible, final elimination.

The Protocol on POPs, 1998 (p. 5a, Article 3, and Annex III as well) foresees reducing releases of polychlorinated dibenzo-p-dioxines (PCDDs), bibenzofurans (PCDFs), hexachlorobenzene (HCB), and polycyclic aromatic hydrocarbons (PAHs) compared to levels of releases in the first year. Annex III states 1990 as the first year or another one in the period of 1985 to 1995 inclusive that is defined at the time of ratification, acceptance, approval, or joining.

Implementation of these requirements is possible in case of introduction of effective system for management of POPs releases. Efficiency of the system depends upon availability of complete and reliable information on income of these substances to the atmospheric air and other environmental media. The first stage in creation of such a system is carrying out estimation of gross releases of PCDDs/PCDFs, PCBs, HCB, and PAHs taking into consideration categories of sources shown on fig. 2.5.1.

Ukraine has powerful industrial and agroindustrial potentials. Unfortunately, a great number of technologies and manufactures being applied are out of date and require modernization. Therefore most of the main categories of sources of releases of POPs classified in SNAP (Selected Nomenclature for Sources of Air Pollution) are available in Ukraine. SNAP is the universal system for determination of categories and subcategories of sources of pollution as well as categories of activity leading to releases of pollutant substances to the atmosphere.

It is known (the Protocol on POPs) that PCDDs/PCDFs releases generated at the time of thermal processes with organic matter and chlorine involved as a result of incomplete combustion or chemical reactions. The following can be great stationary sources of PCDDs/PCDFs releases:

- incineration of wastes, including joint incineration;
- thermal metallurgical processes, for example, manufacture of aluminum and other non-ferrous metals, cast iron, and steel;
- power plants at those some types of fuel are incinerated;
- incineration processes in domestic sector; and
- specific processes of chemical manufacture at those intermediates and by-products are generated.

Releases of HCB generated as a result of the same thermal and chemical processes at those releases of PCDDs/PCDFs take place, and HCB is generated according to the similar mechanism. The following can be great stationary sources of HCB releases:

- incineration of wastes, including joint incineration;
- thermal metallurgical processes; and
- using chlorinated fuel in ovens.

The main sources of PCBs income to the environment can be divided into the following groups:

- manufacture of PCBs and PCBs-containing products (equipment) ;
- using PCBs -containing products;
- utilization of PCBs and materials contaminated with PCBs; and
- releases from reservoirs contaminated with PCBs.

The following can be great stationary sources of PAHs releases:

- systems of heating rooms by incineration of wood and coal;
- open burning processes, for example, incineration of solid wastes, forest fires, and incineration of residual amounts of agricultural crops;
- manufacture of coke and anodes;
- manufacture of aluminum (by Sederberg process); and
- object for wood preservation.

Inventory. Inventory of sources of unintentional production of POPs was carried out in Ukraine in 2002-2004 for the purpose of estimation of gross releases of POPs produced unintentionally. This inventory was carried out taking into account recommendations of the Corinair/EMEP Guide for estimation of releases and their forecast by sources mentioned in the Guide. Guide for inventory of dioxins and furans releases proposed by UNEP, in particular, concerning direct releases and leakages of PCDDs/PCDFs to five media/materials including air, water, soils, wastes, and products (such as mixtures of chemical compounds and customer's goods, for example, textile, paper, etc.), has been taken into account, too. Estimation of averaged yearly releases of POPs from any source has been calculated using the following equation:

Yearly intensity of the source (Yearly releases of POPs) = Releases coefficient × level of activity.

Releases coefficient characterizes amount of each POP coming to the atmosphere as a result of manufacture of a unit mass (or volume) of the produce or incineration of a unit mass (or volume) of fuel (g/ton or l/ton).

Releases of PCDDs/PCDFs. Yearly releases of PCDDs/PCDFs were calculated in grams of toxicity equivalent (TEQ) per year.

Sampling and analysis for determination of amounts of releases of POPs produced unintentionally from each releases source being both time consuming and costly, inventory has been carried out using national statistical data rendered by the State Committee of Statistics of Ukraine. In particular, data of the national statistical accountability have been used rendered by the following forms:

- №1- Toxic wastes «Report on generation, use, and neutralization of toxic wastes»;
- № 1-p (yearly) «Report of enterprise on its produce»;
- № 4-mtp «Report on residual amounts and use of energetic materials and products of petroleum distillation»;
- № 11- mtp «Report on use of fuel, heat energy, and electric energy»;
- № 14- mtp «Report on use and supply of secondary raw materials and wastes of the manufacture»;
- № 2-tp (water industry) «Report on use of water»; and
- № 5-lg «Report on forest fires».

Information as to the sources of POPs releases produced unintentionally belonging to the following categories have been analyzed, too:

- Category 1 – «Waste incineration»;
- Category 2 – «Ferrous and non-ferrous metal production»;
- Category 3 – «Power generation and heating/cooking»;
- Category 4 – «Production of mineral products»;
- Category 5 – «Transport»;
- Category 6 – «Uncontrolled combustion processes»;
- Category 7 – «Production of chemicals, consumer goods»;
- Category 8 – «Miscellaneous»; and
- Category 9 – «Disposal/Landfill».

A List of initial data for the inventory of PCDDs/PCDFs releases in 1990 and 2002 is shown in table 2.5.1.

Table 2.5.1. List of initial data for the inventory of PCDDs/PCDFs releases in Ukraine in 1990 and 2002

Source Categories	Sources of information (forms for gathering statistical data)
Category 1 – «Waste incineration»	
Amounts of incineration of solid wastes	№14-mtp (partly)
Amounts of incineration of dangerous wastes	№1-toxic waste (partly)
Amounts of incineration of medical wastes	Registration unavailable
Amounts of incineration of light fraction of milled wastes	-«-
Amounts of incineration of silt residues	-«-
Amounts of incineration of wood wastes and biomass for non-energetic purposes	-«-
Amounts of incineration of animal remains	-«-
Available information on incineration of wastes in the total	
Category 2 – «Ferrous and non-ferrous metal production»	
Manufacture of iron ore agglomerate	№1-p (yearly)
Manufacture of coke	-«-
Manufacture of cast iron and steel	-«-
Foundry by types of technologies (electric arc, blast furnace, converter, etc.)	-«-
Available information on produce of ferrous and non-ferrous metallurgy in the total	-«-
Manufacture of primary and secondary copper	-«-
Manufacture of primary and secondary aluminum	-«-
Manufacture of lead	-«-
Manufacture of zinc	-«-
Manufacture of magnesium	-«-
Manufacture of grounded metals	-«-
Category 3 – «Power generation and heating/cooking»	
Statistical forms 4-mtp	№4-mtp
Category 4 – «Production of mineral products»	
Manufacture of clinker	№1-p (yearly)
Manufacture of cement by types of technologies	-«-
Manufacture of lime by types of technologies	-«-
Manufacture of brick by types of technologies	-«-
Manufacture of glass by types of technologies	-«-
Manufacture of ceramics by types of technologies	-«-
Manufacture of asphalt by types of technologies	№4-mtp
Category 5 – «Transport»	

Source Categories	Sources of information (forms for gathering statistical data)
Incineration of fuel by types of vehicles as well as by types of energy carriers	№4-mtp
Category 6 – «Uncontrolled combustion processes»	
Available information on forest fires in the total	№5-lg
Incineration of agricultural residues	Registration unavailable
Combustion of wastes at dumps	-«-
Available information on fires in the total	-«-
Category 7 – «Production of chemicals, consumer goods»	
Manufacture of cellulose by types of technologies	№1-p (yearly)
Manufacture of paper	-«-
Processing of waste paper	№14-mtp
Manufacture of non-bleached paper	№1-p (yearly)
Amount of sewage waters produced by cellulose and paper industry by types of technologies	№2-tp (water industry)
Available information on cellulose and paper industry in the total	№1-p (yearly)
Manufacture of chlorinated phenols and their derivatives	Registration unavailable
Manufacture of chlorinated aromatic compounds and their derivatives	-«-
Manufacture of chlorinated aliphatic compounds	-«-
Manufacture of chlorinated catalysts and inorganic chemical compounds	-«-
Manufacture of pentachlorophenol and sodium pentachlorophenolate by types of technologies	-«-
Manufacture of chloranil	-«-
Manufacture of chloronitrophene	-«-
Manufacture of chlorobenzene	-«-
Manufacture of chlorine by types of technologies	-«-
Manufacture of ethylene chloride	-«-
Amount of petroleum distillation	№1-p (yearly)
Amount of manufacture of produce of textile industry	-«-
Amount of manufacture of produce of leather industry	-«-
Category 8 – «Miscellaneous»	
Amount of drying fodders and biomass	Registration unavailable
Amount of cloths cleansed chemically	-«-
Number of dead persons incinerated at crematoria	-«-
Number of cigarettes smoked	№3-torg
Category 9 – «Disposal/Landfill»	
Amount of wastes at dumps	Registration unavailable
Amount of dangerous wastes at dumps	№1-toxic waste
Amount of sewage silts and their processing	«-«
Amount of composting	Registration unavailable
Amount of discharge of municipal and domestic sewage waters to open ponds	№2-tp (water industry)
Amount of removal of worked-out oils	№1-toxic waste

Information on number of objects for statistical observations (except form № 1-p (yearly)) by those information has been gathered are shown in table 2.5.2.

Table 2.5.2. Number of objects for statistical observations in 2002

Index of accountability form	Thousand items
№4-mtp	93
№11-mtp	91
№14-mtp	50
№1-toxic waste	19
№2-tp (water industry)	14
№5-lg	1
№3-torg	55

Overall data on estimation of PCDDs/PCDFs releases in Ukraine in 1990 and 2002 are shown in table 2.5.3.

Distribution of releases to different media from various categories of sources in 1990 and 2002 is shown on figures 2.5.2 and 2.5.3.

The data given show that the second («Ferrous and non-ferrous metallurgies») and the third («Production of electric and heat energy») categories of sources are principal by their contribution to the total amount of PCDDs/PCDFs releases and together compose 95% of the latter.

Table 2.5.3. Estimation of yearly releases of PCDDs/PCDFs, g TEQ

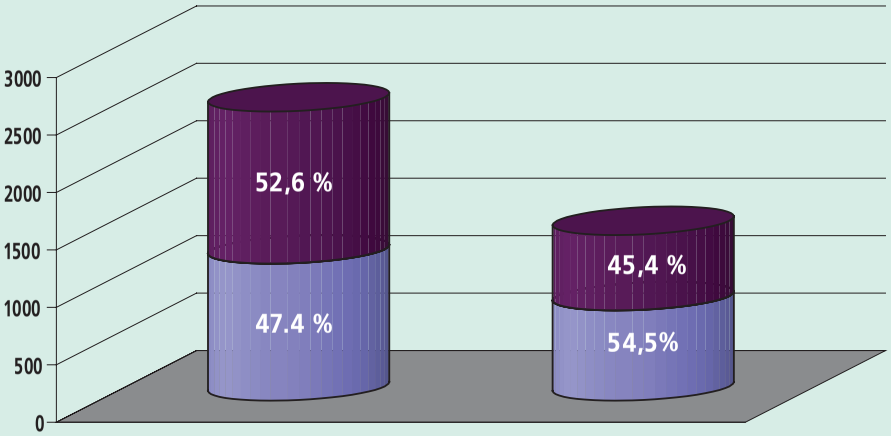
Source Categories	Annual Releases (g TEQ/a)										Total	
	Air		Water		Land		Products		Residue			
	1990	2002	1990	2002	1990	2002	1990	2002	1990	2002	1990	2002
1. Incineration of solid municipal wastes	44,000	14,692	0,0	0,0	0,000	0,000	0,000	0,000	453,2	141,8	497,2	156,5
2. Ferrous and non-ferrous metal production	1028,925	714,678	0,0	0,0	0,000	0,000	0,000	0,000	763,6	471,3	1792,5	1196,0
3. Power generation and heating/cooking	104,683	46,906	0,0	0,0	0,000	0,000	0,000	0,000	0,0	0,0	104,7	46,9
4. Production of mineral products	5,408	1,640	0,0	0,0	0,000	0,000	0,000	0,000	2,3	0,7	7,7	2,3
5. Transport	9,832	7,945	0,0	0,0	0,000	0,000	0,000	0,000	0,0	0,0	9,8	7,9
6. Uncontrolled combustion processes	0,234	0,228	0,0	0,0	0,187	0,182	0,187	0,000	0,0	0,0	0,4	0,4
7. Production of chemicals, consumer goods	0,042	0,016	0,0	0,0	0,000	0,000	0,000	0,185	104,0	41,2	104,2	41,4
8. Miscellaneous	0,004	0,006	0,0	0,0	0,000	0,000	0,000	0,000	0,0	0,0	0,0	0,0
9. Disposal/Landfill	0,000	0,000	0,0	0,0	0,000	0,000	0,000	0,000	0,0	0,0	0,0	0,0
Total by categories 1 to 9	**1193,1**	**786,1**	**0,0**	**0,0**	**0,2**	**0,2**	**0,2**	**0,2**	**1323,2**	**655,0**	**2516,5**	**1451,4**

Total annual amounts of PCDDs/PCDFs releases in Ukraine is estimated as:

- 2,516.5 g TEQ in 1990;
- 1,451.4 g TEQ in 2002

Fig. 2.5.1.

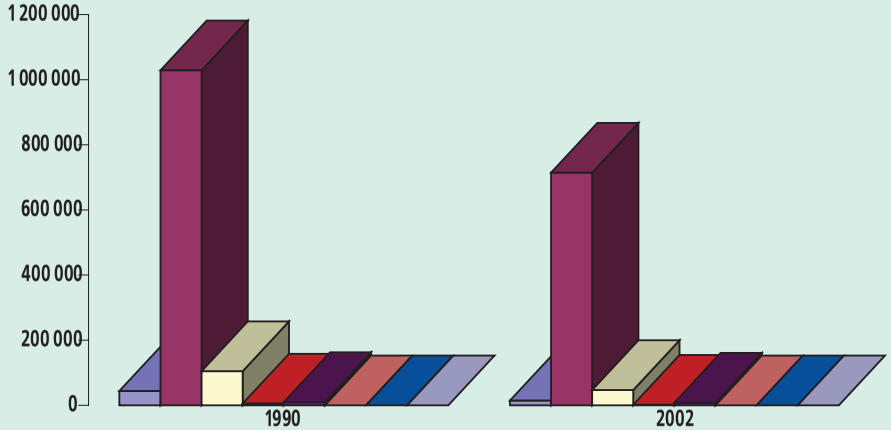
Estimation of yearly emissions of PCBDs/PCBFs to environmental objects and waste products in 1990 and 2002, g TEQ



	1990	2002
WASTE PRODUCTS	1323,2	655
FOODSTUFF	0,2	0,2
SOIL	0,2	0,2
WATER	0	0
AIR	1193,1	786,1
TOTAL	2516,5	1441,4

Fig. 2.5.2. Estimation of yearly releases of PCDDs/PCDFs to environment and wastes in 1990 and 2002, g TEQ

Distribution of PCBDs/PCBFs emissions to air by various categories of sources in 1990 and 2002, g TEQ



	1990	2002
1. INCINERATION OF SOLID DOMESTIC WASTE PRODUCTS	44 000	14 692
2. FERROUS AND NON-FERROUS METALLURGIES	1 028 925	714 678
3. PRODUCTION OF ELECTRIC AND HEAT ENERGY	104 683	46 906
4. MANUFACTURE OF MINERAL PRODUCTS	5 408	1 640
5. TRANSPORT	9 832	7 945
6. NON-CONTROLLED COMBUSTION PROCESSES	0,234	0,228
7. MANUFACTURE OF CHEMICAL PRODUCE	0,042	0,016
8. MISCELLANEOUS	0,004	0,006
TOTAL	1193,1	786,1

Releases of HCB and PCBs. The following sources of unintentional releases of HCB and PCBs are ascribed to the most significant ones according to the Stockholm Convention on POPs:

1. Waste incinerators, including co-incinerators of municipal, hazardous or medical wastes or of sewage sludge;
2. Cement kilns for hazardous wastes incineration;
3. Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching;
4. The following thermal processes in the metallurgical industry:
    4.1. Secondary copper production;
    4.2. Sinter plants in the iron and steel industry;
    4.3. Secondary aluminum production;
    4.4. Secondary zinc production.

These categories are similar to those considered above concerned with PCDDs/PCDFs releases, that is an information as to amounts of manufacture necessary for calculation of HCB and PCBs releases is available.

Unintentional production and releases of HCB and PCBs as well as those of PCDDs/PCDFs can take place in the sources of the following categories:

1. Open burning of wastes, including burning at landfill sites;
2. Thermal processes in the metallurgical industry not mentioned in Part II;
3. Residential combustion sources;
4. Fossil fuel-fired utility and industrial boilers;
5. Firing installations for wood and other biomass fuels;
6. Specific chemical production processes accompanied by releasing unintentionally formed persistent organic pollutants, first of all production of chlorophenols and chloranil;
7. Crematoria;
8. Motor vehicles, particularly those burning leaded gasoline;
9. Destruction of animal carcasses;
10. Textile and leather dyeing (with chloranil) and finishing (with alkaline extraction);
11. Shredder plants for the treatment of end of life vehicles;
12. Smouldering of copper cables;
13. Waste oil refineries.

This is complete list of potential sources of PCBs and HCB releases. At the same time, results of research as to the determination of releases coefficients for these sources are rather confined till now.

Principal sources of income of PCBs releases to environment can be divided into 4 groups:

1. Manufacturing of PCBs and PCBs-containing products (equipment);
2. Using PCBs- ontaining products;
3. Utilization of PCBs and PCBs-containing products;
4. Releases from reservoirs contaminated by PCBs.

Marketable PCBs and products containing them are not manufactured in Ukraine presently, but they were formerly used in a wide range of applications – in closed systems (as dielectric liquids in capacitors and transformers, in hydraulic and chilling equipment, and cables) as well as plasticizers, and in manufacturing of paints (open application). Estimation of income of PCBs from closed systems requires thorough inventory of PCB-containing equipment, research of its condition, and detailed information on PCBs behavior in the environment.

Estimation of PCBs releases from electric equipment has been performed on the basis of the results of implementation of the Project of UNEP and the MENRU concerned with PCBs inventory in Ukraine.

Research done at a number of Russian and Belorusian enterprises as well as analysis of proper information sources allow estimation of PCBs losses (leakages) from functioning equipment. They comprise 0.3 kg/ton for transformers and 2 kg/ton for capacitors.

But it is not all the flown out PCBs that evaporate. It was assumed on the basis of the results of research works having been carried out that specific exhaust of PCBs are 0.06 kg/t for transformers and 0.8 kg/t for capacitors.

PCBs and HCB releases from household wastes incineration

Incineration of solid domestic wastes (SDWP) is principal method of their disinfection. Goals of incineration lie in decreasing amount of SDWP, extermination of pathogenic micro-flora under the influence of high temperatures, and destruction and oxidation of organic substances.

This mode is not widely spread in Ukraine unlike western countries. Four plants for incineration of household wastes have been built in Ukraine before gaining independence by it – in Kyiv, Sevastopol, Kharkiv, and Dniepropetrvsk cities. Total design capacity of the four Ukrainian plants for incineration of household wastes was 1.2 mln. tons wastes per year that is 12% of their gross amount. Two of the plants have already been closed.

Household wastes are low caloric fuel in thermal technologies. As is known, efficiency of incineration depends on caloric value of the fuel. That of household wastes varies in wide range for it depends on a number of factors. For example of whether it has been gathered in winter or in summer. But the system by that household wastes are gathered influences it to the greatest extent.

Wastes are gathered without preliminary treatment in Ukraine, whereas it is formed by way of separate gathering, sorting, and separation in the West. As a result of this, caloric value of «Ukrainian» household wastes are 1200 to 1600 kcal/kg, but that of «western» one is 2300 to 2400 kcal/kg. This fact has not probably been paid attention when purchasing furnaces for incineration of household wastes. Thus, a number of plants for incineration of household wastes have been built and equipped with furnaces manufactured by ChKD «Dukla» plant (Czechoslovakia) designed for incineration of «western» waste. But the system of gathering of household wastes remained «old» that is no treatment of the latter has been foreseen. As a result of this, furnaces have been charged with fuel caloric value of that was almost two times lower than was designed. Both economical and ecological performance of the process decreases because of this.

For example, capacity of Kiev plants for incineration of household wastes «Energiya» is 1.75 times lower compared to the designed value (200 instead of 350 tons per year). Other economical performance of the plant is reduced, too. High humidity of "Ukrainian" household wastes increases consumption of air for its drying. Excess of air in the furnace increases because of this, and performance coefficient decreases, respectively. Plenty of natural gas is consumed additionally for highlighting, and treatment rises in price because of this, too.

Another negative consequence of incineration of «Ukrainian» household wastes in «western» furnace lies in the fact that it is practically impossible to maintain necessary temperature (about 850°C) in the fire-chamber when using a fuel of low grade. Elevated amounts of greenhouse gases and harmful substances are discharged to the atmosphere as a consequence of this.

Research works for increasing efficiency of functioning available furnaces for household wastes incinerators are being conducted in Ukraine.

Electrostatic filters having designed purification coefficient of smoke fumes and dust 97.6% to 99% are used for purification. Old-fashioned installations for incineration of household wastes are not equipped with systems for second purification stage. We shall consider efficiency of purification 98% taking into consideration exhaustion of the equipment including filters.

Information on functioning «Energiya» of «Kyivenergo» association is given below.

1. «Energiya» plant is equipped with four boiler aggregates manufactured by ChKD «Dukla»plant each having incineration capacity of 15 tons per hour. Fire-chamber volume of them is supplied with six-roller cylinder fireguard of «Düsseldorf» system.

2. Each boiler aggregate is equipped with electrostatic filter for purification of smoke fumes from ashes dust according to design documentation for building of the plant.

3. Amounts of thermal treatment (incineration) of wastes in 2002 are shown in table 2.5.4.

4. «Energiya» plant does not perform thermal processing of medical waste, silt residue, and other dangerous wastes.

Table 2.5.4. Amounts of thermal treatment of wastes in 2002

Source Categories	Amount treated, tons
Waste treated altogether	178475,811
Including	
Solid domestic wastes (housing sector)	167972,400
Wastes of manufacturing and servicing	10503,411
Including medicines and perfumery produce	21,538

Dniepropetrovsk plant for incineration of household wastes declared amount of wastes incinerated in 2002 to be 96.527 tons.

Other two enterprises performing incineration of wastes have been revealed.

«Elga» enterprise (Shostka town, Sumy region) rendered the following information as to destruction of wastes in 2002 (they are treated by many-contour pyrolysis with catalytic after-burning of exhaust gases and gas purification system).

1. Medical wastes – 233.1 tons.
2. Pesticides – 126.9 tons.
3. PCBs wastes – 50.8 tons. and
4. Package and wood wastes – 958 tons.
5. Total – 1,368.8 tons.

Incineration of medical wastes is carried out at «Kyiv crematorium» enterprise as well in the amount of 35.6 tons (2002).

Total amount of solid wastes in Ukraine was 276,407.211 ths. tons in 2002.

Measurements performed in Czech Republic and Slovakia having similar lines for incineration and are expedient for use in determination of releases coefficients.

Releases coefficient of 5 mg of PCBs per ton of wastes is recommended to be assumed taking into consideration regime of functioning equipment and unavailability of household wastes separation.

Figures on the amount of medical and industrial wastes incinerated in Ukraine are confined. Information is available that incineration has not gained wide application in Ukraine as a method of utilization of medical and dangerous biological wastes although it takes place here and there. There are no powerful industrial plants for centralized incineration of industrial wastes in Ukraine. Large-scale incineration of industrial wastes in cement kilns is not conducted, too. At the same time, some enterprises exploit small installations for incineration of intrinsic wastes. At last, there is no information on incineration of residues developed from sewage water.

Thus, PCBs releases caused by incineration of household wastes are estimated as 1.38 kg.

Releases coefficient of HCB is reckoned 2 g per ton of waste, and calculated amount of HCB releases is 552.8 kg.

Releases of PCBs and HCB from incineration of fuel by the population

Heat generated at the time of incineration of biomass (predominantly firewood) is used rather widely for heating and food preparation. POPs are generated as a result of partial combustion, mainly in small incineration installations when control equipment is not available.

Coal, black oil, and domestic heating oil are widely used for heating and food preparation in Ukraine, too.

Consumption of firewood by the population in 2002 was 2,437,613 compact cubic meters or 1,828,209.75 tons. 2,097,109 tons of coal, 42,310 tons of brown coal, 2,544.4 tons of fuel oil, and 737 tons of domestic heating oil were consumed in Ukraine for the same period.

Table 2.5.5 contains information as to amounts of PCBs and HCB releases in this category of sources as well as releases coefficients (EC) rendered in the draft new guide proposed for use by the Secretariat of the Stockholm Convention.

Table 2.5.5. Releases amounts and coefficients of PCBs and HCB from incineration of fuel by the population

Fuel	EC for PCBs, kg/ton	Releases of PCBs, kg	EC for HCB, kg/ton	Releases of HCB, kg
Firewood	0,000005	9,14	0,00000006	0,11
Coal	0,000018	37,75	0,000000125	0,26
Brown coal	0,00001	0,42		
Liquid fuel	0,00001	0,03		
Total		**47,34**		**0,37**

There is no enough data as to trustworthy EC for PCBs and HCB releases for other categories of unintentional releases. Therefore research works should be conducted in the future purposed to determination and normative approval of substantiated values of unavailable EC for various sources.

Table 2.5.6 contains overall data as to estimation of total releases of PCBs and HCB caused by their unintentional production in 2002.

Assessment of PAHs releases

Assessment of PAHs releases in 1995 and 1997 for the states of CIS including Ukraine has already been done by EMEP experts. Data given below are estimates PAHs releases in Ukraine in 1995, 1999, and 2002. They were done for revelation of tendencies of their changes compared to previous years. 2002 was taken as the last year for estimation.

EC were reckoned in accordance with table 2.5.7 at the time of estimation of indicative PAHs releases. Statistical data on incineration of various types of fuel in different branches of economics, manufacture of some types of produce, and their consumption have been considered using first of all statistical Ukrainian year-books as well as reports of «TEKT» firm, data rendered by enterprises (partly), and Internet sites [http://archives.epu.kiev.ua/, http://www.8129.ukrindustrial.com/, http://www.altera-finance.com/doc/memoenergosplav1.pdf/, and others].

Table 2.5.6. Assessment of total releases of PCBs and HCB in 2002, kg

Source Categories	Amount of the substance to generate releases, tons	Coefficient of PCBs leakages	Coefficient of PCBs releases	Coefficient of HCB releases	Leakages of PCBs, kg	Releases of PCBs, kg	Releases of HCB, kg
1. Capacitors	1774,125[1)]	2 kg/ton	0.8 kg/ton	-	3548,25	2,84	-
2. Transformers	2000,0[1)]	0.3 kg/ton	0.06 kg/ton	-	600,00	0,04	-
3. Incineration of wastes	276407211,0	-	5 mg/ton	2 g/ton	-	1,38	552,8
4. Incineration of firewood by the population	1828210,0	-	5 mg/ton	0.06 mg/ton	-	9,14	0,11
5. Incineration of coal by the population	2097109,0	-	18 mg/ton	0.125 mg/ton	-	37,75	0,26
6. Incineration of brown coal by the population	42310,0	-	10 mg/ton	-	-	0,42	-
Total	**4148,25**	**51,57**	**553,17**				

Note. [1)] Amount of PCBs - containing capacitors and transformers has been calculated on the basis of data by the state of 2003 concerned with revealed number of capacitors (93,375 items) and transformers (1,180 items) as well as averaged PCBs content of 19 kg per capacitor and 1,695 kg per transformer. Upon obtaining more correct information in 2004 and 2005 the data is shown concerned with number of PCBs-containing electrotechnical equipment as well as the total amount of PCBs have been corrected.

Table 2.5.7. Emission factors of indicative PAHs from unintentional production

Source Categories	SNAP	Emission factors of indicative PAHs, mg/ton			
		Benzo(b) fluoranthene	Benzo(k) fluoranthene	Benzo(a) pyrene	Indeno (1,2,3-c,d) pyrene
Stationary incineration of fuel	01+02+03				
Incineration in production and transformation of energy	010000				
Coal		18	9,2	9,2	14
Black oil		8,6	3,9	4,3	8,6
Gas, mg/1000 m^3		2,1	2,1	1,5	2,1
Incineration by population, in housing and communal services, and other branches	020000				
Coal		3600	1400	2000	1200
Firewood		10300	2700	5000	2500
Peat		1600	400	800	400
Black oil		8,6	3,9	4,3	8,6
Other liquid fuels		8,6	3,9	4,3	8,6
Other solid fuels		2600	900	1400	800
Incineration in industry	030000				
Coal		1080	420	600	360
Firewood		3090	810	1500	750
Peat		480	120	240	120
Black oil		8,6	3,9	4,3	8,6
Other liquid fuels		8,6	3,9	4,3	8,6
Other solid fuels		1550	450	780	410
Production processes	03+04				
Ferrous metallurgy					
Agglomerate manufacturing	030301	-	-	-	-
Coke manufacturing	010406	250	150	500	250
Blast furnace manufacturing	030302	-	-	-	-
Electric steel melting manufacturing	040207	0,07	0,05	0,02	0,02
Cast iron founding manufacturing	030303	0,0014	0,00118	0,000129	0,00158
Non-ferrous metallurgy					
Aluminum production	030310	0,0371	0,0095	0,005	0,0016
Cement production (wet mode, coal)	030311	1,61	-	13,7	2,25
Asphalt concrete production	030313				
Treatment and stockpiling of wastes	090000				
Incineration of domestic wastes	090201	-	-	117	-
Mobile sources	07+08				
Petrol		322	138	230	230
Diesel oil		434	186	310	310

The Results of emissions assessment of indicative PAHs from unintentional production in Ukraine are shown in tables 2.5.8 and 2.5.9 (overall by Source Categories).

Table 2.5.8. Results of emissions assessment of indicative PAHs from unintentional production in Ukraine

Source Categories	SNAP	Emissions of indicative PAHs, kg/year			
		Benzo(b) fluoranthene	Benzo(k) fluoranthene	Benzo(a) pyrene	Indeno (1,2,3-c,d) pyrene
Stationary incineration of fuel Incineration in production and transformation of energy	01+02+03 010000				
Coal					
1995		915	467	467	711
1999		935	478	478	727
2002		964	493	493	750
Black oil					
1995		35,389	16,049	17,695	35,389
1999		10,767	4,883	5,384	10,767
2002		4,945	2,243	2,473	4,945
Gas					
1995		30,2	30,2	21,6	30,2
1999		23	23	16,4	23
2001		23	23	16,4	23
Incineration by population, in housing and communal services, and other branches	020000				
Coal					
1995		44010	17115	24450	14670
1999		33876	13174	18820	11292
200		26208	10192	14560	8736
Black oil					
1995		17520	4593	8505	4253
1999		17757	4655	8620	4310
2002		23793	6237	11550	5775
Gas					
1995		181	45	90	45
1999		93	23	46	23
2002		112	28	56	28
Black oil					
1995		9,795	4,442	4,898	9,795
1999		2,855	1,295	1,428	2,855
2002		1,858	0,842	0,929	1,858
Other liquid fuels					

Source Categories	SNAP	Emissions of indicative PAHs, kg/year			
		Benzo(b) fluoranthene	Benzo(k) fluoranthene	Benzo(a) pyrene	Indeno (1,2,3-c,d) pyrene
1995		0,490	0,222	0,245	0,490
1999		0,533	0,242	0,267	0,533
2002		-	-	-	-
Other solid fuels					
Incineration in industry	030000				
Coal					
1995		23522	9148	13068	7841
1999		20034	7791	11130	6678
2002		24797	9643	13776	8266
Firewood					
1995		389	102	189	95
1999		399	104	194	97
2002		473	124	230	115
Peat					
1995		-	-	-	-
1999		-	-	-	-
2002		-	-	-	-
Black oil					
1995		15,170	6,880	7,585	15,170
1999		4,618	2,094	2,309	4,618
2002		2,107	0,956	1,054	2,107
Other liquid fuels					
1995		5,848	2,652	2,924	5,848
1999		0,077	0,035	0,039	0,077
2002		0,172	0,078	0,086	0,172
Other solid fuels					
Production processes Ferrous metallurgy	03+04				
Coke manufacturing	010406				
1995		3750	2250	7500	3750
1999		4200	2520	8400	4200
2002		4620	2772	9240	4620
Electric steel melting manufacturing	040207				
1995		0,091	0,065	0,026	0,026
1999		0,096	0,069	0,027	0,027
2002		0,121	0,086	0,035	0,035
Non-ferrous metallurgy					
Aluminum production	030310				
1998		0,0086	0,0022	0,0012	0,0004
2000		0,0143	0,0037	0,0019	0,0006
2001		0,0118	0,0030	0,0016	0,0005
Cement production (wet mode, coal)	030311				
1995		12,279	-	104,490	17,161
1999		9,383	-	79,844	13,113
2002		11,523	-	98,051	16,103

Source Categories	SNAP	Emissions of indicative PAHs, kg/year			
		Benzo(b) fluoranthene	Benzo(k) fluoranthene	Benzo(a) pyrene	Indeno (1,2,3-c,d) pyrene
Treatment and stockpiling of wastes	090000				
Incineration of domestic wastes	090201	-	-	105,3	-
Mobile sources	07+08				
Petrol					
1995		1281	549	915	915
1999		1135	486	811	811
2002		1152	494	823	823
Diesel oil					
1995		2000	857	1429	1429
1999		1285	551	918	918
2002		1399	600	999	999

Table 2.5.9. Results of emissions assessment of indicative PAHs from unintentional production in Ukraine by Category of source

Category of source	SNAP	Emissions of indicative PAHs, kg/year			
		Benzo(b) fluoran-thene	Benzo(k) fluoran-thene	Benzo(a) pyrene	Indeno (1,2,3-c,d) pyrene
Total in Ukraine					
1995		93677	35187	56772	33823
1999		79765	29814	49523	29111
2002		83562	30610	51951*	30160
Stationary incineration of fuel	01+02+03				
Incineration in production and transformation of energy	010000				
1995		980,6	513,2	506,3	776,6
1999		968,8	505,9	499,8	760,8
2002		991,9	518,2	511,9	777,9
Incineration by population, in housing and communal services, and other branches	020000				
1995		61721,3	21757,7	33050,1	18978,3
1999		51729,4	17853,5	27487,7	15628,4
2002		50114,9	16457,8	26166,9	14540,9
Incineration in industry	030000				
1995		23932,0	9259,5	13267,5	7957,0
1999		20437,7	7897,1	11326,3	6779,7
2002		25272,3	9768,0	14007,1	8383,3
Production processes	03+04				
1995		3762,4	2250,1	7604,5	3767,2
1999		4209,5	2520,1	8479,9	4213,1
2002		4631,7	2772,1	9338,1	4636,1

Category of source	SNAP	Emissions of indicative PAHs, kg/year			
		Benzo(b) fluoran-thene	Benzo(k) fluoran-thene	Benzo(a) pyrene	Indeno (1,2,3-c,d) pyrene
Including					
coke manufacturing	010406				
1995		3750	2250	7500	3750
1999		4200	2520	8400	4200
2002		4620	2772	9240	4620
Treatment and stockpiling of waste	090000				
Incineration of domestic wastes	090201				
2002			-	105,3	
Mobile sources	07+08				
1995		3281	1406	2344	2344
1999		2420	1037	1729	1729
2002		2551	1094	1822	1822

* – incineration of domestic wastes included

Overall data as to contribution of various category of source to total emissions of indicative PAHs in 2002 are shown in table 2.5.10.

Table 2.5.10. Contribution of various category of source to total emissions of indicative PAHs in 2002, %

Category of source	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Benzo(a) pyrene	Indeno(1,2,3-c,d) pyrene
Stationary incineration of fuel, including:	**91,4**	**87,4**	**78,4**	**78,6**
Incineration in production and transformation of energy	1,2	1,7	1,0	2,6
Incineration by population, in housing and communal services, and other branches	60,0	53,8	50,3	48,2
Incineration in industry	30,2	31,9	27,0	27,8
Production processes, including	**5,5**	**9,0**	**18,0**	**15,4**
coke manufacturing	5,5	9,1	17,8	15,3
Treatment and stockpiling of wastes	-	-	0,2	-
Mobile sources	3,1	3,6	3,5	6,0
TOTAL, %:	**100,0**	**100,0**	**100,0**	**100,0**
TOTAL, tons:	**83,562**	**30,610**	**51,950**	**30,160**

Conclusions by the results of assessment of indicative PAHs emissions in Ukraine

According to the results of estimation, emissions of indicative PAHs in Ukraine in 2002 in all the categories of sources were 196.283 tons, including 83.562 tons of benzo(b)fluoranthene, 30.610 tons of benzo(k)fluoranthene, 51.95 tons of benzo(a)pyrene, and 30.160 tons of indeno(1,2,3-c,d)pyrene.

Principal category of sources of releases of indicative PAHs in Ukraine is stationary fuel incineration in low power installations, especially that performed by population, housing and communal services, and industry. Contribution of this category by separate indicative PAHs varies from 78.4% to 91.4% of total releases. Coke production is the second of the most important sources of releases. Releases of benzo(a)pyrene produced by this source reached 17.8% of total releases in 2002.

We shall pay attention to the fact that data concerned with PAHs releases at the time of stationary incineration of all the categories of fuels are not available even in the latest version (2002) of the European Guide for the inventory of releases to the atmosphere CORINAIR. Data concerned with their releases in coke production are available in this Guide.

Releases from treatment and stockpiling of wastes have been rendered insufficiently by the results of estimation. Incinerations of industrial and medical wastes as well as open incineration of wastes have not been taken into consideration because of unavailability of information on emission factors as well as statistical and other information. Incineration of domestic wastes has been taken into consideration but partly (that performed at the plants for incineration of household wastes).

2.6 SUMMARY OF METHODS AND TECHNOLOGIES FOR POPS DESTRUCTION

Attention is paid to the following moments in the Stockholm Convention concerned with a choice of the best available methods (technologies):

- terms of introduction of proper installations to use;
- time necessary for introduction of such the method;
- amount of consumption of raw materials necessary for concrete process;
- energetic efficiency of the process;
- necessity of prevention and minimization of joint influence of releases on environment;
- necessity of prevention of accidents; and
- availability of similar processes or installations having been introduced successfully in the industry.

These accents are not casual and shall be considered as proper warnings first of all for the countries have just joined to the process of the Stockholm convention and being at an initial stage of creation of the national system for POPs management at real ground. Some more conditions significant in the framework of estimation of technological efficiency can be added to the mentioned list, namely:

- level of mastering of technologies from the view-point of global experience and availability of domestic conditions of their industrial implementation;
- possibility of using available equipment or other one produced serially in integration of technological chain;
- reliability in use and simplicity of servicing;
- stability of the process by qualitative and quantitative parameters irrespective of change of inlet concentration of pollutant substances;
- regime characteristics as to temperature, pressure, aggressiveness of the medium making additional demands to apparatus mounting; and
- qualification level of maintenance staff.

A whole system of methods and technologies for destruction of PCBs and other POPs has been formed in the global practice. They are characterized with various spreading, and their choice depends on experience available in proper country, tasks stated, and types of materials liable to destruction. In general, the following methods are known:

- reaction of high temperature oxidation (thermal destruction) that is realized: -
  in available industrial heat aggregates,
  – in special (stationary and rotating) stoves,
  – in plasma installations (plasmotrones),
  – in melts of salts and metals,
  – in rocket engines; and
  – reaction of catalytic oxidation;
- reaction of ozonization;
- pyrolysis (followed with after-burning including catalytic and plasma ones);
- hydrogenolysis reaction (destruction with hydrogen) realized by thermal, catalytic, and chemical (reagent) methods;
- aerosol catalysis reaction.

But the list is not limited to this. Reaction of electrochemical oxidation occurring at low temperatures, reaction of supercritical water oxidation at high pressure and temperature, and that of dechlorination catalyzed with alkali using polyethylene glycol as well as biotechnological methods, etc. can be added to the mentioned above.

Extent of readiness and approbation of technical and economical decisions as to the mentioned technologies is quite different and have significant distinctions by capital and maintenance discharges. Not all of them have been brought to the state suitable for industrial introduction. Particularly, ozonization technology is at a research stage, and reactions of catalytic oxidation and pyrolysis have been tested insufficiently. Technology developed and realized at «Elga» Ltd. (Shostka town, Ukraine) purposed first of all to PCBs and obsolete pesticides and having productivity of 750 tons per year is a version of pyrolysis method.

Hydrogenolysis technology shall be considered separately. It suits in general not only criterion of ecological efficiency but most of technological and economical requirements listed above. This technology is applied for destruction of liquids containing PCBs, oils, chloroorganic pesticides as well as capacitors, and purification of contaminated soils (according to Australia's experience) that is rather an universal one. But hydrogenolysis process is based on high technology equipment that is not only expensive but the one to demand highly qualified supervision and control. These conditions as well as some other ones do not allow considering hydrogenolysis technologies as possible real alternative to a solution of the POPs problem in Ukraine at the initial stage.

Thus, thermal destruction methods including plasma ones are priority-driven methods for consideration. They are the most widely used in the global practice and gained highly diverse technological and apparatus implantation. They are characterized in the primary amount with relative simplicity and compatible with a number of processes and installations used industrially. But these methods cannot be considered universal as to all the aspects of the problem of POPs. This is concerned with PCBs in particular spread in great amounts of soils, sludge, and water. Solution of the proper problem basing on the methods of hydrogenolysis, catalytic oxidation, and thermal destruction is obviously irrational because of extremely high maintenance charges. Biotechnologies attract attention in this respect.

Specific requirements to thermal technologies of POPs neutralization are concerned with objects of neutralization. Technical oils containing POPs, transformers, capacitors, containers, and some other equipment can be ascribed to their main categories. Specialization of methods of thermal POPs

destruction (their apparatus and technological mounting) has been formed in the global practice according to some tasks although they are universal in general concerned with the nature of the substances to be neutralized. The facts mentioned above do not exclude possibility of creation of technological complexes combining neutralization of various categories of materials containing POPs as well as processes of purification of contaminated equipment, etc.

Solution of the problem of priority should foresee possibility of creation of both stationary and mobile installations for neutralization of materials containing POPs. Necessity in mobile installations is caused by extreme dispersion of objects containing POPs in Ukraine, relatively small amounts of POPs at each of these objects, and unavoidable difficulties in coordination of building of installations for neutralization of POPs with regional authorities.

As is mentioned above, oxidation methods of thermal destruction of POPs can be realized both by a way of creation of special equipment (stoves, reactors, plasmotrones, etc.) and on the basis of heat aggregates having suitable parameters being exploited industrially.

Using heat aggregates available in the industry (first of all cement kilns, blast-furnaces, stoves for melting lime, and some others) is the most attractive from the economical point of view. They ensure temperature and duration of being in the reaction zone necessary for destruction of POPs as well as binding of acidic reaction products with carbonate materials (limestone, chalk, or marl being a component of the charge in manufacture of cement, and limestone fluxes in blast-furnace process). These methods of POPs destruction including obsolete pesticides found application in many countries. Additional introduction of fuel to the reactive zone is not necessary at that, on the contrary, some its economy is ensured.

Over 60 cement kilns have been adapted in general for incineration of various wastes in some countries, first of all in the USA and Canada. Some limitations have been introduced by Food Agricultural Organization (FAO) according to an experience of their use, but FAO does not recommend incineration of pesticides and wastes containing chlorine in cement kilns only in some cases. Limitation is concerned with low productivity installations not equipped with scrubbers that is without purification of gases as well as low productivity ones equipped with them. Some warnings are made as to old type of cement kilns. At the same time, possibility of further spread of attendant incineration of dangerous wastes in cement kilns is under consideration in some industrially developed countries.

In addition: secondary fuel materials in general make significant part at cement plants located in the Western Europe. Particularly, part of secondary fuel materials is 30% to 83% at the plants of HeidelbergCement Concern that occupies the third place in the world by the volume of cement manufacturing. Paper wastes, residues of sewage waters, anode dust, worked-out glycols, paper and plastic pellets, and waste residues of diluters are among them.

Varnish-and-paint wastes, waste glue, ink, pitches, and oils as well as waste petrochemicals, gum, and latex, plastic package, etc. are parts of «Resofuel» combustible for cement kilns. High temperature in the kilns (1450°C) in agglomeration zone, and duration of contact over 5 seconds lead to almost complete neutralization of the most harmful wastes including chloroorganic ones.

Cement plants secure significant additional payment for utilization of each ton of fuel components. «HeidelbergCement» plans starting use of secondary fuel materials at Ukrainian plants (at OJSC «Dnieprocement» and OJSC «Kryvyi Rig Cement»). We accent on the system of additional payments for use (in fact – destruction) of wastes as economical mechanism that can be introduced in hazardous wastes management.

Work-out and wide discussion of the mentioned problems were carried out at the time of an implementation of Ukrainian-Danish project for obsolete pesticides. Objects (plants) for conduction of preliminary experiments have been chosen, but a lack of will and expenses as well as objection of

some public organizations prevented their implementation. At the same time, problems of OP, PCBs, and POPs in the whole by their scales in Ukraine, especially taking into consideration financial potencies of both the state and enterprises demands search of technological decisions to consider available industrial potential of the country in the solution of the POPs problem. Naturally, ecological requirements shall be observed at that. Such a potential applies first of all metallurgical and cement branches.

In addition metallurgy is one of the basic branches of the national economic complex. 14 metallurgical, 3 ferroalloy, and 13 merchant-coke plants are functioning in it. 48 blast-furnaces, 54 open-hearth furnaces, 19 converters, 23 electric ovens for steel melting, and 2 workshops for electric re-melting of cinder are being exploited at metallurgical enterprises. 68 coke batteries are available in chemical-recovery manufacture.

Reconstruction of one of the greatest blast-furnaces in the Europe (№9) was done at «Krivorozhstal» plant in 2003. Metallurgical branch in general consumes up to 20% of electric energy and 12% of gas from the whole demands of the national economy.

In addition there were 15 cement plants in «Ukrcement» Association in 2004. Owners of seven of them are foreign companies, but owners of eight of them are domestic ones. Production capacity of all the plants is 20 mln. tons of produce per year. Manufacture of cement was 8.5 mln. tons in 2003, yearly consumption of electric energy was 1.07 bln. kW·h, and that of natural gas was 1 bln. cubic meters. Almost all the plants work by «wet» technology, but only two plants work by «dry» technology.

Equipment available at the plants is morally out of date. Exhaustion of active part of capital assets was 70% averaged in the branch at the beginning of 2003. Actuality of tasks for reconstruction of plants with their transition to "dry" production technology results from this. Equipment for incineration of dangerous wastes can be made in its course.

But use of the mentioned industrial installations demands some warnings concerned with ecological risks as available experience shows.

Temperature parameters to satisfy technological requirements for destruction of POPs (up to 1400°C to 1500°C) are provided both in blast-furnace and cement (incineration) processes. Necessary duration of being in reactive zone (up to 5 to 7 s) to guarantee destruction of POPs is provided, too (length of revolving cement kilns is 100 m and more, and height of blast-furnaces is 30 to 50 m and more).

At the same time, some research data witness of possible formation of dioxins and their releases to exceed EU norms 1.5 to 2 times in these aggregates. Therefore cement kilns are provided with additional systems for purification of gases in the countries where incineration of PCBs in them is realized. Some limitations as to amount of PCBs to be incinerated are introduced because of the same reasons. But these limitations (no more than 1% of the amount of charge in cements kilns and some others) are not a significant factor in considering problems of their use. Thus, an average cement plant consumes 0.8 to 1.0 tons of charge materials per year, and its productivity by destruction of waste containing PCBs is 8 to 10 ths. tons per year that is quite acceptable variant.

Warnings arising at that are concerned with elevated danger of submicron dust particles and absorption of dioxins by them. But these problems are resolved in the USA and Canada, and regulation of regime, adjustment of technological parameters, and methods of purification of exhaust gases represent a way to this. These measures are less capital-intensive than creation of special installations (especially plasma, hydrogenation, those for pyrolysis in melted metal, etc.).

Social movement purposed against incineration of wastes is a significant factor in solution of the problem. But going without demagogy we shall base on the fact that incineration can be various, and decade of application of cement kilns in the USA and other countries for this purpose is a confirmation to this. Naturally, this shall not stand up against efforts to develop alternative technologies of

destruction of OP, PCBs, and other POPs reasonable economically. Definitive criteria of choice is but meeting stated norms of releases.

Therefore, Ukraine has no reasons to refuse from an experience of using cement kilns for destruction of materials containing PCBs being positive in the whole. Those kilns should be equipped with special means for purification of gases taking into account the mentioned experience. These additional capital investment will be completely defensible for significant advantages of using these kilns will be taken into consideration in comparison of economical efficiency. Moreover, there are no limitations as to pureness, aggregative state, and homogeneity of wastes to be destroyed (that is of great importance in practice).

Ukrainian cement industry is on the verge of dimensioned reconstruction of its basic production assets. Under these conditions equipment (in the course of reconstruction) of one or several revolving furnaces with means of introduction of materials containing PCBs to working area as well as special systems for purification of gases can be attractive business project for owners of cement plants. The state as customer can spare great budget of loan money.

The mentioned is concerned with blast-furnace manufacture to a great extent for some warnings exist concerning use of appropriate equipment for neutralization of PCBs, too. Experience of use of pilot installation at Lipetsk metallurgical plant in Russia deserves attention from this point of view. According to available information, results of use are positive in the whole although a number of problems remain insufficiently revealed.

Metallurgical plant named after Ilyich in Mariupol can be probable object of introduction of this technology in Ukraine for these ideas are supported by its administration.

Two high temperature technological processes of PCBs destruction gained the widest spread in the global practice that is incineration in special furnaces and plasma (plasma and chemical) destruction. They may have various apparatus introduction, in particular, high temperature incineration can be realized both in stationary and revolving furnaces designed for this process. Apparatus and technological design depends upon aggregative state of the materials containing PCBs to be destroyed and other factors, too.

In addition to the mentioned technological approach, an installation for high temperature incineration of POPs based on rocket engines has been patented in Russia.

The most general technical and economical parameters of basic technologies show some advantages of high temperature incineration in furnaces (cyclone reactors). Plasma method differs from other ones with high operating costs, and capital investment in conversion to unit productivity are at approximately equal levels. High operating costs are typical to rocket engines, too.

High temperature technologies have been realized in a number of countries. This applies to cyclone reactors, plasmotrones, and rocket engines. Rather complete information is available due to this concerned with raw materials, energetic, and material and technical provision that allows compilation of rather an absolute idea on their comparative economical efficiency. This allows estimation of their performance as those being one of the basic for Ukraine taking into consideration its industrial potential, a great experience in designing, construction, and use of heat aggregates having various designation as well as technological and design preconditions concerned with plasma technologies and creation of rocket engines.

On the assumption of this, the following perspectives concerned with destruction of PCBs can be relied on as technological and apparatus decisions:

- high temperature of incineration in a cyclone reactor (followed by after-burning of exhaust gases);
- plasma destruction in a reactor;
- high temperature of incineration using a rocket engine as base; and

• high temperature of incineration in a reactor based on liquid fuel rocket engine.

Extents of readiness and revision of technical and technological decisions concerned with the mentioned technologies are not equal ones. Technologies of high temperature incineration in special furnaces including cyclone reactors are being introduced in many countries, but using rocket engines, as it was mentioned, is only in Russia. Similar experience is available in Ukraine, too, but it is concerned with destruction of components of rocket fuel only.

Technology of thermal destruction in electric arc plasma gains wider application for it ensures low risk of PCBBs/PCDFs generation and can be adjusted to a wide range of materials contaminated with POPs. It has been introduced by now in various variations (PACT, PLASKON, STARTECH) in the USA, Canada, Europe, and Australia. Information is available concerning construction of pilot plants using plasma and chemical technology in Russia and China.

Number of base modules to ensure destruction of a thousand tons of PCBs per year on the assumption of two-shift or permanent operation is 1 to 8 for various technologies. A great number of modules complicates control and regulation of the equipment, requires greater staff, and increases risk of emergency situations. This is applied first of all plasma installations, but the latter are being realized in single module variant, too (this is described reduce).

We shall note that all these technologies are characterized with high efficiency of PCBs destruction that reaches 99.9999% in accordance with developers' information. That meets appropriate standards. All of them are characterized with some universality for they allow processing of any high toxicity liquid waste including PCBs without limitations concerned with their concentration. Simplicity and reliability of equipment is intrinsic to these technologies, but one shall bear in mind that they require use of expensive and specific equipment made of special steel. Creation of mobile installations is possible at that.

Reliability of the technologies is defined first of all by term of use of the reactor. In particular, a cyclone one can function for several months without scheduled maintenance. The shortest term of use is typical to plasma technology reactors.

Formation of liquid and solid waste at destruction of PCBs influences greatly cost parameters of technologies. As to liquid wastes (sewage waters), they are generated when using reactors based upon rocket technologies only. Necessity of destruction of the mentioned waste comprises significant part of all the operating costs (up to 25%), and this shall be obvious from the calculation shown below. Solid wastes those can contain up to 50 ppm of PCBs and are not liable to removal to special polygons can be generated in technological processes based upon using cyclone reactor and plasmotrone. Necessity of their additional destruction effects efficiency of the processes less for appropriate part of the value is 10% or less.

The mentioned technologies differ by construction of the reactors and methods of neutralization of products of PCBs destruction, too. But the difference lies in the points for introduction of alkali or soda for neutralization of hydrogen chloride practically alone. Necessity in charcoal filters is explained by need in meeting EU requirements. This stipulates for additional purification of exhaust gases emitted from gas generator when using technologies based on rocket engine or plasmotrone application.

Technologies of plasma destruction of PCBs are equal with those using rocket installations by operational costs. At the same time, general investments to building appear 2 to 3 times higher. The largest items of capital expenses while using plasma technology is a value of non-standard equipment as well as provision with instrumentation, and automation (about USA 1 mln. by each position). They comprise almost 60% of the summarized expenses in the total. This is the most vulnerable feature of the technology that is concerned with a great extent with low productivity of base modules and necessity of integration of 8 of them for reaching productivity of 1 mln. tons of PCBs per year. At the same time but 3 modules are necessary when using rocket engines.

Technologies using reactors based upon rocket engines appeared almost equivalent. The version concerned with using liquid fuel is characterized with a little reduce operating costs, but it dices away by higher value of construction of the installation.

Comparison of the technologies by raw materials and energy consumption is of some interest, too. Expenses for carriers of energy, raw materials, and goods differ significantly. The lowest material expenses are characteristic of plasma technology as well as technology of incineration in a cyclone reactor. But plasma technology exceeds other ones by value relation 4 to 5 times because of higher consumption of electric energy and energy carriers including steam. This introduces additional limitations for its application.

Comparison of such economical performance as specific capital investments, consumption of energy, and total value of destruction of a unit of PCBs shows that cyclone reactor is the less capital-intensive and is characterized with the lowest consumption of energy, other technological and ecological parameters being equal. Productivity of 1 ths. tons of PCBs at that is reached by combination of 2 to 3 base modules productiveness of a single of them being 400 tons per year.

Plasma technology differs from other ones by higher capital and operating costs when comparing technical and economical characteristics. This is due to a low productivity of base modules (135 tons of PCBs per year), high energy consumption, and high values of non-standard equipment, instrumentation, and automation. Their technical and economical performance vary in great limits depending upon constructive characteristics and composition of wastes to be destroyed (prime cost is USD 400 to 4.000 per ton, and value of up to USD 1.5 mln.).

Pilot mobile plasma installation exploited by Pyrolysis Systems Inc. company (Canada) is of the greatest interest in this respect. Its productivity is 4 l/min., and extent of destruction reaches seven nines after the point.

The technical and economical performance mentioned characterize one of the versions of plasma method that is obvious to have reserves for improvement. Attention is attracted by the proposition of EPA (the USA) to supply a plasma installation for processing of high toxicity wastes to some Russian enterprise. Its total mass is 335 tons, and dimensions of the plot for mounting are 24 m × 27 m, its height being 15 m. Its power consumption is 1.000 kW, temperature in reaction area is 1000°C to 1300°C, and extent of destruction is 99.9999%. Oxygen, nitrogen, and compressed air are required for function the installation. Melted cinder and cooled gases that do not require purification are at its outlet.

Cost of the installation is USD 10 mln., and its productivity by capacitors is 300 to 500 kg per hour, but operational costs are USD 750 to 1.000. That is 500 to 1.500 tons per year in conversion to yearly productivity. Therefore specific capital investments reach USD 10.000 per ton that is the greatest value.

One can see when comparing plasma technology with that based upon rocket engine that operational cost for destruction of 1 ton of PCBs are almost equal, but total capital investments are a great deal reduce in case of using rocket engine. But such a comparison cannot be reckoned correct taking into consideration military origination of rocket engines.

An original technology of neutralization of chloroorganic waste based upon aerosol catalyst developed by «Khimtechnologiya» institute of MIP of Ukraine being perspective by its idea cannot be considered as real alternative to available technologies mentioned here at present stage of its development. Economical advantages of this technology can be lost to a great extent bearing in mind necessity of introduction of a block for after-burning of exhaust gases to the production cycle of the installation. At the same time, possibility of its improvement or modification in the perspective shall be considered. In particular, according to available information, an installation having productivity of 1 ton per year is being developed at OJSC «Syanskhimplast» (the Russian Federation). Reaction gas

containing hydrogen chloride is to be neutralized in its aerosol medium, and the first is to be returned to the process of ethylene oxychlorination.

Some other technologies being considered as alternative to high temperature incineration (those based on gas phase chemical reduction, electrochemical oxidation, catalytic hydrogenation, etc.) and proposed for introduction in a number of cases are difficult to be estimated from economical viewpoint at present stage of their development and availability of information.

Technologies for purification of equipment, first of all transformers and containers are subdivided into two main groups by their final purpose. The first one spread more widely is based on processes of purification from PCBs followed further destruction of objects being purified. The other one foresees repeated charge or use upon purification. The latter is generally applied to transformers containing dielectrics with 2.000 ppm of PCBs, and are not considered separately here.

Technologies belonging to the first group include the following versions:

- purification with the aid of methylene chloride;
- purification with the aid of toluene; and
- purification with aqueous detergents (purifiers).

Development and introduction of appropriate technologies are realized by a number of firms in various countries.

Technology applied by «ABB Service» firm (Germany) includes combination of treatment of assembled transformers and their parts (both bodies and winding) with cold and hot solvent and its vapor. Purification of assembled transformers and their parts with a solvent vapor characterizes technology applied by «Aprochim» firm (France), and the same combination of purification with liquid solvent and its vapor is used in the technology by «Cintec» firm (Canada). Russian technologies use purification with solvent vapor.

All the mentioned technologies except the Russian one are characterized with an industrial introduction, approved reliability, application of non-standard tailored equipment, availability of the main materials, and possibility of the creation of mobile installations (they are already available in Germany in particular). As to ecological parameters, purity of the metal after purification is up to 2 ppm when using German technology, but it reaches 50 ppm applying other ones. All of them meet the stated norms as to releases to the atmosphere. Solid wastes in the form of wood and cardboard ones are liable to destruction (or placement to special dumps according to the Russian version).

Productivity of the mentioned installations by the mentioned technologies varies from 2 to 30 ths. tons of transformers per year. Value of purification is within the limits of USD 800 to 1,650 for a ton. More detailed information concerned with technologies applied in the western countries is not available that does not allow full-scale estimation of their comparative cost and value indices under conditions available in Ukraine. The mentioned companies do not mention even nature of the solvent they use in the purification process. The most complete information is available concerned with Russian developments and introductions belonging to «Petrochimtekhnologiya» firm.

The Russian technologies are in general similar to those developed by firms of the other European countries, but some differences are revealed those are to be taken into consideration at economical comparison of different variants. The difference lies first of all in the fact that the Russian technologies foresee purification of assembled transformers followed by their disassembly and restoration of metal parts. Purification of transformers as those is the first (preliminary) stage according to the technologies applied by western firms, but metal parts are purified additionally (after disassembly) in order that PCBs content does not exceed 50 ppm. At that metal parts and winding purified in two stages are liable to restoration (recuperation), but wood and cardboard waste product are being destroyed.

The Russian technologies are characterized with sufficient reliability according to expert estimations. They demand manufacturing non-standard equipment as well, allow possibility of

creation of mobile installations, and meet necessary norms by extent of purification (less than 50 ppm) and releases to the atmosphere. But the differences mentioned above do not allow making a comparison of economical performance of Russian and western technologies as a whole. The first are single-stage in fact, but the second are two-stage and, correspondingly, more expensive in operation. Naturally, single-stage purification is less effective than a two-stage one. But possibility remains that level of purification (removal of PCBs) can be increased owing to prolonged treatment with solvent vapor (methylene chloride in this case).

Differences in handling wood and cardboard wastes containing over 50 ppm of PCBs as a rule do not form essence of the technologies for they belong to the problem of destruction of wastes containing PCBs as a whole.

No Russian technology was brought to industrial introduction by its status in 2003. In particular, the technology applying purification with methylene chloride vapor has been realized in a test (semi-industrial) installation. Technology of purification with toluene has been realized in a pilot project. The same in concerned with technologies using aqueous purifiers. As to the last technology, limitations of its application shall be mentioned. According to the Russian information, this technology does not allow reaching necessary level of purification from PCBs if their concentration in metal parts exceeds 500 ppm. By these reasons the technology assuming a use of aqueous purifier is not considered here.

Taking into consideration availability of a proper domestic experience (at the level of the laboratory research and designing) these two technologies are the most probable variants of the solution of a problem of purification of transformers and containers both for Ukraine and the Russian Federation.

A two-module installation is considered that ensures carrying out of 200 purification operations during a year in conversion to some average transformer. Productivity of the installation is estimated as 350 tons by PCBs, and as 700 tons by weight of purified metal components. Concept of an averaged transformer issues its mass about 5.2 tons, amount of PCBs about 1.7 tons, and amount of wood and cardboard wastes liable to removal of 0.1 ton. Installed capacities are in correspondence to some extent with the types of installations for extermination (destruction) of PCBs considered above.

Calculation of both investment and operational values does not take into consideration expenses for removal or purification of wood and cardboard wastes contaminated with PCBs. This comprises a separate operation as was mentioned above, and it shall be estimated rather in the framework of considering technologies of PCBs extermination. At the same time, possibility of combination of two stages of steam condensation, condensate separation, and purification of sewage waters shall be considered in the process of toluene purification.

Technology using toluene appears more complicated than the process using methylene chloride. This is due to an application of steam for removal of residual amounts (vapor) of toluene from the body of the transformer. Necessity in additional stages of steam and toluene vapor condensation arises at that as well as separation and purification of sewage waters containing PCBs.

A number of technologies for destruction of capacitors containing PCBs have been worked out and introduced in the developed countries. Several perspective methods were proposed in Russia in the last years, and some of them have been tested at pilot or test installations. All of them are subdivided into two groups – the one to foresee utilization (recuperation) of the metal parts of the items and the one that does not foresee the latter. The most widely used method of extermination is high temperature incineration of crushed capacitors.

As to a choice of the most acceptable variants of treatment, experience gained in the Russian Federation is a representative one. Research of a number of technical and technological approaches has been conducted and their estimation from the view-point of environmental safety has been realized. Explosion treatment followed by chemical neutralization of crushed capacitors, thermal and

chemical destruction, combustion in melting furnaces followed by after-burning of exhaust gases, and destruction with the aid of calcination in ovens at 500°C are among them. Not considering details of the estimations having been carried out we shall mention that all of them, excluding the method of using melting furnace, do not secure necessary completeness of PCBs destruction, do not eliminate formation of dioxin generation, and do not meet ecological safety requirements on the whole. They have not been recommended for introduction in spite of the fact that economical performance was acceptable in some cases.

Technology of extermination of capacitors containing PCBs in high temperature furnaces containing boiling melts and equipped with a system for after-burning of exhaust gases ensures the most complete meeting requirements of European standards. Correspondence to them is concerned with both completeness of PCBs destruction (no less than 99.9999%) and dioxin content in exhaust gases (less than 0.1 nt/m3).

The mentioned technology foresees application of rather a typical constructive and technological scheme that ensures its reliability, and using of heat of the melting furnace for warming of the air in the recuperators ensures its energetic effectiveness. It is incineration in melting furnaces that has been considered the most effective way of solution of the problem of capacitors containing PCBs at present time at these conditions. This technology has been recommended for industrial introduction in Russia although research and testing of it has not been completed.

According to the Russian estimations value of the installation capital (expenses) at its productivity of 4 ths. tons of capacitors per year is about USD 1.6 mln., and value of processing (destruction) of 1 ton of capacitors (operating costs) is about USD 1 ths. We shall note for comparison that value of processing of a ton of capacitors is about USD 1.600 according to the available information concerned with extermination technologies. This figure increases to USD 2.200 for a ton if the technology foresees their recuperation (regeneration).

The value of capacitors treatment is USD 4.5 to 5.0 per kilogram for great size ones and about USD 12 per kilogram for small ones according to the experience of «ADJ Limited» firm (Australia).

Plasma technologies of neutralization of capacitors are being developed in the last time. A plasma installation proposed by EPA (the USA) mentioned above is an example of this. This installation is designed for processing of PCBs taken out of electrolytic capacitors without they disassembly (it can be used for destruction of OP and other dangerous wastes, too). Its productivity by capacitors is 300 to 500 kg per hour (about 500 to 1.000 tons per year), and expenses are USD 700 to 1.000 per ton. Value of the installation is USD 10 mln. Thus, plasma technology reaches competitive positions compared to other ones by operating costs, but the level of capital investments remains too high.

More accurate determination of parameters under Ukrainian conditions is impossible at present stage. We anticipate that the value will not differ greatly from the mentioned estimations taking into account the fact that higher values of energy carrier is to be compensated to some extent by reduce expenses for wages. Therefore technical and technological approaches having passed testing and based upon using the melting furnaces for destruction of capacitors containing PCBs can be considered as the basic technology for introduction in Ukraine. This conclusion is confirmed with available laboratory experience at research institutions.

At the same time, preconditions exist of the fact that research and search of alternative variants can lead to the creation of more effective technological decisions including plasma and other ones. As to known technologies, low level of capital investments for the technology of thermal and chemical destruction as well as relatively low value of treatment by calcination in ovens attract some attention. All new developments shall be subjected to additional economical estimation and expertise in this respect.

Neutralization of soils and materials contaminated with POPs characterized with great amounts and comparatively low concentrations of polluters cannot be a priori orientated to the technologies of thermal and catalytic oxidation because of extremely high operating costs. But their use according to available practice is not excluded on the whole.

As to handling contaminated soils as well as materials, and their neutralization, a number of technological approaches being proposed not talking about their removal to specially designed landfills (polygons/storehouses). Using solvents, thermal desorption, calcination in revolving furnaces, treatment in cyclone ovens, and, at last, using of installations (including mobile ones) equipped with oxygen and fuel flares are the most completely approved technologies. A choice of some technology for purification (neutralization) of soils depends first of all on a character of the territory, its square, depth of PCBs penetration to the soils as well as their concentration. This choice is defined with extent of bringing the technology to industrial introduction (its completeness) and its trial at pilot plant at least. Attention shall be paid to an extent of completeness of creation of the equipment, availability of material and resource provision, duration of technological treatment operations, etc. from economical view-point.

Value of neutralization of PCBs contaminated sites in conversion to 1 ton on the whole varies within the limits of USD 150 to 800. Converting to the area is to depend on depth of contamination and necessary amount of excavation of soils.

Technology of catalytic hydrogenolysis reaches competitive positions by cost price, but these processes as was mentioned above are characterized with high capital intensity and require high technology equipment as well as highly qualified maintenance. Value of purification of soils is USD 250 to 400 per ton according to experience gained by «ADJ Limited» firm (Australia).

All the available technologies are subdivided rather clearly into two groups both by capital and current operational expenses that is low and high temperature ones. They are almost two times lower for the latter ones. At the same time, as was shown in the section 1, it is these technologies that ensure meeting environmental requirements to the greatest extent (discussion is concerned with cyclone and revolving furnaces first of all).

Some higher value indices of the technology using cyclone furnace are explained by a necessity of maintenance of higher temperature in the reaction area and higher consumption of fuel respectively.

Especially high specific value indices are intrinsic to mobile version of the installation consuming gaseous oxygen fuel. But this technology is characterized with reduce stability and can be defensible in mobile version only.

Developments concerned with biotechnological methods of neutralization of some POPs and OP first of all attract some attention last time. In particular, Ukrainian scientists proposed composting of OP using organic additives and microorganisms. Application of biotechnological methods is purposed first of all to the objects with low concentration of POPs for using microorganisms in decomposition of such the POPs as PCBs is of low efficiency because of high content of chlorine in them. But they can be rather effective ones in combination with preliminary ultraviolet irradiation of materials contaminated with PCBs. Ukrainian scientists developed process of microbiological destruction of POPs including PCBs as well. Membranous biological film reactor in that possibilities of microbiological destruction of POPs supplemented with membranous effect of separation of substances is used for this.

A choice of some technology is defined, as was mentioned, by concrete conditions formed at some territories (objects). Therefore if a cyclone furnace was built for destruction of PCBs it is purposeful to some extent to use the same technology for neutralization of soils contaminated with PCBs. If their amount is relatively small, orientation to use of solvents can appear purposeful. At last, methods of biotechnological destruction can appear effective (first of all for UP).

Current situation with regard to creation of technical base for neutralization of POPs in Ukraine is as follows:

- the first plant for incineration of OP has been created and passed official certification ("Elga" Ltd., Shostka town);
- a technological development of a plasma method for destruction of POPs has been completed, but its introduction is delayed because of financial reasons;
- an experience has been gained in application of defense technologies (jet engines) for destruction of some dangerous substances, and this may be, in principle, extended to POPs;
- a few small-sized plants for thermal neutralization of vessel and medical wastes have been put into operation and certified (for example, «Greenport», Odesa city, and others);
- a research of the processes of microbiological destruction of POPs, particularly, PCBs, in a membranous film reactor has been started;
- promising technological developments concerning neutralization of chlorine-containing organic wastes based upon aerosol catalysis have been performed («Khimtekhnologia» Institute of MIP);
- technological developments for neutralization of OP at low temperatures (250°C to 300°C) in alkaline medium have been started (the Institute of Electric Welding named after B.O.Paton of NAS of Ukraine);
- a preliminary research has been conducted of using cement kilns for incineration of OP; and
- design of a wide profile technology and creation of an installation for elimination of POPs on its bases is being developed; this technology is based on the use of cyclone furnace thus increasing efficiency and ecological parameters of incineration process (the Institute of Physical and Organic Chemistry and Chemistry of Coal named after L.M.Litvinenko of NAS of Ukraine).

The main problems concerned with creation of industrial infrastructure for POPs management are absence of efficient financial instruments for implementation of the measures from the points of view of both high value of available methods of neutralization and scanty possibilities of the state budget and majority of the enterprises. The terms stated by the Stockholm Convention on POPs along with great amounts of OP as well as industrial wastes ascribed to POPs, PCBs and PCB-containing equipment available in Ukraine should incline to creation of proper facilities for their neutralization as well as branchy infrastructure. International aid shall be attracted to the solution of the problems of neutralization of all the types of POPs using industrial facilities located at the territories of foreign countries, too.

2.7 SUMMARY OF FUTURE PRODUCTION, USE AND POPS RELEASES – REQUIREMENTS TO EXCEPTIONS

Using of pesticides mentioned in the Stockholm Convention on POPs was prohibited legally in Ukraine at the end of the 70-ies of the XX century. Manufacture of the substances included to Annexes A and B of the Convention is not planned in Ukraine neither at present nor in the future.

Term of use of PCBs-containing equipment shall come to end in 2015 to 2020, and that of ultimate deduction and utilization of such the equipment are to be performed up to 2028.

Ukraine being supported by World Bank is to fulfill ultimate physical closure of CTC/PCE manufacture in 2006 to 2007 as source of HCB formation as industrial waste and its releases to the atmosphere.

The problems concerned with management of OP ascribed to the POPs group stockpiled in Ukraine as well as their neutralization shall be solved within the term foreseen by the requirements of the Stockholm Convention.

Releases of the substances mentioned in Annex C of the Convention to the environment will be reduced stepwise due to re-equipment of the enterprises and introduction of new technological decisions by them.

Taking into consideration all the above, Ukraine may not declare any exceptions foreseen by the Stockholm Convention on POPs at present stage. Ukraine is to revise its position periodically in accordance with the decisions of the Conference of the Parties of the Stockholm Convention on POPs.

2.8 CURRENT STATE ENVIRONMENT MONITORING SYSTEM

Legal regulation in the sphere of monitoring of the environment is carried out in accordance with the regulations of the Ukrainian laws «On Environmental Protection», «On Atmospheric Air Protection», «On Animal World», «On Plant World», «On Protection of Lands», «On Wastes», «On Drinking Water and Water Supply», Water Codex of Ukraine, Land Codex of Ukraine, and Forest Codex of Ukraine. Decree of the Verkhovna Rada of Ukraine dated 1998-03-05 #188/98-BP «The Main Directions of the State Politics in the Sphere of Environment Protection, Use of Natural Resources, and Ensuring of Ecological Policy» is among these documents as well. There is a number of decrees of the Cabinet of Ministers of Ukraine to approve documents for monitoring of condition of the environment. We can mention the following ones: «Regulations of the state system for monitoring of the environment» approved by Decree of the Cabinet of Ministers of Ukraine dated 1998-03-30 #391, «Regulations on monitoring of lands» approved by Decree of the Cabinet of Ministers of Ukraine dated 1993-08-20 #661, «Regulations for carrying out state monitoring of waters» approved by Decree of the Cabinet of Ministers of Ukraine dated 1996-07-20 #815, «Order of organization and carrying out of monitoring in the sphere of atmospheric air protection» approved by Decree of the Cabinet of Ministers of Ukraine dated 1999-03-09 #343, Decree of the Cabinet of Ministers of Ukraine «On unified state system of prevention and response to emergency situations of man-caused and natural character» dated 1998-08-03 #1198, «Order of carrying out of state social and hygienic monitoring» approved by Decree of the Cabinet of Ministers of Ukraine dated 2006-02-22 #182, Methodical recommendations for the problems of creation of the system for monitoring of environment having oblast level approved by Order of **MEPU** dated 2005-12-16 #467, and others.

We can subdivide regulations concerned with implementation of some types of activity on monitoring into those dealing with contamination with POPs of surface water, soil, and atmospheric air.

List of regulations concerned with monitoring of contamination of surface water with POPs is as follows.

KND 211.1.1.106-2003, Protection of environment and rational use of natural resources. Organization and carrying out of supervisions of pollution of surface waters. This guide normative document states requirements toward organization and conduction of regime of observations of pollution of surface water by physical, chemical, hydrobiological, and toxicology performance carried out in the network of state monitoring of waters.

GOST 17.1.5.05-85 Environmental protection. Hydrosphere. General requirements to sampling surface and sea waters, ice, and atmospheric precipitations.

GOST 17.1.1.02-77 Environment protection. Hydrosphere. Classification of water objects.

DSTU ISO 5667-3-2001 Sampling. Part 3. Guidance on methods of conservation and preservation of samples.

RD 52.24.66-88 Methodical guidance on determination of content of organohalogen pesticides and their metabolites in surface waters.

RD 52.24.66-88 System of control and accuracy of results of measurements of indices of environmental pollution.

Generalized list of maximum allowable concentrations (MAC) and tentative safe exposure levels (TSEL) of hazardous substances for water of fish industry water bodies (approved by Ministry of

fish industry of the USSR dated 1990-08-09 #12-04-11, Moscow, Ministry of fish industry of the USSR, 1990).

Unified interdepartmental guide for organization and implementation of state monitoring of waters (approved by order of Ministry of ecological resources of Ukraine dated 2001-12-24 #485, Kyiv, Ministry of ecological resources of Ukraine, 2001).

Method of ecological estimation of quality of surface waters by corresponding categories (approved by order of the Ministry of ecological safety of Ukraine dated 1998-03-31 #44, Kyiv, 1998).

List of regulations concerned with monitoring of contamination of soils with POPs is as follows.

GOST 17.4.1.02-83 Environmental protection. Soils. Classification of chemical substances for controlling pollution.

GOST 17.4.4.02-84 Environmental protection. Soils. Methods of sampling and preparation of samples for chemical, bacteriological, and helminthologic analysis.

GOST 17.4.3.03-85 (Standard of the Soviet of Economical mutual aid 4469-84) Environmental protection. Soils. General requirements toward methods of determination of pollutants.

RD 52.18.156-88 Methodical guidelines. Environmental protection. Soils. Methods of representative sampling of soil to characterize dimensional pollution of agroindustrial lands with residual amounts of pesticides.

RD 52.18.180-89 Methodical guidelines. Method of implementation of measurement of mass part of organohalogen pesticides p,p'-DDT, p,p'-DDE, alpha-HCH, gamma-HCH, and trifluraline in samples of soil by gas-liquid chromatography method.

DSTU ISO 11464-2001 (ISO 11464:1994, IDT) National standard of Ukraine, Quality of soil. Preliminary treatment of samples for physical and chemical analysis.

DSTU ISO 8258-2001 (ISO 8258:1991, IDT) Statistical control. Control charts of Shukhart.

RD 52.18.103-89 Methodical guidelines. Environmental protection. Soils. Estimation of quality of analytical measurements of pesticides and heavy metals content in the soil.

List of regulations concerned with monitoring of contamination of atmospheric air with POPs is as follows.

RD 52.04.186-89 Guide for control of pollution of the atmosphere. This normative document regulates organization and carrying out of supervision of pollution of atmospheric air in settlements as well as at oblastal and background levels at the territory of the former USSR, and methods of gathering, processing, and statistical analysis of results of supervisions.

Unified methods of monitoring of background pollution of environmental medium. Moscow, Hydrometizdat, 1986 – 180 p. Method of chemical analysis of concentration of organochlorine pesticides in the atmospheric air and atmospheric precipitations is described in this document.

Objects of the monitoring system are atmospheric air, waters, biological variety, forests, lands, handling waste products, physical factors of impact, and geological medium.

Monitoring of the state of atmospheric air is performed within the bounds of settlements and territories of natural and reserved fund as well as recreational territories concerned with:

- atmospheric precipitations;
- sources of releases of pollutant substances to the atmospheric air;
- other sources of pollution of the atmospheric air where observations conducted; and
- transboundary transfer of pollutant substances with atmospheric air.

Monitoring of the state of waters is performed concerned with:

- surface waters of the dry land including natural and artificial water bodies, currents, and other objects of surface waters;
- underground waters including drinking, mineral, industrial, and thermal ones as well as their fields;

- ground waters;
- sea waters including transitional and coastal ones as well as waters of internal sea, and those of exclusive (maritime) economical zone of Ukraine;
- sources of pollution of surface waters of the dry land, sea, and underground waters including drainage ones (from meliorative systems);
- bottom sediments as source of secondary pollution of surface waters;
- sources and systems of drinking water supply;
- transboundary transfer of pollutant substances with surface waters; and
- use of water resources.

Monitoring of indices of biological variety is performed concerned with:

- land and water ecosystems;
- territories of natural reserved fund;
- plant covering;
- agroindustrial plants;
- green plantations in towns and settlements of town type;
- agroindustrial animals;
- objects of animal world; and
- other biological formations.

Monitoring of the state of forests is performed concerned with:

- forest flora;
- forest fauna including hunters' one;
- forest soils; and
- ground plots not covered with forest vegetation but assigned for requirements of forestry.

Monitoring of the state of lands is performed concerned with:

- pollution of soils having various designation including irrigated and dried ones, those of the territories of natural and reserved fund, lands having recreational designation, and territories of settlements;
- pollution of lands of agricultural designation;
- negative processes concerned with change of fertility of soils at lands of agricultural designation;
- change of landscapes caused by mudflows, earthquakes as well as karts, cryogenic, and other phenomena, and processes concerned with formation of ravines and activation of landslides;
- state of shore lines of rivers, seas, bays, storage pools, estuaries, and hydraulic structures; and
- hazardous increasing of level of ground waters (underflooding) at the territories of settlements.

Monitoring in the sphere of handling hazardous wastes is performed concerned with:

- places and objects for gathering, stockpiling, utilization, removal, neutralization, and burial of waste products;
- impact of places and objects for neutralization, placing, and burial of waste products on environment;
- transboundary circulation of waste products.

Monitoring of the physical factors of impact is performed concerned with:

- acoustic impact on environment;
- ionizing radiation including radioactive one; and
- non-ionizing radiation including electromagnetic one.

Territories of settlements and those designed for building up as well as control areas and areas of restricted building up around sources of physical impact upon environment are liable to monitoring.

Monitoring of the state of geological medium is performed concerned with:

- exogenous and endogenous geodynamic processes including determination of their dimensional and specific characteristics, and activity of their development;
- geochemical performance including determination of content and spreading of natural and chemical elements and compounds as well as those produced artificially;
- geophysical fields including background and anomalous ones; and
- subsurface waters including estimation of resources and their hydrogeological and hydrochemical performance and properties.

Carrying out of monitoring is commissioned to nine subjects of the monitoring system: MOEU, MHU, MAPU, the State committee of forests, MEPU, the State committee of water resources, the State committee of land resources, their oblast bodies as well as enterprises, institutions, and organizations belonging to the sphere of their management those are subjects of the monitoring system according to the national and local programs of implementation of proper measures for environmental protection. Coordination of activity of the subjects of the monitoring system, consideration of current problems concerned with performing of environment monitoring is realized by interdepartmental committee for the problems of environment monitoring consisting of sections functioning in appropriate directions. Its composition and regulations are approved by the Cabinet of Ministers of Ukraine. Financing of the works for creation and functioning of the monitoring system as well as its constituent parts is done in accordance with the order of financing of measures for environmental protection on the expense of facilities foreseen in the State and local budgets according to the legislation.

Compensation of some part of expenses for creation and functioning of constituent parts of the monitoring system can be realized on the expense of innovation funds within the limits of facilities foreseen for measures for environment protection, international grants, and other financing sources (MEPU, MOEU, MHU, MAPU, the State committee for natural resources, the State committee of forestry, the State committee of water resources, the State committee of land resources, and Ministry of building and architecture (earlier named the State committee of housing and communal services), see fig. 2.8.1.

Subjects of the system realize their activity by objects with the following specialization concerned with monitoring.

MEPU – monitoring of atmospheric air and precipitations (content of pollutant substances (PS)) including radionuclides (transboundary transfer of PS); sources of industrial releases to the atmosphere (content of PS including radionuclides); surface and sea waters (hydrochemical and hydrobiological determination, and content of PS including radionuclides); subsurface waters (hydrogeological and hydrochemical determination of composition and properties including residual amount of pesticides and agrarian chemicals as well as estimation of resources); sources of discharge of sewage waters (content of PS including radionuclides); water objects within the limits of the territories designed for nature protection (background content of PS including radionuclides); grounds of various designation including those within the limits of the territories designed for nature protection (content of PS including radionuclides); geochemical state of landscapes (content and spreading of natural and chemical elements and compounds as well as those produced artificially); radiation conditions (at the points of stationary network); geophysical fields (background and anomalous research); natural disasters and hazardous natural phenomena that is endogenous and exogenous geodynamic processes (their dimensional and specific characteristics, and activity of their development), floods, high waters, snow slides, and mudflows (in the oblasts of observation points); land and maritime ecosystems (background content of PS including radionuclides); dumps for industrial and domestic waste (composition of waste, and content of PS

including radionuclides); and subsurface waters; the Ministry conducts observation of endogenous and exogenous geodynamic processes.

MOEU (at the territories subordinate to the Administration of alienation zone and zone of unconditional (compulsory) resettlement as well as other zones contaminated with radioactive substances in consequence of the accident at the Chornobyl NPP) – monitoring of atmospheric air (content of PS including radionuclides), surface and subsurface waters (content of PS including radionuclides); land and water ecosystems (bioindicative analyses); soils and landscapes (content of PS, radionuclides, and their dimensional spreading); sources of releases to the atmosphere (content of PS and amount of releases); sources of discharge of sewage waters (content of PS and amount of releases); and objects for burial of radioactive waste products (content of radionuclides and radiation conditions).

MHU (in the places of dwelling and rest of the population including those at natural territories of resorts) – monitoring of atmospheric air (content of harmful chemical substances); surface waters of dry land and drinking water (chemical, bacteriological, radiological, and virological analyses); sea waters, mineral and thermal ones, medicinal sludge, ozocerite, brine of estuaries and lakes (chemical, bacteriological, radiological, and virological analyses); soils (content of pesticides, heavy metals, bacteriological and virological analyses, presence of helminthes ovum); physical factors (noise, electromagnetic fields, radiation, vibration, etc.); grounds having agricultural use (radiological, agrochemical, and toxicological analyses, and residual amounts of pesticides, agrochemicals, and heavy metals); agricultural plants and produce made of them (toxicological and radiological analyses, and residual amounts of pesticides, agrochemicals, and heavy metals); agroindustrial animals and produce made of them (zootechnich, toxicological, and radiological analyses, and residual amounts of pesticides, agrochemicals, and heavy metals); and surface waters having agroindustrial designation (toxicological and radiological analyses, and residual amounts of pesticides, agrochemicals, and heavy metals).

The State committee of forestry – monitoring of soils of the lands of the forest fund (radiological analyses, and residual amounts of pesticides, agrochemicals, and heavy metals); forest vegetation (injury caused by biotic and abiotic factors, biomass, biological variety, radiological analyses, and content of PS); and hunters' fauna (specific, quantitative, and dimensional performance as well as radiological analyses).

The State committee of water resources – monitoring of rivers, storage pools, channels, irrigation systems, and water basins within the bounds of hydroeconomic systems having complex designation as well as systems of inter-branch and agricultural water supply (content of PS including radionuclides); water bodies within the zones of impact of atomic power plants (content of radionuclides); surface waters in boundary zones and areas of their intensive industrial and economical use (content of PS including radionuclides); lands being irrigated or dried (depth of deposition and mineralization of groundwater, extent of salinity and solonetzicity of soils); and underflooding of rural settlements as well as coastal areas of storage pools (reformation of the coasts and underflooding of the territories).

The State committee of land resources – monitoring of soils and landscapes (content of PS, revelation of erosion and other exogenous processes, dimensional contamination of lands by objects of industrial and agroindustrial manufacture); vegetation covering of lands (specific composition, indices of development and injury of plants); lands being irrigated or dried (secondary underflooding, salinization, etc.); and coastal lines of rivers, seas, lakes, storage pools, estuaries, bays, and hydraulic structures (dynamics of changes and injury of land resources).

Ministry of building and architecture – monitoring of drinking water of the centralized water supply systems (content of PS and amount of consumption); sewage waters of municipal collecting systems and treatment works (content of PS and amount of income); green plantations in towns and settlements of urban type (extent of injury with entomological pests, phytological deceases,

etc.); underflooding of towns and settlements of urban type (hazardous elevation of groundwater); condition of readiness to heating period and its passing, accounts of enterprises of housing and communal services as well as urban electric transport for energy carriers, and level of payment of the population and juridical persons for housing and communal services having been consumed.

Local system for environment monitoring has been created for the purpose of introduction of strategy and action plan of the state system of environment monitoring at the level of administrative and territorial bodies, and increasing of level of implementation of its main functions for provision of demands of the authorities, local self-governing, and society in operative and trustworthy information on the state of the Ukrainian environment. Corresponding methodical recommendations were approved by order of MEPU dated 2005-12-16 #467.

The state system of environment monitoring is based on departmental networks for observation of objects of monitoring and is regulated by departmental normative and methodological documents to state requirements toward methods of carrying out of observations and works, measuring gauges and equipment, processing and generalization of information obtained during observations, documents on order of rendering information, and provision of consumers with the latter.

Order of carrying out of state social and hygienic monitoring was approved by Decree of the Cabinet of Ministers of Ukraine dated 2006-02-22 in order to unite all available monitoring systems, and its validity is spread to POPs as well.

The mentioned monitoring is carried out at the state level by MHU, Ministry of building and architecture, MAPU, and AMSU.

Data of observation of the following are used in the network of carrying out of monitoring:

- state of health of population and factors to impact upon it belonging to the medium of human vital activity including chemical ones;
- natural and climatic factors as well as sources of man-caused impact upon environment including soils;
- radiation conditions;
- social medium;
- state of labor protection and conditions of work; and
- structure and quality of nutrition, and safety of foodstuff for health of the population.

We shall note that national programs are valid in Ukraine that solve the problems of shortening POPs releases along with solution of their main tasks, namely:

- «The national energetic Program of Ukraine up to 2010» approved by Decree of the Verkhovna Rada of Ukraine dated 1996-05-15 #191/96-BP;
- «The complex national Program of energy-saving in Ukraine» approved by decree of the Cabinet of Ministers of Ukraine dated 1997-02-05 #148;
- «The program of stepwise cessation of using leaded petrol in Ukraine» approved by Decree of the Cabinet of Ministers of Ukraine dated 1999-10-01 #1825, etc.

«Regulations of the state system of environment monitoring» is in force since 1998. It was approved by Decree of the Cabinet of Ministers of Ukraine #391, and changes to it were introduced according to Decrees of the Cabinet of Ministers of Ukraine dated 1999-09-24 #1763 and 2001-05-16 #528. It regulates order and responsibility for environment monitoring including substances belonging to the POPs group.

Existing forms of statistical accountability were renewed and new ones were introduced in 2003 by SSCU. New pollutant substances including those belonging to the POPs group released to the atmosphere were introduced to the statistical form. Gathering of statistical data at present includes gathering some data concerned with releases to the atmospheric air by (correspondingly) private vehicles, those belonging to enterprises, railway and air transport, and agricultural machines. Only

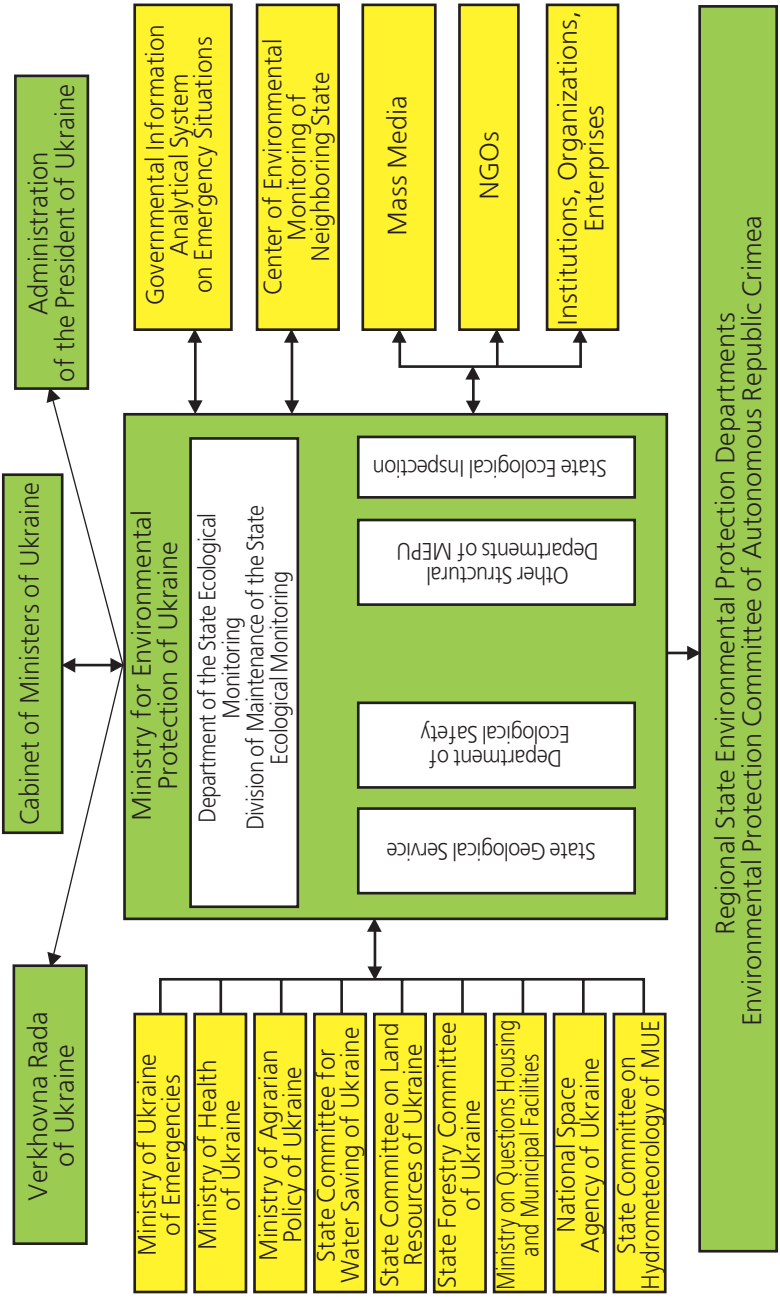


Fig. 2.8.1. Generalized scheme of the State system of environment monitoring

benzo(a)pyrene releases have been taken into account up to present time when carrying out inventory of releases of pollutant substances belonging to the POPs group included to the protocol on POPs. Gathering of statistical data as to hazardous wastes at present is based upon a new classification of hazardous wastes harmonized with international ones, and the list of wastes has been renewed.

2.9 ENVIRONMENTAL AND PUBLIC HEALTH IMPACTS OF POPS

At present analytical determination of substances from the POPs group is performed in the main by laboratories of the State service of hydrometeorology; toxicological, sanitary and hygienic as well as physical and chemical laboratories of the State sanitary and epidemic service of Ukraine (at the level of district, town, and oblast SES); laboratories for analytical control of the State Departments of Ecology and Natural Resources; institutions subordinate to SCPTRCP; and some other departments. Moreover, some elements of POPs monitoring are realized in the spheres of industrial and technical as well as research activity of the institutions belonging to the systems of MAPU, SVS, research institutes of NASU, MHU, and AMSU as well as those having other subordination.

According to the information of the National agency for accreditation of Ukraine three laboratories have been accredited on carry out tests of POPs determination to the requirements of DSTU ISO 17025 by the state of 2005-11-11. These are Test Centers of the L. Medved Institute of Ecological Hygiene and Toxicology (Kyiv city), Dzerzhinsk town SES (Dzerzhinsk town, Donetsk oblast), and the Test Center of Produce of O. Marzeev Institute of Hygiene and Medical Ecology of AMSU (Kyiv city).

Unfortunately, data on measuring laboratories in the sphere of handling POPs are rather contradictory that witnesses of necessity of improvement of their registration and analysis.

Measurements are conducted by laboratories having various levels of attestation and accreditation rendered by proper central and territorial bodies of SCPTRCP. According to the information rendered by the latter, its territorial bodies attested over 700 laboratories to carry out measurements in the sphere of control of the state of environment by the state of 2005-11-30. At the same time, the mentioned institution rendered information of availability of but 74 laboratories attested for the right to realize measurements for determination of content of POPs in Ukraine by the state of 2005-12-20.

Majority of them (49 laboratories) belong to the system of sanitary and epidemic service. 12 laboratories have been attested for the right of measuring of PCBs content. 72 laboratories have been attested for the right of measuring of content of organochlorine pesticides (OCP), mainly DDT (71 ones), HCH isomers (49 ones), heptachlor (37 ones), and aldrin (32 ones). Determination of HCB is in the sphere of accreditation of but 18 laboratories, and that of dieldrin – 12 ones. But 9 laboratories in industrial cities (Kharkiv, Zaporizhzhya, Dniepropetrovsk, Odesa, and Donetsk) have been accredited for the right of determination of PAHs (benzo(a)pyrene).

According to the results of interrogation realized in the network of implementation of the GEF/UNEP project on the basis of a questionnaire by UNEP as to POPs monitoring in various countries, these data are not quite real and are not full ones.

Interrogation showed that but a single institution is available in Ukraine (the L. Medved Institute of Ecological Hygiene and Toxicology, Kyiv city) that has been accredited for the right of carrying out of measurements of PCDDs/PCDFs content (in emitted substances, fish, waste products, and soils).

We shall note that according to the results of interrogation purpose of that was envelopment of the maximum number of departments activity of those is connected to handling POPs obtaining reliable information as to the state of POPs monitoring in Ukraine is a very complicated task at present stage. The information obtained has incomplete character concerning both research methods and forms and accreditation levels of the laboratories and objects and volumes of carrying

out research as well as terms of their implementation. But 45 questionnaires have been obtained for carrying out analysis of the state of laboratory provision of monitoring that should be reckoned insufficient for generalization.

Sampling and determination of POPs content is carried out in the main in accordance with the normative documents of the former USSR. But 8 methods for performing measurements have been attested in Ukraine by National body «Ukrmetrteststandart» by 2005-11-30 according to the information rendered by SCPTRCP. 6 of them are concerned with determination of organochlorine POPs pesticides (in foodstuff and raw materials), 1 of them is concerned with PCBs determination, and 1 – for PAHs. Determination of PCDDs/PCDFs content is carried out in accordance with EPA and EPA TO-4A 1613 methods.

According to the data of interrogation researches are done in the main for determination of chlorooorganic pesticides, predominantly of DDT and its derivatives, and heptachlor and HCB in some cases. Data concerned with determination of PCB and PCDDs/PCDFs content are single instances. The main objects being analyzed in the system of the state epidemic supervision are foodstuff, plants, water, and soils, and in the system of the State hydrometeorology service – soils and surface waters. Research of waste products is a rare instance, and determination of PCDDs/PCDFs content has been performed three times (the L.Medved Institute of ecological hygiene and toxicology). Objects of global monitoring are under research in single instances, for example, maritime biota is studied at A.Kovalevsky Institute of Biology of Southern Seas of the NASU. As to biological media, their analyses are being performed at the Institute of medicine of labor of the AMSU almost alone. We shall note as well that determination of PAHs is realized in practice only at the Institute of Hygiene and Medical Ecology of AMSU.

ULQSAP of MAP realizes determination of levels of pollution of soils with aldrin, endrin, dieldrin, chlordan, DDT (DDD/DDE), and heptachlor in the sphere of handling POPs, but amount of analyses and square of the territories depends on financing.

The T.Shevchenko National University is engaged in the problems of chemical ecology (geographical, chemical, and biological faculties). The university studies a condition of environmental contamination chemical substances and their influence on ecology. This work was started at the geographical faculty in 1992 in the network of RAD/TOX project purpose of that was studying of extent of pollution of the territories with PCBs and DDT against the background of their radioactive contamination caused by the Chornobyl accident. CEMU conducted chemical research of water, bottom sediment, and water life for POPs content in the network of the program of complex ecological monitoring of environment in restoration of deep-water vessel pass of «Danube – Black Sea» in common with ecological laboratory of geographical faculty.

In other words, some specialization of the laboratories in the sphere of POPs handling is observed according to the results of questionnaire design, and this can be used further for creation of basic laboratories (table 1 and annexes).

At the same time less than 100 methods for determination of releases of pollutant substances to the atmospheric air are valid in Ukraine, and they envelop lower part of the substances. They are realized in the network of the available system for control of releases including POPs, and the principle declared is carrying out control of all the sources of releases concerned with all the pollutant substances. These methods are in «List #2 of normative documents to state determination of quality performance of environment objects, releases, discharges, and industrial wastes validity of those prolonged to 2007-12-31» (Annex 2 of the Order of Ministry of Ecological and Natural Resources of Ukraine dated 2002-06-19 #232). There are no any methods for determination of POPs in releases to the atmospheric air among them.

The mentioned List legalizes only 3 methods for determination of some POPs in water by chromatographic mode, namely:

- gas chromatography method for determination of organochlorine pesticides (OCPs) and PCBs at their joint presence: α-HCH, β-HCH, γ-HCH, δ-HCH, heptachlor, p,p'-DDE, p,p'-DDD, p,p'-DDT, kelthane, nitrochlor, pentachloronitrobenzene, and propanid;
- method for determination of HCB by thin layer chromatography (the Council of economical mutual aid, «Unified methods of research of quality of waters», part 1, Moscow, 1987); and
- method for determination of polychlorcamphene (toxaphene) by thin layer chromatography.

We shall note that use of departmental methods for determination of POPs content is practiced in performing monitoring, too.

Annex B contains list of methods developed by MHU that allow performing control of observation of hygienic norms in the sphere of POPs handling.

The Ukrainian Research Institute of Environmental Problems worked out databases concerned with atmosphere and hydrosphere as well as instruments and methods to be used in the monitoring networks of MEPU, and they have been held since 2002. These databases contain information rendered by appropriate stations for analytical control of the State Ecological Inspection, the State Committee for Hydrometeorology, and (partly) the State Geological Service. These data include placement of the stations for carrying out of monitoring, parameters being measured, their periodicity, equipment and gauges being used, and analytical methods. A separate database contains list of gauges for monitoring of the state of air used since 1946, and ones for monitoring of quality of water since 1961.

We shall declare taking into consideration the mentioned facts that analytical base for ensuring monitoring in Ukraine requires improvement and development.

On the whole results of environment monitoring are used not enough efficiently for estimation of ecological conditions, factors to cause change of the state of environment, and efficiency of the measures for environment protection. They do not render appropriate results in the process of taking decisions, formation of policy, or rising of level of comprehension of ecological problems in the country by Ukrainian community. Authorities began expressing its anxiety with unavailability of comprehensive and permanent information on the state of environment but after recent accidents having serious ecological consequences (such as explosions at military storage houses in Zaporizhzhya oblast).

According to the data rendered by the State hydrometeorological service but two OCPs belonging to the POPs group are being monitored regularly. These are DDT (including p,p'-DDE, p,p'-DDT, and p,p'-DDD) and HCB in the waters and DDT only (including p,p'-DDE, p,p'-DDT, and p,p'-DDD) in the soils at the territory of Ukraine.

Analysis of data of regular observations performed by the state system of organizations of the hydrometeorological service concerned with pollution with POPs has been done in the network of implementation of the Project, namely:

- **surface waters** for the period of 1993 to 2003 at 87 rivers, 15 storage pools, 7 lakes, and 1 channel, in 161 points;
- **soils** for the period of 1994 to 2003 in 21 oblasts, the Autonomous Republic of Crimea, and 37 administrative oblasts. Results of 18,317 analyses for determination of DDT metabolites and HCB in water and 2,385 samples of soil have been studied.

Various river basins are rather different by level and structure of pollution with POPs. Results of researches of surface waters in Ukraine show steady stabilization of the level of pollution at some sections of the rivers both for increasing and for decreasing POPs content. Local level of pollution of water with DDT metabolites and HCB is typical for Ukrainian rivers. p,p'-DDT, and p,p'-DDE

contribute the most greatly pollution of the surface waters, and exceeding of norms has been found in 10% of samples analyzed.

River basins of Dnipro, Dniester, and Danube are those contaminated to the greatest extent. Tendency to lowering content of the mentioned pesticides in the waters of Western Bug and lakes is observed. Insignificant pollution of waters is observed in the rivers of Southern Bug basin. Waters of the rivers of Crimea, Sieverskiy Donets, the ones running between Southern Bug and Dniester as well as those nearby the Azov Sea, between Dniester and Danube can be ascribed to those not contaminated with POPs.

Rather high values of p,p'-DDE content are typical for waters of the Dnipro er basin. The highest concentrations of this compound are observed at the areas near large cities where they are washed off from the territories by surface and shower flow. Thus, maximum concentration of p,p'-DDE that is 0.112 μg/dm^3 in the waters of Kakhovka storage pool was found near Berislav town in 1997. Maximum concentration of p,p'-DDE at the level of 0.070 μg/dm^3 in the waters of Dnipro storage pool was found near Zaporizhzhya city in 2002, and in the waters of Kaniv storage pool at the level of 0.062 μg/dm^3 near Kyiv city. Level of contamination of waters of these storage pools has stabilized and did not change practically since 1997. The most prolonged pollution with p, p'-DDE is typical to the point in Kyiv city of the Kaniv storage pool of the Dnipro river basin (fig. 2.9.1).

Content of p,p'-DDE at the point shown on fig. 2.9.1 was within the measures of 0.001 μg/dm^3 to 0.062 μg/dm^3 for the last 7 years. Low contamination has been observed in the main course of Dnieper river for 10 years. Maximum concentration of 0.022 μg/dm^3 was revealed in the oblast near Kherson city in 1993, but it was 0.001 to 0.009 μg/dm^3 at the period of 1994 to 2003.

A little cases of HCB revelation have been observed in the basins under research. The greatest number of them was at the period of 1993 to 1995. The greatest amount of instances when norms have been exceeded (9.38%) has been observed for the waters of Western Bug, but the highest concentrations have been revealed in the waters of Sieversky Donets river (diapason of 0.016 μg/dm^3 to 0.098 μg/dm^3), Dnieper river basin (0.003 μg/dm^3 to 0.098 μg/dm^3), and Danube one (0.005 μg/dm^3 to 0.022 μg/dm^3).

HCB has been revealed in all the 6 storage pools of the Dnipro basin for the period of 1993 to 1997. The highest concentrations have been observed in Dniprodzerzhinsk storage pool near Verkhnyodniprovsk town at the level of 0.074 μg/dm^3, Kyiv and Kremenchuk storage pools near Novopertivtsi village and Svitlovodsk town at the level of 0.030 μg/dm3, and Kaniv storage pool near Kyiv city within the measures of 0.003 μg/dm^3 to 0.008 μg/dm^3, but we should note that instances of revelation of this compound became more frequent in 1997. It was revealed almost in all the confluents; its content was at unfavorable level and was as much as 0.001 μg/dm^3 to 0.098 μg/dm^3. The greatest amounts of exceeding norms have been observed in the waters of Gnilopyat, Desna, Ros, and Trubizh rivers. The highest concentrations have been revealed in the waters of the following rivers: Golovesnya (Pokoshytchi village, level of 0.058 μg/dm^3), Irsha (Malin town, level of 0.016 μg/dm^3), Ros (Korsun-Shevtchenkivskiy town, level of 0.040 μg/dm^3), Sula (Lubny town, level of 0.050 μg/dm3), Uday (Priluki town, level of 0.098 μg/dm^3), and Desna (Novograd-Siversky town, level of 0.010 μg/dm^3).

Contamination of water with HCB is more typical for the point of Kyiv city of the Kaniv storage pool belonging to Dnipro basin, and the highest level of water pollution falls at 1994 (fig. 2.9.2).

In general, level of contamination of the rivers under research greatly lowered compared to earlier period. According to literary data, level of pollution of water in the mouth part of Dnipro with DDT varied within the measures of 0.1 μg/dm^3 to 0.6 μg/dm^3 at the period of 1979 to 1985. Similar data on soils are not available.

Fig. 2.9.1. Dynamics of change of concentration of p,p'-DDE at the point in Kyiv city of the Kaniv storage pool of the Dnipro river basin

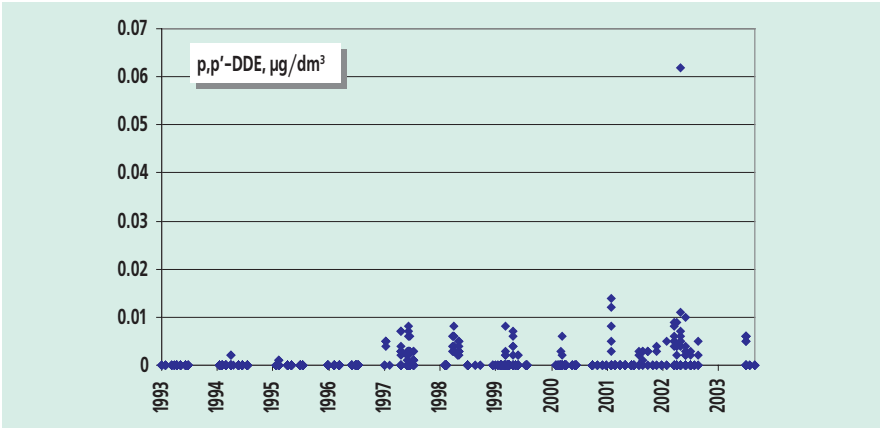
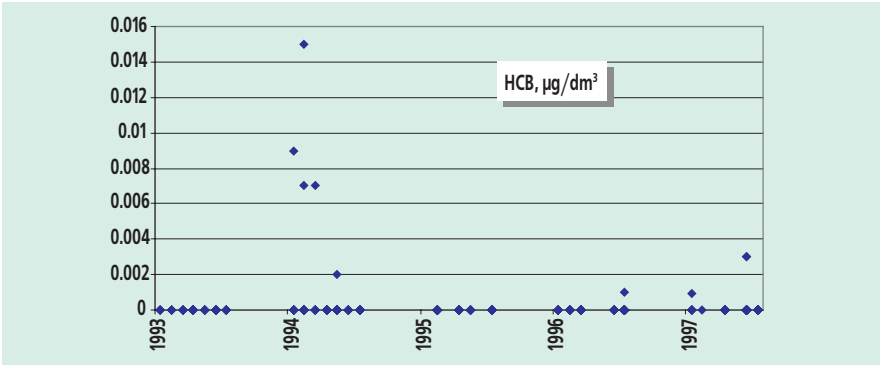


Fig. 2.9.2. Dynamics of change of concentration of HCB at the point in Kyiv city of the Kaniv storage pool of the Dnipro river basin.



Possibility of contamination of water objects with pesticides is caused first of all by flow of water from melted snow and rain water from agricultural grounds as well as deflection of drainage flow and carrying out of irrigation works for principal part of rivers' flow off is formed at lands belonging to agricultural grounds. Wash-out of pollutant substances (POPs) from these lands defines ecological state of water objects first of all.

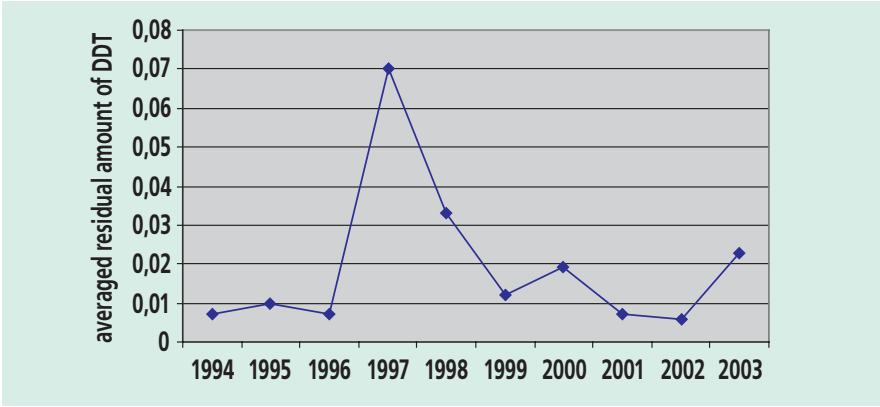
It has been stated that residual amounts of pesticides being POPs violate formation of biological and hydrochemical regimes of water objects. Particularly, impact of persistent toxic substances on water ecosystems violates processes of vital activity of water life and impacts human health.

Necessity in real estimation of change of quality of natural waters and taking measures for environment protection in order to lower amount of POPs application in cultivation of agroindustrial crops is caused by this.

Gathering of information ***as to contaminated soils*** at the Ukrainian territory has been performed by p,p'-DDT, and p,p'-DDE. Calculation of averaged and maximum levels of residual amounts (RA) of «general» DDT index has been done, and number of instances of exceeding

maximum permissible concentrations as well as squares of contaminated plots has been determined. Tendency of change of averaged residual amount of DDT in some years at the territory of Ukraine shows no stability (fig. 2.9.3).

Fig. 2.9.3. Dynamics of change of averaged residual amount of DDT in the soils at the plots of Ukrainian territory under research



Results of calculations for 1994 to 2003 are witness of low index of exceeding norms (10% maximum). The highest per cent of exceeding has been revealed in 1997 and 1998.

The highest indices of contamination of agroindustrial lands with residual amounts of DDT were observed in 1997 and 1998. 212 samples of soils were analyzed in 1997, and 10% of samples showed exceeding of maximum allowable concentrations. Averaged content of residual amounts of DDT in the soils of agricultural lands was 0.07 mg/kg at the researched territory of 5.135 hectares. Total contaminated area appeared 840 hectares that is 16% of the area having been researched. 256 hectares were planted with orchards, 165 ones with maize, 163 ones with corn crops, and the rest with other types of agroindustrial crops.

Analysis of results of observation of pollution of soils with POPs in 1994 to 2003 showed that the oblasts of Ukraine differ greatly by level of contamination. Contamination of soils with POPs is observed almost permanently in Zaporizhzha, Vinnitsa, Kherson, and Donetsk oblasts during the last 10 years.

Analysis of contamination of soils with POPs for the last 10 years witnesses that their unsanctioned application at agricultural lands is observed in some oblasts of Ukraine especially in treatment of orchards and vineyards.

Ukrainian law "On ensuring of sanitary and epidemic well-being of the population" declares that studying, estimation, and forecasting of health indices of the population depending on the state of environment of human vital activity as well as determination of factors of environment to effect negatively health of the population are one of the main directions of activity of the State sanitary and epidemic service.

Institutions and entertainments of the State sanitary and epidemic service perform monitoring of content of chemical substances including POPs in soil, water of surface water bodies that of centralized and non-centralized water supply, air of closed rooms and settlements, and foodstuff ***in order to state cause-and-effect relation*** between level of sickness rate of the population and environmental factors. 38,282 analyses were performed by institutions and entertainments of the State sanitary and epidemic service during 2005.

Results of monitoring are shown in table 2.9.1

Table 2.9.1. Results of monitoring analyses for determination of POPs content in the Ukrainian objects under research in 2005

Object of research	Number of samples analyzed				
	Heptachlor	ΣDDT	ΣHCH	γ-HCH	Aldrin
Soil	160 (5 over MAC)	472 (7 over MAC)	46	351 (6 over MAC)	49
Water of surface water bodies	490	982	273	753 (4 over MAC)	132
Water of centralized and non-centralized water supply	263	887	235	734	209
Indoor air	3	29 (10 over MAC)	-	-	-
Air of settlements	1	7	1	1	-
Foodstuff	5,052 (1 over MRL)	6,165 (4 over MRL)	2,050 (3 over MRL)	5,418	4,186

Results of laboratory control of foodstuff performed by the network of sanitary and epidemic stations of Ukraine in 1963 to 1965 showed that their contamination with residual amounts of DDT reached 30% to 34% in fruits, 28% in vegetables, 6% in vegetable preserves, 25% in jams, 10% to 14% in grain-crops, and 40% to 45% in vegetable oils, but that in milk and other foodstuff manufactured by cattle breeding very frequently exceeded maximum allowable levels. High concentrations of DDT in vegetable oils are explained by high solubility of this compound in fats. Concentration of DDT in flesh and liver of animals was 7 to 16 mg/kg.

Levels of OCPs content in organisms of haematherms (both wild and domestic) used as food by men were generally a great deal higher than those registered in vegetable foodstuff. This fact witnesses of both gross violations of prohibition of treatment of milk and slaughter cattle with this insecticide from the one side and evidence of high contamination of fodders caused by its use for treatment of forage crops as well as ones used for their feeding partly.

Full-scale and experimental data obtained in the process of studying extent of accumulation of DDT in muscular tissues of fish at insecticide concentration of 0.012 mg/l to 0.013 mg/l in the water showed identical results: it reached 0.86 mg/kg under river conditions and 0.98 mg/kg under model water pond conditions. Thus, DDT could intake to human organism in concentrations of a few ten thousand parts of mg/l, but its intake with fish flesh was more hazardous.

Analysis of data for the period of 1950 to 1970 performed in the network of implementation of the Project witnesses of sufficient contamination of foodstuff, sources of water supply, and air medium with DDT. These levels of contamination were cause of accumulation of DDT and its derivatives in human organism from the moment of conception followed with all the negative consequences.

On the whole, averaged level of contamination with DDT of daily ration was 0.58 mg, that of sources of drinking water supply was 0.0008 mg/l, and that of atmospheric air was 0.002 mg/m3 in

Ukraine in 1950 to 1970. Thus, level of DDT intake at the period of its intensive application exceeded permissible level 2 times for adults and 4 times for children (not taking into account its intake with breast milk). It shall be taken into consideration that its intake took place in parallel with impact of residual amounts of other preparations belonging to the POPs group (HCH, PCC) as well as compounds of other classes upon human organism.

Period of 1971 to 1990 is characterized by stepwise introduction of prohibitions and limitations concerned with persistent organochlorine pesticides declared in the 1960-ies into practice.

Research performed in 1983 showed that averaged DDT content in foodstuff (in 283 samples of 17,165 ones) was 0.05 mg/kg.

According to the data of the unified system for control of residual amounts of pesticides in agricultural produce and foodstuff DDT was revealed in 201 samples of foodstuff among 5,341 ones (1.31%), and polychlorcamphene (toxaphene) was revealed in 2 samples among 696 ones in 1984.

Number of instances of revelation of POPs pesticides in the samples under research significantly lowered, and quantitative indices of their content decreased a great deal, too compared to the period of 1950 to 1970.

Averaged residual content of toxaphene was at the level of 0.1191 mg/kg and 0.1652 mg/kg in 1988 and 1989, respectively. Averaged content of revealed toxaphene in the samples was 0.0891 mg/kg in 1990.

This decrease appeared to some greater extent in the level of DDT concentrations in the air of settlements and foodstuff and to some lower extent in its level in the water of open subsurface sources of water supply that is obviously connected to specific features of DDT degradation and migration in the «ground – water» system.

Period of 1991 to 1996 is characterized with decomposition of the interdepartmental system for control of observation of the requirements of safe application of pesticides for economic and domestic purposes. At the same time in spite of shortening amounts of chemical means for plants protection unsanctioned and uncontrolled use of pesticide preparations (including those belonging to the POPs group) grows in some small-scale enterprises. This could lead to environment pollution.

According to the data of the automated control system (ACS) «pesticide – air of the working area» of MHU for 1993, DDT was revealed in the air in concentrations of 0.08 mg/m3 to 0.7 mg/m^3 in the places of stockpiling of pesticides. It is known that concentrations of pesticides decrease about 2 times while distance from the source of pollution increases by 500 m.

Therefore, impact of DDT upon human beings in concentrations exceeding TLV (0.001 mg/m^3) can be observed at a distance of km 1 km to 2 km from the storehouses covering at the area of 300 to 600 hectares.

Data on pollution of sources of water supply with DDT and toxaphene (PCC) in 1992 witness of the fact that percentage of positive samples as well as averaged content of DDT and its metabolites in 1991 to 1993 in water was registered practically at a constant level (table 2.9.2).

Table 2.9.2. Averaged concentrations of some pesticides in the water of Ukrainian rivers

Pesticide	Number of samples	Percentage of positive samples	Averaged content, mg/l
DDT	3910	1,816	0,0184
DDE	955	6,178	0,0166
DDD	180	12,222	0,0021
Toxaphene (PCC)	994	0,101	0,05

According to the data of expert analysis of the ACS "pesticides – biological media of man – foodstuff" frequency of DDT revelation in Ukraine was 1.1% of the total amount of samples (16,837), that of DDE was 6.24% (6,695), DDD – 5.01% (919), and PCC – 0.07% (1,471). Percentage of positive samples was 0.77% of the total amount of samples (15,263) for DDT, 4.17% (among 6,266) for DDE, and 3.69% (among 839) for DDD. Clear tendency to lowering frequency of instances of contamination of foodstuff with residual amounts of POPs pesticides is observed. Averaged level of DDT and its metabolites in foodstuff was 0.0018 mg/kg in 1991 and 0.0011 mg/kg in 1993. Similar figures for PCC were 0.2160 mg/kg and 0.0880 mg/kg, respectively, but those for aldrin were 0.283 mg/kg and 0.4375 mg/kg, respectively.

According to the data of the report done by the L.Medved Institute of Ecological Hygiene and Toxicology of MHU content of DDT and its metabolites in 1998 in various types of foodstuff was registered at the levels shown in table 2.9.3 (in mg/kg). Averaged content of DDT and its metabolites was at the level of 0.018 mg/kg.

Table 2.9.3. Results of determination of content of DDT and its metabolites in various types of foodstuff, mg/kg

Types of foodstuff	Content of DDT and its metabolites, mg/kg
Meat and meat produce	0,0005-0,08
Eggs	0,0005-0,01
Milk	0,0005-0,007
Fish	0,0005-0,15
Flour produce	0,0005-0,01
Vegetables and potato	0,0005-0,01
Fruits and berries	0,0005-0,005
Fats (vegetable and animal)	0,0005-0,01

We shall note that presence of DDT and its metabolites has been registered in all the samples analyzed that is in 100% cases. Difference in frequency of revelation of the pesticide in the samples according to the results of analyses performed by different institutions is concerned with use of methods of chemical analyses different by their sensitivity.

Therefore, results of informational search for this period witness that ultimate effects of environmental pollution with POPs are expressed in their accumulation in foodstuff and migration to groundwater.

It is known that performing of biological monitoring purposed to revelation and estimation of levels of accumulation of xenobiotics in test biological human media (biological liquids, tissues of internals, etc.) is the most adequate method for determining relations between quality performance of environment and state of professional and averaged health of the population. The best objects for performing such monitoring are blood and breast milk. At the same time, literary data on accumulation of POPs in human biological media are extremely restricted.

Due attention has been paid to determination of OCPs content in human organism since 1963 to 1964 by both research institutes of hygienic profile and laboratories belonging to the network of oblastal SES.

It was shown for the first time in performing biological monitoring of OCPs at the beginning of the 1980-ies that not only DDT and HCH but HCB are revealed in the breast milk of women of 20 to 37 years old living in the city of Kyiv.

Moreover, quantitative composition of DDT and its derivatives as well as HCH isomers was defined more exactly. It was shown that 2,4'-DDT, 2,4'- and 4,4'-DDD as well as 2,4'-DDE could intake with breast milk to baby's organism along with 4,4'-DDT (DDT) and 4,4'-DDE (DDE). Frequency of 4,4'-DDE revelation reached 100%, whereas that of 4,4'-DDT, α-, β-, and γ-HCH exceeded 90%.

Total content of DDT and its derivatives (ΣDDT) varied within the measures of 0.87 μg/l to 186.57 μg/l (33.42 ± 6.48), and up to 87% of them (about 50% averaged) was part of 4,4'-DDE (0.1 μg/l to 140 μg/l). Total amount of HCH isomers (ΣHCH) varied in the interval of 0.02 μg/l to 41.87 μg/l (8.29 ± 3.27), and in some cases up to 100% of them fell upon β-HCH (over 70% averaged, or 0.05 μg/l to 40.5 μg/l). HCB content was (0.12 ± 0.04) μg/l (table 2.9.4.).

The Institute for Occupational Health of the AMSU has been performing biological monitoring of OCPs for the last 15 years among various contingents of population including those subject to elevated risk (children, pregnant women, women recently confined, teenagers, patients having neoplasm, etc.). Results of research for determination of background content of OCPs in breast milk of women living in some oblasts of Ukraine for some years are rendered in table 2.9.5. Women having no occupational contact with OCPs and other POPs have been subjected to the research.

Table 2.9.4. Results of determination of OCPs content in breast milk of Ukrainian women in 1981 to 1986 (μg/l)

Oblast	Years	Σ DDT	Σ HCH	HCB
Kyiv city	1981-1983	0,87 – 86,57 (33,42 ± 6,48)	0,02-41,87 (8,29 ± 3,27)	(0,12 ± 0,04)
Kyiv oblast	1986	18,72 ± 4,96	14,27 ± 6,37	0,59 ± 0,31

Table 2.9.5. Results of determination of content of OCPs in breast milk of Ukrainian women in 1994 to 2000 (μg/l)

Oblast	Years	Σ DDT	Σ HCH	HCB	Σ OCPs
Kyiv city	1994	18,73 – 253,55	3,68 – 26,98	0,69 – 3,96	23,1 -284,49
Kyiv oblast		40,74 – 83,59	8,59 – 15,21	2,03 – 6,84	51,36-105,64
Sumy oblast		34,15 – 48,33	9,03	0,59 – 0,68	43,77 – 58,04
Other oblasts (Khmelnitskiy and Chernivtsi oblasts and Kryvyi Rig area)		10.64 to 44.02	3.15 to 22.18	0.31 to 0.88	14.1 to 67.08
Kyiv city	1995	23,37 – 66,59	5,91 – 41,32	0,55 – 4,89	29,83 – 112,8
Rivne oblast		35,19 – 49,97	7,85 – 14,08	0,23 – 2,31	43,27 – 66,36

Oblast	Years	Σ DDT	Σ HCH	HCB	Σ OCPs
Chernigiv oblast		19,91 – 139,95	3,59 – 20,30	0,41 – 3,19	23,91 –163,44
Donetsk oblast	1995[1]		1 – 5,2		
Dnipropetrivsk city	1996	9,68 – 86,37	0,69 – 45,77	0,02 – 1,04	10,39 –133,18
Zaporizhzhya city		1,87 – 136,07	0,16 – 88,81	0,01 – 0,18	2,04 – 225,06
Poltava city	1998	5,8 – 43,1	2,0 – 13,3	0,04 – 0,89	7,84 – 57,29
Poltava oblast	2000	82,23	10,53	1,09	93,85

Note: 1 – year of publishing; 2 – median value

Research of samples of breast milk by content of organochlorine pesticides among women living in Poltava city of 17 to 35 years old endured first, second, third, or forth childbirth witnesses that 100% of the persons studied being workers of intellectual labor and brain labor work engaged in industry, building, service sphere as well as housewives and having never any professional contact with pesticides were carriers of persistent organochlorine pesticides, DDT and its derivatives, and γ-HCH and its isomers. HCB was found in 45% of instances.

Unfortunately, it is impossible to evaluate content of such significant representatives of the POPs group as polychlorinated dibenzo-p-dioxines, polychlorinated dibenzofuranes, and polychlorinated biphenyls because of unavailability of data of systematic monitoring, although research of samples of breast milk shows that risk of their impact on health of Ukrainian population can be rather a high one.

Approximate estimation of danger of POPs to health of Ukrainian population can be conducted but on the basis of available data of levels of OCPs content in the organisms of Ukrainian citizens for the last 10 to 15 years. The fact that presence of persistent organochlorine compounds is an integral index of environment pollution and volume of impact of these pollutants upon human organism should be born in mind.

Risk of impact of PCDDs, PCDFs, and PCBs on human organism in Ukraine is higher than that in developed countries (the USA and Japan) and is connected to general pollution of the dwelling territory and foodstuff. Generalization of the data available allows drawing conclusions that Ukraine is a state where levels of contamination of breast milk with DDT can be higher than those in other parts of the world in spite of prohibition of DDT application taken 35 years ago. This can cause extreme levels of exposition for descendants.

Minimum and maximum OCPs daily intake with breast milk have been calculated taking into account values of its daily consumption of 130 ml per kilogram of baby's mass: ∑DDT 35.36 μg/l to 275.5 μg/l, ∑HCCH 10.53 μg/l to 84.05 μg/l, and HCB 1,09 μg/l to 7,92 μg/l (table 2.9.6).

The L.Medved Institute of Ecological Hygiene and Toxicology conducted research of PCDDs, PCDFs, and PCBs in samples of breast milk in the network of the first (1993) and the third (2000) rounds of the Euro WHO with financial aid of this organization.

Samples were taken in 2000 in two districts of Kyiv city and in an agricultural area of Kyiv oblast. Questionnaire design of 35 donors of breast milk was performed in accordance with the requirements of WHO, and analysis of questionnaire data was fulfilled. Three general samples were formed (500 ml out of 50 ml of milk from each donor) depending on oblast of dwelling and conditions of labor of donors of milk for further analyzing for PCDDs, PCDFs, and PCBs content. Analyzing was carried out at the State Institute of chemical and veterinary analysis of foodstuff (Freeburg, Germany).

Analysis of the data obtained showed that breast milk taken of donors dwelling in agricultural oblast contained the highest total amounts of PCDDs, PCDFs, and PCBs put together.

Table 2.9.6. Load of OCPs on baby organisms in Ukraine in 2000 to 2004

Age of the baby (months)	Averaged weight of the body for both sexes (g)	Daily consumption of breast milk (ml)	Factual intake of OCPs to babies' organisms, µg/pers.								
			Σ DDT			Σ HCH			HCB		
			Permissible daily dose (µg/pers.)	min	max	Permissible daily dose (µg/pers.)	min	max	Permissible daily dose (µg/pers.)	min	max
At birth	3300	429	8,25	15,17	118,36	33,0	4,52	36,06	1,98	0,468	3,400
1	3885	505	9,71	17,86	139,33	38,85	5,32	42,44	2,33	0,550	3,999
2	4730	615	11,82	21,75	169,68	47,30	6,47	51,69	2,84	0,670	4,871
3	5445	708	13,61	25,03	195,34	54,45	7,45	59,51	3,27	0,772	5,607
4	6165	801	15,41	28,32	220,99	61,65	8,43	67,32	3,70	0,873	6,344
5	6825	887	17,06	31,36	244,72	68,25	9,34	74,55	4,09	0,967	7,025
6	7420	965	18,55	34,12	266,24	74,20	10,19	81,11	4,45	1,052	7,643
7	7820	1017	19,55	35,96	280,59	78,20	10,70	85,48	4,69	1,108	8,055
8	8280	1076	20,70	38,05	296,87	82,80	11,33	90,44	4,97	1,173	8,522
9	8550	1111	21,37	39,28	306,52	85,50	11,69	93,38	5,13	1,211	8,799
10	8622	1121	21,55	39,64	309,28	86,22	11,80	94,22	5,17	1,222	8,878
11	9145	1189	22,86	42,04	328,04	91,45	12,52	99,93	5,49	1,296	9,417
12	9480	1232	23,70	43,56	339,91	94,80	12,97	103,55	5,69	1,343	9,757
Index of exceeding (times)				1,84	14,35		–	1,09		–	1,71

Notes:

1. Value of daily consumption of breast milk is 130 ml per kilogram of baby's mass.
2. Minimum and maximum median value of OCPs content in breast milk in some oblasts is as follows: Σ DDT 35.36 µg/l to 275.5 µg/l; Σ HCH 10.53 µg/l to 84.05 µg/l; and HCB 1.09 µg/l to 7,92 µg/l.
3. Permissible daily intake, mg/kg: DDT – 0.0025; HCH – 0.01; and HCB – 0.0006.

According to estimation of content of persistent toxic substances in various oblasts performed in the network of monitoring under the aegis of WHO, content of PCDDs/PCDFs in breast milk in Ukraine in 2001 to 2002 was 10.04 (8.38 to 10.16) pg of TEQ/g, and that of dioxin-like polychlorinated biphenyls was 19.95 (14.10 to 22.00) pg of TEQ/g. We shall emphasize that this index is higher than that in Bulgaria, Czech Republic, Finland, Hungary, Ireland, Norway, Romania, Russia, and Slovakia (6.14 to 9.44 pg of TEQ/g), but it is a great deal lower than that in the Netherlands (18.27 pg of TEQ/g). At the same time, it is higher for dioxin-like PCBs than the values obtained for all the mentioned countries (2.87 to 15.68 pg of TEQ/g).

Available information on content of DDT in breast milk of women allows comparing data obtained at various periods of observation in Ukraine with other oblasts of the world (table 2.9.7).

Table 2.9.7. Content of DDT in breast milk of women in various oblasts of the world in 1980 to 2000

Oblast	Content of ΣDDT in breast milk of women, ng/g of fat		
	1960 to 1969	1980 to 89	1990 to 99
Ukraine	trace amounts to 414,700	25-5330	53-7244
the USA / Canada	2800-74002	385-2500[2]	–
Western Europe	4800-50402	561-2200[2]	283-2283[2]
Eastern Europe	2288-258830	550-6800[2]	1072-2357[2]
Asia and the Near East		1200-13800[2]	2260-6420[2]
Latin America		770-6250[2]	594-6440[2]
Other oblasts (Australia, Africa, and New Zealand)		69-15830[2]	473-6000[2]

Notes: * – according to averaged indices for some countries of the oblast.

Levels of β-HCH revealed in Ukraine are higher than those in European countries. These tendency is concerned with not all the data mentioned in the appropriate literary sources for 4,4'-DDE and 4,4'-DDT. As to other OCPs, their content in biological media is comparable or lower than those described for Europe. Levels of PCBs content for 153 and 138 congener's concentrations of those are highest are at the interval of other supervisions made in Europe at the same time.

Comparison of the data obtained with the results of analyses on content of PCDDs, PCDFs, and PCBs in breast milk taken of donors in the USA (California) and Japan (Fukuoka and Osaka) has been done, too.

Thus, according to the results of biological monitoring performed almost 25 years after introduction of prohibition for DDT application, the following tendencies have been revealed:

- background concentrations of OCPs remain significant and vary in rather wide limits, and ΣDDT is within the interval of 1.87 μg/l to 253.55 μg/l (53.43 ng to 7,244.29 ng per g of milk fat), ΣHCH is 0.16 μg/l to 88.81 μg/l (4.57 ng to 2,537.3 ng per g of milk fat), and HCB content is 0.01 μg/l to 6.84 μg/l (0.29 ng to 195.62 ng per g of milk fat);
- levels of OCPs content in the breast milk of women living in the city of Kyiv are higher than those for other oblasts;
- older women (30 to 39 years old) have higher OCPs content in their breast milk than younger ones (20 to 29 years old);

- women having higher OCPs content in their breast milk observed aborts and stillbirth instances in the past as well as pathological childbirths more frequently; and
- daily intake of OCPs to babies' organisms with breast milk of their mothers exceeds acceptable daily intake (ADI) several times in many cases (ΣDDT up to 13 times, ΣHCH up to 2.3 times, and HCB up to 1.5 times).

It has been stated that althow concentration of OCPs in breast milk lowered greatly for 15 years upon introduction of prohibition on DDT application in the agriculture, but calculated daily intake of OCPs to baby's organism in many cases significantly, and dozens times by some components, exceeded ADI. Instances when exceeding of ADI is observed for several studied xenobiotics (DDT, HCH, and HCB) simultaneously cause the greatest anxiety.

DDT content in the blood of persons working with pesticides at the period of intensive use of OCPs in agriculture varied mostly within the limits of 0.2 mg/l to 50 mg/l, and that for non-professional contingents was from trace amounts to 1 mg/l. Concentration of OCPs in the blood observed at the time of checkup of some contingents of persons working in agriculture for subsequent decades is shown in table 2.9.8.

Table 2.9.8. Content of persistent OCPs in the blood (1967 to 1970)

Year of observation	Contingent of checked persons	Number of checked persons	OCPs content, mg/l		
			ΣHCH	ΣDDT	Reference
1967	Storekeepers of chemical weed-killers and pest-killers	33		0,01-0,8	[114]
1968	Women in childbirth	40		сліди-1	[91]
1968	Storekeepers of chemical weed-killers and pest-killers	106		0,1-3,2	[115]
1969	Air and technical crew	267		0 (0,2)-50	[116]
	Agricultural workers	55		0 (0,2)-195	
	Control	47		0 (0,2)-9	
1970	Agricultural workers	35	0,3-0,6	0,4-40	[117]

It has been shown for the first time that the list of xenobiotics found in the blood includes 4,4'-DDT (DDT), 4,4'-DDE, 2,4'-DDT, 2,4'-DDD, 4,4'-DDD, 2,4'-DDE, and γ- α-, β- and δ-isomers of HCH as well as HCB.

The Institute for Occupational Health has been conducting regular research of OCPs content in the blood of workers and the population on the whole especially contingents of elevated risk since 1991. It is performed at the time of carrying out of epidemiological research of the state of reproductive function of agricultural women workers in view of the Chornobyl disaster and studying of the state of health of the persons having eliminated consequences of the accident at the Chornobyl NPP and conditions of work of mechanic-operators of agriculture at controlled territories.

Results of biological monitoring performed in 1992 to 2004 are shown in table 2.9.9.

Table 2.9.9. Results of research for determination of content of persistent organochlorine pesticides in the blood of rural and urban Ukrainian population in 1991 to 2004

Terms of observations	Oblast of observations	Contingent of checked persons	Sex	Age	Number of checked persons	OCPs content in the blood, μg/l		
						HCB	Σ HCH	Σ DDT
1991	Kyiv oblast, Polissya and Boryspil districts	Machine-operators of agriculture	M		25		2,0-34,3 (9,5-12,9)*	1,5-62,33 (19,6-24,7)*
1992	Polissya district	Ploughmen, cattle-breeders, machine-operators of agriculture, and office workers	M		298		15,6	17,62
1992	Myronivka district	Ploughmen, cattle-breeders, and office workers	F	22-53	87	0 (0,06) – 0,16	3,38-41,42	4,18-77,27
1993-1995	Zhitomyr oblast, Olenivka district	Ploughmen, cattle-breeders, and office workers	F	20-58	206	0 (0,08) – 45,96	20 – 930	3,4 – 260,6
		Teenagers	F	14-17	30	0 – 4,0	0,05-162,7	0,05-951,95
1998	Kyiv oblast, Vasylkiv district	Teenagers	F	14-17	30	0 (0,01) – 0,26	0 (0,04) – 3,49	0 (0,05) – 11,53
1998	Kyiv city Poltava city	Women in childbirth	F		25	0 (0,13)-3,1 0 (0,06)-0,76	0,18-87,9 8,6-76,1	0,18-15,4 0,3-4,5
2000	Poltava and Kyiv cities	Pregnant women	F		32	1,6±0,02	49,26±13,4	42,4±11,1
2001	Kyiv city		F, M		6	0 (0,82)-33,39 (6,9)	9,61-437,7 (123,3)	1,62-71,45 (31,41)
2004	Kyiv city	Pregnant women	F		14	0,37±0,09	3,58±0,18	92,96±3,12

Note: * by averaged figures in the villages. / M-male, F-female.

Generalization of data of research of over 750 samples of blood of rural and urban inhabitants performed during the last decade showed that levels of OCPs content remain rather high ones despite prohibition of their application in agriculture. Concentrations of xenobiotics under research vary in very wide range: ΣDDT 0.05 μg/l to 952 μg/l, ΣHCH 0.04 μg/l to 930 μg/l, and HCB 0.01 μg/l to 46 μg/l. Comparison with the figures obtained in other oblasts of the world showed that total levels of DDT and its derivatives, HCH isomers as well as HCB in Ukraine can exceed significantly averaged and boundary values typical to other countries (table 2.9.10).

Table 2.9.10. Results of research for determination of OCPs content in human blood in various oblasts of the world in 1991 to 2004

Oblast	Years	OCPs content in the blood, μg/l		
		HCB	∑HCH	∑DDT
Ukraine	1991-2004	0,01-46	0,04-930	0,05-952
Canada	1994			11,3
Croatia	1994-1995		1,5	4,2
Spain	1992-1995			10
India	2002			32-48
	1997		39-148	
Pakistan	1996		до 1440	
Greenland	2000	0,1-7		
Germany	2000	<0,1-4,8		
Caribbean oblast	2002			80
Salvador	2002			80
Guatemala	2002			10-31
Brasilia Argentina Chili	2002		1,1-50	0,4-97

Data on studying of POPs accumulation in adipose tissues are of significant scientific interest because of high lipophily of these substances.

The works to reflect state of "mother – baby" systems are of greatest interest.

It was shown first at the time of carrying out of biological monitoring of OCPs among the contingents that had never have professional contact with pesticides at the beginning of the 1980-ies that adipose tissues contain not only 4,4'-DDT (DDT) and 4,4'-DDE (DDE) but 2,4'-DDT, 2,4'-DDD, 4,4'-DDD, and 2,4'-DDE. Qualitative composition of HCCH isomers content was determined more exactly for the first time (γ- α-, β-, and δ-isomers were identified, too), and hexachlorobenzene (HCB) was found as well (table 2.9.11).

Table 2.9.11. Results of determination of OCPs content in adipose tissues in 1964 to 1983

Year	Oblast	Exposition	Sex	Age	Number of checked persons	OCP	% of positive samples (cases)	Content (averaged value), mg/kg
1	2	3	4	5	6	7	8	9
1964	Donetsk oblast				21	DDT	47,6	0,65-10
1967[1]	Kyiv city and Kyiv oblast.	professional	M + F, among them M	12 to 65	41	4,4'-DDT	97,6	trace amounts to 21 (4.33)
							12,2	trace amounts
							48,8	less than 5
							24,5	5 to 10
							7,3	10 to 20
							4,8	over 20
					15	4,4'-DDT	85,4	trace amounts to 20 (3.86)
							12.1	trace amounts
							39,4	less than 5
							31,6	5 to 10
							2,3	10 to 20
1967	Kyiv city and Kyiv oblast.						100	0,5 to 12 (4)
1968[1]	Kyiv city and Kyiv oblast.	IU	M		9	4,4'-DDT		(3.1)
1968[1]	Ukraine	IU	IU	IU	698	4,4'-DDT	42.1 51% of them	trace amounts to over 50 1 to 10
							12,9	trace amounts to 1
							28,6	1 to 5
							22,4	5 to 10

Year	Oblast	Exposition	Sex	Age	Number of checked persons	OCP	% of positive samples (cases)	Content (averaged value), mg/kg
1	2	3	4	5	6	7	8	9
							13,6	10 to 15
							20,1	15 to 50
							2,4	over 50
		professional			19		94.7% of them	5.2 to 153 5.2 to 20
		IU			200		40,5	0.2 to 15
					327	DDT	99%	5.3 to 7.57
1969						DDE		3.2 to 7.1
						HCH		1 to 1.15
		IU		still-born children	47	DDT	44,7%	(1.04)
1973				1 to 5 months	–	DDT	–	1 to 3.5 (2.5)
				children mortal by accident	7	DDT		3.3 to 4
1981[1]				children mortal by accident		4,4'-DDT		(2.28)
						4,4'-DDT		(2.95)
1981-1982	Kyiv city	unexposed	F	10-49	32	Σ DDT	100%	0.5 to 14.2 (3.13±0.76)
			F	10-49		Σ HCH	100%	0.03 to 2.14 (0.78±0.11)
			F	10-49		HXB		0.0001 to 0.085 (0.011±0.003)

Notes: 1 – year of publication; 2 – averaged value; IU – information unavailable

Comparison of data obtained in Ukraine at various periods of observation with similar ones for other oblasts of the world has been carried out (table 2.9.12).

Table 2.9.12. Content of DDT and its derivatives in adipose tissues in various oblasts of the world

#	Oblast	Content in adipose tissues, mg/kg		
		1960 to 1969	1970-1979	1980-1984
1	Ukraine	trace amounts to over 50 (max 153)	1,04 to 4	0,5 to 14,2 3,13±0,76
2	North America*	4,4 to 23,18	7,9 to 9,9	5,9
3	South America*	4,1 to 13,2		
4	Western Europe*	2,2 to 15,7	1,9 to 16,75	
4	Eastern Europe*	9,6 to 23,5	2,41 to 14,7	6,92
5	Africa*	5,9 to 8,8	2,9 to 5,4	
6	Asia*	2,4 to 26	2,7 to 25	7,8
7	Oceania*	1,81 to 14,6	4,9	

Note: * – in accordance with averaged values for the countries

It has been shown that DDT content in human adipose tissues reached extreme values (up to 153 mg/kg) in some cases at the period of its intensive application, but upon its prohibition in 1970 it reduced to some extent and is close by diapason of its values to the countries of Asia, Africa, and Oceania. DDT content became a little lower than that in the European countries. At the same time, values of background DDT content in human body in Ukraine at the beginning of the 1980-ies were nearly the same that in the European oblast on the whole.

Comparative analysis with the data obtained almost 15 years earlier showed that levels of DDT accumulation and its derivatives in adipose tissues did not change virtually.

Pesticides have been found not only in the blood but in the sweat, gall, and urine at the time of check of 336 persons (collective farmers, agronomists, and disinfectors) in the concentrations from trace amounts to up to 0.3 μg /l having had professional contact with OCPs including DDT in the past.

Research of the «mother – baby» system showed that DDT and its derivatives as well as HCH and HCB are found in amniotic fluid of women in childbirth of the oblasts under research. These figures in amniotic fluid taken at the time of childbirth were 0.03 μg/l to 0.16 μg/l for HCB and 0.08 μg/l to 3.46 μg /l for DDT.

Results of research for determination of DDT content in the bodies of the persons engaged in agriculture and the ones having no any contact with pesticides performed almost 15 years upon prohibition of its application are given in table 2.9.13.

Analysis of POPs data monitoring witnesses on necessity of organization and carrying out of permanent systematic monitoring of level of environment pollution with POPs and state of health of Ukrainian population. Measures purposed to lowering chemical load with POPs upon environment and human organism require permanent improvement.

Necessity in improvement and standardization of methodological approach to estimation of risk, safety criteria, and quality performance of the environment came to a head because of understanding that POPs belong to the class of super toxicants as well as compilation of information on high sensitivity of men to some super toxicants.

Table 2.9.13. Results of determination of content of persistent organochlorine pesticides in human biological media in Ukraine

Terms of observations	Oblast of observations	Contingent of checked persons	Sex	Age	Number of checked persons	Індикаторні біологічні середовища	OCPs content, μg/l		
							HCB	Σ HCH	Σ DDT
1985-1987	Rural and urban	Various professions	M and F		36	urine	0,001-0,91	0,07-12,40	0,49-28,37
1986-1988	Kyiv oblast	Field-crop growers	F		50	urine	0,04 – 1,80	0,50 – 4,53	0,13 – 14,01
1986-1988	Kyiv oblast	Mechanic-operators of agriculture	M		50	urine	0 (0,01) – 0,41	0,21 – 4,03	0,67 – 7,19
1986-1988	Kyiv oblast	Women in childbirth	F		20	urine	0 (0,04)– 0,27	0,09 – 3,78	0,31 – 3,91
1986-1988	Zhytomyr oblast	Women in childbirth	F		30	urine	0 (0,01)– 0,14	0,24 – 16,11	2,59 – 42,84
1986-1988	Zhytomyr oblast	Women in childbirth	F		30	amniotic fluid	0 (0,03)– 0,16	0,05 – 0,16	0,08 – 3,46
1984-1986	Zhytomyr oblas	Various professions	M and F	20-60	10	gall	0,02-1,92	0,17-2,99	1,69-12,25
1986	Rural and urban		M and F		11	sweat	0,11-0,35	0,29-7,72	1,53-16,17
1991	Kyiv oblast	Mechanic-operators of agriculture	M	27-56	26	hair (μg/g)		0,05-2,03	0 (0,04)-0,99
1993-1995	Zhytomyr oblast	Teenagers	F	14-17	19	hair (μg/g)	0-1,30	0,13-1,99	0,1-0,7
1994-1995	Kyiv oblast	Mechanic-operators of agriculture	M		41	hair (μg/g)		0,002-3,2	0,006-0,541
1998	Kyiv oblast	Teenagers	F	14-17	19	hair (μg/g)	H/o	H/o	0 (0,11) - 0,053
1994-1995	Kyiv oblast	Mechanic-operators of agriculture	M		41	saliva		0,89-12,80	0,97-61,86

2.10 PUBLIC INFORMATION, AWARENESS AND EDUCATION OF POPS AMONG TARGET GROUPS

Independent research carried out in Ukraine confirmed today's insufficient level of information of the society as to problems concerned with POPs both among wide and separate groups of the population.

Pilot sociological research conducted in the framework of implementation of the project «Enabling Activities for the Development of National Implementation Plan for the Stockholm Convention on POPs in Ukraine» showed that wide society refers to solution of ecological problems rather passively relying in this first of all upon state and non-state entertainments. Necessity of spreading information on POPs has been recognized as necessary by majority of the respondents. Agricultural and industrial enterprises as well as transport are the main polluters with POPs on the respondents' opinion.

In spite of insufficient amount of information on POPs almost a fifth part of the persons having been interrogated (19.2%) revealed some education of what substances belong to this group. They mentioned DDT (4.3%) and dioxins (6.8%) the most frequently. But it has been revealed upon acquaintance with the list of the main POPs and sources of their origination that majority of the respondents knew of these pollutants but had no idea of their belonging to POPs or did not know what this term means.

We can conclude on rather a low level of ecological education of urban inhabitants those reckon "typical" urban pollution sources (incineration of household waste, heat and power plants, automobile vehicles, etc.) causes of dioxins generation and poisons for mice, rats, mosquitoes, and other insects sources of DDT. Urban inhabitants do not realize the fact that consumption of agricultural produce contaminated with POPs sometimes causes greater threat to their health than its consumption by rural inhabitants for the latter consume produce grown at homestead lands without use of POPs.

Results of interrogation show that rural inhabitants are better informed on the POPs issues and sources of contamination with them compared to urban ones. Dioxins and DDT are primary pollutants for urban inhabitants, but aldrin and DDT are those for rural ones. In general, respondents contact almost all the known POPs every now and then or permanently, and this witnesses indirectly on significant spread of the latter in Ukraine.

Rather a great interest of respondents to threat concerned with impact of POPs upon environment and human health has been revealed in the course of interrogation. Thus, two thirds (66%) of the persons having been interrogated would like to get more information on impact of POPs, and but 13,3% do not demand such information. A problem situation is obvious: from the one hand, citizens would like to be aware of the problems concerned with POPs as much as possible, but from the other hand, appropriate information is almost unavailable at present or of unsystemized character. Editions to publish materials on POPs are intended rather for professionals not for ordinary citizens. Respondents prefer oblast printed editions, television, and broadcasting most of all (fig. 2.10.1). This is concerned first of all with rural inhabitants, but methods of «passive» agitation (leaflets, booklets, placards, etc.) appeared more effective for urban inhabitants. Moreover, townspeople strive for direct contact with proper specialists at lectures and «round tables». Informational and education work using the mentioned sources do not require too high expenditures and can be organized directly on places engaging bodies of oblast self-governing as well as society.

At the time of conduction of the interrogation information of the Stockholm Convention was not spread in the community in fact. Education on it is different in various oblasts where interrogation was carried out, and the lowest levels of it were in the Autonomous Republic of Crimea as well as Vinnitsa and Ivano-Frankivsk oblasts. Even in the Kyiv oblast center (that city is the capital of

Ukraine) but a quarter of the persons having been interrogated had ever heard of the Convention. These results could have been foreseen for wide informational support of the ideas of the Convention is unavailable at the state level at present, so majority of the persons having been interrogated have but scanty information on this document and its purpose. Majority of the persons (60%) having had idea of the Convention had obtained proper information from periodical editions, a great deal fewer part had obtained it from telecasts or broadcasts, but other sources of information had not been used at all or had been used non-effectively, and they had been purposed to restricted auditoria and had not met requirements of possible recipients, etc.

Results of interrogation specifies about insufficient knowledge as a whole about an ecological situation in the country and about POPs in particular. Almost all the persons having been interrogated expressed want to obtain more such information.

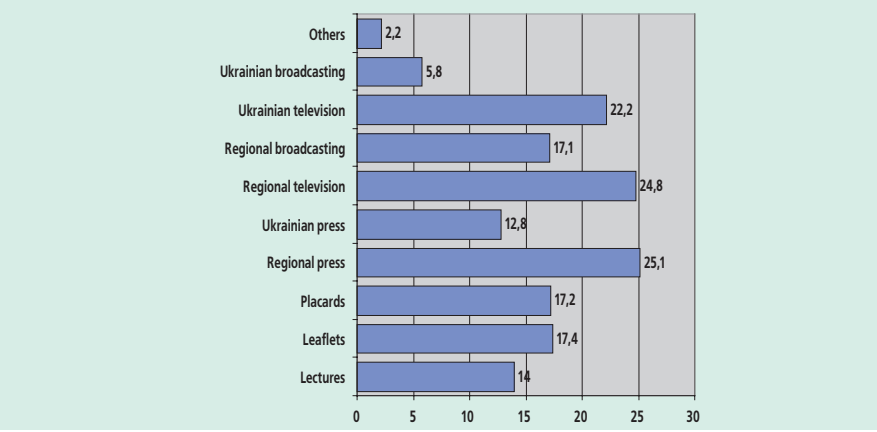


Fig. 2.10.1. The most attractive sources of information on POPs (in % of all the persons having been interrogated)

Overall results of the research witness of:

- insufficient education of the society concerned with the POPs issue as well as the Stockholm Convention on POPs in the country;
- unavailability of active work at the national level as to development and implementation of informational strategy concerned with the POPs issue and ways to rising levels of education of the society on POPs (including the Stockholm Convention);
- imperfection of the system of training and retraining of the personnel that lecture ecology course as well as other branches of science taking into consideration elucidation of the POPs issue and ways to its overcoming;
- unavailability of special training literature as well as scientific and popular one concerned with the POPs issues;
- unavailability of training programs concerned with the problems of ecological education containing sections dedicated to POPs, thus, separate courses and lessons are available at a confined number of educational institutions; and
- unavailability of training (retraining) programs for state employee's official activity of those concerned with solution of POPs issue.

An efficient educational program is required for spreading information on the Stockholm

Convention. It shall consider all the specific features of potential auditorium using all available forms and methods of popularization.

Moreover, level of education of the community as well as informing and training in Ukraine as to POPs issue and the Stockholm Convention on POPs has been determined due to results and conclusions made in the upshot of implementation of a number of projects, campaigns, and researches dedicated to the POPs issue.

Analysis of level of education on POPs issues in secondary and higher educational institutions showed its insufficient level. Research of existing legal and normative framework valid in Ukraine as well as available educational programs on profile disciplines (chemistry, biology, ecology, etc.) has been conducted, too. P. 3 of the National doctrine of development of education foresees ensuring of ecological education among others by the state; availability and continuity of education, and variety of educational programs (Decree of the President of Ukraine dated 2002-04-17 #347/2002). P. 29 foresees periodical renewal and mutual concordance of contents of training, re-training, and raising the levels of skill of pedagogic and scientific and pedagogic personnel.

Consultations with leading experts of the Institute of natural and geographic education and ecology of the M.Dragomanov National Teacher-Training University, the T.Shevchenko Kyiv National University, the National University «Kyiv Mogila Academy», and Kyiv Natural and Scientific Lyceum #145 became another implement. Workers of the educational sphere reckon that urgent need exists in search of new effective forms and methods of information of wide masses of the community on the POPs issue and the Stockholm Convention on them. They think it is necessary to introduce information on structure, properties, physiological impact, accumulation, spreading, sources of origination, and transformation of POPs as well as ways to their neutralization to the educational process. Necessity of formation of ecological conscience and ecological culture of the young people through active forms of education and training, engagement of wide masses of the youth being pupils and students to carrying out of measures for rising level of ecological knowledge on hazardous chemical substances including POPs is of the greatest importance.

Cycles of lectures have been introduced at the mentioned educational institutions in the framework of some special courses since 2000 to 2002. For example, a lecture named «the Stockholm Convention on POPs» is introduced at the geographic faculty of the T.Shevchenko Kyiv National University within the special course «International Ecological Conventions». A course of lectures named «Toxic Substances in Environment» is held in the framework of a normative course named «Foundations of Ecology» at the mechanical and mathematical faculty, at the Institute of international relations, and at the Institute of philology of the same university. Lectures on POPs as separate themes or parts of those have been introduced into special courses «Chemistry of the Earth and Ecological Problems» and «Chemistry of natural compounds» at the M.Dragomanov National Teacher-Training University. Lectures concerned with the POPs issue are held in the framework of special courses of «International Ecological Law» and «Ecological Engineering». Lectures dedicated to POPs issues are delivered in the network of special courses «International ecological law» and «Ecological engineering» at the National university «Kyiv Mogila Academy». A number of course and diploma works concerned with the POPs issue have been carried out in 2004 and 2005 in these institutions, and a pupil of the 10th form of Kyiv Natural and Scientific lyceum #145 occupied the first place at the All-Ukrainian competition of the Minor Academy of Sciences of Ukraine.

Experts of the M.Dragomanov National Teacher-Training University proposed creation of educational and methodical center on the basis of chemistry chair for it is educational and methodical potential of this higher educational institution that allows creation of both new branch standards in basic disciplines concerned with POPs and performing of the Stockholm Convention in Ukraine and lobby introduction of appropriate themes and sections to educational programs of secondary schools

as well as special and higher educational institutions of MOESU. It would be expedient to work off a model of a pilot project for creation of educational and methodical provision as well as mechanism of introduction of problems concerned with POPs and the Stockholm Convention to wide range of educational programs for both pupils and students and training staff in the framework of carrying out of training and re-training and rising level of skill of workers of educational sphere.

Interaction of higher educational institutions with organizations, manufacturers, employers, representatives of authorities and business as well as the National Agency of Investments and Innovations can be an important direction of integration of educational elements concerned with POPs and the Stockholm Convention. This can become an effective channel of introduction of the problems concerned with POPs to the programs of training of engineering workers, specialists in technologies, etc.

Analysis of possibilities of education in Ukraine as to spreading of information on POPs and the Stockholm Convention revealed another potentially ponderable way that is a framework of out-of-school education. 1,497 non-school institutions of educational system function in Ukraine, and the following directions of their activities can be mentioned among other ones: ecological and naturalistic, scientific and technical, and tourist and those for study of local lore. Therefore we think it necessary to develop informational and methodical materials assigned for use in out-of-school institutions of MOESU.

2.11 ACTIVITIES OF NON–GOVERNMENTAL STAKEHOLDERS

According to information of SSCU (Statistical year-book of Ukraine for 2004) there are **2,069** funds in Ukraine, and **443** of them are international and **1,626** are all-Ukrainian ones. **51** of them are communities (associations) for environmental protection (ecological ones), and **16** of them are international, and **35** are all-Ukrainian ones.

Number of oblast and local non-governmental ecological organizations (NGOs) in various oblasts of Ukraine differs from a few to dozens ones. For example, 6 of them function in Zhytomyr oblast, 41 of them function in Vinnitsa oblast, and 50 ones function in L'viv oblast.

Territorial difference exists in development of them. Thus, Western Ukraine (L'viv, Ivano-Frankivsk, Ternopil, and Zakarpattya oblasts) is distinguished with a great number of organizations having educational and political current, and their activity concerned with children's rest and out-of school educational work. About 80% of all the organizations registered in the oblast exist 6 to 7 years at the most, and but 10% of them are ones having functioned at the time of existence of the former USSR. Children's and youth's organizations form a great interlayer in Zaporizhzhya oblast (32%). Territorial variety of Ukrainian organizations allows offering methods of local policy concerned with development of unprofitable initiatives as a whole.

Public Council functioning at MEPU and Public Councils of oblast departments of the MEPU unite NGOs. Purpose of functioning of the Public Council is ensuring favorable conditions for solution of ecological problems and wise engagement of the society to development and taking decisions of great importance in the sphere of state management of ecological safety. Representatives of the organizations as well as educational institutions and entertainments form the Public Council. The latter holds monthly meetings where a wide amount of issues concerned with ecological safety is being solved.

Significant progresses in improvement of access of the community to ecological information as well as its engagement to discussion of ecological problems are observed in Ukraine. On the other hand, improvement of ecological education and level of comprehension of the community did not lead to increase of its pressure to authorities and enterprises-polluters for strengthening management in the sphere of environment protection and reducing of level of contamination as well as amount of waste generated in Ukraine. There are many factors that depend on availability of objective and

comprehensible assessments of the state of the environment. This segment remains a problem one for Ukraine.

There are a number of NGOs taking active part in solution of POPs issue in Ukraine (table 2.11.1). These are first of all members of International POPs Elimination Network (IPEN) that is National Environmental NGOs «MAMA-86» (the national IPEN coordinator in Ukraine since 2004) and Journalists' organization (WETI) – Western Ukrainian Charity Foundation for Ecological and Tourism Educational Information (L'viv city).

Representatives of the National Environmental NGO «MAMA-86» took part in the work of the intergovernmental negotiations committee for the development of the Stockholm Convention on POPs (1999 to 2000), diplomatic conference for signing of the Stockholm Convention on POPs (2001), and the First conference of the Parties of the Stockholm Convention on POPs (2005).

The All-Ukrainian Ecological League realizes informational campaign concerning POPs. «EcoPravo-Kharkiv» organization performed research of the national legislation concerned with POPs.

National Environmental NGO «MAMA-86», Journalists' fund WETI – Western Ukrainian philantropic fund for ecological and educational information (L'viv city), Ukrainian Ecological Association «Green World», «Ecology Media group» (Kyiv city), «Democrasy and Development» Center, Scientific and Informational Center «Ecology. Woman. World» (Kyiv city) actively participated in implementation of the GEF/UNEP project «Enabling Activities for the Development of National Implementation Plan for the Stockholm Convention on POPs in Ukraine».

Table 2.11.1. Activities of NGO in solution of POPs issue

#	NGO	Informational POPs campaign
1	National Environmental NGO «MAMA-86»	**International level:** MAMA-86 a member of International POPs Elimination Network (IPEN) **National level:** Participation in implementation of the GEF/UNEP project «Enabling Activities for the Development of National Implementation Plan for the Stockholm Convention on POPs in Ukraine» **Local level:** Campaign for solution of the problem of obsolete pesticides in Carpathians oblast (2000 to 2006)
2	All-Ukrainian Ecological League	Implementation of the project that has been fulfilled in the framework of the **International POPs Elimination Project (IPEP) (2005)**
3	Journalists' organization (WETI) – Western Ukrainian Charity Foundation for Ecological and Tourism Educational Information (L'viv city)	Research of the POPs national legislation

#	NGO	Informational POPs campaign
4	The Ukrainian Geographical Society	Working for the Protocol of Pollutant Release Transfer Register (PRTR) under Aarhus Convention Working for solution of the POPs issue at oblast level
5	«EcoPravo-Kharkiv»	Working in the framework of the project of the Program of Oblast Ecological Plans for elimination of OP stockpiles in Svatovo area of Lugansk oblast
6	The Bureau of Ecological Investigations (L'viv city)	Participation in implementation of the GEF/UNEP project «Enabling Activities for the Development of National Implementation Plan for the Stockholm Convention on POPs in Ukraine»
7	NGO of Svatovo town (Lugansk oblast)	Participation in implementation of the GEF/UNEP project «Enabling Activities for the Development of National Implementation Plan for the Stockholm Convention on POPs in Ukraine» and monthly publication of informational bulletins «Persistent organic pollutants (POPs) in Ukraine and in the world» (2004 and 2005)
8	«Ecology Media Group» (Kyiv city)	Participation in implementation of the GEF/UNEP project «Enabling Activities for the Development of National Implementation Plan for the Stockholm Convention on POPs in Ukraine» namely organization of a «round table» for Media and NGO by results of Gallup poll for assessment of level of education of the society on impact of POPs upon health of the population and environment (2004)
9	The Scientific and Informational Center «Ecology. Woman. World» (Kyiv city)	Participation in implementation of the GEF/UNEP project «Enabling Activities for the Development of National Implementation Plan for the Stockholm Convention on POPs in Ukraine» in 2003 to 2004
10	«Democracy and Development» Center (Kyiv city)	Participation in implementation of the GEF/UNEP project «Enabling Activities for the Development of National Implementation Plan for the Stockholm Convention on POPs in Ukraine» in 2003 to 2004
11	Ukrainian Ecological Association «Green World»	Participation in implementation of the GEF/UNEP project «Enabling Activities for the Development of National Implementation Plan for the Stockholm Convention on POPs in Ukraine» in 2003 to 2004

PART 3

NATIONAL STRATEGY AND PRIORITIES FOR IMPLEMENTATION OF THE STOCKHOLM CONVENTION ON POPS

3.1. POLITICAL STATEMENT

Draft

THE CABINET OF MINISTERS OF UKRAINE

DECREE

dated 200 #

Kyiv

On approval of the National Implementation Plan of the Stockholm Convention on Persistent Organic Pollutants

To approve National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (enclosed).

Prime Minister of Ukraine

3.2.NATIONAL STRATEGY AND PRIORITIES FOR IMPLEMENTATION OF THE STOCKHOLM CONVENTION ON POPS

POPs National strategy shall be based on the political decision and realization of a number of measures in various spheres with the purpose of protection of human health and environment from POPs.

The main principles of POPs national policy:

- Fulfillment obligations under Stockholm Convention are a part of general international obligations of Ukraine in the sphere of management of chemical substances. Relations as well as working platform shall be set between the Stockholm Convention, Aarhus Protocol, the Basel Convention, the Rotterdam Convention and other appropriate international conventions.
- Policy, strategy, and national and branch programs for environment protection shall be modernized in such the way that they reflect POPs priority and other issues of management of hazardous and toxic substances. They shall identify potential impact by POPs for human health and environment, and state clearly priority actions on the basis of analysis of expenses and profit. Flexible mechanisms to ensure if necessary possibility of their timely and efficient correction and updating shall be part of these documents.

National strategy in accordance to the Stockholm Convention shall foresee:

- Prohibition of manufacture and use (except PCBs in equipment), eliminate import and export of POPs chemical listed in Annexes A and B with modification of national legislation.
- Establish a schedule to phase out the use of PCBs in equipment according to Annex A, Part II(a) of the Stockholm Convention and totally ban these PCBs by 2005.
- Implement systematic measures for reduction of exposure and risk from use PCBs-containing equipment according to the Annex A, part II(b) of the Stockholm Convention.
- Prohibit recovery for reuse in other equipment of PCBs-containing liquids according to the Stockholm Convention requirements Annex A, part II(d) by amendments of legislation and establish environmentally sound waste of management liquids and equipments contaminated PCBs no later than 2028.
- Identify the PCBs content in other the energy equipment and articles and manage until 2025.
- Evaluate national options for specific exceptions according to the Stockholm Convention requirements after establishing of Register of specific exceptions.
- Further investigation of sources and current management options regarding releases of chemicals listed in Annex C in order to prepare relevant Action Plan.
- Identify BAT and BEP for every particular industry sources and introduction of BAT and BEP for all new sources.
- Promote of measures to achieve POPs releases reduction.
- Manage of OP stockpiles and wastes in environmentally sound manner, following international standards and guidelines.
- Establish a schedule PCBs-containing stockpiles and wastes in environmentally sound manner, starting since the completion of the inventory process.
- Prohibit disposal operations of POPs wastes listed in Annexes A, B, and C that may lead to recovery, recycling, reclamation, direct reuse or alternative uses by amendments of legislation.
- Development of a strategy for identification and remediation of the contaminated sites by chemicals listed in Annexes A, B, and C in environmentally sound manner.
- Realization of the measures for implementation of Communication strategy and establishing ways for information exchange among stakeholders.

- Implementation of measures for promoting POPs awareness among the public, decision makers and stakeholders on the basis of Communication strategy.
- Carrying out of scientific researches aimed at the decision of POPs problem.
- Monitoring system development focused on human health and the environment protection.
- Implementation of technical assistance programs for the purpose to fulfill obligations under Stockholm Convention with promoting of potential international investments and transfer of technology.

National priorities for introduction of the Stockholm Convention have been determined. Their determination included the following steps: defining the process and methodology, selecting the ranking criteria, consulting NGOs and stakeholders, validating identified priorities determined, and transferring priority areas to the NIP objectives. A wide spectrum of stakeholders participated in discussions on which problems are most critical and what measures would be most appropriate for implementation of Stockholm Convention and NIP development.

The following groups of criteria were selected to be used for ranking POPs priorities: (i) direct benefits to the public and environmental health as well as economic and social benefits; (ii) magnitude of the problem at different levels (international, national, local); (iii) perception by different stakeholders (international community, central and local governments, NGO and the general public, businesses); and (iv) affordability & availability (technology, infrastructure, staff, financial perspective). The following **important POPs priorities were identified for Ukraine in accordance with the selected criteria:**

- Development legal and regulatory framework for management of POPs in accordance with the requirements of the Stockholm Convention.
- Improvement of POPs monitoring system.
- Legislative ensuring of introduction and actualization of the National Register of POPs stockpiles and amount of substances belong to the POPs group.
- Development of legislative framework on conducting and actualizations of the national register of places of storage and availability of OP belonging to the POPs.
- Selection of the most acceptable technologies for destruction or neutralization of POPs and remediation of POPs contaminated sites.
- Destruction (treatment) of over 11,000 tons of HCB – waste of CTC located at the polygon for toxic waste of "Oriana-Halev" Ltd. in the town of Kalush, Ivano-Frankivsk oblast, final physical closing of the given manufacture, and ensuring of monitoring of the mentioned polygon.
- Neutralization (destruction) of OP belonging to the POPs and neutralization of PCBs-containing equipment and waste in environmentally sound manner.
- Reduction or elimination of POPs releases.
- Development of analytical base for improvement of POPs monitoring system.
- Identification and rehabilitation of POPs contaminated sites and soils using up-to-date technologies including agrarian and biological.
- Carrying out of scientific research with the purpose of the decision of POPs issues.
- Implementation of measures for promoting of POPs awareness among public and stakeholders.
- Mobilization of resources and ensuring financing of expenditure with potential international investments for the purpose to fulfill the obligations under the Stockholm Convention.

3.3. TOP PRIORITY ACTIONS

Top Priority Actions for NIP foreseen by the Action plan shown in table 3.3.1 are anticipated to be realized till 2010 (numeration and titles of measures and tasks mentioned in the table correspond to those mentioned in Section 5 «Action plan»)

Table 3.3.1. Top Priority Actions

Number and name of action plan	Number and measures of task	Numbers of measures	Estimated costs of measures till 2010, ths. UAH	Note
1. Strengthening of the institutional system and improvement of the legislative framework	**5.1.1.** Introduction of changes and amendments to the relevant Ukrainian legislation	5.1.1.1, 5.1.1.2, 5.1.1.3, 5.1.1.4, 5.1.1.5, 5.1.1.6, 5.1.1.7, 5.1.1.8	1475,5	
	5.1.3. Establishing state sanitary and hygienic monitoring of POPs	5.1.3.1	275,0	
2. Neutralization of OP stockpiles and IW including POPs	**5.2.1.** IIntroduction of national register of places of storage and availability of OP and IW belonging to the POPs	5.2.1.1	250,0	The planned duration of performance of this measure till 2025
	5.2.2. Neutralization (destruction) of over 11,000 tons of HCB that is waste of CTC manufacture in the town of Kalush, Ivano-Frankivsk oblast by ecologically and economically acceptable technologies and final physical closing of the given manufacture	5.2.2.1, 5.2.2.2	11005,0	
	5.2.3. Neutralization of over 1,000 tons of DDT stockpiled in Odesa oblast by ecologically and economically acceptable technologies	5.2.3.1	2525,0	

Number and name of action plan	Number and measures of task	Numbers of measures	Estimated costs of measures till 2010, ths. UAH	Note
	5.2.4. Neutralization (destruction) of POPs stockpiled OP in Ukraine by ecologically and economically acceptable technologies	5.2.4.1, 5.2.4.2, 5.2.4.3, 5.2.4.4	71240,5	Including UAH 6,031.5 ths. foreseen by budget program 2401250 «Management of waste and hazardous chemical substances» of the State fund for environment protection (MEPU) for 2006-2007
3. Neutralization/ destruction of PCBs-containing waste and equipment	**5.3.1.** Development and introduction of national register of objects at those PCBs-containing equipment and waste have been revealed	5.3.1.1	578	
	5.3.2. Carrying out of complex inventory and labeling of PCBs-containing equipment and waste	5.3.2.1	2424,0	General planned duration of carrying out this measure is till 2028
	5.3.3. Creation of material and technical base for performing activities as to neutralization of PCBs-containing capacitors, transformers, and other equipment as well as destruction of the latter	5.3.3.1, 5.3.3.2, 5.3.3.3	35855,0	
4. Reduce or elimination of POPs releases (annex C of the Stockholm Convention) from intentional production and use	**5.4.1.** Introduction of national register of POPs releases	5.4.1.1	505,0	
	5.4.2. Carrying out of inventory of POPs releases in accordance with the requirements of international guides	5.4.2.1, 5.4.2.2	151,5	

Number and name of action plan	Number and measures of task	Numbers of measures	Estimated costs of measures till 2010, ths. UAH	Note
	5.4.3. Reduction of POPs releases by enterprises of metallurgical industry	5.4.3.1	5050,0	
	5.4.4. Reduction of POPs releases by power plants	5.4.4.1	5555,0	
	5.4.5. Development economic and legal framework for introduction of cleaner manufacture and BAT/ BEP by enterprises	5.4.5.1, 5.4.5.2	505,0	
5. Identification and management of contaminated sites including polluted POPs	**5.5.1.** Establishing of national register of contaminated sites including polluted POPs	5.5.1.1, 5.5.1.2	405,5	
	5.5.2. IImplementation of measures for remediation of territories polluted POPs	5.5.2.2, 5.5.2.3	110,5	
6. Exchange of POPs information among stakeholders and increasing public awareness and education	**5.6.1.** Maintenance of permanent POPs information exchange among stakeholders according to the requirements of the Stockholm Convention and the Protocol on POPs	5.6.1.1	30,0	
	5.6.2. Increasing public awareness and education on POPs	5.6.2.2, 5.6.2.3	1010,0	
	5.6.3. Introduction of POPs information to educational process	5.6.3.1, 5.6.3.2, 5.6.3.3, 5.6.3.4	2222,0	
7. Sustainability of POPs monitoring system in Ukraine	**5.7.1.** Carrying out of technical audit and creation of data bank of chemical and analytical laboratories performing state POPs monitoring and research	5.7.1.1, 5.7.1.2	150,0	

Number and name of action plan	Number and measures of task	Numbers of measures	Estimated costs of measures till 2010, ths. UAH	Note
	5.7.2. Improvement of system of monitoring and financial and technical support of laboratories which carry out state monitoring of POPs as component of Global POPs monitoring system	5.7.2.1, 5.7.2.2, 5.7.2.3, 5.7.2.4.2, 5.7.2.4.3	404,0	
	5.7.3. Sustainability of the system for increasing qualification of the personnel of laboratories carrying out of the state POPs monitoring	5.7.3.1	300,0	
	5.7.4. Introduction of National Pollutant Release and Transfer Register (PRTR) under the requirements of the Protocol on PRTR of the Aarhus Convention including POPs	5.7.4.1	1300,0	The planned duration of performance of this measure till 2028
	5.7.5. Carrying out of HCB monitoring at the solid toxic waste polygon including over 11,000 tons of HCB in the Kalush town, Ivano-Frankivsk oblast	5.7.5.1	100,0	The planned duration of performance of this measure till 2015
	5.7.6. Carrying out of DDT monitoring of the burial ground nearby Altestove settlement, Odesa oblast	5.7.6.1	125,0	The planned duration of performance of this measure till 2011
8. Scientific research	**5.8.1.** Carrying out of scientific research purposed on solution of POPs issue in Ukraine	5.8.1.1, 5.8.1.2, 5.8.1.3, 5.8.1.4, 5.8.1.5, 5.8.1.6, 5.8.1.7, 5.8.1.8	4169,2	The planned duration of performance of this measures 5.8.1.7 and 5.8.1.8 is till 2012
	5.8.2. Carrying out of national and participation in international conferences, seminars, symposiums, etc. concerning methods and technologies of POPs neutralization, reducing POPs releases and impact on human health and environment	5.8.2.1	388,0	The planned duration of performance of this measure till 2028

3.4. STRATEGY FOR INFORMATION EXCHANGE

Low level of awareness of Ukrainian citizens is observed in the latter years because of lack of objective information on ecological situation on the whole as well as solution of actual problems concerned with POPs in Ukrainian informational sphere. Analysis of interrogation of public opinion in Ukraine shows that a significant part of Ukrainian citizens are not enough aware of the problems concerned with POPs and the Stockholm Convention on POPs. This does not allow them to work out their own conscious attitude toward sources of pollution and impact of POPs upon human health and environment.

The main purpose of the strategy is improvement of comprehension of danger of POPs and encouragement of yearning of Ukrainian society for introduction of the regulations of the Stockholm Convention on POPs, particularly, by way of increasing level of awareness of Ukrainian citizens.

Creation of communicative system for establishing contacts, spreading of information on POPs, and studying of public opinion for provision of various categories of people with information on POPs they need at certain moment in certain place meeting their requirements and knowledge having been already gained is important goal of information, education, and enlightenment of the population and concerned parties.

Tasks of the strategy are as follows:

- determination of the key problems and demands;
- working out of tactics and creation of a program of practical stages for implementation of informational strategy concerning POPs issue; and
- estimation of status and monitoring of public opinion by way of all-round and regular interrogation of citizens in accordance with international experience and standards.

Informational strategy will be based on the following principles:

- improvement of communication with society;
- spreading of information on POPs among people;
- orientation to special auditoria;
- simplicity and structuredness by themes;
- long-term consequences of the information process; and
- scaled attraction of oblast governmental and non-governmental organizations.

Basing on the course to balanced growth taken by Ukraine and specific features of the national information sphere, this informational strategy is formed on the following principles:

- state support of information processes for the society and concerned parties;
- timeliness, objectivity, and non-anticipation in preparation and rendering information; and
- specific role of funds as well as educational and enlightening institutions in the processes of informing community.

The task auditoria for communication are Ukrainian citizens joint together taking into account level of their awareness on POPs issues as well as age, sex, education level, dependence on stereotypes, and extents of awareness of the problems concerned with ecological safety. Determination of social, demographic, geographic groups as well as specific features of taking information in the oblast by different groups and subgroups is of importance, too.

Structuring of the task groups is as follows:

- employees of enterprises working with POPs;
- farmers and employees of the agroindustrial complex;
- inhabitants of countryside;
- managers of state and local levels influencing process of taking decisions concerned with POPs issue;

- wide community (accent to women and young people);
- students and teachers of the higher educational institutions (students and lecturers of faculties for natural sciences and journalism is a separate group);
- pupils and teachers of secondary educational institutions;
- medical workers;
- ecological funds; and
- scientists and researches.

Basic methods:

- informing; and
- training

Dimensions and subjects for strategy implementation:

Activity for increasing awareness of Ukrainian society in the problems concerning POPs shall take place in four levels:

- governmental (central and local bodies of the state executive power);
- parliamentary (groups for supporting of the Program for balanced development, Conception for ecological education, ratification of the Stockholm Convention, etc.);
- municipal (local self-government bodies); and
- institutions of civil community (funds and civil initiatives, political centers, etc.), and scientific and business groups.

Subjects for introduction of informational strategy are:

- the state in the persons of its leaders, and central and local authorities;
- parliamentarians;
- non-governmental organizations;
- educational institutions;
- Ukrainian population; and
- Mass Media.

Attraction of representatives of Ukrainian society in other countries is important, too.

Basic measures are stepwise creation of national informational network the structure of that is to take into consideration:

- experience of similar campaigns;
- resource demands/possibilities of organizations being partners within the bounds of the tasks of NIP; and
- foundation of a network of informational centers (pilot projects for creation of the national informational center "Ukraine against POPs", educational and enlightening center for POPs issues on the basis of the M.Dragomanov National Teacher-Training University, pilot projects for creation of informational centers, points, stands at secondary educational institutions, colleges, libraries located in the city of Kyiv and other Ukrainian settlements).

The main directions of informational strategy and ways of spreading and exchange with information concerning POPs are as follows:

Objective information concerning POPs issues shall be supplied through the whole complex of Ukrainian mass media including Internet, and be accompanied with analytical support. It is proposed to realize the following projects for increasing informational activity while ensuring proper financing of them:

- Creation of national catalogue of informational resources concerning POPs containing the most complete information on spreading of POPs, storage houses with obsolete pesticides, etc.

in Ukraine. This catalogue shall be provided with information on POPs having already been packed and utilized. It is designated for exchange with information and using by concerned categories of population (specialists, scientists, researches, representatives of enterprises, governmental and non-governmental organizations);
- Informational measures (organization of conferences, symposiums, round tables, discussions, and seminars) in those non-governmental organizations and state structures take part;
- Creation of national Internet portal, Internet sites, and informational centers;
- Monthly informational bulletin to be distributed in paper and electronic variants;
- Information in informational bulletins having similar subjects;
- Information in electronic and printed mass media;
- Booklets, informational leaflets (non-governmental ecological organizations can participate in their spreading);
- Social radio and television publicity, a number of short-length video reels (8 to 12 subject reels, each of 1 min. to 2 min. long), and educational and informational documental video films; and
- Placards that can be positioned in hospitals, polyclinics, near places for stockpiling pesticides, and at ecological organizations.

Educational and education measures in the network of strategy of informing society are as follows:
- introduction of information on POPs to educational process;
- renewal of contents of programs of chemical, biological, geographic, and other disciplines in the aspect of information concerning POPs;
- introduction of special courses for studying POPs issue to educational programs of higher and secondary educational institutions (for instance, "Actual chemical problems" course containing information on the problems concerned with POPs);
- attraction of students/pupils of the appropriate higher and secondary educational institutions, members of chemical hobby groups etc. to POPs theme (by carrying out of seminars, round tables, and conferences);
- favoring participation of young students and pupils in researches of POPs issues;
- creation of manual of «What we know of POPs» containing normative materials for higher and secondary educational institutions and colleges;
- development and introduction of scientific and methodical materials, and lecture courses for teachers of higher, secondary educational institutions, colleges, and chemical hobby groups;
- preparation of a number of booklets containing description of POPs issues in Ukraine and in the world, their distribution at enterprises, governmental and non-governmental organizations, educational institutions, and measures of information and education character for masses;
- favoring development of ecological journalism at proper higher educational institutions, attraction of interested journalists to cooperation with ecological funds, participation in conferences, seminars, and round tables concerning POPs issues;
- carrying out of short-term courses for various categories of population. They shall be first of all representatives of governmental and non-governmental organizations whose activity can affect taking decisions concerning POPs, physicians, and employers of enterprises dealing directly with problems of stockpiling, packaging, and utilization of POPs; and
- foundation of educational and enlightening center for POPs issues on the basis of the M.Dragomanov National Teacher-Training University, informational centers, points, stands at secondary educational institutions, colleges, libraries located in the city of Kyiv and other Ukrainian settlements in order to spread advanced domestic and world experience concerning

elucidation of environmental problems and, particularly, POPs issue.

Principal moments in carrying out of communication:

- reach of interaction between subjects of implementation of informational strategy;
- respect of MM independence;
- important and necessary activity among wide groups of population;
- efficiency of cooperation with partners;
- the best introduction requires some initiative (support of non-governmental organizations those are sources of up-to-date knowledge and practical experience concerning POPs issue due to their integration to international networks of non-governmental ones for environment protection and sustainable development, in particular, for permanent management of chemical substances, preparation and carrying out of measures of information and education character concerning POPs for masses).

An important constituent part of the informational strategy is regular monitoring of its implementation and improvement of its contents while all the concerned parties participate in the process.

Anticipated results are as follows:

- increasing of awareness, enhancement of civil activity and that of non-governmental organizations concerning POPs issues;
- activation of participation of state structures in the measures concerned with POPs;
- increasing of attention and expert approach of MM to POPs and hazardous waste themes; and
- improvement of knowledge of new tasks and demands concerned with ecological safety in the Ukrainian community.

Described aspects of the national strategy, policy, purposes, and priorities concerned with introduction of the Stockholm Convention are laid to the basis of NIP quintessence of that is expounded in the following sections.

PART 4

ESTIMATED COST OF NIP IMPLEMENTATION

The international obligations of Ukraine on performance of requirements under Stockholm Convention have multilateral and long-term character, and demand corresponding financing. A combined approach is supposed for the decision of this issue, namely:

- use of the certain economic mechanisms within the framework of an opportunity of the country;
- consolidation of financial opportunities resources of the state and private enterprises (corporations); and
- reception of the international technical and financial assistance on multilateral and bilateral agreements.

The most expensive measures are neutralization of stockpiled OP containing POPs, remediation of POPs contaminated sites, and neutralization of PCBs and PCBs-containing equipment. Neutralization cost of one ton certain POPs can change enough wide limits as well as cost as a whole of all actions. It will be depends on the state decision: whether to increase national capacities on neutralization POPs or to use corresponding technologies and capacities abroad.

Tables 4.1 and 4.2 are shown estimated costs for neutralization of OP containing POPs as well as PCBs and PCBs-containing equipment. Table 4.3 shows estimated amount of financing of measures including to Action Plan by years. The distribution of amount of financing on different sources (table 4.4) the following:

- State budget of Ukraine is about 40% or UAH 381.236.08 thousand;
- local budgets, private financing of enterprises, and other sources are about 10% or UAH 94.330.0 thousand;
- international investments are about 50% or UAH 773.019.1 thousand.

It is supposed that 27.7% from a total amount of cost of actions will be approximately financed on all sources of financing till 2010.

The table 4.5 is shown the distribution of preliminary amount of financing of Action Plan due to the State budget for the period of 2006 to 2008.

According to preliminary estimate of national and international experts realization of the measures planned to the NIP will demand financing of UAH 953.090.2 thousand or USD 188.730.7 thousand for the period of 2006 to 2028.

These amounts of financing are estimated and shall be specified more accurately at detailed development of estimates for carrying out of activities in corresponding projects.

Table 4.1. Estimated costs (USD) for neutralization of OP stockpiles and IW including POPs

Object	Amount, tons	Estimated cost of 1 ton		Total estimated cost, millions	
		UAH	$	UAH	$
OP and IW (HCB) containing including POPs	32703	11017	2182	360,28	71,343

Table 4.2. Estimated Costs (USD) for neutralization of PCBs and PCBs-containing equipment

Name of the object	Amount, tons	Measures	Estimated cost of a unit of the object, ths.		Total estimated cost, millions	
			UAH	$	UAH	$
1.PCBs-containing capacitors (150.000...200.000 items)	9.000 to 12.000 tons (total mass of capacitors)	Destruction	15150,0	3000,0	136,35 – 181,8	27,00 – 36,00
2.PCBs-containing transformers (1.500...3.000 items)	8.300 to 16.600 tons (total mass of transformers)	Removal of PCBs	8080,0	1600,0	67,06 – 134,13	13,28 – 26,56
3.PCBs removed from transformers	3.070 to 6.140 tons	Destruction	12625,0	2500,0	38,76 – 77,52	7,68 – 15,35
4.PCBs stored at the stockpiles	400 to 600 tons	Destruction	12625,0	2500,0	5,05 – 7,58	1,00 – 1,50
TOTAL					**247,22 - 401,03**	**48,96 - 79,41**

Note: The table contains expected reserves of PCBs and PCBs-containing equipment that can be revealed in Ukraine upon finishing of detailed inventory. The data of inventory 2004 have been taken for a basis (102 ths. capacitors, 1,002 transformers, 250 tons PCBs being stored, total 4,240 tons PCBs) and estimations of experts concerning real number of these objects that exceed these costs from 1.5 to 3.0 times. Costs of installations for neutralization are not taken into consideration in this table.

Table 4.3. Estimated financing of measures including to Action Plan by years

Measures		2006	2007	2008	2009	2010	2011 to 2028	TOTAL ths. UAH	TOTAL ths. $	TOTAL %
1. Strengthening of the institutional system and improvement of the legislative framework		45,0	595,5	660,0	350,0	100,0	1200,0	2950,5	584,2	0,3
2. Neutralization of OP stockpiles and IW including POPs		9111,5	20805,0	24450	32395	46759,4	226759,1	360280,0	71342,6	37,8
3. Neutralization/destruction of PCBs-containing equipment and waste		0	3380,0	3630,0	32232,0	23367,0	382343,0	444952,0	88109,3	46,7
4. Reduce or elimination of POPs releases (annex C of the Stockholm Convention) from intentional production and use		0	2180,0	3540,0	3070,0	2845,5	126,0	11761,5	2329,0	1,2
5. Identification and management of contaminated sites including polluted POPs		1673,8)	210,0	460,5	445,5	341,0	40586,2	43717,0	8656,8	4,6
6. Exchange of POPs information among stakeholders and increasing public awareness and education		0	2795,0	2251,0	1607,0	885,0	14500,0	22038,0	4364,0	2,3
7. Sustainability of POPs monitoring system in Ukraine		10105,0	1611,0	9582,0	9301,0	8980,0	20975,0	60554,0	11990,9	6,4
8. Scientific research		1280,0	930,0	907,2	740,0	762,0	2218,0	6837,2	1353,9	0,7
Total	ths. of UAH	22215,3	32506,5	45480,7	80140,5	84039,9	688707,3	953090,2	188730,7	100,0
	ths. of $	4399,1	6436,9	9006,1	15869,4	16641,6	136377,7			
	%	2,3	3,4	4,8	8,4	8,8	72,3			

Table 4.4. Estimated distribution of amount of financing sources for ensuring implementation of the requirements of the Stockholm Convention on POPs for the period of 2006-2028 years

Problem Area	Estimated Costs, ths. UAH			
	Funding sources			TOTAL, ths. UAH
	State budget	Local budgets, proper funds of enterprises, and other sources	International investments	
1. Strengthening of the institutional system and improvement of the legislative framework	2950,5	0	0	**2950,5**
2. Neutralization of OP stockpiles and IW including POPs	144112,0	36028,0	180140,0	**360280,0**
3. Neutralization/destruction of PCBs-containing equipment and waste	177980,0	44496,0	222476,0	**444952,0**
4. Reduce or elimination of POPs releases (annex C of the Stockholm Convention) from intentional production and use	4704,6	1176,0	5880,9	**11761,5**
5. Identification and management of contaminated sites including polluted POPs	17487,0	4371,0	21859,0	**43717,0**
6. Exchange of POPs information among stakeholders and increasing public awareness and education	8815,0	2204,0	11019,0	**22038,0**
7. Sustainability of POPs monitoring system in Ukraine	24222,0	6055,0	30277,0	**60554,0**
8. Scientific research	5470,0	0	1367,2	**6837,2**
TOTAL	**385741,1**	**94330,0**	**473019,1**	**953090,2**

The distribution of amount of financing on different sources for implementation of the requirements of the Stockholm Convention for the period of 2006-2008 years is as follows:

- State budget of Ukraine – UAH 385,741.1 ths.;
- Municipal budgets, proper funds of enterprises, and other sources – UAH 94,330.0 ths.; and
- International assistance – UAH 473,019.1 ths.

Table 4.5. Distribution of preliminary amount of financing of Action Plan due to the State budget for the period of 2006 to 2008

Problem Area	Amount of financing on environment protection measures for years, ths. of UAH						
	2006	2007	2008	2009	2010	2011-2028	Всього
1. Strengthening of the institutional system and improvement of the legislative framework	45,0 [1)]	595,5	660,0	350,0	100,0	1200,0	**2950,5**
2. Neutralization of OP stockpiles and IW including POPs	6283,5 [1)]	6545,5	7055,0	7450,0	7970,0	108808,0	**144112,0**
3. Neutralization/destruction of PCBs-containing equipment and waste	0	4457,6	6355,5	6370,8	18584,1	142212,0	**177980,0**
4. Reduce or elimination of POPs releases (annex C of the Stockholm Convention) from intentional production and use	0	872,0	1416,0	1228,0	1138,2	50,4	**4704,6**
5. Identification and management of contaminated sites including polluted POPs	1673,8 [1)]	84,0	184,2	178,2	136,4	15230,4	**17487,0**
6. Exchange of POPs information among stakeholders and increasing public awareness and education	0	1118,0	900,4	642,8	354,0	5799,8	**8815,0**
7. Sustainability of POPs monitoring system in Ukraine	10000,0 [2)]	706,0	3698,8	4182,8	2982,8	2651,6	**24222,0**
8. Scientific research	1000,0 [1)]	1080,0	998,0	372,0	562,0	1458,0	**5470,0**
Total	**19002,3**	**15458,6**	**21267,9**	**20774,6**	**31827,5**	**277410,2**	**385741,1**

Calculation of costs for 2007 and following years has been done taking into account distribution of forecast costs of cost for realization of measures for environment protection in the section of budget programs of the State fund for environment protection for 2007 year.

Notes:

[1)] Funds foreseen in the budget program 2401250 "Toxic waste management" of the State fund for environment protection (for MEPU);

[2)] Funds foreseen in the budget program КПКВК 2301890 – Decree of the Cabinet of Ministers of Ukraine dated 2006-05-17 #681(for MHU).

PART 5

ACTION PLAN

Action plan 5.1. Strengthening of the Institutional System and Improvement of the Legislative Framework

Action Plan Goal

Improvement of the existing legislative framework by harmonization it to the requirements of the Stockholm Convention and the Protocol on POPs

Actions	Anticipated results	Responsible institutions	Sources of finance	Time-frame	Estimated costs ths. UAH/ ths. $US
Task 5.1.1. Introduction of changes and amendments to the relevant Ukrainian legislation					
5.1.1.1 Development of the Ukrainian laws «On the ratification of the Stockholm Convention on Persistent Organic Pollutants (POPs)» and «On ratification of the Protocol on POPs for the Convention (1979) of the UNECE of Long-range Transboundary Air Pollution» by the Parliament of Ukraine	Adoption of laws «On ratification of the Stockholm Convention on persistent organic pollutants (POPs)» and «On ratification of the Protocol on POPs for the Convention (1979) of the UNECE of Long-range Transboundary Air Pollution»	MEPU	State budget	2006-2008	90,0 [1)] / 17,8
5.1.1.2 Introduction of amendments to «the List of pesticides banned for application in agriculture that cannot be registered or re-registered in Ukraine», namely POPs pesticides which have not been added to the List yet	Improved legislation on POPs pesticides	MEPU	State budget	2008	30,0 / 5,9

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
5.1.1.3 Development of legal and regulatory framework to set up a national register of locations for stockpiling OP pesticides including POPs	Providing state control of locations for stockpiling OP pesticides including POPs	MEPU, MHU, and MAPU	State budget	2007-2008	50,5 / 10,0
5.1.1.4 Development of legal and regulatory framework to set up a national register of enterprises using PCBs-containing equipment and places for stockpiling of equipment and PCBs-containing waste	Providing state control of enterprises using PCBs-containing equipment and places for stockpiling of equipment and PCBs-containing waste	MEPU, MHU, MFEU, MIPU, MTCU, and SSCU	State budget	2007-2009	150,0 / 29,7
5.1.1.5 Development of legal framework to regulate using, stockpiling, labeling, removing from use, neutralization/destruction of PCBs as well as PCB-containing equipment and waste	PDrafts of documents to regulate the usage of PCB-containing equipment and waste	MEPU, MHU, MFEU, MIPU, and MTCU	State budget	2007-2009	300,0 / 59,4
5.1.1.6 Development of legal and regulatory framework to set up a national register of POPs releases in compliance with the requirements of international guides	Availability of legal and regulatory framework to set up a national register of POPs releases	MEPU, MHU, MFEU, MIPU, and MTCU	State budget	2007-2008	305,0 / 60,4

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
5.1.1.7 Development of legal and regulatory framework to set up a national register PRTR	Availability of legal and regulatory framework to set up a national register of PRTR	MEPU, MHU, MAPU, MFEU, MIPU, MTCU, and SSCU	State budget	2007-2010	300,0 / 59,4
5.1.1.8 Development of appropriate regulatory framework for identification of contaminated sites including POPs polluted	Drafts of regulatory documents for identification of contaminated sites including POPs polluted	MEPU, MHPU, and MOEU	State budget	2007-2008	250,0 / 49,5
Task 5.1.2. Introduction of new regulatory acts on POPs					
5.1.2.1 Development and Introduction of allowable concentrations and identification methods of PCDDs/PCDFs in food products and environment	Entry into force of allowable concentrations and identification methods of PCDDs/PCDFs in food products and environment	MEPU and MHU	State budget	2011-2013	750,0 / 148,5
5.1.2.2 Development and Introduction of POPs maximum allowable releases (MAR) from stationary and mobile sources in accordance with the Protocol on POPs	Entry into force of POPs MAR from stationary and mobile sources in accordance with the Protocol on POPs	MEPU and MHU	State budget	2011-2013	450,0 / 89,1
Task 5.1.3. Establishing state sanitary and hygienic monitoring of POPs					
5.1. Development and introduction of regulatory documentation on state sanitary and hygienic monitoring of POPs	Establishment of state sanitary and hygienic monitoring of POPs	MEPU and MHU	State budget	2007-2010	275,0 / 54,5

Action plan 5.2. Neutralization of OP stockpiles and IW including POPs

Action Plan Goal

Decreasing impact of OP stockpiles and IW including POPs on human health and environment

Total cost of the measures is UAH 360.280 mln. (USD 71.343 mln.).

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
Task 5.2.1. Introduction of national register of locations for stockpiling OP pesticides and IW including POPs					
5.2.1.1 Implementation of measures for introducing and updating a national register of locations for stockpiling OP pesticides and IW including POPs	Providing State control of locations for stockpiling OP pesticides and IW including POPs	MEPU, MHU, MAPU, and RSA	State budget, local budgets, private funds of enterprises, and international investments	2006-2025	1000,0 / 198,0
Task 5.2.2. Neutralization (destruction) of over 11,000 tons of HCB that is waste of CTC manufacture in the town of Kalush, Ivano-Frankivsk oblast by ecologically and economically acceptable technologies and final physical closing of the given manufacture					
5.2.2.1 Development of input data and substantiation of choice of the most effective way of neutralization (destruction) of over 11,000 tons of HCB that is waste of CTC manufacture by ecologically acceptable technologies	1. Specifications (certificate) for HCB that is waste of CTC manufacture are approved. 2. "Estimation of impact upon environment (EIE) of activity purposed to neutralization (destruction) of over 11,000 tons of HCB that is waste product of CTC manufacture" is developed.	MEPU, RSA, KMSA, and «Oriana-Halev» Ltd	State budget, local budgets, private funds of enterprises, and international investments	2007-2009	4945,0 / 979,0

Actions	Anticipated results	Responsible institutions	Sources of finance	Time-frame	Estimated costs ths. UAH/ ths. $US
	3. Results of analysis for presence of POPs in the ground and ground waters at the territory of the polygon for solid toxic waste that is place for burial of over 11,000 tons of HCB that is waste of CTC manufacture are worked out. 4. «Instruction as to carrying out works concerned with transfer of solid toxic waste having been buried in modules of the polygon for solid toxic waste to places of their re-package and transportation to places for neutralization (destruction)» is developed. 5. «Principal scheme of neutralization (destruction) of over 11,000 tons of HCB that is waste product of CTC manufacture» is coordinated.				
5.2.2.2 Realization of a complex of measures on final physical closing of CTC manufacture in the town of Kalush, Ivano-Frankivsk oblast	Final physical closing of CTC manufacture as source of HCB waste and releases in the town of Kalush, Ivano-Frankivsk oblast	MEPU, RSA, KMSA, and «Oriana-Halev» Ltd	Private funds of «Oriana-Halev» Ltd. and international investments	2006-2007	1010,0 200,0 5050,0 1000,0 **Total:** **6060,0** **1200,0**
5.2.2.3 Realization of measures as to neutralization of over 11,000 tons of HCB by ecologically and economically acceptable technology	Neutralization of over 11,000 tons of HCB, improvement of ecological situation of Ivano-Frankivsk oblast	MEPU, MHU, and RSA	State budget and international investments	2010-2015	**117311,5** **23230,0**

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
Task 5.2.3. Neutralization of over 1,000 tons of DDT stockpiled in Odesa oblast by ecologically and economically acceptable technologies					
5.2.3.1 Realization of measures for search and approbation of acceptable technologies (from the economic and ecological point of view) for neutralization of over 1,000 tons of DDT including 800 tons of that placed in the burial ground nearby Altestove settlement, Odesa oblast, and elimination of the burial ground and remediation of the territory	1. "Principal scheme of opening, taking out, re-package, and transportation for neutralization of over 1,000 tons of DDT stockpiled at the territory of Odesa oblast including 800 tons of that placed in the burial ground nearby Altestove settlement, Odesa oblast" is coordinated with local authorities. 2. "Estimation of impact upon environment (EIE) of activity purposed to neutralization (destruction) of over 800 tons of DDT placed at the burial ground nearby Altestove settlement, Odesa oblast" is developed. 3. Working design documentation for opening of the burial ground removal, and transportation for neutralization (destruction) of hazardous chemical substances including 800 tons of those placed at the burial ground nearby Altestove settlement, Odesa oblast is developed.	MEPU, MTCU, MHU, MIPU, RSA and NASU	State budget, local budget, private funds of the enterprise, and international investments	2007-2009	2525,0 / 500,0
5.2.3.2 Realization of measures for neutralization of over 1,000 tons of DDT including 800 tons of that placed in the burial ground nearby Altestove settlement	1. Design documentation for neutralization (destruction) of over 1,000 tons of DDT including 800 tons of that placed in the burial ground for poisons nearby Altestove settlement, Odesa oblast, and elimination of this burial ground is developed.	MEPU, MTCU, MHU, RSA, and KMSA	State budget, local budget, private funds of enterprises, and international investments	2010 - 2012	27775,0 / 5500,0

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
	2. Neutralization (destruction) of over 1,000 tons of DDT including 800 tons of that placed at the burial ground nearby Altestove settlement, Odesa oblast, is done, and the burial ground is eliminated. 3. Improvement of ecological situation of Odesa oblast.				
Task 5.2.4. Neutralization (destruction) of POPs stockpiled OP in Ukraine by ecologically and economically acceptable technologies					
5.2.4.1 Development of pilot and industrial specimen of movable module installation for neutralization of OP and persistent toxic waste	Movable module installation for neutralization of OP and persistent toxic waste is put into operation	MEPU,	State budget, local budget, and other sources	2006-2007	1981,0 [1] / 392,3
5.2.4.2 Realization of measures for destruction of stockpiled OP at the territory of Kherson oblast	Neutralization of 324.4 tons of OP	MEPU and RSA	State budget, local budget, and other sources	2006	2650,5 [1] / 524,8
5.2.4.3 Realization of measures on ecologically safe preservation of OP at the territory of Sumy oblast	Neutralization of 120 tons of OP and reduction of the level of environment pollution	MEPU and RSA	State budget, local budget, and other sources	2006	1400,0 [1] / 277,2

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
5.2.4.4 Implementation of pilot projects for complete neutralization of OP including POPs, and remediation of contaminated sites in the AR of Crimea and Vinnitsa, Donetsk, Kyiv, Lviv, and Khmelnitsky oblasts those are places with the greatest amount of stockpiled OPs by ecologically and economically acceptable technologies	1. Working-off of technologies for complete neutralization of OP including e POPs, and remediation of contaminated sites in the AR of Crimea and Vinnitsa, Donetsk, Kyiv, Lviv, and Khmelnitsky oblasts, and improvement of ecological situation in those oblasts. 2. Neutralization of OP including POPs: – the AR of Crimea, including Sevastopol– 1,195.0 tons; – Mykolaiv oblast – 797.7 tons; – Kherson oblast – 834.0 tons; – Kyiv oblast – 1,932.0 tons; – Vinnitsa oblast – 1,073.9 tons; – Donetsk oblast – 863.3 tons; – Lviv oblast – 769.0 tons; – Khmelnitskiy oblast – 597.4 tons. **Total –8,063.2 tons.**	MEPU and Local authorities in the AR of Crimea and oblasts	State budget, local budgets, private funds of enterprises, and international investments	2007-2010	81944,4 16226,6
5.2.4.5 MEPU, MHU, and Local authorities in the AR of Crimea and oblasts	Development and realization of local plans for measures concerning OPs neutralization including POPs, and their annual correction bearing in mind gained experience while implementation projects	MEPU and Local authorities in the AR of Crimea and oblasts	State budget, local budgets, private funds of enterprises, and international investments	2007-2025	112687,8 22314,4

Action plan 5.3. Neutralization/destruction of PCBs-containing equipment and waste

Action Plan Goal

Realization of PCBs-containing equipment and waste management using safe to human health and environment methods and technologies

Total cost of the measures is UAH 444.95 mln. (USD 88.109 mln.).

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
Task 5.3.1. Development and introduction of national register of objects with the PCBs-containing equipment and waste					
5.3.1.1 Implementation of measures concerning development and maintenance of national register of objects with the PCBs-containing equipment and waste	1. Development of tools (electronic data bank) for the national register of objects with the PCBs-containing equipment and waste. 2. Development, coordination, and introduction of procedure of maintenance of the national register. 3. Establishment of state control of objects with the PCBs-containing equipment and waste by ensuring regular actualization of data introduced to national register.	MEPU, MHU, MFEU, MIPU, MTCU, and SSCU	State budget	2007-2028	758,0 150,0
Task 5.3.2. Carrying out of complex inventory and labeling of PCBs-containing equipment and waste					
5.3.2.1 Implementation of measures concerning carrying out of complex inventory and marking PCBs-containing equipment and waste	1. Implementation of complex inventory of PCBs-containing equipment and waste. 2. Implementation of marking of PCBs-containing equipment and waste, and introduction of this information to the national register.	MEPU, MIPU, MFEU, and MTCU	State budget, private funds of enterprises, and international investments	2007-2010, further permanent actualization	2424,0 480,0 606,0 120,0 **Total:** **3030,0** **600,0**

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
Task 5.3.3. Creation of material and technical framework for performing activities as to neutralization of PCBs-containing capacitors, transformers, and other equipment as well as destruction of PCB					
5.3.3.1 Creation of material and technical framework for cleaning of transformers from PCBs and working out of some technology for complete neutralization of PCBs-containing transformers, and transportation of PCBs for destruction	Ensuring of technical possibility for cleaning of transformers from PCBs	MEPU, MIPU, MFEU, and MTCU	State budget, private funds of enterprises, and international investments	2007-2010	1414,0 280,0 2121,0 420,0 **Total:** **3535,0** **700,0**
5.3.3.2 Creation of material and technical framework for destruction of PCBs-containing capacitors and working out of some technology for complex of works to ensure safe remove from use of PCBs-containing capacitors, storage, and transportation to the place for their destruction	Ensuring of technical possibility of neutralization/destruction of capacitors PCBs-containing	MEPU, MIPU, MFEU, and MTCU	State budget, private funds of enterprises, and international investments	2007-2010	10100,0 2000,0 15150,0 3000,0 **Total:** **25250,0** **5000,0**
5.3.3.3 Creation of material and technical framework for destruction of PCBs working out of some technological operations to ensure ecologically safe carrying out of the process of PCBs destruction	Ensuring of technical possibility of destruction of PCBs	MEPU, MIPU, MFEU, and MTCU	State budget, private funds of enterprises, and international investments	2007-2010	2828,0 560,0 4242,0 840,0 **Total:** **7070,0** **1400,0**

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
Task 5.3.4 Remove from use and neutralization/destruction of PCBs-containing capacitors					
5.3.4. 1 Implementation of pilot project for development and introduction of the network schedule for replacement of available capacitors with ecologically safe ones; organization of collection, safe storage, and neutralization of capacitors PCBs-containing at some Ukrainian enterprise that is owner of a great number of them (not less than 10,000 items)	Working off of technology for remove from use and neutralization/destruction of capacitors PCBs-containing	MEPU and MFEU	State budget, private funds of the enterprise, and international investments	2007-2015	505,0 100,0 5353,0 1060,0 5050,0 1000,0 **Total:** **10908,0** **2160,0**
Task 5.3.5. Destruction of synthetic PCBs-containing liquids					
5.3.5.1 Implementation of pilot project for collection and neutralization of stores of synthetic liquids PCBs-containing (not less than 60 tons) at some Ukrainian enterprise	Working off of technology for collection and neutralization of synthetic liquids PCBs-containing	MEPU and MFEU	State budget, private funds of the enterprise, and international investments	2009-2011	50,5 10,0 505,0 100,0 353,5 70,0 **Total:** **909,0** **180,0**

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
Task 5.3.6. Remove from use and neutralization/destruction of PCBs-containing transformers					
5.3.6.1 Implementation of pilot project for development and introduction of the network schedule for replacement of available transformers with ecologically safe ones at some Ukrainian enterprise that is owner of their great number of them (not less than 90 items)	Working off of technology for remove from use and neutralization/ destruction of transformers PCBs-containing	MEPU and MIPU	State budget, private funds of the enterprise, and international investments	2007-2015	50,5 10,0 2373,5 470,0 2424,0 480,0 **Total:** **4848,0** **960,0**
Task 5.3.7. Remove from use and neutralization/destruction of PCBs - containing equipment					
5.3.7.1 Development of material and technical framework for remove from use of transformers containing PCBs at national level taking into account working out of technologies for implementation of these works while performing task 5.3.3	Creation of technological framework remove from use of transformers containing PCBs capacity of which ensures solution of the problem at Ukrainian level	MEPU, MFEU, and MIPU	State budget, private funds of enterprises, and international investments	2010-2018	6060,0 1200,0 3030,0 600,0 **Total:** **9090,0** **1800,0**
5.3.7.2 Development of material and technical framework remove from use of capacitors containing PCBs at the national level	Creation of technological framework for ensuring collection, transportation, and destruction of capacitors and other electrotechnical equipment containing PCBs	MEPU, MFEU, and MIPU	State budget, private funds of enterprises, and international investments	2010-2018	25250,0 5000,0 25250,0 5000,0 **Total:** **50500,0** **10000,0**

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
5.3.7.3 Development of material and technical framework for destruction of PCBs at national level taking into account working out of technologies for implementation of these works while performing task 5.3.3	Creation of technological framework for ensuring collection, transportation, and destruction of PCBs at national level	MEPU, MIPU, MFEU and MTCU	State budget, private funds of enterprises, and international investments	2010-2018	12120,0 2400,0 6060,0 1200,0 **Total:** **18180,0** **3600,0**
5.3.7.4 Development and realization of schedule for stepwise remove from use and neutralization of capacitors, transformers, and other PCBs-containing equipment. Destruction of PCBs and neutralization of waste (capacitors and other electrotechnical equipment) contaminated with POPs	Neutralization/destruction of PCBs, PCBs-containing waste and equipment	MIPU, MFEU, MTCU, MODU, MEPU, and MHU	State budget, local budgets private funds of enterprises, and international investments	2010-2028	116420,0 23053,5 88992,0 17662,2 105462,0 20883,5 **Total:** **310874,0** **61559,2**

Action plan 5.4. Reduce or elimination of POPs releases (annex C of the Stockholm Convention) from intentional production and use

Action Plan Goal

Reduction on harmful impact of POPs by human health and the environment

Total cost of the measures is UAH 11.761 mln. (USD 2.330 mln.).

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
Task 5.4.1. Introduction of national register of POPs releases					
5.4.1.1 Establishing and introduction of national register of POPs releases	National register of POPs releases	MEPU, SSCU, MHU, and RSA	State budget, local budgets, private funds of enterprises, and international investments	2007-2009 further regularly	202,0 40,0 101,0 20,0 202,0 40,0 **Total:** **505,0** **100,0**
Task 5.4.2. Carrying out of inventory of POPs releases in accordance with the requirements of international guides					
5.4.2.1 Development of methodical recommendations for calculation of amounts of POPs releases in air from stationary sources in accordance with the requirements of the international guides and implementation of measures for introduction of annual inventory of POPs releases in accordance with the requirements of the international guides	Improvement of the national legislative framework concerning air protection and introduction of inventory of POPs releases	MEPU, RSA, and MHU	State budget, local budgets, private funds of enterprises, and international investments	2007-2009 further regularly	60,6 12,0 30,3 6,0 60,6 12,0 **Total:** **151,5** **30,0**

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
Task 5.4.3. Reduction of POPs releases by enterprises of metallurgical industry					
5.4.1.1 Realization of pilot project at some metallurgical enterprise as to development and realization of measures concerned with reduction of POPs releases by way of application of BAT/BEP and carrying out of quantitative analysis of POPs releases	Reduction of POPs releases at some metallurgical enterprise	MEPU, MIPU, MHU, and RSA	State budget, local budget, private funds of enterprises, and international investments	2007-2009	202,0 40,0 101,0 20,0 202,0 40,0 **Total:** **505,0** **100,0**
Task 5.4.4. Reduction of POPs releases by power plants					
5.4.2.1 Realization of pilot project at various categories of fuel incinerating power plants (powerful coal heat power plants, combined heat power plants, boiler-houses of both housing and communal and industrial sectors) and determination of list of POPs that are thrown out with smoke gases, their volumes and also development and realization of measures as to their reduction	Reduce of POPs releases at a number of fuel incinerating power plants of various categories (powerful coal heat power plants, combined heat power plants, boiler-houses of both housing and communal and industrial sectors)	MEPU, MFEU, and MHU	State budget, local budget, private funds of enterprises, and international investments	2007-2009	60,6 12,0 30,3 6,0 60,6 12,0 **Total:** **151,5** **30,0**

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
Task 5.4.3. Reduction of POPs releases by enterprises of metallurgical industry					
5.4.3.1 Realization of pilot project at some metallurgical enterprise as to development and realization of measures concerned with reduction of POPs releases by way of application of BAT/BEP and carrying out of quantitative analysis of POPs releases	Reduction of POPs releases at some metallurgical enterprise	MEPU, MIPU, MHU, and RSA	State budget, local budget, private funds of enterprises, and international investments	2007-2010	2020,0 400,0 1010,0 200,0 2020,0 400,0 **Total:** **5050,0** **1000,0**
Task 5.4.4. Reduction of POPs releases by power plants					
5.4.4.1 Realization of pilot project at various categories of fuel incinerating power plants (powerful coal heat power plants, combined heat power plants, boiler-houses of both housing and communal and industrial sectors) and determination of list of POPs that are thrown out with smoke gases, their volumes and also development and realization of measures as to their reduction	Reduce of POPs releases at a number of fuel incinerating power plants of various categories (powerful coal heat power plants, combined heat power plants, boiler-houses of both housing and communal and industrial sectors)	MEPU, MFEU, and MHU	State budget, local budget, private funds of enterprises, and international investments	2007-2010	2222,0 440,0 1111,0 220,0 2222,0 440,0 **Total:** **5555,0** **1100,0**
Task 5.4.5. Development economic and legal framework for introduction of cleaner manufacture and BAT/BEP by enterprises					
5.4.5.1 Establishing of training center for introduction of cleaner technologies on the basis of BAT/BEP and development of regulatory framework for its constant functioning.	1. Development and introduction of complex of normative documents and measures for introduction of cleaner technologies on the basis of BAT/BEP.	MEPU	State budget, local budgets, private funds of enterprises, and international investments	2007-2010	202,0 40,0 101,0 20,0 202,0 20,0

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
	2. Functioning of the training center for introduction cleaner technologies on the basis of BAT/ BEP. 3. Increasing of knowledge and qualification of stakeholders.				**Total:** **505,0** **100,0**

Action plan 5.5. Identification and management of contaminated sites including polluted POPs

Action Plan Goal

Improvement of system for control and management of contaminated sites including polluted POPs

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
Task 5.5.1. Establishing of national register of contaminated sites including polluted POPs					
5.5.1.1 Development of guideline for fulfillment of inventory of contaminated sites including polluted POPs with preliminary ecological and geological estimation	Guideline for fulfillment of inventory of contaminated sites including polluted POPs	MEPU	State budget	2007-2008	50,5 10,0
5.5.1.2 Development of national register of contaminated sites including polluted POPs on the basis of GIS technologies	Register of contaminated sites including polluted POPs	MEPU	State budget	2007-2009	355,0 70,3

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
5.5.1.3 Fulfillment of inventory of contaminated sites including polluted POPs with inserting data to national register of contaminated sites and determination of priorities	Regular inventory of contaminated sites including polluted POPs	MEPU, RSA, MHU, MAPU, and MOEU	State budget and local budgets	2009-2028	600,0 118,8 400,0 79,2 **Total:** **1000,0** **198,0**
Task 5.5.2. Implementation of measures for remediation of territories polluted POPs					
5.5.2.1 Development of Instruction for fulfillment of environmental impact assessment of sites polluted POPs	Instruction for fulfillment of environmental impact assessment of sites polluted POPs	MEPU	State budget	2007-2009	**60,0** **11,9**
5.5.2.2 Realization of pilot projects for remediation of sites with typical contamination including POPs, and fulfillment of complex ecological and geological estimation and complex of measures for their remediation	Working off of some technology and methods for remediation of territories characterized with typical contamination including that with POPs	MEPU, MHU, MAPU, MIPU, MFEU, and MTCU	State budget, local budgets, private funds of enterprises, and international investments	2006-2015	800,0 158,4 400,0 79,2 800,0 158,4 **Total:** **2000,0**
5.5.2.3 Fulfillment of comparative analysis and choice of technologies/methods for remediation of contaminated sites including polluted POPs	List of recommended technologies/ methods for remediation of contaminated sites including polluted POPs	MEPU, MHU, MOEU, and NASU	State budget	2007-2009	**50,5** **10,0**

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
5.5.2.4 Development of local action plans for remediation of sites polluted POPs taking into account local specifics	Local action plans for remediation of sites polluted with POPs taking into account local specifics	RSA and MEPU	State budget, local budgets, and private funds of enterprises	2010-2011	40,4 8,0 20,2 4,0 40,4 8,0 **Total:** **101,0** **20,0**
5.5.2.5 Fulfillment of measures for remediation of sites polluted POPs in accordance with local specifics	Remediation of sites polluted POPs performed in accordance with local specifics	RSA and MEPU	State budget, local budgets, private funds of enterprises, and international investments	2012-2028	15530,6 3075,4 7922,8 1568,9 16646,6 3296,4 **Total:** **40100,0** **7940,7**

Action plan 5.6. Exchange of POPs information among stakeholders and increasing public awareness and education

Action Plan Goal

Development of POPs exchange information system at the national, local, and international levels.
Total cost of the measures is UAH 22.038 mln. (USD 4.364 mln.).

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
Task 5.6.1. Maintenance of permanent POPs information exchange among stakeholders according to the requirements of the Stockholm Convention and the Protocol on POPs					
5.6.1.1 Creation of a network for POPs exchange information among stakeholders at the national, local, and international levels	Maintenance of stakeholders with reliable POPs information	MEPU, MHU, MEAU, MOEU, MAPU, MIPU, MFEU,MTCU, NASU, AMSU, MESU, MODU, SCBT, NGOs, and MM	State budget	2007-2008	**30,0 / 5,9**

Заходи	Очікувані результати	Відповідальні установи	Джерела фінансування	Термін	Орієнтовна вартість, тис. грн. тис. USD
5.6.1.2 Realization of measures for establishing and functioning of national coordination center for POPs exchange information among the Secretariat and the Parties of the Convention and the Protocol on POPs and stakeholders	1. Creation and functioning of the national coordination centre for POPs exchange information in order to meet requirements of the Stockholm Convention on POPs. 2. Coordination of actions concerning gathering information on POPs in Ukraine and its presentation to the Secretariats of the Stockholm Convention on POPs and Convention on Long-range Transboundary Air Pollution and exchange POPs information among stakeholders at the national and international levels.	MEPU	State budget, local budgets, and international investments	2007-2028	4159,0 823,6 4408,0 872,8 4159,0 823,6 **Total:** **12726,0** **2520,0**
5.6.1.3 Implementation of measures on maintenance and regular updating on POPs information at Web- site	Ensuring of functioning and updating on POPs information at Web- site	MEPU	State budget	2007-2015	**1000,0** **198,0**
Task 5.6.2. Increasing public awareness and education on POPs					
5.6.2.1 Development and distribution of all available POPs information in mass media (publication of articles, booklets and posters, making of video blocks, implementation of cycles of radio and television programs, round tables, conferences, and seminars at the national and local levels)ів	Regular informing of the public and stakeholders on POPs issue	MEPU and MHP	State budget, funds of NGOs and MM, and international investments	2007-2028	2525,0 500,0 2525,0 500,0 **Total:** **5050,0** **1000,0**

Actions	Anticipated results	Responsible institutions	Sources of finance	Time-frame	Estimated costs ths. UAH/ ths. $US
5.6.2.2 Development of educational and methodical and informational materials concerning POPs for the following task groups: 1) representatives of authorities; 2) employers and professional units of agriculture and industry concerned to formation, application, and utilization of POPs; 3) specialists of health protection system. Holding of educational and trainings seminars for the mentioned task groups.	Distribution of educational and informational materials among stakeholders	MEPU and MESU	ДState budget, funds of NGOs and MM, and international investments	2007-2009	252,5 / 50,0 252,5 / 50,0 **Total: 505,0 100,0**
5.6.2.3 Development of educational and informational materials concerning nature and impact of POPs on human health and environment for distribution among NGOs and medical institutions	Distribution of educational and informational materials among NGOs and in medical institutions	Мінприроди, MEPU, MHU, and MESU	State budget, funds of NGO and MM, and international investments	2007-2009	252,5 / 50,0 252,5 / 50,0 **Total: 505,0 100,0**
Task 5.6.3. Introduction of POPs information to educational process					
5.6.3.1 Development and introduction to educational programs of higher and secondary educational institutions of lecture courses and special courses on chemistry, biology, ecology, communal hygiene and other adjacent educational programs for studying of POPs issue.	Renewal of educational programs of chemical, biological, geographic, and other branches of science concerning information on POPs	MESU, MHP, and MEPU	State budget, international investments, and funds of NGOs	2007-2009	505,0 / 100,0 505,0 / 100,0 **Total: 1010,0 200,0**

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
5.6.3.2 Development of educational and methodical materials for non-school institutions of the educational system having ecological directions including information on POPs	Distribution of educational and methodical materials among non-school educational institutions, increasing knowledge on POPs issue among young people	MESU and MEPU	State budget, funds of NGOs and MM, and international investments	2007-2009	252,5 50,0 252,5 50,0 **Total:** **505,0** **100,0**
5.6.3.3 Development of educational and methodical materials on POPs for programs of retraining and professional development of teachers and lecturers of special and higher educational institutions within the system of permanent education	Increasing of level of knowledge on POPs of teachers and lecturers of special and higher educational institutions	MESU, MHP, and MEPU	State budget and international investments	2007-2009	101,0 20,0 101,0 20,0 **Total:** **202,0** **40,0**
5.6.3.4 Development and introduction of pilot project named "POPs issue and its position in educational and training process" on the basis of the M.Dragomanov National Teacher-Training University for the purpose of creation (modification) of branch standards of education that can be recommended for higher, special, and secondary educational institutions	Renewal of existing and creation of new educational courses and special courses, methodical materials concerning POPs issues, distribution of appropriate educational materials among teachers and lecturers of educational institutions	MESU and MEPU	State budget and international investments	2007-2008	252,5 50,0 252,5 50,0 **Total:** **505,0** **100,0**

Action plan 5.7. Sustainability of POPs monitoring system in Ukraine

Action Plan Goal

Sustainability of the existing POPs monitoring system in Ukraine in order to comply with the Stockholm Convention and the Protocol on POPs for the purpose of effective protection of human health and environment from POPs and supply of authorities in the sphere of health and environment protection with real POPs monitoring data.

Total cost of the measures is UAH 60.554 mln. (USD 11.554 mln.).

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
Task 5.7.1. Carrying out of technical audit and creation of data bank of chemical and analytical laboratories performing state POPs monitoring and research					
5.7.1.1 Carrying out of technical audit of available Ukrainian analytical laboratories to realize state monitoring, and assessment of existing capacity and capacity building needs to analyze POPs (equipment, etalons and test reference materials, measuring methods, etc.)in order to comply with the Stockholm Convention. **5.7.1.2** Creation of data bank of these POPs chemical with estimation of their material and technical and normative and methodical supply.	Data bank on analytical laboratories to realize state POPs monitoring and scientific research.	MEPU, MHU, and SCSCP	State budget	2007 - 2009	**150,0** **29,7**

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
Task 5.7.2. Improvement of system of monitoring and financial and technical support of laboratories which carry out state monitoring of POPs as component of Global POPs monitoring system					
5.7.2.1 Development of proposals on sustainability of existing POPs monitoring system and financial and technical support of analytical laboratories which carry out state monitoring in accordance with the international requirements as component of the Global POPs monitoring system	Proposals on sustainability of existing POPs monitoring system and financial and technical support of analytical laboratories which carry out state monitoring in accordance with the international requirements as component of the Global POPs monitoring system	MEPU, MHU, and MAPU	State budget	2007 - 2008	**101,0** **20,0**
5.7.2.2 Creation of Ukrainian united list of certificated POPs methodologies in accordance with the international requirements (with their approbation, updating, and unification).	Ukrainian united list of certificated POPs methodologies	MEPU, MHU, and MAPU	State budget	2007 - 2008	**50,5** **10,0**
5.7.2.3 Development of unified requirements to registration of reports of laboratory researches in accordance with the international requirements	Unified requirements to registration of reports of laboratory researches in accordance with the international requirements	MEPU and MHU	State budget	2007 - 2008	**50,5** **10,0**

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
5.7.2.4. Establishing of seven base completed laboratories for carrying out of the state POPs monitoring and researches	1. Creation of seven base completed laboratories for carrying out of the state POPs monitoring and researches. 2. Certificated of seven base POPs laboratories. 3. Sustainability of POPs monitoring system and carrying out of POPs researches purposed to reduction of negative their impact of human health and environment. 4. Accreditation of seven base laboratories. 5. Supplement of seven base laboratories by mobile laboratories for sampling and carrying out POPs express analyses..	MEPU, MHU, MOEU, and SCSCP	State budget, local budgets, private funds of enterprises, and international investments	2007-2012	9543,0 1889,7 20987,0 4155,8 11270,0 2231,7 **Total:** **41800,0** **8277,2**
5.7.2.5 Development of action plan for establishing and constant functioning of POPs biological monitoring system as a component of social - hygienic monitoring	Action plan for establishing and constant functioning of POPs biological monitoring system as a component of social - hygienic monitoring	MHPU, SCSCP, and MEPU	State budget	2007- 2008	**101,0** **20,0**

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
5.7.2.6 Development of action plan for establishing and constant functioning of united POPs monitoring electronic database in Ukraine	Action plan for establishing and constant functioning of united POPs monitoring electronic database in Ukraine	MEPU	State budget	2008- 2009	**101,0** **20,0**
5.7.2.7. Maintenance of actions for establishing and constant functioning of certificated PCDDs/PCDFs analytical laboratory on the basis of existing "Dioxin" center at the L.Medved Institute of Ecological Hygiene and Toxicology of MHPU	Establishing and constant functioning of certificated PCDDs/PCDFs analytical laboratory on the basis of existing "Dioxin" center at the L.Medved Institute of Ecological Hygiene and Toxicology of MHPU	MHU	State budget and international investments	2007-2028	10000,0 [2)] 1980,2 100,0 19,8 **Total:** **10100,0** **2000,0**
Task 5.7.3. Sustainability of the system for increasing qualification of the personnel of laboratories carrying out of the state POPs monitoring					
5.7.3.1 Carrying out of estimation of the professional level of personnel analyzing POPs and development of proposals for sustainability of the certification system and professional development of personnel analyzing POPs	Estimation of the professional level of personnel analyzing POPs and development of proposals for sustainability of the certification system and professional development of personnel analyzing POPs	MEPU and MHU	State budget	2006-2028	2070,0 409,9 1380,0 273,3 **Total:** **3450,0** **683,2**
5.7.3.2 Development of methodical literature, handbooks, and reference books on analyzing POPs, and organization of professional development of the personnel of analytical laboratories which carry out state monitoring of POPs	Handbooks, scientific and methodical literature, reference books on analyzing POPs. Certificated personnel of the laboratories analyzing POPs. Constant functioning of the POPs monitoring system in Ukraine.	MEPU, MHU, and MAPU	State budget and international investments	2006-2028	2,070.0 409.9 1,380.0 273.3 **Total:** **3,450.0** **683.2**

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
Task 5.7.4. Introduction of National Pollutant Release and Transfer Register (PRTR) under the requirements of the Protocol on PRTR of the Aarhus Convention including POPs					
5.7.4.1 Establishing and updating of National Pollutant Release and Transfer Register (PRTR) under the requirements of the Protocol on PRTR of the Aarhus Convention including POPs	Constant functioning of National Pollutant Release and Transfer Register	MEPU	State budget, local budgets, private funds of enterprises, and international investments	2007-2028	1600,0 316,8 800,0 158,4 1600,0 316,8 **Total:** **4000,0** **792,1**
Task 5.7.5. Carrying out of HCB monitoring at the solid toxic waste polygon including over 11,000 tons of HCB in the Kalush town, Ivano-Frankivsk oblast					
5.7.5.1 Quarterly sampling and carrying out of analysis of surface and underground water, grounds, atmospheric air on HCB at the solid toxic waste polygon in the town of Kalush, Ivano-Frankivsk oblast	Carrying out of the quarterly monitoring at the solid toxic waste polygon in the town of Kalush, Ivano-Frankivsk oblast	MEPU, MHU, RSA, and "Oriana-Halev" Ltd., Kalush town, Ivano-Frankivsk oblast	State budget, local budget, funds of "Oriana-Halev", and international investments	2006-2015	80,0 19,8 40,0 10,0 80,0 19,8 **Total:** **200,0** **39,6**

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
Task 5.7.6. Carrying out of DDT monitoring of the burial ground nearby Altestove settlement, Odesa oblast					
5.7.6.1 Quarterly sampling and carrying out of analysis of surface and underground water, grounds and atmospheric air on DDT at the territory of the DDT burial ground and adjacent territory nearby Altestove settlement, Odesa oblast	Monitoring of the DDT burial ground and adjacent territory nearby Altestove settlement, Odesa oblast	MEPU, MHPU, RSA, and Bogatskiy SDO MSPCI of the NASU	State budget, funds of Odesa seaport, and international investments	2006-2011	75,0 14,85 62,5 14,85 **Total:** **150,0** **29,7**

Action plan 5.8. Scientific research

Action Plan Goal

Carrying out of scientific research and obtaining data for planning of measures and approval of decisions for reduction of impact of POPs on environment and human health

Total cost of the measures is UAH 6.837 mln. (USD 1.354 mln.).

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
Task 5.8.1. Carrying out of scientific research purposed on solution of POPs issue in Ukraine					
5.8.1.1 Development of the National Program «Protection of environment and Ukrainian population from dioxins and dioxin type toxicants for 2008-2015»	National Program «Protection of environment and Ukrainian population from dioxins and dioxin type toxicants for 2008-2015»	MHU and MEPU	State budget	2007-2008	**101,0** **20,0**
5.8.1.2 Development of The program of scientific researches on impact of POPs on environment and human health	The program of scientific researches on impact of POPs on environment and human health	MEPU and MHU	State budget	2007-2008	**55,6** **11,0**
5.8.1.3 Development of program of scientific researches and projects purposed on creation and approbation of methods, technologies, and installations (including movable) for removal of PCBs from transformers, and destruction of capacitors and other equipment PCBs-containing	Program of scientific researches and projects purposed on creation and approbation of methods, technologies, and installations (including movable) for removal of PCBs from transformers, and destruction of capacitors and other equipment PCBs-containing	MEPU and MIPU	State budget	2007-2008	**60,6** **12,0**

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
5.8.1.4 Performing of scientific substantiation for introduction of norms as to PCDDs/PCDFs content and methods for their determination in food products and environment objects in Ukraine	Scientific substantiation for introduction of norms as to PCDDs/PCDFs content and methods for their determination in food products and environment objects in Ukraine	MHU and MEPU	State budget	2007-2010	**121,0** **24,0**
5.8.1.5 Performing of scientific substantiation for introduction of maximum allowable POPs releases from stationary and mobile sources in accordance with the requirements of the Protocol on POPs in Ukraine	Scientific substantiation for introduction of maximum allowable POPs releases from stationary and portable sources	MEPU and MHU	State budget	2007-2010	**121,0** **24,0**
5.8.1.6 Creation of program for scientific research and projects purposed on development of methodologies for remediation of territories polluted POPs	Program for scientific research and projects purposed on development of methodologies for remediation of territories polluted POPs	MEPU, MHU, and MIPU	State budget	2007-2010	**60,0** **11,9**
5.8.1.7 Development and realization of scientific research and projects purposed on creation, approbation, and introduction of methodologies, technologies, and installations (including mobile) for neutralization of OP and IW including POPs	Realization of scientific research and projects introduced methods and technologies for neutralization of POPs. Improvement of ecological condition of Ukraine.	MEPU, MHU, and MIPU	State budget, private funds of enterprises, and international investments	2006-2012	1690,0 334,6 400,0 79,2 **Total:** **2090,0** **413,9**

Actions	Anticipated results	Responsible institutions	Sources of finance	Timeframe	Estimated costs ths. UAH/ ths. $US
5.8.1.8 Development and introduction of new technological decisions on reducing POPs releases.	Introduction of new technologies for purification of industrial gases, and reducing of POPs releases	MHU, MEPU, MIPU, and RSA	State budget, private funds of enterprises, and international investments	2006-2012	2000,0 396,0 400,0 79,2 **Total:** **2400,0** **475,2**
Task 5.8.2. Carrying out of national and participation in international conferences, seminars, symposiums, etc. concerning methods and technologies of POPs neutralization, reducing POPs releases and impact on human health and environment					
National and international scientific and scientific and practical conferences, seminars, symposiums, etc. concerning methods and technologies for POPs neutralization, reducing POPs releases, and impact on human health and environment	Exchange of results of scientific research and introduction of advanced achievements in the sphere of POPs management	MEPU	State budget, international investments, and private funds of enterprises	2006-2028	1260,8 249,7 567,2 112,3 **Total:** **1828,0** **362,0**

Notes.

[1)] Within the framework of budgetary financing of government bodies and funds stipulated by the budgetary program2401250 "Handling waste and hazardous chemicals" of the State Fund of Environmental Protection (MEP),

[2)] Funds stipulated by the budgetary program КПКВК 2301890 – Decree of the Cabinet of Ministers dated 2006-05-17 #681 (MHU).

PART 6

IMPLEMENTATION, EVALUATION AND UPDATING

The NIP is an operational document providing a framework for the implementation of the Stockholm Convention in Ukraine. The current NIP is only a first step in meeting the obligations arising from the Stockholm Convention and is oriented mainly for the period of 2006 to 2028.

The NIP has been developed through an extensive stakeholder consultation process and passed all national co-ordination procedures. Involving all stakeholders in NIP implementation is one of the pre-conditions for obtaining the expected results. Clear sharing of responsibilities and tasks is a key element of the NIP implementation and this will call for a close inter-ministerial and inter-sectoral coordination and cooperation.

The overall operational coordination of NIP implementation will be the responsibility of the MEPU. In order to ensure an effective and efficient coordination and cooperation will establish a high-level the National Interagency Coordinating Committee (NICC). The role of the NICC will be to supervise and evaluate the implementation of the NIP and decide on its revision or updating. Another important task of the Commission will be to incorporate implementation of the NIP into other national strategies, policies and plans.

It is expected that MEPU to create Center on Chemical Safety (CCS) thus bringing various related international Conventions' focal points under one umbrella. The CCS will act as the executive arm of NICC to deal with day-to-day activities in this field and coordinate and manage Ukrainian international obligations under Basel, Stockholm, Rotterdam, LRTAP Conventions and Aarhus Protocol, thus gaining synergies and improving and increasing efficiency, cost-effectiveness, transparency, accountability and cross-fertilization.

The possible reasons of the NIP evaluation and updating can be the following:

- New requirements for the NIP preparation to be specified by of the Conference of the Parties and which was not introduced to the NIP.
- Listing of new chemicals in Annexes of the Stockholm Convention or the Protocol on POPs.
- The new proposals made by stakeholders.
- Other valid reasons which can directly affect on NIP implementation.

The main interested and responsible parties of the NIP evaluation and updating are:

- Global, region, and subregional international organizations (GEF, UNEP, EU, etc.).
- Central and local government bodies.
- Scientific institutions.
- Enterprisers.
- Public and NGOs.

Because NIP actions will be very costly adequate support from national and international sources is therefore a crucial pre-condition for successful NIP implementation, for both technical assistance and investments.

Ukraine seeks technical assistance in the following areas:

- Neutralization of the stockpiled of OP and IW including POPs (establishment of state control of places of their storage, and determination of the most acceptable ecological and economical technologies for neutralization of over 11 ths. tons of HCB stored at the polygon nearby the town of Kalush, Ivano-Frankivsk oblast; over 1,000 tons of DDT stockpiled in Odesa oblast (over 800 tons are placed at the burial ground nearby Altestove settlement) as well as over 19 ths. tons of other OP find out in all the oblasts).
- Neutralization/destruction of PCBs-containing equipment and waste (carrying out of complex inventory and marking PCBs-containing equipment and waste with introduction of this information to the national register, ensuring of technical possibility of transformers purification, and neutralization of capacitors and PCBs).
- Reduce or elimination of POPs releases (implementation of pilot projects at some metallurgical and power plants with reduction of POPs releases).
- Identification and management of contaminated sites including polluted POPs (development of plans, working-off of methods and technologies for remediation of contaminated sites and its implementation taking into account specifics of the oblasts).
- Exchange of POPs information among stakeholders and increasing public awareness and education (creation and functioning of the national coordination centre for POPs exchange information, distribution of educational and informational materials among stakeholders, carry out of seminars, courses, trainings, etc.).
- Improvement of state monitoring system and strengthening of financial and technical support of laboratories which carry out state monitoring of POPs as component of Global POPs monitoring system (establishing of base laboratories and their supplement with necessary stationary and movable installations for sampling and analysis for POPs content, establishing and permanent functioning of accredited laboratory for determination of PCDDs/PCDFs content on the base of existing "Dioxin" center at the L.Medved Institute of Ecological Hygiene and Toxicology of MHU, development of appropriate methodical literature, organization of the system for raising of the level of personnel of the laboratories, and creation and permanent functioning of national PRTR).

Evaluation of implementation progress is an important component of the NIP. In will allow for assessing whether and to what extent the NIP objectives are being met and what are the NIP components in need of updating. Performance evaluation will be done in a transparent way, through a participatory process, involving all stakeholders. Their results will be made available to the general public.

The goal of evaluation indicators is to assess how NIP activities effect the direction of change in environmental quality and to measure the magnitude of that change. While most NIP indicators will allow quantitative evaluation of implementation process and impacts of various activities, many indicators will seek to measure qualitative aspects, e,g, monitoring the evolution of public attitudes towards POPs problems. Furthermore, as the NIP seek to address many institutional issues, which are as much about quality as they are about quantity, both numerical indicators and qualitative assessment will be employed. The range of verifiable indicators of the NIP implementation may include but not necessarily be limited to the following:

- National legal and regulatory framework amended to meet requirements of the Stockholm Convention.

- Legal and regulatory framework developed for:

– introducing and updating a national register of locations for stockpiling OP pesticides and IW including POPs;

– set up a national register of enterprises using PCBs-containing equipment and places for stockpiling of equipment and PCBs-containing waste;

– using, stockpiling, labeling, removing from use, neutralization/destruction of PCBs as well as PCB-containing equipment and waste;

– set up a national register of POPs releases in compliance with the requirements of international guides;

– PRTR establishing ;

– set up a national register of contaminated sites including polluted POPs on the basis of GIS technologies.

- Entry into force of allowable concentrations and identification methods of PCDDs/PCDFs in food products and environment.
- Entry into force of POPs MAR from stationary and mobile sources in accordance with the Protocol on POPs.
- State sanitary and hygienic monitoring of POPs established.

The verification of indicators will be done through assessment of reports provided by MEPU. It is foreseen that MEPU will be responsible for collecting relevant information, evaluating the performance indicators, assessing the implementation needs, progress and troubles for NIP implementation and will periodically report on its findings to the NICC. Ministries and other state bodies will be responsible for NIP monitoring and evaluation within their sectors. The results shall be part of the decision-making process. Local authorities will have monitoring and evaluation responsibilities in the areas of their jurisdiction. They will be disseminated to the public authorities (at various levels), the private sector, external donors, mass media and the general public. This will be done through the annual State of the Environment Reports and the MEPU web-site.

It has to be stated that the NIP is not a rigid document and it will be subject to revisions and updating on regular basis, e.g. every 5 years. This obviously will be linked to the performance evaluation process.

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LIST OF THE ENVIRONMENT INTERNATIONAL AGREEMENTS

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
	CONVENTIONS				
1.	Convention of Long-range Transboundary Air Pollution (LRTAP)	1979-11-14	1980-05-13 (r) Decree of the Supreme Soviet of the UkrSSR #231-X	16.03.1983	- 13.11.1979 -16.03.1983
2.	The Vienna Convention for the Protection of the Ozone Layer	1985-03-22	20.05.1986 (p) Decree of the Council of ministers of the UkrSSR #188	22.09.1988	- 22.03.1985 - 22.09.1988
3.	Convention on Environmental Impact Assessment in a Transboundary Context	1991-02-26	1999-03-19 (r) Ukrainian law #534-XIV	18.10.1999	- 25.02.1991 - 10.09.1992
4.	Convention on the Protection of the Black Sea Against Pollution	1992-04-21	1994-02-04 (r) Decree of the Verkhovna Rada of Ukraine #3939-XII	14.04.1994	- 21.04.1992 - 15.01.1994
5.	Convention on Biological Diversity	1992-06-11	1994-11-29 (r) Ukrainian law #257/94-BP	07.02.1995	- 05.06.1992 - 29.12.1993
6.	The United Nations Framework Convention on Climate Change	1992-07-11	1996-10-29 (r) Ukrainian law #435/96-BP	11.08.1997	- 09.05.1992 - 21.03.1994
7.	Convention on the Conservation of European Wildlife and Natural Habitats (Bern convention)	1998-08-17 (assigned for passing of the law on joining because of change of status of Ukraine in EU)	1996-10-29 (pr) Ukrainian law #436/96-BP Letter of the Minister of external affairs dated 1998-12-17 to the General secretary of the EU concerned with reckoning the Law as consent on obligations determined by the Convention	01.05.1999	- 01.06.1982 - 19.09.1979
8.	Convention on Protection and Use of Transboundary Watercourses and International Lakes	1999-06-17	1999-07-01 (pr) Ukrainian law #801-XIV	06.01.2000	- 17.03.1992 - 06.10.1996

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
9.	Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES)	1973-03-03	1999-05-14 (pr) Ukrainian law #662-XIV	2000-03-29	
10.	Convention on the Conservation of. Migratory Species of Wild Animals (CMS)	1979-06-27	1999-03-19 (pr) Ukrainian law #535-XIV	2000-03-29	
11.	Convention on Protection and Sustainable use of the Danube River		2002-01-17 (r) Ukrainian law #2997-III	2003-03-13	- 1994-06-29 - 1998-10-22
12.	Convention for the Sustainable Development in the Carpathians	2003-05-22	Decree of the Cabinet of Ministers of Ukraine on approval and rendering to ratification #2033 dated 2003-12-26 Ukrainian law #1672-IV dated 2004-04-07 Note of the Slovak Republic #1364/2004-05-11 dated 2004-04-29 note of MEA of the Hungarian Republic #6942/Adm/KUM/2005 dated 2005-03-30	2006-01-04	
13.	The European Landscape Convention	2004-06-17	Ukrainian law (r) #2831-IV dated 2005-09-07	2006-07-01	- 2000-10-20 - 2004-03-01
14.	The United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought. and/or Desertification, Particularly in Africa		Ukrainian law on joining of Ukraine #61-IV dated 2002-07-04	11.08.1997	- 1994-10-14 - 1996-12-26
15.	Convention on Prevention of Pollution of Seas by Discharging of Waste and other Materials	1972-12-29	1975-12-24 (r) Decree of the Supreme Soviet of the UkrSSR	1976-03-06	- 1972-12-29 - 1975-08-30

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
16.	Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar, 1971)		1996-10-29 (legal succession) Ukrainian law #437/96-BP		
17.	Convention on persistent organic pollutants (the Stockholm Convention)	2001-05-23	Ukrainian law #949-V dated 2007-04-18 (r)		
18.	Basel Convention On The Control of Transboundary Movements Of Hazardous Wastes and their disposal	1989-03-22	1999-07-01 (pr) Ukrainian law #803-XIV	2000-01-06	- 1989-03-22 - 1992-05-05
19.	The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and. Pesticides in International Trade	1998-09-10	Ukrainian law #169-IV dated 2002-09-26 on joining	2004-02-24	- 1998-09-10 - 2004-02-24
	AGREEMENTS				
1.	Agreement on collaboration in the sphere of environment protection (CIS)	1992-02-08 (not assigned by Ukraine)			
2.	Agreement between Ukrainian Government and Government of the USA on collaboration in the sphere of environment protection	1992-05-07 In force since 1992-05-07			
3.	Agreement between Ukrainian Government and Government of the Hungarian Republic on collaboration in the sphere of environment protection and territorial development	1992-08-13 In force since 1993-02-02			
4.	Agreement between Ukrainian Government and Government of the Russian Federation on joint use and protection of Transboundary water bodies	1992-10-19 In force since 1992-10-19			

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
5.	Pact on principles of relations and collaboration	1993-02-10 In force since 1994-08-05			
6.	Agreement on collaboration in the sphere of environment protection	1993-06-10 In force since 1993-06-10			
7.	Agreement between Ukrainian Government and Government of the Tunis Republic on development of economical and technical collaboration in the sphere of water industry	1993-12-07 In force since 1993-12-07			
8.	Agreement between Ukrainian Government and Government of the Polish Republic on collaboration in the sphere of environment protection	1994-01-24 In force since 1994-04-30			
9.	Agreement between Ukrainian Government and Government of the Polish Republic	1994-01-24			
10.	Agreement between Ukrainian Government and Government of the Russian Federation on collaboration in the sphere of geodesy, cartography, cadastre, and distance probing of the Earth	1994-04-26 In force since 1994-04-26			
11.	Agreement between Ukrainian Government and Government of the Russian Federation on joint exchange with topographic and geodesic, cartographic, and aerospace materials	1994-04-26 In force since 1994-04-26			
12.	Agreement between the State geological service of Ukraine and geological service of the France Republic	1994-05-19			

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
13.	Agreement between the Ministry of environment protection and nuclear safety of Ukraine and the Ministry of nuclear safety of the France Republic on collaboration in the sphere of nuclear safety	1998-09-03 In force since 1998-09-03			
14.	Agreement between Ukrainian Government and Government of the Slovak Republic concerned with issues of water industry in boundary waters	1994-06-14 In force since 1995-12-15			
15.	Agreement between Ukrainian Government and Government of the Moldova Republic on joint use and protection of boundary waters	1994-11-23 In force since 1995-05-29			
16.	Agreement between Ukrainian Government and Government of the Byelorussia Republic on collaboration in the sphere of environment protection	1994-12-16 In force since 1994-12-16			
17.	Agreement between the Ministry of environment protection of Ukraine and the Ministry of environment protection of Denmark on collaboration in the sphere of environment protection	1994-06-01 In force since 1994-06-01			
18.	Agreement between Ukrainian Government and Government of the State of Israel on collaboration in the sphere of environment protection	1996-11-25 In force since 1999-02-12			
19.	Agreement on collaboration in the sphere of environment protection (the Ministry of ecological safety of Ukraine)	1995-06-26 In force since 1995-06-26			

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
20.	Agreement between Ukrainian Government and Government of the Russian Federation on collaboration in the sphere of environment protection	1995-07-26 In force since 1998-07-26			
21.	Agreement between Ukrainian Government and Government of the Moldova Republic on collaboration in the sphere of geodesy, cartography, cadastre, and distance probing of the Earth	1996-04-10 In force since 1996-08-08			
22.	Agreement between Ukrainian Government and Government of the Polish Republic on collaboration in the sphere of water industry in boundary waters	1996-10-10 In force since 1998-12-29			
23.	Agreement between the Head department of geodesy, cartography, and cadastre of the Cabinet of Ministers of Ukraine and the Head department of geodesy, cartography, and cadastre of the Cabinet of Ministers of Uzbekistan Republic on collaboration in the sphere of geodesy, cartography, cadastre, and distance probing of the Earth	1996-12-05 In force since 1996-12-05			
24.	Agreement between Ukrainian Government and Agreement of the Moldova Republic on collaboration of boundary oblasts of Ukraine and administrative and territorial units of the Moldova Republic	1997-03-11 In force since			

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
25.	Agreement between Ukrainian Government and Government of the Denmark Kingdom concerned with aid in energetic program that takes into account aspects of environment protection	1997-04-02 In force since			
26.	Agreement between Ukraine and the Russian Federation on status and conditions of presence of the black Sea navy of the Russian Federation at the Ukrainian territory	1997-05-28 In force since 1999-07-12			
27.	Agreement between the State committee of water industry of Ukraine and the Ministry of public works and water resources of the Arabic Republic of Egypt on collaboration in the sphere of water industry	1997-06-15 In force since			
28.	Agreement between Ukrainian Government and Romanian Government on collaboration in the sphere of water industry in boundary waters	1997-09-30 In force since 1999-01-28			
29.	Agreement between Ukrainian Government and Georgian Government on collaboration in the sphere of geodesy, cartography, cadastre, and distance probing of the Earth	1997-10-28 In force since 2003-06-26			
30.	Agreement between Ukrainian Government and Government of the Hungarian Republic for issues of water industry in boundary waters	1993-06-28 In force since 1994-02-19			
31.	Agreement on collaboration in the network of international programs of EU and CIS countries	1997-11-24 Ratified on 1998-01-16			

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
32.	Agreement between the Cabinet of Ministers of Ukraine and Government of the Uzbekistan Republic un the sphere of environment protection and rational use of natural resources	1998-02-19 In force since 1998-02-19			
33.	Interoblastal Ukrainian-Romanian-Moldavian Agreement of creation of European oblast «Lower Danube»	1998-08-14			
34.	Agreement between Ukraine and the USA on oblastal ecological center of Ukraine	1999-12-08 In force since 1999-12-08			
35.	Agreement between the Ministry of environment and planning of the territories of the Republic of Moldova, the Ministry of waters, forests, and environment protection of Romania, and the Ministry of ecology and natural resources of Ukraine on collaboration in the zone of the territories for nature protection in Danube mouth and lowest course of Prut river	2000-06-05			
36.	Agreement between the Cabinet of Ministers of Ukraine and Government of the Azerbaijan Republic on collaboration in the sphere of geodesy, cartography, and distance probing of the Earth	2000-05-19			
37.	Agreement on collaboration near the bounds in the sphere of studying, developing, and protection of the bowels	2001-05-31 In force since 2001-10-04			

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
38.	Agreement between the Cabinet of Ministers of Ukraine and Government the Republic of Byelorussia on collaboration in the sphere of geodesy, cartography, and distance probing of the Earth	2001-06-18 In force since 2001-09-27			
39.	Agreement between the Cabinet of Ministers of Ukraine and Government the Republic of Byelorussia on joint using and protection of transboundary waters	2001-10-16 In force since 2002-06-13			
40.	Agreement between the Ministry of ecology and natural resources of Ukraine and the Ministry of environment protection and oblastal development on collaboration in the sphere of environment protection	2001-10-17 In force since 2001-10-17			
41.	Agreement between the Ministry of ecology and natural resources of Ukraine and the Ministry of environment protection of the Estonian Republic in the sphere of environment protection	2002-10-14 In force since 2002-10-14			
42.	Agreement between the Ministry of ecology and natural resources of Ukraine and the Ministry of natural resources of the Russian Federation in the sphere of studying, exploring, and using of mineral and raw material resources	2002-10-10 In force since 2002-10-10			

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
43.	Agreement on grant of the trust fund of the Global ecological fund (the Project for preservation of biological variety in the corridor of the sea of Azov and Black sea) between Ukraine and the International bank of oblastal development that participates as entertainment of the Global ecological fund for introduction	2002-01-31	2002-11-22 (r)		
44.	Agreement between the Ministry of ecology and natural resources of Ukraine and the Ministry of environment and water resources of the Republic of Bulgaria	2003-01-30 In force since 2003-01-30			
45.	Agreement on collaboration between Ukraine and the Great Socialist People's Arabic Djamagyry in the sphere of geological researches	2003-10-14 In force since 2004-06-14			
46.	Agreement between the Cabinet of Ministers of Ukraine and Government of the Turkish Republic on collaboration in the sphere of environment protection	2003-12-01			
47.	Agreement on collaboration between pre-Carpathian province inspector of environment protection in Zheshov and the State department of ecology and natural resources in Lviv oblast	2004-06-24			

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
48.	Agreement between the State committee of forestry of Ukraine and Direction for problems of development and collaboration in Switzerland concerning technical collaboration in the network of Swiss-Ukrainian Project of forestry development in Transcarpathian area "Forza"	2004-11-19 In force since 1004-11-19			
49.	Agreement between the Ministry of environment protection of Ukraine and the Ministry of nature and environment of Mongolia on collaboration in the sphere of environment protection	2004-12-08 In force since 2004-12-08			
50.	Agreement on protection of African and Eurasian migrating water birds and waders	1998-10-16 In force since 2003-01-01			
51.	Agreement on protection of bats in the Europe (containing amendments dated 1995)	1991-12-04 In force since 199-10-30			
52.	Agreement between Ukrainian Government and Government of the Federative Republic of Germany	1993-06-10			
53.	Agreement on protection of cetaceans of Black sea, Mediterranean sea, and adjacent area of water of the Atlantic ocean admitted on the 24th of November, 1996	1996-11-24 In force since 2004-01-01			

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
	PROTOCOLS				
1.	Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP	1984-09-28	1985-07-15 (p) Decree of the Council of ministers of the UkrSSR #271	1985-08-15	- 1984-09-28 - 1988-01-28
2.	Protocol on the Reduction of Sulphur Releases or their Transboundary Fluxes by at least 30 percent	1985-07-09	12.08.1986-08-12 (p) Decree of the Council of ministers of the UkrSSR #282	1987-09-02	- 1985-07-08 - 1987-09-02
3.	The Montreal protocol on ozone depleting substances	1988-02-18	1988-09-13 (p) Decree of the Council of ministers of the UkrSSR #269	1989-01-01	- 1987-09-16 - 1989-01-01
4.	Protocol on restriction of releases of nitrogen oxides and their international currents to LRTAP	1988-11-01	1989-06-03 (p) Decree of the Council of ministers of the UkrSSR #153	1989-10-22	- 1988-10-31 - 1991-02-14
5.	Protocol on intentions between the State committee of geology and using of bowels of Ukraine and the Ministry of metallurgy and mines of the Islam republic of Iran	1992-04-26 In force since 1992-04-26			
6.	Protocol between the Ministry of environment protection of Ukraine and the State department of environment protection and natural resources of the Republic of Moldova	1993-11-19			

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
7.	Protocol between the State geological service of Ukraine and the State department of oil and gas of Alabama state (the USA)	1999-02-24			
8.	Protocol between the Ministry of ecology and natural resources of Ukraine and the Ministry of environment protection and power engineering of the Kingdom of Denmark	2000-10-19 In force since 2000-10-19			
9.	Cartakhena protocol on biological security		2002-09-12 (r)		
10.	Protocol on mutual understanding between the Ministry of ecology and natural resources of Ukraine and the State department of trade, industry, and labor of the Republic of Gambia	2002-02-14			
11.	Protocol between the State committee of water industry of Ukraine and the Ministry of irrigation of Syrian Arabic Republic on collaboration in the sphere of water industry	2002-04-21			
12.	Protocol on understanding between the state geological service and the Ministry of ecology and natural resources of Ukraine and the Ministry of economical planning and investments of the Republic of Sudan	2002-05-15			

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
13.	Protocol on collaboration between the Ministry of ecology and natural resources of Ukraine and the Agency for environment protection (AFEP) of the USA	2002-11-05			
14.	Protocol on collaboration between the Ministry of ecology and natural resources of Ukraine and the Program of UNO on environment – the World center for monitoring of nature protection (UNEP – WCMNP)	2003-01-10			
15.	Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes	1999-06-17	2003-07-09 (r) Ukrainian law #1066-IV Deposited in the General Secretariat of UNO on 26th of September, 2003		
16.	Kyoto Protocol to the United Nations Framework Convention on Climate Change	1999-03-15	Estonian republic (r) 2002-09-03 ratified Ukrainian law #1430-IV dated 2004-02-04 (r)		- 1997-12-11
17.	Protocol on mutual understanding between the Ministry of ecology and natural resources of Ukraine and the Department of management of water resources of Romania	2005-05-24			
18.	Protocol on scientific and technical collaboration in the sphere of geology and mineral resources between the Ministry of ecology and natural resources of Ukraine and the Ministry of oil and mineral resources of the Arabic Republic	2005-07-01			

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
	MEMORANDUMS				
1.	Memorandum on understanding between the Ministry of ecology and natural resources of Ukraine and the Ministry of economical growth and trade of Alberta province (Canada)				
2.	Memorandum between Ukrainian Government and Georgian Government	1993-04-13			
3.	Memorandum between the State geological service of Ukraine and the Federal department of geological sciences and natural resources (Germany)	1993-10-19			
4.	Memorandum on intentions between the Ministry of environment protection of the Ministry of environment protection of the Republic of France	1994-01-26			
5.	Memorandum between the state geological service of Ukraine and the Department of geological resources of the Geological service of Canada	1995-04-05			
6.	Memorandum on understanding between the Ministry of environment protection and nuclear safety of Ukraine and the Federal Ministry of environment of the Austrian Republic	1996-04-25			

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
7.	Memorandum between the State geological service of Ukraine and "Aurora Pacific" Company (Canada)	1998-07-23			
8.	Memorandum on understanding between the Ministry of environment protection of Ukraine and Michigan research institute of environment (the USA)	1999-07-29			
9.	Memorandum between Ukrainian Government and Canadian Government	1999-01-28			
10.	Memorandum between the State geological service of Ukraine and the State agency of ecology and mineral resources of the Republic of Kirghizia	1997-07-30			
11.	Memorandum between the State geological service of Ukraine and the Ministry of land and resources of the Chinese People's Republic	1999-08-14			
12.	Memorandum between the State geological service of Ukraine and the Department of geology of the Republic of Georgia	1999-08-06			
13.	Memorandum between the State geological service of Ukraine and the State committee of ecology and mineral resources of the Republic of Azerbaijan	1999-09-28			
14.	Memorandum between the State geological service of Ukraine and the State industrial association "Ageom" (Moldavia)	1999-10-25			

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
15.	Memorandum between the State geological service of Ukraine and Committee of geology and protection of Earth interior	1999-10-27			
16.	Memorandum between the State geological service of Ukraine and the Geological service of Hungary	1999-10-29			
17.	Memorandum between the Ministry of environment protection and nuclear safety of Ukraine and the Ministry of environment of the Republic of Finland	1999-09-24			
18.	Memorandum on intentions between Ukrainian Government and Government of the USA (the Agency of international development)	1999-12-08			
19.	Memorandum between the State geological service of Ukraine and the Geological service of the Slovak Republic	2000-02-17			
20.	Memorandum on understanding between the Ministry of ecology and natural resources of Ukraine and Council of ecological researches of South African Republic	2000-09-18			
21.	Memorandum between the State geological service of Ukraine and the National company for research of mineral resources of the Ministry of mines and power engineering of the Federative republic of Brasilia	2001-02-01			

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
22.	Memorandum of Interregional Program of enhancement of Sieverskiy Donets river (Ukraine – Russia)	2001-02-16			
23.	Memorandum on understanding between the Ministry of housing, the Ministry of transport, public works, water industry, planning, and environment, the Ministry of agriculture, management of natural resources, and fish industry of the Kingdom of Netherlands, and the Ministry of environment protection and nuclear safety of Ukraine	2001-09-24			
24.	Memorandum on understanding between Ukrainian Government and Danish Government	2003-05-20			
25.	Memorandum on understanding on the measures for protection of thin beak curlew Numenius tenuirostris	1995-06-12			
26.	Memorandum on mutual understanding on protection and management of middle Europe population of bustard Otis tarda.	2002-04-17			
27.	Memorandum on mutual understanding on the measures for protection of pond water-hen Acrocephalus paludikola	2003-05-21			

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
28.	Memorandum on two-side collaboration between Ukrainian Government and Canadian Government for realization of projects for joint introduction according to article 6 of the Kyoto Protocol	2005-12-07			
	DECLARATIONS				
1.	Declaration on prospects of collaboration between Ukraine and the Lithuanian Republic	1995-03-28			
2.	Declaration on collaboration in creation of Lower Danube Green Corridor between the Ministry of environment and water resources of the Republic of Bulgaria, the Ministry of environment and planning of the territories of the Republic of Moldova, the Ministry of waters, forests, and environment protection of Romania, and the Ministry of ecology and natural resources of Ukraine	2000-06-05			
3.	Declaration on collaboration in the sphere of environment protection and land, Bradenburg	1999-07-16			
4.	Declaration of the ministries of Hungary, Romania, Slovakia, and Ukraine responsible for environment protection	2000-04-03			

№	Name of international legal document	Data of signing by Ukraine	Date of ratification (r), passing (p), endorsement (e), approval (a), and joining (j)	Data of coming into force in Ukraine	General information on international agreement: 1) date of assigning (endorsement); and 2) date of coming into force
5.	Declaration on collaboration between the State department of ecological resources in Lviv oblast, DHI (Czechia), and SPR-Consult GMBH (Germany) assigned on the 3rd of May, 2001				
6.	Joint declaration of the Ministry of environment protection of Ukraine and Department of power engineering of the USA	1999-05-28			

LIST OF LABORATORIES PARTICIPATING IN POPS MONITORING

№ п/п	Name of laboratory	Address	POPs	Matrices	Accreditation
1.	All-Ukrainian State Scientific and Production Center for Standardization, Metrology, Certification, and Protection of Consumers' rights (SE "Ukrmetrteststandart"), Research department for assurance of measurements of composition and properties of substances and materials	b. 4, Metrologichnaya street, Kyiv city, 03143, Ukraine tel.: (+38044)5265298 E-mail: molar@ukrcsm.kiev.ua	Aldrin, chlordane, endrin, dieldrin, DDT (including DDD/DDE), heptachlor, mirex, toxaphene, HCB, PCBs, dioxins, and furans	Ambient Ambient air, soil, industrial wastes, water and effluents, and solid and liquid wastes	National Agency for Accreditation, in accordance with the requirements of DSTU ISO/IEC 17025 for the right of carrying out measurements in the sphere of spread of state metrological supervision and beyond it
2.	Institute for Occupational Health of the AMSU, Laboratory of analytical chemistry and monitoring of toxic substances	b. 75, Saksaganskogo street, Kyiv city, 01033, Ukraine tel.: (+38044)2894188 E-mail: yik@nanu.kiev.ua	Aldrin, dieldrin, DDT (including DDD/DDE), heptachlor, and HCB	Environment matrices, food, breast milk, and blood	Attested in the state metrological system, SE "Ukrmetrteststandart", certificate #PT-011/02), 2002
3.	IL.Medved Institute of Ecological Hygiene and Toxicology (ECOGINTOX) of MHPU, Test center	b. 6, Geroiv Oborony street, Kyiv city, 03680, Ukraine tel.: (+38044)5269700 E-mail: pmg@medved.kiev.ua	Aldrin, chlordane, endrin, dieldrin, DDT (including DDD/DDE), heptachlor, HCB, PCBs, dioxins, and furans	Food, ambient air, soil, water, transformer oil, and waste	National Agency for Accreditation, in accordance with the requirements of DSTU ISO/IEC 17025
4.	Ukrainian Laboratory of Quality and Safety of Agricultural Food of the National Agrarian University	b. 15, Geroiv Oborony street, Kyiv city, 03041, Ukraine, tel.: (+38044)2678954 E-mail: V.Lokhanska@nauu.kiev.ua	Aldrin, chlordane, dieldrin, DDT (including DDD/DDE), endrin, heptachlor, and mirex	Food and environment matrices	Accredited by SE "Ukrmetrteststandart", certificate #PT-0106/04 dated 2004-04-20

№ п/п	Name of laboratory	Address	POPs	Matrices	Accreditation
5.	Institute of Hygiene and Medical Ecology of the AMSU, Laboratory of carcinogenic factors	b. 50, Popudrenka street, Kyiv city, 660094, Ukraine tel.: (+38044)5593445 E-mail: chernich@usch.kiev.ua	PAHs: benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3,-cd)pyrene	Ambient air, air of working district, soil, water, stack emission, and food	National Agency for Accreditation, in accordance with the requirements of DSTU ISO/IEC 17025
6.	Ukrainian Scientific Center of Sea Ecology (UkrSCSE), Department of analytical control	b. 89, Frantsuz'kiy boulevard, Odesa, 65009, Ukraine tel.: (+38048)7288253 E-mail: lawmd@te.net.ua	Aldrin, endrin, dieldrin, DDT (including DDD/DDE), heptachlor, HCB, and PCBs	Sea water, soil, sediment, and biological matrices	Attested in the state metrological system in accordance with "the Rules of authorization and attestation in the state metrological system" approved by Order of the SCSCPU dated 2005-03-29 #71
7.	Ukrainian Research Institute of Ecological Problems (UkrRIEP), Laboratory for ecological and analytical research	b. 6, Bakulina street, Kharkiv, 61166, Ukraine tel.: (+38057)7170326 E-mail: vasyuki@niip.kharkov.ua	Aldrin, dieldrin, DDT (including DDD/DDE), heptachlor, HCB, and PCBs	Surface, ground, drinking water, and effluents, sediment, soil, and waste	Attested in the state metrological system
8.	A.Kovalevskiy Institute of Biology of Southern Seas of the NASU, Department of radiation and chemical biology	b. 2, Nakhimova avenue, Sevastopol city, 99011, Ukraine tel: (+380692)550079 E-mail: opxb@ibss.iuf.net	Dieldrin, DDT (including DDD/DDE), endrin, heptachlor, and PCBs	Sea water, soil, sediment, and biological matrices	Attested in the state metrological system

№ п/п	Name of laboratory	Address	POPs	Matrices	Accreditation
9.	Ukrainian Research Institute of Alcohol and Biotechnologies of Food of MAPU, National analytical center for control of food quality		Aldrin, chlordane, endrin, dieldrin, DDT (including DDD/DDE), heptachlor, mirex, toxaphene, HCB, PCBs, dioxins, and furans	Food, agricultural raw materials, and environmental matrices	Attested in the state metrological system
10.	Measuring laboratory of the Danilo Galitskiy L'viv National medical University	b. 69, Pekarska street, L'viv city, 79010, Ukraine	DDT, aldrin, HCH, and heptachlor		Attested in the state metrological system
11.	Measuring laboratory of the Research center of prophylactic and clinical toxicology	b. 30, Dunayska street, L'viv city, 79010, Ukraine	DDT, aldrin, HCH, and heptachlor		Attested in the state metrological system
12.	SE "Research institute of medical and ecological problems" of MHU, Test center	b. 30, Fed'kovicha street, Chernivtsi city, 58022, Ukraine	DDT, aldrin, dieldrin, endrin, heptachlor, HCB, and xehabromobiphenyl		Attested in the state metrological system

№ п/п	Name of laboratory	Address	POPs	Matrices	Accreditation
13.	SE "Chernigivstandartmetrologiya". Test laboratory of food and food raw materials	b. 110A, Pyatnits'ka street, Chernigiv city, 14005, Ukraine tel.: (+3804622)53201	Aldrin, dieldrin, and DDT (including DDD/DDE)		The national agency fir accreditation, in accordance with the requirements of DSTU ISO/IEC 17025 and DSTU 3412
14.	SE "Krymstandartmetrologiya", Test center	b. 61, street named after "Kryms'ka pravda" newspaper, Simferopol city, 95000, Ukraine tel.: (+380652)482965 E-mail: aic@standard.crimea.ua	Aldrin, dieldrin, DDT (including DDD/DDE), heptachlor, and HCB		Attested in the state metrological system
15.	SE "Sevastopol Scientific and Production Center of Standardization, Metrology, and Certification", Test center of produce	b. 32, 6th Bastionna street, Sevastopol city, 99008, Ukraine tel.: (+380692)559001 E-mail: smet@stel.sebastopol.ua	Aldrin, dieldrin, DDT (including DDD/DDE), endrin, heptachlor, and HCB	Food, environmental matrices, and food	Accreditation by the NAAU in accordance with the requirements of DSTU 3412-96, accreditation certificate #UA 6.001.H.070
16.	Crimean Republic State Design and Technological Center for Protection of Fertility of Soil and Quality of food, Test laboratory	b. 75/1, Kyivska street, Simferopol city, 95017, Ukraine	DDT, heptachlor, and α-, β-, and γ-HCH	Food	Attested in the state metrological system

№ п/п	Name of laboratory	Address	POPs	Matrices	Accreditation
17.	Odesa frontier state control and toxicological laboratory of the Main state inspection of plants protection	b. 5A, Vannyi side street, Odesa city, 65016, Ukraine tel.: (+380482)687250	Aldrin, chlordan, endrin, dieldrin, DDT (including DDD/DDE), heptachlor, mirex, toxaphene, and HCB	Food	Attested in the state metrological system
18.	Uzhgorod frontier state control and toxicological laboratory of the Main state inspection of plants protection	b. 56, Stanciyna street, Uzhgorod city, 88000, Ukraine tel.: (+3803122)25832 E-mail: updktl@mail.uzhorod.ua	HCB, aldrin, endrin, dieldrin, DDT (including DDD/DDE), and heptachlor	Water, soil, and pesticides residues in food	Attested in the state metrological system
19.	Kharkiv region state design and technological center for protection of fertility of soil and quality of food, test and production laboratory of	b. 21A, Kosmichna street, Kharkiv city, 61145, Ukraine tel.: 7011164	DDT and HCH	Food	Attested in the state metrological system
20.	Poltava inter-region production control and toxicological laboratory of the State station of plants protection	b.19, Zinkivska street, Poltava city, Ukraine	DDT, aldrin, heptachlor, and HCH	Food	Attested in the state metrological system
21.	Production and measuring laboratory of Chernivtsi region state design and technological center for protection of fertility of soil and quality of food	b. 194A, Chervonoarmiyska street, Chernivtsi city, 58013, Ukraine	DDT	Food	Attested in the state metrological system
22.	Kharkiv region state laboratory of veterinary medicine	b. 148, Zhovtnevoyi Revolutsii street, Kharkiv city, 61157, Ukraine tel.: 234678, 232609	DDT and HCH		Attested in the state metrological system

№ п/п	Name of laboratory	Address	POPs	Matrices	Accreditation
23.	Poltava region state laboratory of veterinary medicine	b. 2, Myru street, Gorbanivka village, Poltava region, Ukraine	DDT, aldrin, dieldrin, endrin, heptachlor, HCH, and HCB		Attested in the state metrological system
24	Kremenchuk town state laboratory of veterinary medicine	b. 39, Butyrina street, Kremenchuk town, Ukraine	DDT, heptachlor, and γ-HCH		Attested in the state metrological system
25.	Republic Committee of EnvironmentPprotection of the AR of Crimea, Department of analytical control of sources of pollution and monitoring	b. 198, Kechkemetska street, Simferopol city, 95022, Ukraine	DDT, DDE, and α-, β-, and γ-HCH		Attested in the state metrological system
26.	State Department of Ecology and Natural Resources in Dniepropetrovsk region, laboratory of the department of analytical control and monitoring	b. 69, Laboratorna street, Dniepropetrovsk city, 49010, Ukraine tel.: 464161	DDT and heptachlor	Environmental matrices	Attested in the state metrological system
27.	State Department of Ecology and Natural Resources in Sumy region. Division of analytical control and monitoring	b. 27, Kirova street, Sumy city, 40030, Ukraine tel: (+380542)270095 E-mail: Ecosumy@ utel.net.ua	DDT (including DDD/DDE)	Environmental matrices	Attested in the state metrological system in accordance with DSTU 3412
28.	Kharkiv Region Center of Hydrometeorology, Complex laboratory for supervision of environment pollution	b. 48, Chernyshevskogo street, Kharkiv city, 61002, Ukraine tel.: 7003684	DDT and β-HCH	Environmental matrices	Attested in the state metrological system

№ п/п	Name of laboratory	Address	POPs	Matrices	Accreditation
29.	Central SES, sanitary and hygienic laboratory	b. 41, Yaroslavs'ka street, Kyiv city, 04071, Ukraine E-mail: cses@g.com.ua	Aldrin, DDT (including DDD/DDE), heptachlor, and HCB	Habitat of human vital functions	Attested in the state metrological system and MHU, certificate #152 dated 2001-12-28
30	Central SES of water transport toxicological laboratory	Illichivsk town, Odesa region, Ukraine	Aldrin, dieldrin, DDT (including DDD/DDE), heptachlor, and HCB	Laboratory is accredited for the right of carrying out of measurements in the sphere of application of the state metrological supervision in accordance with the sphere of accreditation	Attested in the state metrological system in accordance with PMU 18-2000
31.	Central food control and production laboratory of Chernigiv region consumers' union	b. 139, Peremogy avenue, Chernigiv city, Ukraine tel.: 36173	Aldrin and DDT	Food	Attested in the state metrological system
32.	Vinnitsa region SES, sanitary and hygienic laboratory	b. 11, Malinovs'kogo street, Vinnitsa city, 21100, Ukraine tel.: (+380432)320625	Aldrin, dieldrin, DDT (including DDD/DDE), heptachlor, HCB, PCBs, and PCDD/PCDF	Habitat of human vital functions	Attested in the state metrological system
33.	Dzerzhynsk town SES, test center	b. 8, Trest street, Dzerzhynsk town, 85200, Ukraine tel.: (+3806247)36366 E-mail: sesdzer@mail.ru	Aldrin, DDT (including DDD/DDE), and heptachlor	Habitat of human vital functions	Attested in the state metrological system in accordance with DSTU ISO/IEC 17025-2001

№ п/п	Name of laboratory	Address	POPs	Matrices	Accreditation
34.	Dniepropetrovsk region SES, toxicological laboratory	b. 39A, Philosofs'ka street, Dniepropetrovsk city, 49006, Ukraine tel.: (+38056)7708381	Aldrin, DDT (including DDD/DDE), heptachlor, and HCB	Habitat of human vital functions	Attested in the state metrological system
35	Donetsk region SES, laboratory for sanitary and hygienic research	b. 3, Lubavina street, Donetsk city, 83015, Ukraine	DDT, aldrin, HCB, HCH, heptachlor, and benzo(a)pyrene	Habitat of human vital functions	Attested in the state metrological system
36.	Zhytomyr region SES, toxicological laboratory	b. 64, Velyka Berdychivska street, Zhymomyr city, 10002, Ukraine	Aldrin, chlordane, dieldrin, DDT (including DDD/DDE), endrin, and heptachlor	Habitat of human vital functions	Attested in the state metrological system
37.	Zakarpathian region SES, toxicological laboratory	b. 96, Sobranets'ka street, Uzhgorod city, 88017, Ukraine E-mail: oblses@uzh.ukrtel.net	Aldrin, DDT (including DDD/DDE), and heptachlor	Habitat of human vital functions	Attested in the state metrological system
38.	Zaporizhzhya region state SES, sanitary and hygienic laboratory	b. 27, V.Recordna street, Zaporizhzhya city, 69037, Ukraine tel.: (+380612)343062 E-mail: zpoblses@ukr.net	Aldrin, DDT (including DDD/DDE), and heptachlor	Habitat of human vital functions	Attested in the state metrological system
39.	Kirovograd region SES, laboratory office of toxicology of chemical	b. 40/9, Pushkina street, Kirovograd city, 25013, Ukraine	Aldrin, DDT (including DDD/DDE), and heptachlor	Habitat of human vital functions	Attested in the state metrological system

№ п/п	Name of laboratory	Address	POPs	Matrices	Accreditation
40.	Lugansk region SES, laboratory of sanitary and hygienic department	b. 159, Luganskoi pravdy street, Lugansk city, 91031, Ukraine E-mail: sgl@ oblses.lg.ua	Aldrin, dieldrin, DDT (including DDD/ DDE), and heptachlor	Habitat of human vital functions	Attested in the state metrological system
41	L'viv region SES, toxicological laboratory	b. 8, B.Lepkogo street, Lviv city, 79005, Ukraine tel.: (+380322)744068 E-mail: ses@lviv.gu.net	Aldrin, dieldrin, DDT (including DDD/DDE), heptachlor, and HCB	Habitat of human vital functions	Attested in the state metrological system
42.	L'viv city SES, sanitary and hygienic department	b. 27, Krupyars'ka street, Lviv city, 79010, Ukraine	DDT, aldrin, HCH, and heptachlor	Habitat of human vital functions	Attested in the state metrological system
43.	Mykolaiv region SES, test laboratory	b. 1, Lazurna street, Mykolaiv city, 54058, Ukraine tel.: (+380512)417527	Aldrin, dieldrin, DDT (including DDD/DDE), endrin, heptachlor, and HCB	Habitat of human vital functions	Attested in the state metrological system
44.	Odesa region SES, central laboratory	b. 6, V.Slepnyova street, Odesa city, 65039, Ukraine	Heptachlor, dieldrin, aldrin, and heptachlor	Habitat of human vital functions	Attested in the state metrological system
45.	Poltava region SES, sanitary and hygienic laboratory	b. 35A, Vatutina street, Poltava city, 36039, Ukraine	Aldrin, dieldrin, DDT (including DDD/DDE), endrin, heptachlor, and toxaphene	Habitat of human vital functions	Attested in the state metrological system

№ п/п	Name of laboratory	Address	POPs	Matrices	Accreditation
46.	Rivne region SES, sanitary and hygienic laboratory	b. 3, Kotlyarevskogo street, Rivne city, 33028, Ukraine tel.: (+380362)237149 E-mail: oses@obladmin.rv.ua	Aldrin, DDT (including DDD/DDE), and heptachlor	Habitat of human vital functions	Attested in the state metrological system
47	Sevastopol district SES, toxicological department	b. 10, Komunistychna street, Sevastopol city, 99003, Ukraine E-mail: ses27@ukr.com.sebustopol.ua	Aldrin, DDT (including DDD/DDE), and heptachlor	Habitat of human vital functions	Attested in the state metrological system
48.	Simferopol city SES	b. 8, Morozova street, 95022, Ukraine	Aldrin, DDT, and heptachlor	Habitat of human vital functions	Attested in the state metrological system
49.	Sumy region SES, laboratory of the sanitary and hygienic department	b. 32, Tsupruna street, Sumy city, 40003, Ukraine; tel.: (+380542)257952 E-mail: oses@obladmin.rv.ua	Aldrin, heptachlor, and DDT and its metabolites	Habitat of human vital functions	Attested in the state metrological system
50.	Kharkiv region SES, toxicological laboratory	b. 70, Pomirky street, Kharkiv city, 61070, Ukraine E-mail: oblses@online.kharkov.com	Aldrin, chlordan, dieldrin, DDT (including DDD/DDE), heptachlor, toxaphene, and HCB	Habitat of human vital functions	Attested in the state metrological system

№ п/п	Name of laboratory	Address	POPs	Matrices	Accreditation
51.	Kherson region SES, laboratory of sanitary and hygienic department	b. 3, Prof. Uvarova street, Kherson city, 73000, Ukraine	Aldrin, dieldrin, DDT (including DDD/ DDE), and heptachlor	Habitat of human vital functions	Attested in the state metrological system
52	Khmelnitskiy region SES, central sanitary and hygienic laboratory	b. 55, Pilipchuka street, Khmelnitskiy city, 29001, Ukraine E-mail: vsy@ svitonline.com	Aldrin, dieldrin, DDT (including DDD/ DDE), and heptachlor	Habitat of human vital functions	Attested in the state metrological system
53.	Cherkasy region SES, toxicological laboratory	b. 3, Volkova street, Cherkasy city, 18005, Ukraine E-mail: cherkoblses@ majar.com	Aldrin, dieldrin, DDT (including DDD/ DDE), heptachlor, and toxaphene	Habitat of human vital functions	Attested in the state metrological system
54.	Chervivtsi region SES, toxicological laboratory	b. 7, Gakmana street, Chervivtsi city, 58000, Ukraine tel.: (+380372)523581 E-mail: cherses@ sacura.net	Aldrin, dieldrin, DDT (including DDD/ DDE), and heptachlor	Habitat of human vital functions	Attested in the state metrological system
55.	Chernigiv region SES, toxicological laboratory	b. 11A, Lubetska street, Chernigiv city, 14000, Ukraine	Aldrin, dieldrin, DDT (including DDD/ DDE), and heptachlor	Habitat of human vital functions	Attested in the state metrological system

№ п/п	Name of laboratory	Address	POPs	Matrices	Accreditation
56.	Berezhany town SES, sanitary and hygienic laboratory	b. 4, Rynok square, Berezhany town, Ternopil region, Ukraine	DDT	Habitat of human vital functions	Attested in the state metrological system
57	Bogorodchany town SES	b. 8, Petrasha street, Bogorodchany settlement of town type, 77701, Ukraine tel.: 21736	DDT, aldrin, heptachlor, dieldrin, HCB, and HCH	Habitat of human vital functions	Attested in the state metrological system
58.	Borschiv dictrict SES, sanitary and hygienic laboratory	b. 7, S.Striltsiv street, Borschiv town, Ternopil region, Ukraine tel.: 21642	DDT	Habitat of human vital functions	Attested in the state metrological system
59.	Buchach district SES, sanitary and hygienic laboratory of	b. 1, Mitskevicha street, Buchach town, Ternopil region, Ukraine	DDT	Habitat of human vital functions	Attested in the state metrological system
60.	Volochys'k district SES	b. 1, Pochynky street, Volochys'k town, Ukraine	DDT and HCH	Habitat of human vital functions	Attested in the state metrological system
61.	Gusyatyn district SES, sanitary and hygienic laboratory	Suhkodilska street, Gusyatyn settlement of town type, Ivano-Frankivsk region, Ukraine	DDT	Habitat of human vital functions	Attested in the state metrological system
62.	Galych town SES	b. 13, Maydan Rizdva street, Galych town, 77100, Ukraine tel.: 21120	DDT, aldrin, heptachlor, dieldrin, HCB, and HCH	Habitat of human vital functions	Attested in the state metrological system

№ п/п	Name of laboratory	Address	POPs	Matrices	Accreditation
63.	Gorodenka district SES, sanitary and hygienic laboratory	b. 6, Konstitursyi Ukrainy street, Gorodenka town, Ivano-Frankivsk region, Ukraine	DDT, aldrin, heptachlor, dieldrin, PCBs, HCB, and HCH	Habitat of human vital functions	Attested in the state metrological system
64	Gorodysche district SES, sanitary and hygienic laboratory	b. 32A, Geroiv Chornobylya street, Gorodysche town, 19500, Ukraine	DDT, HCH, heptachlor, and aldrin	Habitat of human vital functions	Attested in the state metrological system
65.	Dolyna town SES	b. 133, Oblisky street, Dolyna town, 77500, Ukraine tel.: 22527	DDT, aldrin, heptachlor, dieldrin, HCB, HCH, and PCBs	Habitat of human vital functions	Attested in the state metrological system
66.	Zalischyky district SES, sanitary and hygienic laboratory	b. 26, Grushevskogo street, Zalischyky town, Ternopil region, Ukraine	DDT	Habitat of human vital functions	Attested in the state metrological system
67.	Zbarazh district SES, sanitary and hygienic laboratory	b. 8, Nezalezhnosti street, Zbarazh town, Ukraine	DDT	Habitat of human vital functions	Attested in the state metrological system
68.	Zboriv district SES, sanitary and hygienic laboratory	b. 40, Gogolya street, Zboriv town, Ukraine	DDT	Habitat of human vital functions	Attested in the state metrological system
69.	Izyaslav district SES	b. 53, B.Khmelnitskogo street, Izyaslav town, Ukraine	DDT and HCH	Habitat of human vital functions	Attested in the state metrological system

№ п/п	Name of laboratory	Address	POPs	Matrices	Accreditation
70.	Kalush town SES, sanitary and hygienic laboratory	b. 9, Karakaya street, Kalush town, 77300, Ukraine tel.: 29004	DDT, aldrin, heptachlor, dieldrin, HCB, HCH, and PCBs	Habitat of human vital functions	Attested in the state metrological system
71	Kam'yanets-Podil'sky district SES	b. 58, Matrosova street, Kam'yanets-Podil'sky town, Ukraine	DDT and HCH	Habitat of human vital functions	Attested in the state metrological system
72.	Kolomya town SES	b. 30, Getmanska street, Kolomya town, 78200, Ukraine tel.: 24913	DDT, aldrin, heptachlor, dieldrin, HCB, HCH, and PCBs	Habitat of human vital functions	Attested in the state metrological system
73.	Kozova district SES, sanitary and hygienic laboratory	b. 6, Sichovykh Striltsiv street, Kozova settlement of town type, Ternopil region, Ukraine tel.: 21849	DDT	Habitat of human vital functions	Attested in the state metrological system
74.	Kosiv district SES, sanitary and hygienic laboratory	b. 10, Shevchenka side street, Kosiv town, 78600, Ukraine	DDT, aldrin, heptachlor, dieldrin, HCB, HCH, and PCBs	Habitat of human vital functions	Attested in the state metrological system
75.	Krasyliv district SES	b. 100, Grushevskogo street, Krasyliv town, Ukraine	DDT and HCH	Habitat of human vital functions	Attested in the state metrological system
76.	Kremenchuk state town SES, measuring laboratory	b. 18, Boyka street, Kremenchuk town, Ukraine	Aldrin, α-, β-, and γ-HCH, heptachlor, total amount of HCH isomers, DDT and its metabolites, and dieldrin	Habitat of human vital functions	Attested in the state metrological system

№ п/п	Name of laboratory	Address	POPs	Matrices	Accreditation
77.	Kremenets district SES, sanitary and hygienic laboratory	b. 6A, Kozubskogo street, Kremenets town, Ternopil region, Ukraine	DDT	Habitat of human vital functions	Attested in the state metrological system
78	Lanivtsi district SES, sanitary and hygienic laboratory	b. 50, Vyshnivetska street, Lanivtsi settlement of town type, Ternopil region, Ukraine tel.: 21324	DDT	Habitat of human vital functions	Attested in the state metrological system
79.	Monastyrsk district SES, sanitary and hygienic laboratory	b. 33, Shevchenka street, Monastyrsk town, Ternopil region, Ukraine	DDT	Habitat of human vital functions	Attested in the state metrological system
80.	Pidvolochysk district SES, sanitary and hygienic laboratory of	b. 26, Morozenka street, Pidvolochysk town, Ternopil region, Ukraine	DDT	Habitat of human vital functions	Attested in the state metrological system
81.	Rozhnyativ district SES	b. 27, 16 Lypnya street, Rozhnyativ settlement of town type, Ivano-Frankivsk region, 77600, Ukraine tel. 20676	Aldrin, dildrin, DDT (including DDD/ DDE), heptachlor, HCB, HCH, and PCBs	Habitat of human vital functions	Attested in the state metrological system
82.	Sambir district SES, sanitary and hygienic department	b. 23, Vidrodzhennya street, Rudky town, Sambir district, L'viv region, Ukraine	DDT, aldrin, HCH, and heptachlor	Habitat of human vital functions	Attested in the state metrological system
83.	Slavuta district SES	b. 6, Lenina side street, Slavuta town, Ukraine	DDT and HCH	Habitat of human vital functions	Attested in the state metrological system

№ п/п	Name of laboratory	Address	POPs	Matrices	Accreditation
84.	Snyatyn district SES, sanitary and hygienic laboratory	b. 20, Kobrynskiy street, Snyatyn town, 78300, Ukraine tel.: 22476	DDT, aldrin, heptachlor, dieldrin, HCB, HCH, and PCBs	Habitat of human vital functions	Attested in the state metrological system
85	Terebovlya district SES, sanitary and hygienic laboratory	b. 20, Zastinotska street, Terebovlya town, ternopil region, Ukraine tel.:21642	DDT	Habitat of human vital functions	Attested in the state metrological system
86.	Tysmenitsya district SES, sanitary and hygienic laboratory	Lysets village, Tysmenitsya district, Ivano-Frankivsk region, 77455, Ukraine	DDT, aldrin, heptachlor, dieldrin, HCB, HCH, and PCBs	Habitat of human vital functions	Attested in the state metrological system
87.	Tlumach district SES, sanitary and hygienic laboratory	Tlumach town, Ivano-Frankivsk region, 78000, Ukraine	DDT, aldrin, heptachlor, dieldrin, HCB, HCH, and PCBs	Habitat of human vital functions	Attested in the state metrological system
88.	Chortkiv district SES, sanitary and hygienic laboratory	b. 52, S.Bandery street, Chortkiv town, Ukraine tel.: 21642	DDT	Habitat of human vital functions	Attested in the state metrological system
89.	Shepetivka district SES	b. 70, V.Kotyka street, Shepetivka town, Ukraine	DDT and HCH	Habitat of human vital functions	Attested in the state metrological system
90.	Shumsk district SES, sanitary and hygienic laboratory	b. 8, Maydan Nezalezhnosti street, Shumsk settlement of town type, Ternopil region, Ukraine	DDT	Habitat of human vital functions	Attested in the state metrological system

№ п/п	Name of laboratory	Address	POPs	Matrices	Accreditation
91.	Yavoriv district SES, sanitary and hygienic department	b. 9, I.Mazepy street, Yavoriv town, Lviv region, Ukraine	DDT, aldrin, HCH, and heptachlor	Habitat of human vital functions	Attested in the state metrological system
92	"Ista-Tsentr" Ltd., laboratory for analytical control	b. 30, Kursantska street, Dniepropetrovsk city, 49051, Ukraine tel.: 311105	Benzo(a)pyrene	Environmental matrices	Attested in the state metrological system
93.	CJSC "Oberon-Tsentr", laboratory of analytical control of environmental matrices	b. 2, Bazova street, Dniepropetrovsk city, 49127, Ukraine tel: 7294739	Benzo(a)pyrene	Environmental matrices	Attested in the state metrological system
94.	O.Bogatskiy SDO MS PCI, test laboratory for control of the state of environment	b. 89, Lustdorfska doroga street, Odesa city, 65011, Ukraine	DDT and γ-HCH	Environmental matrices	Attested in the state metrological system
95.	CJSC "Kharkiv Scientific Center of Military Ecology", laboratory for physical and chemical control methods	b. 28, Petrovskogo street, Kharkiv, 61024, Ukraine tel.: 7128350, 7194026, fax: 1719617	DDT, heptachlor, HCB, γ-HCH, and benzo(a)pyrene	Environmental matrices	Attested in the state metrological system
96.	"UkrTEST" Ltd., ecological laboratory of	b. 193, Lenina avenue, Zaporizhzhya city, 69006, Ukraine tel.: 120084	Benzo(a)pyrene, DDT, heptachlor, HCB, and HCH	Environmental matrices	Attested in the state metrological system
97.	OJSC "Khorol tinned milk factory of children's food", test laboratory	b. 17, Molodizhna street, Khorol town, Ukraine	DDT, heptachlor, α- and γ-HCH, aldrin, and dieldrin	Environmental matrices	Attested in the state metrological system

USED ANALYTICAL METHODS FOR IDENTIFICATION AND QUANTIFICATION OF POPS

№	Methodical guidelines	Hygienic normative	LOQ	Method	Reference
1	2	3	4	5	6
1.	DDT	ADI 0.005 for adults/ 0.0025 for children			
	Air				
	Methodical guidelines for measuring concentrations of DDT and its derivatives, hexachlorobenzene, HCH isomers, and methoxyclor in air by gas-liquid chromatography method (approved by MH of the USSR with #5032-89 on 1989-06-08)	TLV – 0.1 mg/m^3 and atmospheric air – TLV 0.005/ TWA 0.001mg/m^3	4,4'-DDE, 4,4'-DDD, 2,4'-DDD – 0.008 mg/m3 and 2,4'-DDT and 4,4'-DDT – 0.02 mg/m3 (when sampling 25 l of air)	GLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Reference book. V. II – Moscow: Agropromizdat, 1992. – p. 193 to 195.
	Identification of organochlorine pesticides-OHP-(aldrin, hexachlorane, DDD, DDVP, DDT, dieldrin, diptal, crotilin, polychloropynene, simazine, tetrachloronitrobenzene, chloroindane, chloro-IFK, chlorophos, chlorophenol in air by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)		LOD 1 μg	TLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 3 to 9.
	Methodical guidelines for gas chromatographic identification of dimethyldichlorovinylphosphate, γ-hexachlorocyclohexane, and dichlorodiphenyltrichloroethane in air (approved by MH of the USSR with #2313-81on 1981-03-18)		0.05 mg/m^3	GLC	Methodical guidelines for identification of harmful substances in air. Digest XVII. – Moscow: MH of the USSR, 1981. – p. 33 to 36.

№	Methodical guidelines	Hygienic normative	LOQ	Method	Reference
1	2	3	4	5	6
	Methodical guidelines for titrimetric, photometric, and chromatographic identification of organochlorine chemical weed and pest killers in air (approved by MH of the USSR with #1718-77 on 1977-04-18)		LOD 0.5 μg in the sample (0.01 мг/м3 calculated when sampling 50 l of air)	TLC	Methodical guidelines for identification of harmful substances in air – Moscow: ЦРИА "Morflot", 1981. – p. 228 to 235.
	Water				
	Methodical guidelines for identification of organochlorine pesticides in water, foodstuff, fodders, and tobacco goods by thin layer chromatography (approved by MH of the USSR with #2142-80 on 1980-01-28)	MAC 0.002 mg/dm^3	0.005 mg/dm^3	TLC	Methodical guidelines for identification of microquantity of pesticides in foodstuff, fodders, and environment. – Digest XI. – Moscow: the State chemical committee of the USSR, 1981. – p. 22 to 44.
	Identification of residues of OHPs at availability of polychlorinated biphenyls in water by gas-liquid chromatography method with electron capture detector (approved by MH of the USSR with #1540-76 on 1976-12-20)		*0.00002 mg/dm^3*	TLC	Methodical guidelines for identification of microquantity of pesticides in foodstuff, fodders, and environment. – Digest VIII. – Moscow: the State chemical committee of the USSR,, 1977. – p. 1 to 8.
	Identification of DDT, DDE, DDD, aldrin, dieldrin, heptachlor, kelthane, methoxychlor, ethersulphonate, and other chemical weed and pest killers in water, foodstuff, fodders, and biological media by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)		0.002 mg/dm^3	TLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 9 to 17.
	Identification of DDT, DDE, DDD, aldrin, dieldrin, heptachlor, kelthane, methoxychlor, ethersulphonate, and other chemical weed and pest killers in water, foodstuff, fodders, and biological media by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)		0.0004 mg/dm^3	GLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 17 to 20

№	Methodical guidelines	Hygienic normative	LOQ	Method	Reference
1	2	3	4	5	6
	Methodical guidelines for identification of residues of OHPs and products of their decomposition (α-HCH, γ-HCH, heptachlor, aldrin, kelthane, DDE, DDD, and DDT) in water by chromatography methods at their joint availability (approved by MH of the USSR with #4120-86 on 1986-06-01)		0.0002 mg/dm^3	GLC	Methodical guidelines for identification of microquantity of pesticides in foodstuff, fodders, and environment. – Digest XII. – Moscow: the State chemical committee of the USSR, 1981. – p. 99 to 112.
	Identification of residual amounts of OHPs in the availability of polychlorinated biphenyls in water by gas and liquid chromatography method (approved by MH of the USSR with #1540-76 on 1976-12-20)				Methodical guidelines for identification of microquantity of pesticides in foodstuff, fodders, and environment. – Digest VIII. – Moscow: the State chemical committee of the USSR,, 1977. – p. 1 to 8.
	Unified gas chromatography method for identification of residues of OHPs and polychlorinated biphenyls in foodstuff and environmental objects (approved by Coordination center of the Steady committee of agriculture of the Council of mutual economical aid, Poznan town, October of 1987)		0.00001 mg/dm^3	GLC	Unified methods of identification of residues of pesticides in foodstuff, fodders, and environment – Poznan, the Council of mutual economical aid, the Steady committee of agriculture. Coordination center, 1987. – p. 58 to 83.
	Soil				
	Methodical guidelines for identification of organochlorine pesticides in water, foodstuff, fodders, and tobacco goods by thin layer chromatography (approved by MH of the USSR with #2142-80 on 1980-01-28)	*MAC 0.1 mg/kg*	0.06 mg/kg	TLC	Methodical guidelines for identification of microquantity of pesticides in foodstuff, fodders, and environment. – Digest XI. – Moscow: the State chemical committee of the USSR, 1981. – p. 22 to 44.
	Unified gas chromatography method for identification of residues of organochlorine pesticides (hexachlorobenzene, α- and γ-HCH, and DDE, DDD, and DDT) in soil by gas-liquid chromatography method (approved by MH of the USSR with #1766-77 on 1977-10-12)		0.005 mg/kg	GLC	Methodical guidelines for identification of microquantity of pesticides in foodstuff, fodders, and environment. – Digest IX. – Moscow: the State chemical committee of the USSR,, 1979. – p. 18 to 23.

№	Methodical guidelines	Hygienic normative	LOQ	Method	Reference
1	2	3	4	5	6
2.	**HCB**	ADI 0.0006			
	Air				
	Methodical guidelines for gas chromatography identification of hexachlorobenzene in air (approved by MH of the USSR with #2696-83 on 1983-04-21)	TLV 0.9 mg/m^3 and atmospheric air 0.013 mg/m^3	0.02 mg/m^3 (when sampling 5 l of air)	GLC	Methodical guidelines for identification of harmful substances in air. Digest XVIII. – Moscow: MH of the USSR, 1983. – p. 15 to 18.
	Methodical guidelines for measuring concentrations of DDT and its derivatives, hexachlorobenzene, HCH isomers, and methoxyclor in air by gas-liquid chromatography method (approved by MH of the USSR with #5032-89 on 1989-06-08)		0.004 mg/m^3 (when sampling 25 l of air)	GLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Reference book. V. II – Moscow: Agropromizdat, 1992. – p. 193 to 195.
	Identification of organochlorine pesticides (aldrin, hexachlorane, DDD, DDVP, DDT, dieldrin, diptal, crotilin, polychloropynene, simazine, tetrachloronitrobenzene, chloroindane, chloro-IFK, chlorophos, chlorophenol in air by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)		LOD 1 μg	TLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 3 to 9.
	Methodical guidelines for titrimetric, photometric, and chromatographic identification of organochlorine chemical weed and pest killers in air (approved by MH of the USSR with #1718-77 on 1977-04-18)		LOD 0.5 μg in the sample (0.01 mg/m^3 calculated when sampling 50 l of air)	TLC	Methodical guidelines for identification of harmful substances in air – Moscow: ЦРИА "Morflot", 1981. – p. 228 to 235.
	Water				
	Methodical guidelines for identification of organochlorine pesticides in water, foodstuff, fodders, and tobacco goods by thin layer chromatography (approved by MH of the USSR with #2142-80 on 1980-01-28)	MAC 0.001 mg/dm^3 in the water of water bodies and 0.05 mg/dm^3 in the economic and housing water	0.005 mg/dm^3	TLC	Methodical guidelines for identification of microquantity of pesticides in foodstuff, fodders, and environment. – Digest XI. – Moscow: the State chemical committee of the USSR, 1981. – p. 22 to 44.

№	Methodical guidelines	Hygienic normative	LOQ	Method	Reference
1	2	3	4	5	6
	Identification of DDT, DDE, DDD, aldrin, dieldrin, heptachlor, kelthane, methoxychlor, ethersulphonate, and other chemical weed and pest killers in water, foodstuff, fodders, and biological media by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)		0.002 mg/dm^3	TLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 9 to 17.
	Unified gas chromatography method for identification of residues of organochlorine pesticides (hexachlorobenzene, α- and γ-HCH, and DDE, DDD, and DDT) in soil by gas-liquid chromatography method (approved by MH of the USSR with #1766-77 on 1977-10-12)		0.005 mg/kg	GLC	Methodical guidelines for identification of microquantity of pesticides in foodstuff, fodders, and environment. – Digest IX. – Moscow: the State chemical committee of the USSR, 1979. – p. 18 to 23.
3.	**Aldrin**	ADI unavailable			
	Air				
	Identification of organochlorine pesticides (aldrin, hexachlorane, DDD, DDVP, DDT, dieldrin, diptal, crotilin, polychloropynene, simazine, tetrachloronitrobenzene, chloroindane, chloro-IFK, chlorophos, chlorophenol in air by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)	TLV – 0.01 mg/m^3 and atmospheric air – 0.0005 mg/m^3	LOD 1 μg (when sampling 10 l of air)	TLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 3 to 9.
	Methodical guidelines for titrimetric, photometric, and chromatographic identification of organochlorine chemical weed and pest killers in air (approved by MH of the USSR with #1718-77 on 1977-04-18)		LOD 0.5 μg in the sample (0.01 mg/m3 calculated when sampling 50 l of air)	TLC	Methodical guidelines for identification of harmful substances in air – Moscow: ЦРИА "Morflot", 1981. – p. 228 to 235.

№	Methodical guidelines	Hygienic normative	LOQ	Method	Reference
1	2	3	4	5	6
	Water				
	Methodical guidelines for identification of organochlorine pesticides in water, foodstuff, fodders, and tobacco goods by thin layer chromatography (approved by MH of the USSR with #2142-80 on 1980-01-28)	MAC 0.0004 mg/dm^3 in the water of water bodies and 0.002 mg/dm^3 in the economic and housing water	0.005 mg/dm^3	TLC	Methodical guidelines for identification of microquantity of pesticides in foodstuff, fodders, and environment. – Digest XI. – Moscow: the State chemical committee of the USSR, 1981. – p. 22 to 44.
	Identification of DDT, DDE, DDD, aldrin, dieldrin, heptachlor, kelthane, methoxychlor, ethersulphonate, and other chemical weed and pest killers in water, foodstuff, fodders, and biological media by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)		0.002 mg/dm^3	TLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 9 to17.
	Identification of DDT, DDE, DDD, aldrin, dieldrin, heptachlor, kelthane, methoxychlor, ethersulphonate, and other chemical weed and pest killers in water, foodstuff, fodders, and biological media by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)		0.0004 mg/dm^3	GLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 17 to 20.
	Methodical guidelines for identification of residues of OHPs and products of their decomposition (γ-HCH, α-HCH, heptachlor, aldrin, kelthane, DDE, DDD, and DDT) in water by chromatography methods at their joint availability (approved by MH of the USSR with #4120-86 on 1986-06-01)		0.00008 mg/dm^3	GLC	Methodical guidelines for identification of microquantity of pesticides in foodstuff, fodders, and environment. – Digest XII. – Moscow: the State chemical committee of the USSR, 1981. – p. 99 to 112.

№	Methodical guidelines	Hygienic normative	LOQ	Method	Reference
1	2	3	4	5	6
	Soil	*NN*			
	Methodical guidelines for identification of organochlorine pesticides in water, foodstuff, fodders, and tobacco goods by thin layer chromatography (approved by MH of the USSR with #2142-80 on 1980-01-28)		0.06 mg/kg	TLC	Methodical guidelines for identification of microquantity of pesticides in foodstuff, fodders, and environment. – Digest XI. – Moscow: the State chemical committee of the USSR, 1981. – p. 22 to 44.
4.	**Heptachlor**	ADI 0.0005			
	Air				
	Identification of organochlorine pesticides (aldrin, hexachlorane, DDD, DDVP, DDT, dieldrin, diptal, crotilin, polychloropynene, simazine, tetrachloronitrobenzene, chloroindane, chloro-IFK, chlorophos, chlorophenol in air by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)	TLV – 0.01 mg/m^3 and atmospheric air – 0.001 max/0.0002 mg/m^3 (calculated)	LOD 1 μg in the sample (0.1 mg/m^3 calculated when sampling 50 l of air)	TLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 3 to 9.
	Methodical guidelines for titrimetric, photometric, and chromatographic identification of organochlorine chemical weed and pest killers in air (approved by MH of the USSR with #1718-77 on 1977-04-18)		LOD 0.5 μg in the sample (0.01 mg/m^3 calculated when sampling 50 l of air)	TLC	Methodical guidelines for identification of harmful substances in air – Moscow: ЦРИА "Morflot", 1981. – p. 228 to 235.
	Water				
	Methodical guidelines for identification of organochlorine pesticides in water, foodstuff, fodders, and tobacco goods by thin layer chromatography (approved by MH of the USSR with #2142-80 on 1980-01-28)	MAC 0.001 mg/dm^3 (in the water of water bodies)	0.005 mg/dm^3		Methodical guidelines for identification of microquantity of pesticides in foodstuff, fodders, and environment. – Digest XI. – Moscow: the State chemical committee of the USSR, 1981. – p. 22 to 44.

№	Methodical guidelines	Hygienic normative	LOQ	Method	Reference
1	2	3	4	5	6
	Identification of residues of OHPs at availability of polychlorinated biphenyls in water by gas-liquid chromatography method with electron capture detector (approved by MH of the USSR with #1540-76 on 1976-12-20)		0.00001 mg/dm^3	GLC	Methodical guidelines for identification of microquantity of pesticides in foodstuff, fodders, and environment. – Digest VIII. – Moscow: the State chemical committee of the USSR,, 1977. – p. 1 to 8.
	Identification of DDT, DDE, DDD, aldrin, dieldrin, heptachlor, kelthane, methoxychlor, ethersulphonate, and other chemical weed and pest killers in water, foodstuff, fodders, and biological media by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)		0.002 mg/dm^3	TLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 9 to 17.
	Identification of DDT, DDE, DDD, aldrin, dieldrin, heptachlor, kelthane, methoxychlor, ethersulphonate, and other chemical weed and pest killers in water, foodstuff, fodders, and biological media by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)		0.0004 mg/dm^3	GLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 17 to 20.
	Unified gas chromatography method for identification of residues of OHPs and polychlorinated biphenyls in foodstuff and environmental objects (approved by Coordination center of the Steady committee of agriculture of the Council of mutual economical aid, Poznan town, October of 1987)		0.00001 mg/dm^3	GLC	Unified methods of identification of residues of pesticides in foodstuff, fodders, and environment – Poznan, the Council of mutual economical aid, the Steady committee of agriculture. Coordination center, 1987. – p. 58 to 83.
	Methodical guidelines for identification of residues of OHPs and products of their decomposition (γ-HCH, α-HCH, heptachlor, aldrin, kelthane, DDE, DDD, and DDT) in water by chromatography methods at their joint availability (approved by MH of the USSR with #4120-86 on 1986-06-01)		0.00008 mg/dm^3	GLC	Methodical guidelines for identification of microquantity of pesticides in foodstuff, fodders, and environment. – Digest XII. – Moscow: the State chemical committee of the USSR, 1981. – p. 99 to 112.

№	Methodical guidelines	Hygienic normative	LOQ	Method	Reference
1	2	3	4	5	6
	Soil				
	Methodical guidelines for identification of organochlorine pesticides in water, foodstuff, fodders, and tobacco goods by thin layer chromatography (approved by MH of the USSR with #2142-80 on 1980-01-28)	MAC 0.05 mg/kg	0.06 mg/kg	GLC	Methodical guidelines for identification of microquantity of pesticides in foodstuff, fodders, and environment. – Digest XI. – Moscow: the State chemical committee of the USSR, 1981. – p. 22 to 44.
5.	**Dieldrin**	ADI unavailable			
	Air				
	Identification of organochlorine pesticides (aldrin, hexachlorane, DDD, DDVP, DDT, dieldrin, diptal, crotilin, polychloropynene, simazine, tetrachloronitrobenzene, chloroindane, chloro-IFK, chlorophos, chlorophenol in air by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)	TLV 0.01 mg/m^3	LOD 1 μg in the sample (0.1 mg/m3 calculated when sampling 10 l of air)	GLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 3 to 9.
	Methodical guidelines for titrimetric, photometric, and chromatographic identification of organochlorine chemical weed and pest killers in air (approved by MH of the USSR with #1718-77 on 1977-04-18)	NN	LOD 0.5 μg in the sample (0.01 mg/m3 calculated when sampling 50 l of air)	TLC	Methodical guidelines for identification of harmful substances in air – Moscow: ЦРИА "Morflot", 1981. – p. 228 to 235.
	Water				
	Identification of DDT, DDE, DDD, aldrin, dieldrin, heptachlor, kelthane, methoxychlor, ethersulphonate, and other chemical weed and pest killers in water, foodstuff, fodders, and biological media by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)	NN		TLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 9 to 17.

№	Methodical guidelines	Hygienic normative	LOQ	Method	Reference
1	2	3	4	5	6
	Soil				
	Identification of heptachlor, heptachlor epoxide and γ-HCH in plants, soil and water (approved by MH of the USSR with #1112-73 on 1973-07-30)	NN	0.01 mg/kg	TLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 33 to 35.
6.	**Endrine**	ADI unavailable			
	Air				
	Identification of organochlorine pesticides (aldrin, hexachlorane, DDD, DDVP, DDT, dieldrin, diptal, crotilin, polychloropynene, simazine, tetrachloronitrobenzene, chloroindane, chloro-IFK, chlorophos, chlorophenol) in air by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)	TLV 0.01 mg/m^3	LOD 1 μg in the sample (0.1 mg/m3 calculated when sampling 10 l of air)	TLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 3 to 9.
	Methodical guidelines for titrimetric, photometric, and chromatographic identification of organochlorine chemical weed and pest killers in air (approved by MH of the USSR with #1718-77 on 1977-04-18)		LOD 0.5 μg in the sample (0.01 mg/m^3 calculated when sampling 50 l of air)	TLC	Methodical guidelines for identification of harmful substances in air – Moscow: ЦРИА "Morflot", 1981. – p. 228 to 235.
	Water				
	Soil				
7.	**Chlordan**	ADI unavailable			
	Air				
	Methodical guidelines for titrimetric, photometric, and chromatographic identification of organochlorine chemical weed and pest killers in air (approved by MH of the USSR with #1718-77 on 1977-04-18)	0.01 mg/m^3	LOD 0.5 μg in the sample (0.01 mg/m^3 calculated when sampling 50 l of air)	TLC	Methodical guidelines for identification of harmful substances in air – Moscow: ЦРИА "Morflot", 1981. – p. 228 to 235.

№	Methodical guidelines	Hygienic normative	LOQ	Method	Reference
1	2	3	4	5	6
	Identification of organochlorine pesticides (aldrin, hexachlorane, DDD, DDVP, DDT, dieldrin, diptal, crotilin, polychloropynene, simazine, tetrachloronitrobenzene, chloroindane, chloro-IFK, chlorophos, chlorophenol) in air by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)		LOD 1 µg in the sample (0.1 mg/m3 calculated when sampling 10 l of air)	TLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 3 to 9.
	Water				
	Soil				
8.	**Toxaphene (polychlorocamphene)**	ADI unavailable			
	Air				
	Identification of polychloropynene and polychlorocamphene in air, water, soil, potato and beetroot, meet, milk, tissues of internal organs of animals, blood, and urine by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)	TLV – NN and atmospheric air – 0.007 mg/m^3	LOD 0.5 µg (0.004 mg/m^3 calculated)	TLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 62 to 69.
	Methodical guidelines for titrimetric, photometric, and chromatographic identification of organochlorine chemical weed and pest killers in air (approved by MH of the USSR with #1718-77 on 1977-04-18)		LOD 0.5 µg in the sample (0.01 mg/m^3 calculated when sampling 50 l of air)	TLC	Methodical guidelines for identification of harmful substances in air – Moscow: ЦРИА "Morflot", 1981. – p. 228 to 235.
	Water				
	Identification of polychloropynene and polychlorocamphene in air, water, soil, potato and beetroot, meet, milk, tissues of internal organs of animals, blood, and urine by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)	MAC 0.002 mg/dm3 in the water of water bodies and 0.005 mg/dm3 in the economic and housing water	LOD 0.5 µg (0.005 mg/m3 calculated)	TLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 62 to 69.

№	Methodical guidelines	Hygienic normative	LOQ	Method	Reference
1	2	3	4	5	6
	Soil				
	Identification of polychloropynene and polychlorocamphene in air, water, soil, potato and beetroot, meet, milk, tissues of internal organs of animals, blood, and urine by thin layer chromatography (approved by MH of the USSR with #1112-73 on 1973-07-30)	MAC 0,5 mg/kg	LOD 0.5 μg (0.01 mg/m^3 calculated)	TLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko – Moscow: Kolos printing house, 1977. – p. 62 to 69.
	Identification of polychloropynene in water, soil, potato, beetroot and its tops, and meat in the availability of DDT and other organochlorine pesticides and polychlorocamphene in soil (approved by MH of the USSR, 1971)		0.05	TLC	Methodical guidelines for identification of microquantity of pesticides in foodstuff, fodders, and environment. – Digest V. – Moscow: the State chemical committee of the USSR, 1971. – p. 53 to 62.
	Chromatography method of identification of polychlorocamphene in soil (approved by MH of the USSR, 1974)		0.05	TLC	Methodical guidelines for identification of microquantity of pesticides in foodstuff, fodders, and environment. – Digest VI, P. I. – Moscow: the State chemical committee of the USSR, 1974. – p. 123 to 125.
9.	**Mirex**	ADI unavailable			
	Air				
	Water				
	Soil				
10.	**PCDDs**	ADI unavailable			**Officially approved control methods unavailable**
	Air	NN			
	Water	NN (but dioxin – 0.000035 mg/m^3)			
	Soil	NN			

№	Methodical guidelines	Hygienic normative	LOQ	Method	Reference
1	2	3	4	5	6
11.	**PCDFs**	ADI unavailable			**Officially approved control methods unavailable**
	Air				
	Water				
	Soil				
12.	**PCBs**	ADI unavailable			
	Air				
	Method for performing measurements of mass concentration of polychlorinated biphenyls in air of working area and exhausts of air from production areas and installation for regeneration of pyralene by spectrophotometry method (Coordinated by MH of Ukraine: Decree of MH of Ukraine #2 dated 2003-01-08, attested by SCTRCP of Ukraine, attestation certificate MBB 081/12-0072-02 dated 2002-12-29)	TLV 1.0 mg/m^3			
	Water				
	Methodical guidelines for identification of organochlorine pesticides and polychlorinated biphenyls at their joint availability in environmental objects and biological materials (approved by MH of the USSR with #1792 on 1977-11-18)	MAC 0.001 mg/m^3	0.0003 mg/dm^3	GLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko, Doct. of Sc. (Biol.) – Moscow: Kolos printing house, 1983. – p. 10 to 18.
	Unified gas chromatography method for identification of residues of OHPs and polychlorinated biphenyls in foodstuff and environmental objects (approved by Coordination center of the Steady committee of agriculture of the Council of mutual economical aid, Poznan town, October of 1987)		0.0003 mg/dm^3	GLC	Unified methods of identification of residues of pesticides in foodstuff, fodders, and environment – Poznan, the Council of mutual economical aid, the Steady committee of agriculture. Coordination center, 1987. – p. 58 to 83.

№	Methodical guidelines	Hygienic normative	LOQ	Method	Reference
1	2	3	4	5	6
	Soil				
	Methodical guidelines for identification of organochlorine pesticides and polychlorinated biphenyls at their joint availability in environmental objects and biological materials (approved by MH of the USSR with #1792 on 1977-11-18)	MAC total 0.06 mg/kg including pentachloroben zene 0.01 mg/kg, tetrachlorobenzene 0.06 mg/kg, and trichlorobenzene 0.03 mg/kg	0.03 mg/kg	GLC	Methods of identification of microquantity of pesticides in foodstuff, fodders, and environment. Editor M.A.Klisenko, Doct. of Sc. (Biol.) – Moscow: Kolos printing house, 1983. – p. 10 to 18.
	Unified gas chromatography method for identification of residues of OHPs and polychlorinated biphenyls in foodstuff and environmental objects (approved by Coordination center of the Steady committee of agriculture of the Council of mutual economical aid, Poznan town, October of 1987)		0.03 mg/kg	GLC	Unified methods of identification of residues of pesticides in foodstuff, fodders, and environment – Poznan, the Council of mutual economical aid, the Steady committee of agriculture. Coordination center, 1987. – p. 58 to 83.

Note: NN – not normed; GLC – gas-liquid chromatography; TLC – thin layer chromatography; HPLC – high performance liquid chromatography; TLV – air of working area; ADI – acceptable daily intake.

VALID SANITARY POPS STANDARDS

POPs	Hygienic standards		
	Air of working area	Ambient air	Drinking water
	MPC	MPC	MPC
DDT – dichloro-diphenyl-trichloroethane	0,1	– 0,005*	0,1
Aldrin [+]-	0,01	0.0005 (ASLE)	0,002
Dieldrin (dildrin)	0,01	–	–
Endrin -	–	–	–
Chlordan - (chlorindan)	0,01	–	–
Heptachlor-	0,01	– 0,001*	0,05
Hexachlorobenzene[+]-	0,9	0.013 (ASLE)	0,05
Mirex	–	–	–
Toxaphene (polychlorocamphene)	–	0.007 (ASLE)	0.005
Polychlorobiphenyls[+] PCBs	1	–	0,001
Polychlorodibenzofuranes PCDFs	–	–	–
Polychlorodibenzoxines PCDDs	–	–	–

* The standard has been substantiated for active ingredient (a.i.) of the pesticide designated for conditions of agricultural manufacture and accepted as "universal" framework of the program of POPs elimination.